Nº de Aluna: 26055

CHINA'S SPACE PROGRAM: A NEW TOOL FOR PRC "SOFT POWER" IN INTERNATIONAL RELATIONS?

MARA IMRAN

MASTER DISSERTATION

Supervisor: Dr. Tiago Moreira de Sá

SEPTEMBER

2010

F C S H
Faculdade de Ciências Sociais e Humanas
Universidade Nova de Lisboa

DECLARATION

I declare that this thesis is the result of my independent and personal research. Its content is original and all sources consulted are duly mentioned in the text, notes and bibliography.

The candidate,

_____

Lisbon, ... of ..... of .....

I declare that this thesis is able to be submitted to public examination.

The supervisor,

_____

Lisbon, ... of ..... of .....

Personal Dedication

In the name of God Almighty, most gracious and most merciful, who blessed me with the wisdom and knowledge to accomplish my goal.

I dedicate this work to my dear husband, Dr. Tayyab Imran who encouraged me in my desire and determination to enhance my knowledge. I could not have completed this journey without him. He inspired, motivated, and challenged me in every step of life since I married, especially for believing in me. Also, I would like to dedicate my work to my baby who is soon to arrive in this world.

ACKNOWLEDGMENTS

It is with great pleasure that I thank the many people who made my education and this thesis possible. It has been a fantastic experience for me, as a person from Romania, to study and live for two years in Portugal. My life has become much more enriched by this experience. I have established friendship with many nice people and as a student I got the chance to learn a lot about Portuguese culture and history.

I am grateful and indebted to all my professors in Ciência Política e Relações Internacionais Área de Especialização em Relações Internacionais, for giving me the chance and opportunity to pursue my Master at the Universidade Nova de Lisboa. My special thanks to Prof. Dr. Carlos Gaspar, who has provided me with stimulating discussions in his classes. I truly value your opinion and expertise, thank for your support and motivation during the course of my study.

My highest regard goes to Dr. Tiago Moreira de Sá, for all your support and sound advice during my stay at UNL FSCH and especially helping me in organize my thoughts in writing this thesis. Without his supervision, this thesis would not have been a reality, thanks again for your valuable time and guidance.

RESUMO

Quando a China lançou um anti-satélite (ASAT) em Janeiro de 2007 para destruir um de seus satélites meteorológicos inactivos, a maioria das reacções de académicos e especialistas espaciais dos Estados Unidos da América focaram-se numa potencial "corrida espacial" militar entre os Estados Unidos e China.

Esquecido, no entanto, é o crescente papel da China como competidor global no lado *não-militar* do espaço. O programa espacial Chinês vai muito além das aplicações militares contra-espaciais e as manifestas aspirações a missões tripuladas, incluindo a exploração lunar. A sua busca de ambos os empreendimentos comerciais e científicos internacionais constitui uma pequena, mas crescente, percentagem global de lançamentos para o espaço e para a indústria dos serviços relacionados com satélite. Destaca-se também a vontade da China para cooperar com as nações distantes da Ásia para fins políticos e estratégicos. Estas parcerias podem constituir um desafio para os Estados Unidos e aumentar o "soft power" da China entre os principais aliados dos Estados Unidos e mesmo em algumas regiões tradicionalmente de influência estado-unidense (por exemplo, a América Latina e África). Assim sendo, uma resposta adequada dos E.U.A. não pode estar assente no empreendimento de um esforço contra-espacial baseado no "hard power", mas sim num renascimento dos esforços estado-unidenses de exploração espacial do passado, bem como a implementação de políticas de controle de exportações mais favoráveis para os negócios.

PALAVRAS-CHAVE: China, República Popular da China, o espaço, os satélites, soft power, contra-espaciais, APSCO, APRSAF, E.U.A., política espacial, a segurança do espaço, ASAT, ITAR

ABSTRACT

When China launched an anti-satellite (ASAT) weapon in January 2007 to destroy one of its inactive weather satellites, most reactions from academics and U.S. space experts focused on a potential military "space race" between the United States and China. Overlooked, however, is China's growing role as global competitor on the *non-military* side of space. China's space program goes far beyond military counterspace applications and manifests manned space aspirations, including lunar exploration. Its pursuit of both commercial and scientific international space ventures constitutes a small, yet growing, percentage of the global space launch and related satellite service industry. It also highlights China's willingness to cooperate with nations far away from Asia for political and strategic purposes. These partnerships may constitute a challenge to the United States and enhance China's "soft power" among key American allies and even in some regions traditionally dominated by U.S. influence (e.g., Latin America and Africa). Thus, an appropriate U.S. response may not lie in a "hard power" counterspace effort but instead in a revival of U.S. space outreach of the past, as well as implementation of more business-friendly export control policies.

KEYWORDS: China, People's Republic of China, space, satellites, soft power, counterspace, APSCO, APRSAF, U.S. space policy, space security, ASAT, ITAR.

TABLE OF CONTENTS

INTRODUCTION……1

1. RESEARCH QUESTION AND OBJECTIVE ……...2
2. REVIEW OF THE LITERATURE……..3
3. RESEARCH METHODOLOGY AND SOURCES……..10
4. OVERVIEW OF PROBLEMS AND HYPOTHESIS……...11
5. IMPORTANCE AND RELEVANCE TO U.S. POLICY……..12
6. STRUCTURE OF THE CHAPTERS……13

CHAPTER I: CONCEPTUAL FRAMEWORK OF "SOFT POWER"……15

I. 1. DEFINITION AND SOURCES OF "SOFT POWER"…….16
I. 2. "SOFT POWER" WITH CHINESES CHARACTERISTICS……..18

CHAPTER II: CHINESE SPACE MOTIVATIONS AND CAPABILITIES……...24

II. 1. SPACE PROGRAMS: ONLY A SUPERPOWER LUXURY?.....24
II. 2. MOTIVATIONS AND EMERGING CAPABILITIES OF THE CHINESE SPACE PROGRAM…….26
II. 3. CINA'S SPACE LAUNCH FACILITIES……....32
II. 4. CHINA'S SPACE TRACKING CAPABILITY……...33
II. 5. CHINA'S MANNED SPACE PROGRAM……..34
II. 6. CHINA'S SATELLITES……...35

CHAPTER III: CHINA'S "SOFT POWER" IN SPACE: DOMESTIC ASPECTS…...38

III. 1. SHENZHOU: LEADERSHIP LEGITIMIZER?.....40
III. 2. AMBITIONS FOR THE MOON, MARS & A SPACE STATION…….44
III. 3. DOMESTIC SPACE APPLICATIONS & SPINOFFS……....51

CHAPTER IV: CHINA'S "SOFT POWER" IN SPACE: INTERNATIONAL ASPECTS.....61
IV. 1. CHINA WITH EUROPE.....64
IV. 2. CHINA WITH SOUTH AMERICA.....66
IV. 3. CHINA WITH AFRICA.....70
IV. 4. CHINA WITH ASIA.....73
IV. 5. CHINA WITH THE UNITED NATIONS.....76
IV. 6. CHINA AND POSSIBLE SPACE CHALLENGERS IN ASIA.....79
IV. 7. CHINA AND THE UNITED STATES: RIVAL, COMPETITOR, OR PARTNER?.....83

CONCLUSION.....91
LIST OF REFERENCES.....104
LIST OF FIGURES.....128
LIST OF TABLES.....129

LIST OF ABBREVIATIONS AND ACRONYMS

ABM	Anti-Ballistic Missile Treaty
AP-MCSTA	Asia-Pacific Multilateral Cooperation in Space Technology and Applications
APRSAF	Asia-Pacific Regional Space Agency Forum
APSCO	Asia-Pacific Space Cooperation Organization
ASAT	Anti-Satellite
ASEAN	Association of South East Asian Nations
BMD	Ballistic Missile Defense
CALT	Chinese Academy of Launch Vehicle Technology
CAS	China Academy of Sciences
CASC	China Aerospace Science & Technology Corporation
CAST	China Academy of Space Technology
CBERS	China-Brazil Earth Resources Satellite
CCP	Chinese Communist Party
CCTV	China Central Television
CD	Conference on Disarmament
CLEP	Chinese Lunar Exploration Program
CNSA	China National Space Agency
COPUOS	Committee on the Peaceful Uses of Outer Space (UN)
CSSTEAP	Center for Space Science and Technology Education in Asia and the Pacific (UN)
CZ	Chang Zheng ("Long March")
DFH	Dong Fang Hong ("The East is Red")
DoD	Department of Defense (US)
DSP	Defense Support Program
EOSAT	Earth Observation Satellite Company (US)
ESA	European Space Agency

EU	European Union
EVA	Extravehicular Activity
F-BOM	Fratricide by Orbital Mechanics
FMCT	Fissile Material Cutoff Treaty
GEO	Geosynchronous Orbit
GIS	Geographic Information System
GPS	Global Positioning System
IADC	Inter-Agency Debris Coordinating Committee
ICBM	Intercontinental Ballistic Missile
INEP	National Institute of Space Investigation Brazil
IR	International Relation
ISRO	Indian Space Research Organization
ISS	International Space Station
ITAR	International Traffic in Arms Regulations
KKV	Kinetic Kill Vehicle
LEO	Low Earth Orbit
MEO	Medium Earth Orbit
MTCR	Missile Technology Control Regime
MOST	Ministry of Science and Technology
MoU	Memorandum of Understanding
MTCR	Missile Technology Control Regim
MUST	Macao's University of Science and Technology
NAOC	National Astronomical Observatories, Chinese Academy of Sciences
NASA	National Aeronautics and Space Administration (US)
NATO	North Atlantic Treaty Organization
NMD	National Missile Defense
NOAA	National Oceanic and Atmospheric Administration (US)
NRSCC	National Remote Sensing Center of China
NSAs	Nuclear Disarmament, Negative Security Assurances

OOSA	Office of Outer Space Affairs (UN)
PAROS	Prevention of Arms Race in Outer Space
PNT	Precision Navigation and Timing
PLA	People's Liberation Army (China)
PPWT	Prevention of the Placement of Weapons in Outer Space
PRC	People's Republic of China
RESAP	Regional Space Application Program (UN)
SCOSA	Sub-Committee on Space technology and Applications (ASEAN)
SMMS	Small Multi-Mission Satellite
TCBM	Transparency and Confidence Building Measures in Outer Space Activities
THEOS	Thailand Earth Observation Satellite
TT&C	Telemetry, Tracking & Control
UN	United Nations
UNESCAP	Economic and Social Commission for Asia and the Pacific's (UN)
US	United States

INTRODUCTION

The purpose of this dissertation is to examine the political dimension of contemporary space activities by analyzing the strategic objectives and motivations of the governments that undertake this programme particularly how China is using space as a "soft power" tool in International Relations and whether Washington is miscalculating the main direction of China's threat to U.S. space policy and strategy.

Today's world politics is in fase of transition from unipolarity to multipolarity, and it's characterized by competition among nations. As Robert Kagan notes, the grand expectation that after the Cold War the world would enter an era of a peaceful and homogeneous international system has proven wrong. Competition for status and global influence has once again become the key feature of the international scene.[1]

As a reflection of the international system, the contemporary space environment is characterized by a multiplicity of space-faring nations[2] competing for honour and influence. Where the traditional space pattern was limited to the political-military confrontation of the United States and the former Soviet Union, recent decades have seen the rapid proliferation of new nations active in space, including developing and smaller countries.

China, India, Japan and the European Union all now have independent capabilities to send satellites and spacecraft into orbit, including the indigenous production of launch vehicles. Several other countries, such as Israel, South Korea, Brazil, Iran, Malaysia, Pakistan, Turkey and Taiwan, are at various stages of development of their own satellite and launching capabilities.

The origin of the "Space Age", and thus of the politics of space, can be traced back to the 4th October 1957, when the Soviet Union launched, from a secret missile base in the Soviet Republic of Kazakhstan, the first man-made orbiting satellite, Sputnik I.

This event is regarded as a fundamental transition point in world history and changed the context of international relations, generating the global perception that the United

[1] Kagan, R 2008, The Return of History and the End of Dreams.
[2] The term space-faring nation is used to define a nation capable to launch vehicles into space

States was technically inferior to, and hence potentially weaker, than the Soviet Union, and conferring to the latter significant prestige, translated as an increased power status[3].

The United States' political status and national interests were therefore at stake when President John F. Kennedy announced in 1961 the creation of the Apollo program, intended to send a man to the moon and back before the end of the decade.

The Apollo program was therefore created to counter the negative perception generated by the Sputnik's success; the logic behind Apollo was a space race for leadership strategy in the Cold War fight for global influence against the Soviets.

As Joan Johnson-Freese notes, space is a *strategic asset* capable of directly securing national and foreign policy interests, and it "has never been solely, or even primarily, about exploration. It has always been linked to other goals, usually related to foreign policy."[4]

The studies of Michael Sheehan also provide a corrective to the idea that space programmes are science-driven, according to Sheehan, "space and politics are, and always have been, inseparably interlinked. The central driving force for all space programmes has been political objectives. Space programmes have reflected and implemented the prevailing national and international ideologies of the time, whether they are power politics, communist internationalism, European integration, national self-determination or anything else".[5]

1. RESEARCH QUESTION AND OBJECTIVE

Ever since China launched an anti-satellite (ASAT) weapon in early 2007 to destroy one of its inactive weather satellites, a great deal of attention has focused on prospects for a possible military "space race" between the United States and China.

---

[3]The U.S. Information Agency in the report "Impact of U.S. and Soviet Space Programs on World Opinion", published in July 1959, determined: "In sum: Sensitivity to military implications is marked, and has produced strong concern over the possibility that the USSR now enjoys military superiority over the West, and a belief in some quarters that this is a fact…Soviet successes in space have produced a major revision in the image of the USSR and to some degree of the Soviet system, and lent greatly enhanced credibility to Soviet propaganda claims. The USSR, by appearing to have spectacularly overtaken the US in a field in which the US was very generally assumed to be first by a wide margin, is now able to present itself as fully comparable to the US and able to challenge it in any field it chooses -- perhaps the most striking aspect of the propaganda impact of space developments".

[4]Johnson-Freese, J 2007, *Space as a Strategic Asset*, Columbia University Press, p.7.

[5] Sheehan, M 2007, *The International Politics of Space,* Routledge, p.2

However, has been overlooked is China's growing role as global competitor on the *non-military* side of space. Thus, the focus of this thesis addresses the question of how is China using cooperative commercial and scientific space ventures as part of a larger strategy to increase its soft power and enhance its international reputation and influence with in Asia and across the globe.

The objective of this research consists in providing a better understanding of the contemporary politics of space. The present acceleration and expansion of international space capabilities and activities will be therefore described in terms of *"soft power,"* that is the quest for international prestige and national pride.

2. REVIEW OF THE LITERATURE

The literature on China's space activities is already voluminous. A subset of this work address issues of direct relevance to this thesis: Is China pursuing a space program to enhance national unity? Or is it focused more on its economic development? It is done for international respect? Or are the efforts at military power projection through space assets part of a larger anti-access strategy so it can retake Taiwan without interference from Washington?

A study by U.S. Air Force Lt. Col. J. Barry Patterson looked at China's space program from the perspective of the threat posed to the United States in two main areas: economic impact and security. He argues that since the Chinese space program is subsidized by the government (exaggerated further by the generally lower comparative wages for its space scientists as well the undervalued *renminbi*), Beijing is in a position to "dump" space launch services onto the world market.[6] He also cites security concerns that any assistance given to the Chinese in increasing launch reliability and apogee kick motor technologies would be directly transferable to their Intercontinental Ballistic Missile (ICBM) program and, worse yet, possibly exported to "rogue nations" and used against American interests.[7] Given that the paper was written in 1995, some of the data are not as relevant today, especially given the growing number of Chinese commercial

[6] Lieutenant Colonel J. Barry Patterson, *China's Space Program and its Implications for the United States* (Maxwell AFB, Ala.: Air War College, April 19, 1995), 16.
[7] Ibid. 20-22. Apogee kick motors are used to boost satellites from geostationary transfer orbit (GTO, approx. 600 miles) out to geostationary (GEO, approx. 22,300 miles) but would also help Chinese military refine their solid-rocket motors.

and non-strategic (space science) launches since the Loral-Hughes scandal. However, the potential for dual-use, civilian-military space technology transfer has been consistently raised as one of main objections to Chinese-U.S. space cooperation and the issue will likely remain a thorny issue for some time to come.

Steven Lambakis sees China's growing commercial space capabilities as having an important role to play militarily as well. He highlights Chinese recognition of space as a "new arena for competition" and a "strategic frontier" that needs to be defended.[8] Citing a number of Chinese Army generals, defense professionals, and numerous FBIS translations from Chinese military journals dating mostly from the mid-1990s, he draws the conclusion that that China fully understands and appreciates the wide array of military advantages that space offers, especially in a Taiwan Strait scenario. He asserts that "military satellites are now legitimate targets in war…and thus ASATs are legitimate weapons".[9]

Three events in recent history have shaped a decidedly negative view of the Chinese space program: the Cox Commission Report, the Wen Ho Lee scandal, and the 2007 Chinese Anti-Satellite (ASAT) test. The Cox Commission Report, released in 1999, painted China as a direct threat to the United States, especially with regard to space-based as well as ground-based anti-satellite systems.[10] Its genesis was the botched Chinese Long March 2E rocket launches of Hughes satellites in 1992 and 1995 and the failed Long March 3B launch of Loral's *Intelsat 708* and the subsequent efforts by these U.S. companies to help the Chinese analyze and overcome their technical problems. Although several chapters of the Cox report are concerned with possible transfers of high performance computers and U.S. nuclear weapons designs, the bulk of the report investigates Chinese acquisition of American technology for their missile and space forces and satellite launches. It details Chinese efforts to use U.S. technology to enhance their Intercontinental Ballistic Missile (ICBM) and military space program through advances in missile airframe fairing (shroud) design and reliability, improved guidance

---

[8] Steven J. Lambakis, *On the Edge of Earth: The Future of American Space Power* (Lexington, KY: University of Kentucky Press, 2001), 192-193.

[9] Lambakis, On the Edge of Earth: The Future of American Space Power, 194. Also see William E. Burrows, The Survival Imperative: Using Space to Protect Earth (New York, NY: Forge, Tom Doherty & Associates, 2006), 217.

[10] The classified report was released on January 3, 1999, and the declassified report on May 25, 1999.

and control, staging mechanisms and associated kick motors and "smart" dispensers, stress & load tests, launch failure anomaly analysis & diagnostics, coupled loads analysis, and modeling and simulation.[11] Although there is the larger theme of Chinese technology stealing through various schemes, the report's conclusion is that American space technology wrongfully ended up in Chinese hands.[12]

On the heels of the Cox Report, was the alleged theft of U.S. nuclear warhead design secrets and transfer to the Chinese by Wen Ho Lee, a naturalized U.S. citizen from Taiwan and a scientist working at the Los Alamos weapons research facility. Although he was arrested in December 1999 and spent nine months in solitary confinement, he was eventually cleared of the 59 charges against him except for having to pay a $100 fine for "mishandling classified data".[13] Nevertheless, there was a cloud of suspicion over anything dealing with Chinese space and missile technology in the late 1990s.

Although China's space program continued to grow despite the Congressional backlash after the Cox Report and resulting ban on technology exports to China, its unannounced shootdown of an inactive weather satellite on January 11, 2007, by a directascent Kinetic-Kill-Vehicle (KKV), resurrected ill feelings of how China was behaving and why everyone should be suspicious of its growing space aspirations. The use of ASATs for space control or space warfare is not a new topic and has been written about extensively.[14] However, China was never seriously mentioned until the turn of the

---

[11] Christopher Cox, *U.S. National Security and Military/Commercial Concerns with People's Republic of China* (Washington D.C.: U.S. House of Representatives, Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China, 1999), Ch. 4, 225-232; Ch.5, 2-5, 76-84.

[12] For a rebuttal to the Cox Report, see Stanford University's Center for International Security and Cooperation (Alastair Iain Johnston, et al.), see: http://iisdb.stanford.edu/pubs/10331/cox.pdf. The Cox Committee Rebuttal to the "Stanford Assessment," as well as the Stanford "response" to the Cox rebuttal are also conveniently located at: http://www.people.fas.harvard.edu/~johnston/cox.html.

[13] A copy of the 59-count indictment can be viewed at: http://www.fas.org/irp/ops/ci/docs/lee_indict.html. Also see Paul Fahri, "U.S., Media Settle with Wen Ho Lee," *Washington Post*, June 3, 2006, http://www.washingtonpost.com/wpdyn/content/article/2006/06/02/AR2006060201060.html (accessed November 27, 2009). He sued the government for supposedly leaking sources and violating his privacy to the media, and was awarded $1.6 million in damages in June 2006. For a criticism of the media's role in the Wen Ho Lee case, see Robert Scheer's, "No Defense: How the 'New York Times' Convicted Wen Ho Lee," in *The Nation*, October 23, 2000, http://www.thenation.com/doc/20001023/scheer. Lee also co- authored a book about his ordeal, *My Country Versus Me: The First-Hand Account by the Los Alamos Scientist Who Was Falsely Accused of Being a Spy* (New York, NY: Hyperion, 2003).

[14] See Joseph S. Nye, Jr. and James A. Schear, eds., *Seeking Stability In Space: Anti-Satellite Weapons and the Evolving Space Regime* (Lanham, MD: Aspen Strategy Group and University Press of

century when reports about its research and development of anti-space doctrine came to the forefront.

The RAND Corporation under *Project Air Force* published a recent study on China's "antiaccess strategies" that specifically mentioned "attacks on satellites" as part of a potential Chinese military strategy to counter U.S. military superiority.[15] Although the ASAT test demonstrated only a capability to strike a satellite in low-earth orbit (LEO), this would enable China to hit U.S. imagery intelligence satellites, which were one of the top priority targets based on RAND's assessment.[16]

Beyond a direct-ascent Kinetic Kill Vehicle (KKV), are have been additional writings on other aspects of a potential Chinese anti-space program, including ground-based lasers, micro-satellites or parasite satellites, as well as nuclear warhead-generated high-altitude electromagnetic pulses to disable enemy satellites.[17] In general, the defense industry-related articles tend to paint any Chinese progress in space as a menacing threat. Even China's wellpublicized *Shenzhou* human space program has come under scrutiny as actually serving as a cover for reconnaissance purposes.[18]

Despite some of the military and national security concerns, the focus of this thesis is on how China is using space as a "soft power" tool in International Relations (IR) and whether Washington is miscalculating the main direction of China's threat to U.S. space policy and strategy. To that end, Joan Johnson-Freese notes that one purpose of space programs is "techno-nationalism," which she defines as, "using technology to build

---

America, 1987); Steven J Lambakis, *On the Edge of Earth: The Future of American Space Power* (Lexington, KY: University of Kentucky Press, 2001); Colonel Susan M. Puska, ed., *People's Liberation Army After Next* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, August 2000); Jeffrey G. Lewis, *The Minimum Means of Reprisal: China's Search for Security in the Nuclear Age* (Cambridge, MA: MIT Press, 2007).

[15] Roger Cliff, Mark Burles, Michael S. Chase, Derek Eaton, and Kevin Pollpeter, *Entering the Dragon's Lair: Chinese Antiaccess Strategies and Their Implications for the United States* (Santa Monica, CA: RAND, 2007), 57-58.

[16] Ibid. 59.

[17] Stacey Solomone, "China's Space Program: The Great Leap Upward," *Journal of Contemporary China* (Vol. 15, No. 47, May 2006):316-317; Richard D. Fisher, Jr., "Space to Manoevre – Satellite Attack Upsets U.S. Space Supremacy," *Jane's Intelligence Review* (March 01, 2007); Mark A. Stokes, *China's Strategic Modernization: Implications for the United States* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 1999). For world reaction to ASAT test, see WMD Insights. "Special Report: Chinese Anti-satellite Weapon Test – The Shot Heard 'Round the World," *WMD Insights: Issues and Viewpoints in the International Media,* http://www.wmdinsights.com/I13/I13_EA1_SP_PRC_ASAT.htm (accessed December 21, 2009).

[18] Desmond Ball, "China Pursues Space-Based Intelligence Gathering Capabilities," *Jane's Intelligence Review* (December 01, 2003).

stature and power perceptions".[19] Clearly, a country that is able to build its own satellites, launch them, and then control them to exploit the space domain is among an elite group of nations and enjoys higher prestige than those that cannot. Especially for nations wishing to become "players in space" and "build knowledge-based societies, technology development…attract more global information technology jobs…and link [rural] villages and cities,"[20] some kind of national investment in space is absolutely essential.

As China dips into its state resources to pursue its space program, there are natural, tangible benefits that will result. Job creation, stimulation of national interest in science, math, aerospace, and astronomy, and "spin-off" technologies resulting from space program research and development are but a few. However, there are more intangible, yet very real, benefits as well. First, a successful space program, especially a manned-space version, brings heightened global prestige as well increased internal credibility and prowess to the supporting scientific and technical communities. Johnson-Freese likens the Chinese effort to the American success enjoyed during the heyday of the Apollo program, and adds that "a successful demonstration…in manned spaceflight carr [ies] significant geopolitical implications…technology advancements can be viewed to indicate national stature, and potentially, power".[21]

Johnson-Freese follows this theme in another work, stating that "space is one of the most globalized aspects of world commerce,"[22] inferring that non-space players are behind the power curve in the increasingly globalized world. Specifically addressing China, Johnson-Freese notes that China wants to develop space capabilities "as part of globalization efforts and to send a techno-nationalist message regionally and globally".[23]

The concept of "techno-nationalism" has some parallels to Joseph Nye's term "soft power," which he defines as "the ability to get what you want through attraction rather than coercion or payments. It arises from the attractiveness of a country's culture,

[19] Joan Johnson-Freese, *Space as a Strategic Asset* (New York: Columbia University Press, 2007), 11.
[20] Johnson-Freese, *Space as a Strategic Asset*, 169, 202.
[21] Ibid., 11.
[22] Johnson-Freese, "Strategic Communication with China: What Message About Space?" 44.
[23] Ibid., 52.

political ideals, and policies".[24] Nye sees China's efforts in space as a way to "help increase its prestige and attraction".[25] For China's space program to attract countries in Africa and South America, some measure of soft power may have been usefully applied.

Joshua Kurlantzick cites as growing evidence of Chinese soft power the "large official delegations from…Brazil and various African nations that now regularly visit China at the government's invitation"[26] as well as "in older groupings like the Association of Southeast Asian Nations [ASEAN] and in newer pan-Asian institutions, like the East Asia summit".[27] From a space perspective, this was manifested initially in the creation of the Asia-Pacific Multilateral Cooperation in Space Technology and Applications (AP-MCSTA) and then its subsequent transformation into the Asia-Pacific Space Cooperation Organization (APSCO), conveniently headquartered in Beijing.[28]

U.S. Navy Commander John Klein assesses China's rise in space as primarily associated with national power, national strategy, international influence, and world prestige. Although his main intent is to use historical maritime strategy to address current U.S. space strategy, he notes that as China continues to expand its "celestial lines of communication," it will have a "greater say in how the most desirable communications frequencies and geostationary orbital slots are assigned and used," and thus able to use coercive diplomatic influence if needed.[29]

China scholar David M. Lampton also elaborates the argument about China's "underappreciated space program" as one aspect of its power projection, economic

---

[24] Joseph S. Nye, Jr., *Soft Power: The Means to Success in World Politics* (NY: Perseus Books Group, 2004), x.
[25] Nye, Soft Power: The Means to Success in World Politics, 88.
[26] Joshua Kurlantzick, "China's Charm Offensive," *Commentary*, 122,3 (2006): 37.
[27] Ibid., 38. See also his article, "China's Charm: Implications of Chinese Soft Power," *Carnegie Endowment for International Peace*, Policy Brief No. 47, June 2006; "China's Latin Leap Forward." *World Policy Journal*, Fall 2006; also James H. Hoey, "The Global Reach of Chinese Soft Power: China's Rise and America's Decline?" M.A. Thesis, Naval Postgraduate School, September 2007; "China's Foreign Policy and "Soft Power" in South America, Asia, and Africa," Senate Foreign Relations Committee Report, April 2008; and Phillip Saunders, "China's Global Activism: Strategy, Drivers, and Tools," *INSS Occasional Paper*, NDU Press, October 2006.
[28] See APSCO website: http://www.apmcsta.org.
[29] John J. Kelin, Space Warfare: Strategy, Principles and Policy (New York, NY: Rutledge, 2006), 62. CDR Klein suggests "celestial lines of communication" (CLOC) be used instead of "space lines of communication" (SLOC) to avoid acronym confusion with the standard "sea lines of communication" (SLOC).

development, and more importantly "ideational power".[30] At its foundation, ideational power does not involve financial incentives or threats of military force. Rather, it comes from "the intellectual, cultural, spiritual, leadership, and legitimacy resources that enhance a nation's capacity to efficiently define and achieve national objectives".[31] He acknowledges some similarities between "ideational power" and Joseph Nye's "soft power" and Amitai Etzioni's "normative power," but adds that his term is broader in the sense that it also "includes leadership, human resources, innovation, and culture".[32] Thus China's push into space has intellectual attraction, creates a sense of national unity, can help promote economic development and raise standards of living, and can add diplomatic legitimacy to China as its participates in international space affairs.[33]

A recent study by Kevin Pollpeter portrays China's efforts as aimed at taking "a leading role in regional space cooperation" and as having the potential for space power to contribute to China's comprehensive national power, as well as to "advance China's diplomatic interests with oil-rich countries".[34] He devotes considerable effort to documenting the rise of Chinese commercial space prowess and how that will challenge American military, political, commercial, and economic interests.

Janie Hulse highlights the gradual pullout of American clout in Argentina and its subsequent replacement with Chinese technical assistance and influence. She underscores the threat to the United States manifested in China's desire cooperate with Brazil on spy satellite technology, as well as Western hemispheric space tracking facilities, which would give China extremely convenient monitoring of U.S. satellites and improved imagery of North America.[35] Although she also focuses on the telecommunications

---

[30] David Lampton, *The Three Faces of Chinese Power: Might, Money, and Minds* (Berkeley, CA: University of California Press, 2008), 56.
[31] Ibid., 118.
[32] Lampton, *The Three Faces of Chinese Power: Might, Money, and Minds*, 56.
[33] Ibid., 119.
[34] Kevin Pollpeter, *Building for the Future: China's Progress in Space Technology During the Tenth 5-Year Plan and the U.S. Response* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, March 2008), vii, 31.
[35] Janie Hulse, *China's Expansion into and U.S. Withdrawal from Argentina's Telecommunications and Space Industries and the Implications for U.S. National Security* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, September 2007), 20-21 and 34-35.

industry, she nonetheless sees the international commercial space arena in Central and South America as a vital industry where America's preeminence may be waning.

3. RESEARCH METHODOLOGY AND SOURCES

This thesis pursues both *historical* and *political science* methodologies in this thesis. By pursuing a "blended" approach, I mean it first examines the history of the Chinese space program briefly, concentrating on Beijing's initial forays into cooperative commercial and scientific ventures with other nations. It then highlights the current political science debate over the nature of the Chinese "threat" in space, which most analysts have assumed to be centered on hard-power and military dimensions. It then investigates possible concerns on the "soft power" side and on China's motivations in forging international partnerships through space projects and joint scientific endeavors. The thesis looks at the parallel developments in China's "soft power" approaches to commercial space, sketching the rise of AP-MCSTA and APSCO, space initiatives in ASEAN, as well as its diplomatic outreach through space ventures with Russia, and countries in the European Union, Africa and South America.

Additionally, this thesis examines the various United Nations space-related organizations, treaties, and conventions of which China is a member and signatory nation. The history of these organizations, as well as the treaties, helps to sketch the rise of Chinese influence in space through international fora. As noted by CNA China Space analyst Dean Cheng, China did not have a say regarding the formation of arms control and Missile Control Technology Regime (MCTR) rules, but has "sought a seat at the table on space issues, in order to help establish the fundamental 'rules of the road'.[36] Exploring the role and contributions that Chinese have made through the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) Regional Space Application Programme (RESAP) is useful, especially in tracking Chinese soft power efforts and ability to influence as well as "[determine] the international terms and conditions for space operations".[37]

---

[36] Dean Cheng, "China and the International Space Community: A Brief Overview," *Chinese Military Update*, Vol. 1, No. 5 (October 2003): 2.

[37] Cheng, "China and the International Space Community: A Brief Overview," 2.

Finally, this thesis uses both the 2000 and 2006 PRC State Council White Papers on space as baselines for what China has officially stated in regard to the intentions of its space program. Since information on most international space launches and projects that the Chinese are involved in is available through open media reporting, the thesis uses extensive open press reporting as an additional source of information.

4. OVERVIEW OF PROBLEMS AND HYPOTHESIS

Two questions lay behind the purpose of this thesis. First, why are space programs important and what is China doing to leverage them? A growing number of nations recognize the advantages of space applications. From the tangible aspects of Presition Navigation and Timing (PNT), remote sensing, weather forecasting, monitoring for natural disasters, and telecommunications (satellite TV, cell phones, etc.) to the more abstract aspects of political prestige, "soft power," and techno-nationalism, more countries are investing in both commercial and scientific space projects. China is not simply standing idly by, but instead is promoting itself as a provider of these services to others, despite short-term economic costs. Part of the thesis problem is to assess why China has chosen certain nations in Asia as well as others far outside of its Asian backyard to market these services to and what it hopes to gain from them.

Second, is America's comparative advantage in commercial space at risk to China by failing to compete effectively in these areas? Ever since the release of the Cox Commission's report in 1999, and the subsequent addition of International Traffic in Arms Regulations (ITAR) stipulations specifically against exporting satellites and launch vehicles, the United States has suffered significant consequences, both politically and economically. Joan Johnson-Freese says that Washington is sending the wrong strategic communication message about space, in particular that the United States is loath to admit that it "no longer owns space" and cannot accept that "other countries may want to use space for both civil and military purposes"[38]. With America snubbing China's desire to join the *International Space Station* (ISS), yet extending the same invitation to South

[38] Joan Johnson-Freese, "Strategic Communication with China: What Message About Space?," *China Security*, World Security Institute, 2:2 (2006): 45.

Korea and Brazil, it seems that the message is more politically motivated than a question of whether or not either nation can provide logistics or financing for the project, or even poses a potential military risk. Part of this thesis will explore China's ventures with nations that are opening their doors and actively seeking space project cooperation, often denied by the United States.

The preliminary questions that the thesis assesses are:

- How is China using its space capabilities as a strategic asset in furthering its national interests? These may include working with nations that can provide access to oil reserves to feed growing Chinese demands from its civilian and industrial sectors.
- How is Beijing using its "soft power" and space capabilities to advance its international prestige through cooperative, bilateral, and multilateral space projects? Is it purposefully playing up its role as a responsible space-faring nation through participation in relevant United Nations space organizations, regional organizations like Asia-Pacific Space Cooperation Organization (APSCO), and by signing important space-related United Nations (UN) treaties?
- Is China pursuing a strategy of creating long-term partnerships through space that may reduce American influence in Asia, Africa, and South America and that may even expand to the point that U.S. interests are compromised, degraded, or even isolated?
- Is the United States in danger of mischaracterizing the motivations and rationales behind China's space program and, as a result, pursuing counterproductive policies that actually create incentives for other countries to side with China against American interests in space?

5. IMPORTANCE AND RELEVANCE TO U.S. POLICY

When one mentions "China" and "space" in the same sentence, most people proceed along several basic lines of thought. Some think of the Chinese ASAT test on January 11, 2007, and view Chinese forays into space as hostile and menacing mainly to American military interests. Others recall the Loral-Hughes "scandal" and the alleged transfer of

sensitive U.S. missile technology to China's strategic rocket forces. Still others think of China's growing interest in manned space flight and lunar exploration as it develops its respective *Shenzhou* and *Chang'E* programs. However, very few people acknowledge China's commercial space ventures with Nigeria, Venezuela, and France or of the space-related scientific connections China has forged with England's Surrey Space Center and the European Space Agency (ESA) through the Dragon I/II and Double Star programs.

China's space program goes far beyond just military counterspace applications, manned space aspirations, and lunar exploration endeavors. Its pursuit of both commercial and scientific international space ventures constitutes a small, yet growing, percentage of the global space launch and related space satellite service industry and also highlights China's willingness to cooperate with nations far away from Asia for political and strategic purposes. Thus, the importance lies in understanding how China, through greater cooperation in space-related ventures, is establishing long-term partnerships that may constitute a threat either to counter or even isolate the United States and enhance China's "soft power," amongst both key American allies as well as some developing nations in U.S. backyard. An appropriate U.S. response, however, may not lie in the military arena, but instead in a revival of both past U.S. space outreach efforts as well as more business-friendly export control policies.

6. STRACTURE OF THE CHAPTERS

To understand the importance of the space medium, it is necessary to understand the background of why countries have space programs in the first place. Chapter I describe the conceptual framework of "soft power". Thus, Chapter II first covers the strategic nature of space systems and how the growth of space-faring nations potentially reflects trends of techno-nationalism, "soft power," as well as a desire to take full advantage of the space domain, and then sketches some of the motivations and current capabilities of the Chinese space program. Chapter III assesses China's space program from commercial, scientific, and government legitimacy perspectives and focuses on their role in China's *domestic* development of space-based soft power. Chapter IV focuses on China's rise *internationally*, and breaks down China's space outreach efforts by major world regions, concluding with an analysis of the Sino-U.S. relationship in space. In the

end the conclusion by assessing U.S. space policy and strategy. It recommends a specific course of remedial action for U.S policy to help promote American soft power in space as well as to shape China's rise as a space-faring nation in a positive direction.

CHAPTER I: CONCEPTUAL FRAMEWORK OF "SOFT POWER"

The basic concept of power in the most general terms refers to the ability of influencing the behavior of others to achieve the outcome one desires through coercion, inducement or attraction. Governments have forever utilized their military and economic might to achieve investment national goals and in turn increase their power.

The "soft power" concept was initially defined on scientific and theoretical levels by the American political scientist, Harvard University professor Joseph Nye, based on the United States foreign policy to maintain its positive image in the world and to promote the best features of American culture and its social achievements. There are many controversial and differing opinions concerning Nye's concept of soft power which have lead to some confusion in our understanding of what soft power actually is. To explain this different way of understanding the idea of soft power, I will discuss a specific how China's Soft Power is transforming the world, focuses on how China uses its soft power—culture, investment, academia, foreign aid, public diplomacy— to influence other countries in the developing world, which clearly enunciates its goal as soft power. Whereas Nye excluded aid and formal diplomacy from his soft power, in Asia, the idea of soft power implies all elements outside the security realm including investment and aid. Countries like China have identified and developed conscious strategies to enhance their soft power. The confusion arises because economic resources can produce both hard and soft power behavior. As Walter Russell Mead has argued, "economic power is sticky power; it seduces as much as it compels…A set of economic institutions and policies…attracts others into our system and makes it hard for them to leave." A successful economy is an important source of attraction. Sometimes in real world situations, it is difficult to distinguish what part of an economic relationship is comprised of hard and soft power.[39]

The first section of this chapter examines the concept and definition of "soft power", it relates to attraction and public diplomacy. The second section of chapter provides the analysis carried out by Beijing policy of "soft power", takes into account the basic mechanisms of the classical concept of forming favorable image of the country in the

[39] Nye, "Think Again: Soft Power." See http://yaleglobal.yale.edu/content/think-again-soft-power (accessed September 15, 2010)

world and examination of China's "peaceful rise" by way of soft power. Thus, under the "classical concept" refers to the concept of which the state intended to constitute the task of global geopolitical nature and have the resources to do so. Among the mechanisms it can be noted, a conducting various activities of cultural nature, which would have been the most positive features of Chinese culture with an emphasis on the achievement of China (economic) in recent years. To the other hand, cooperation in providing assistance in economic and social sphere, health, education, provision of humanitarian assistance, holding on the world arena those strategic partnerships in space activities in particularly how China using space as a diplomatic tool.

I. 1. DEFINITION AND SOURCES OF "SOFT POWER"

In 1990, Joseph Nye published a book which first popularized the term "soft power", referring primarily to ways in which a nation's cultural resources constitute a form of power that can enhance or even substitute for military and economic strength. In simplistic terms, Nye explained:

> "The basic concept of power is the ability to influence others to get them to do what you want. There are three major ways to do that: one is to threaten them with sticks; the second is to pay them with carrots; the third is to attract them or co-opt them, so that they want what you want. If you can get others to be attracted, to want what you want, it costs you much less in carrots and sticks."

In an environment of multiple transnational linkages and changing nature of power, the tools of effective diplomacy include not only **"**soft power" is a term used in international relations theory to describe the ability of a political body, such as a state, to indirectly influence the behavior or interests of other political bodies through cultural or ideological means. Professor Joseph Nye remains the most prominent proponent, in a 1990 book, *Bound to Lead: The Changing Nature of American Power*, strengthened by his *Soft Power: The Means to Success in World Politics (2004)*, and further elaborated in *The Power of Lead (2008).* While its usefulness as a descriptive theory has not gone unchallenged, soft power has since entered popular political discourse as a way of distinguishing the subtle effects of culture, values and ideas on others' behavior from more direct coercive measures, such as military action (hard power) or economic

incentives. In the words of Joseph Nye, "soft power" emanates from three resources: "a state's culture (in places where it is attractive to others), its political values (where it lives up to them at home and abroad), and its foreign policies (where they are seen as legitimate and having moral authority)."[40] In other words, a country has more soft power if its culture, values and institutions incite admiration and respect in other parts of the world**.** It uses an attraction to shared values, and the justness and duty of contributing to the achievement of those values. The success of soft power heavily depends on the actor's reputation within the international community, as well as the flow of information between actors. Thus, soft power is often associated with the rise of globalization and neoliberal international relations theory. Popular culture and media is regularly identified as a source of soft power, as is the spread of a national language, or a particular set of normative structures; a nation with a large amount of soft power and the good will that engenders it inspire others to acculturate, avoiding the need for expensive hard power expenditures.

By contrast, Kurlantzick includes China's trade and overseas investment in his definition of soft power. As Kurlantzick points out, soft power has changed. "For the Chinese, soft power means anything outside of the military and security realm, including not only popular culture and public diplomacy but also more coercive economic and diplomatic levers like aid and investment and participation in multilateral organizations—Ney's carrots and sticks."[41]

There are many definitions of soft power, but basically, when the Chinese government talks about its new soft power in the world, it means all power outside of the military sphere, including diplomacy, aid, investment, and economic tools. Quoting from Nye, Kurlantzick describes soft power as resting on the ability "to shape the preferences of others…It is leading by example and attracting others to do what you want. If I can get you to do what I want, then I do not have to use carrots or sticks to make you do it."[42]

Soft power can be developed through relations with allies, economic assistance and cultural exchanges which in turn would result in a more favorable public opinion.

---

[40] Joseph S. Nye Jr., *Soft Power: The Means to Success in World Politics.* New York: Public Affairs, 2004.
[41] Joshua Kurlantzick 2007, *'Charm offensive: how China's soft power is transforming the world',* Yale University Press, p. 6.
[42] Ibid.

Therefore, soft power can be either 'High' i.e. targeted at elites or 'Low' i.e. targeted at the broader public.[43]

I. 2. "SOFT POWER" WITH CHINESES CHARACTERISTICS

The concept of soft power has made a strong impression in China too. Joseph Nye's theory on "soft power" has captured the imagination of Chinese scholars and the general public and stimulated a lively debate on how to increase and employ China's soft power. In this case, a very remarkable experience in China, which is one of the first centers of Asian civilization, using the "soft power" on a global scale.

According to Peng Fuchun, National People's Congress deputy "we should never underestimate the importance of building soft power as economic miracle is only one side of China's rising in the world area" [44] In light of this, China is expanding its use of cultural, educational and diplomatic tools to increase its appeal across the world. China is steadily increasing its support for cultural exchanges, sending doctors and teachers to work abroad, welcoming students from other nations to study in China, and paying for Chinese-language programs abroad. China has established Confucius Institutes with a mission to promote the Chinese language, culture and a range of other aspects of learning about China, including its business environment. Several of these institutes have already been established around the world, in such places as Japan, Australia, Sweden and the United States, and Beijing aims eventually to open some 100 of them.[45]

Win-win diplomacy aimed at multilateralism, mutually beneficial cooperation and the spirit of inclusiveness remains the keystone of China's foreign relations. China has supported its win-win strategy with initiatives like signing the Southeast Asia Treaty of Amity and Cooperation and committing itself to creating a Code of Conduct on the South China Sea.[46] China's embrace of free trade and promotion of the idea that it will become a source of foreign direct investment strengthens its image and the success of its developmental model holds significant appeal for many Southeast Asian countries. China

---

[43] Joshua Kurlantzick, 'China's Charm: Implications of China's Soft Power', Policy Brief No.47, Carnegie Endowment for International Peace, June 2006

[44] 'Soft Power' : A New Focus at China's Two Sessions, National People's Congress, People's Republic of China, URL: www.npc.gov.cn

[45] Purnendra Jain and Gerry Groot, 'Beijing's Soft Power Offensive', *Asia Times Online*, May 17, 2006

[46] Kurlantzick, 'China's Charm: Implications of China's Soft Power', p-2

has been using its aid as one of its soft power strategies. The diplomatic component, among other actions, involves befriending resource-rich nations that the U.S. and others see as pariahs. With its policy of "non-interference" in the domestic affairs of other nations, China counters efforts by the U.S. and others to isolate countries such as Sudan, Iran, and Zimbabwe. China also cultivates friendships with nations such as Venezuela that currently have unfriendly relations with the United States, but in doing so, it is careful not to appear to divert oil supplies from the U.S. market. Relations with developing countries, as China's low-key policy toward Venezuela indicates, do not trump China's high priority needs to avoid military confrontation and keep the U.S. market open to Chinese exports.

China has also become more pragmatic. It does not want to directly antagonize the U.S. or poke a finger in its eye; it wants to still have a good relationship with the U.S. but pursue these other strategies at the same time. For instance, China has a very good relationship with Venezuela, whose Hugo Chavez has made stridently anti-U.S. statements in many forums, including the U.N. When he did the same in Beijing, China's ambassador to Venezuela immediately told the local press that China did not want to associate itself with those statements.

Chinese aid to Philippines, Laos and Indonesia has far outnumbered U.S. aid in the region. The Chinese government is also gradually increasing its aid to African countries under the China- Africa Cooperation Forum. China has also adjusted its diplomacy and unlike a decade ago joined the World Trade Organization, contributed more than 3,000 troops to serve in United Nations peacekeeping operations, become more helpful on non-proliferation issues (including hosting the six-party talks on North Korea), settled territorial disputes with its neighbors, and joined a variety of regional organizations.[47]

As Kurlantzick points out, China's successes in weakening U.S. positions around the world are often a direct result of mistakes by the U.S., ranging from unilateralism to its failure to even try to understand Middle Eastern societies on their own terms.

The "flat world" of globalization, so stridently advocated by Clinton and presidency of George W Bush, simply did not create the improved quality of life it promised for many Third World countries. Consequently, these countries now view China's model, and

[47] Joseph S. Nye Jr, 'The Rise of China's Soft Power', *The Wall Street Journal*-Asia, 29 December 2005

China's influence, as the only feasible option they have at their disposal. This is an important point for Kurlantzick because without it, an analysis of China's use of soft power could too easily descend into predictable condemnations of the country's relationship with nefarious dictators and corrupt bureaucracies.

These are certainly valid points, and ones Kurlantzick emphasizes, but he does not shy away from the fact that the inadequate results of the past 20 years of U.S. soft power have created an opening for any competing ideology, of which China's hybridized embrace between a centrally planned economy and open market is only the most recent and viable alternative: China seems to have enjoyed striking success and poverty reduction other developing nations can't help but notice. At the same time, the Washington Consensus has failed many developing nations. During the late 1980s and the 1990s, many African and Latin American nations opened their economies, slashed tariffs, and undertook other painful economic reforms, yet few nations in either Latin America or Africa saw their economies take off. Even when these poor regions boosted growth, it seemed to have no measurable impact on employment, leaving masses of unemployed people willing to try another economic model, and leaders groping for answers as well.[48]

After September 11, 2001, the U.S. had its attention understandably focused on the threat of terrorism rather than on the implications of turning a blind eye toward China, or the shortcomings of unfettered US-led economic globalization. But even had U.S. focus on the "global war on terror" been effective, judicious and constructive, the country would have vacated some areas where it was exercising its soft power, which would have created openings into which China could squeeze. That the U.S. so badly mismanaged the post-September 11 world has, among other things, clearly increased China's ability to project itself around the world.

The exercise to understand China's foreign policy in its yet-infant stages is certainly important, but Kurlantzick forcefully reminds us that China is emphasizing soft-power strategies because it sees this as the United States' weak point: "In Chinese publications, Wang Jisi, one of China's elite intellectuals, noted that America's weakness was its soft

[48] Joshua Kurlantzick 2007, *'Charm offensive: how China's soft power is transforming the world',* Yale University Press, p. 57

power, not its hard power. And after the Iraq war began in 2003, the scholar Biwu Zhang found, Chinese authors agreed that America had suffered 'a serious setback in terms of soft power."[49]

Space has become another area where China is exerting its soft power. It is positioning itself as a space benefactor to the developing world-the same countries in some cases, whose natural resources China covets. China not only designed, built and launched a satellite oil rich Nigeria but also combined it with a major loan to help pay the costs. It has signed a similar contract with Venezuela and is developing an earth observation satellite system with Bangladesh, Indonesia, Iran, Mongolia, Pakistan, Peru and Thailand. [50]

In addition to serving national security and domestic civilian use of space, China's space activities are also being used as a tool for diplomacy. The nation's space related international cooperation efforts, which began with a bilateral arrangement for satellite development, have blossomed to include the establishment of satellite tracking stations and a leading role in multilateral frameworks. China's pursuit of such international cooperation is expected to expand in the future, and will likely help the nation to secure its necessary supply of resources and energy. In light of this posture and China's growing efforts to provide African nations with official development assistance and debt relief, projects like the China-Nigeria partnership in communication satellite development and launches can be seen as examples of China's exploitation of space activities as a diplomatic tool.

It is highly probable that competition between China and other advanced space-faring nations will intensify with regard to space development and use in general. The use of space is certain to become an increasingly vital element of China's security and civil needs. However, as a nation that operates in the globalized world, China is starting to realize that growth in science and technology cannot be achieved outside of that environment.

China has been quietly making investments in some non-military fields with a view to engaging other nations. Space Technology is one area where China is engaging

[49] Ibid. 32-33.
[50] Jim Yardley, 'China uses space Technology as Diplomatic Trump Card', *International Herald Tribune*, May 24, 2007

developing nations by providing them assistance to either develop their space program or to launch satellites on their behalf. It is establishing linkages in the space arena with countries in Africa and South America, including Nigeria, Venezuela, and Brazil. China's ultimate objectives are the natural resources and markets in these parts of the world. China is talking its friendship with Pakistan to a higher plane by helping the latter in the space field as well. China has also promised Bolivia help in developing its space program within three years and in the launch of its first satellite.[51] A successful space program, especially a manned-space version, brings heightened global prestige as well increased internal credibility and prowess to the supporting scientific and technical communities.

Joan Johnson-Freese notes that China wants to develop space capabilities "as part of globalization efforts and to send a techno-nationalist message regionally and globally".[52]

The concept of "techno-nationalism" has some parallels to Joseph Nye's term "soft power"; Nye sees China's efforts in space as a way to "help increase its prestige and attraction".[53] For China's space program to attract countries in Africa and South America, some measure of soft power may have been usefully applied.

As Kurlaznick points out, soft power as it is applicable to China is more than the original concept advanced by Nye, as now it is broader in its scope. China perceives soft power as anything that is outside of the military and security realm and this includes not only popular culture and public diplomacy but also coercive economic and diplomatic levers such as aid and investment as well as participation in multilateral organizations-something that China shied away from in the past.

Kurlantzick focuses on China's pursuit of developing nations in Southeast Asia, Africa, Latin America, and Central Asia-areas of the globe that have been alienated in one way or another by the U.S. It is here where China succeeds in promoting itself as having an effective model for social and economic success and where it turns a blind eye to the dictatorial shenanigans, even Kurlantzick makes various suggestions as to how the U.S. can respond and as he states, it still enjoys crucial advantages over China,

---

[51] Unattributed, "Space Technology and Soft-Power": A Chinese Lesson for India, *Institute for Defense Studies & Analyses,* http://www.idsa.in/node/3154/17 (accessed July 8, 2010)
[52] Joan Johnson-Freese, *Space as a Strategic Asset*, 169, 202.
[53] Joan Johnson-Freese,"Strategic Communication with China: What Message About Space?" 44.

particularly with its military power that if used correctly, can compliment soft power. Case in point is its deployment for humanitarian missions such as the tsunami response that demonstrated that only the U.S. had sophisticated military to move aid overnight.

China is strategically positioning itself as a focal point for all space-related activities, from providing financial assistance to manufacturing, and launching facilities for states in Asia, Africa and South America. This approach has multiple benefits – an increase in China's global footprint, flow of benefits to the Chinese space industry, experimentation with new technologies, and wins friends. The following chapter will explore what soft power abilities the major space-faring nations obtain through space activity. It focuses on China's motivation and capabilities.

CHAPTER II: CHINESE SPACE MOTIVATIONS AND CAPABILITIES

It is easy to understand, given the background of the Cold War and the initial space race between the America and then-USSR in the 1950s and 1960s, why space programs have been traditionally regarded as a "hard power" asset. In more recent times, however, that hard edge to space power has been continually dulled by the growing number of actors (both state-sponsored and private commercial entities) in space and the concurrent expansion of soft power applications of space programs. This chapter examines the reasons why many states are now entering space and what soft power abilities they obtain through space activity. It then focuses on China's specific motivations and capabilities.

II. 1. SPACE PROGRAMS: ONLY A SUPERPOWER LUXURY?

Access to space was at one time the hallowed and exclusive ground of the superpowers: the United States and the former Soviet Union. Looking back several decades, only these two large, powerful states with financial and scientific resources could muster the required effort to develop the necessary technical acumen to research, test, develop, and field rocket and satellite technology. Currently, access to space is only a matter of money and interest. Much of the technology can be obtained relatively inexpensively, and there are a host of commercial and state enterprises worldwide that are competing to help other countries gain access to space.

A recent report by the FUTRON Corporation highlights several emerging space trends with international impact, for example:

- Rise of space as a global information and communication environment;
- Growth of commercial space (e.g., cheaper boosters, more launch service providers);
- Introduction of "NewSpace" (e.g., space tourism, commercial spaceports);
- Advancement of Asian leaders (specifically referring to the Chinese, Indian, and Japanese space programs); and
- Globalization of space participation.[54]

[54] David Vaccaro, "Who Will Lead the Next Space Race?" *FUTRON Corporation* (October 1, 2008). See also: Mark Kaufman, "U.S. Finds its Getting Crowded Out There: Dominance in Space Slips as Other Nations Step Up Their Efforts," *WashingtonPost.com*, July 9, 2008, A01.

Space-based telecommunications are no longer a luxury of the superpowers, but a commodity that many nations have either developed on their own or bought into through partnerships or broader consortiums. This is compounded by the fact that more nations have started up their own space agencies and are developing new vehicles and booster rockets. The last bullet on the "Globalization of space participation" captures this concept very well in its follow-on text:

> *Space is no longer the exclusive province of a handful of countries*. The 10 leaders [major space-faring nations] are now joined by scores of others with some degree of space involvement—whether a national satellite, an astronaut flown by a partner nation, membership in an intergovernmental space organization, or participation in a collaborative space project. From Colombia's *Libertad* satellite to Nigeria's *Nigcomsat*, from Australia's Hyshot suborbital test to Saudi Arabia's Riyadh Space Research Institute, *countries from all six populated continents now participate in space.*[55]

Given the upward trend for space activities, how would "country X" get started in space? What typical milestones should be reached? Nicolas Peter, in his study on the "new geography of civilian space activities," suggests a four-stage evolution for a nation's space program, as follows:

- Purchase satellites from other countries;
- Develop space systems in cooperation with other countries;
- Develop satellite systems independently; and
- Disseminate knowledge of satellite development to other countries.[56]

Looking at China's progress in space since 1970, it seems to be following these four stages in fairly close order. China bought much of the high-tech transponder technology for its *Dongfanghong-1* ("East is Red") communication satellite from West Germany. Sanctions resulting from international condemnation of the Tiananmen Incident in 1989 forced China to look at non-Western assistance for space technology, and it chose to partner with Brazil on the China-Brazil Earth Resource Satellite (CBERS, or *Ziyuan* for

[55] Ibid. Emphasis in italics is author's. Note: China led effort for Nigeria's NIGCOMSAT-1, further detailed in Chapter IV. The 10 leading nations were mentioned earlier in the article as: Brazil, Canada, China, Europe (as an integrated region), India, Israel, Japan, Russia, South Korea, and the United States.
[56] Nicolas Peter, "The Changing Geopolitics of Space Activities," *Space Policy*, Vol. 22, No. 2 (May 2006): 101.

"resource" in Chinese) in the mid-1990s. In addition to the CBERS program, China has had an ongoing partnership with the European Space Agency involving the Double Star/Cluster project and Dragon I/II projects, which focus on studying Earth's magnetic belts and magnetosphere, and various applications of remote sensing, respectively.[57]

Although its domestic satellite manufacturing may not have reached the level of sophistication that Washington and Moscow enjoy, Beijing nonetheless has produced its own satellites and launch vehicles with marked success (discussed below). China currently has ongoing projects for launching satellites and training engineers and space operators from Nigeria and Venezuela.[58] Clearly, according to Peter's evolutionary progression model for national space agencies, China has stepped through all four stages and continues to operate in each one of them to this day. But to what end?

II. 2. MOTIVATIONS AND EMERGING CAPABILITIES OF THE CHINESE SPACE PROGRAM

According to the United Nation's Office for Outer Space Affairs, there are more than 50 countries that have national space programs.[59] Since the launch of Sputnik in 1957 and Yuri Gagarin's first flight into space back in 1961, the price tag of getting your own slice of the space market has been falling. As noted space historian Howard E. McCurdy commented, "Space, at least Earth's orbit, is no longer the exclusive domain of the few."[60] Louis Friedman, who is the executive director of the Pasadena-based Planetary Society, echoes similar comments about why more countries are getting into space. Once a country has its own satellite in orbit, he asserted, they "immediately become a player on the world stage".[61] He added countries that aspire to "be an economic

[57] Chinese cooperation with ESA is covered in more detail in Chapter IV. For more information on the Double Star program, see: http://sci.esa.int/science-e/www/area/index.cfm?fareaid=70 (accessed December 29, 2009). Information on the Dragon program can be found at: http://earth.esa.int/dragon/ (accessed December 29, 2009).
[58] China successfully launched versions of their DHF-class communications satellite for each country, NIGCOMSAT-1 and VENESAT-1, respectively. China's international space cooperation is more thoroughly addressed in Chapter IV.
[59] United Nations Office for Outer space (UNOOSA) See http://www.unoosa.org/oosa/en/OOSA/index.html, however it is important to note that few nations possess a truly *independent* launch capability.
[60] Peter Pae, "Third World Sets Sights on Space," *Los Angeles Times* (October 14, 2003): A1.
[61] Friedman.

and technological power in their region…going to space is a way to show that."[62] The Cold War, which had "limited space cooperation to 'intra-bloc' cooperation," has ended, and there are "new and emerging relations among civilian space entities in the post-Cold War era".[63] Thus, it should come as no surprise that China, with its growing economic power and burgeoning scientific and technology capacities would be interested in exploring the possibilities of outer space and expanding its cooperation with other nations.

In October 2006, China released a key document that outlined its policy regarding space, entitled, "China's Space Activities in 2006." This white paper is divided into five sections, covering its aims and principles, a review of the last five years in space, its plans for the next five years, its development policies as well as international exchanges and cooperation.[64] While there is an emphasis on foreign cooperation at the end, there are also plans for China to set the foundation to become a "commercial space superpower…through launching dozens of domestic satellites on improved boosters".[65]

Looking at the other major Asian space contenders, to include Japan, India, and now an ambitious South Korea, none have been able to match China's success either in its manned program or in its launch record. The following table shows China's space activity compared with the other major space-faring nations:

Reported Spaceflights Launched by Country, 2003-2007

	Russia	U.S.	China	EU	Japan	India
2003	21	26	7	4	3	2
2004	23	19	8	3	0	1
2005	26	16	5	5	2	1
2006	25	23	6	5	6	1
2007	22	16	10	5	2	3

Table 1: Reported Spaceflight Launched by Country, 2003-2007[66]

[62] Ibid.
[63] N. Peter, "The Changing Geopolitics of Space Activities,"101.
[64] White Paper, "China's Space Activities in 2006," People's Republic of China, Information Office of the State Council, (October 12, 2006). This is an updated version of the original White Paper released in 2000. Both versions are more thoroughly analyzed for their domestic and international impacts in Chapters III and IV respectively.
[65] Andy Pasztor, "China's Rocket Service Makes Inroads, Irks U.S.," *Wall Street Journal* (October 5, 2007): A13.
[66] Source: Jeffrey Logan, CRS Report for Congress RS22777, "China's Space Program: Options for

Figure 1 below shows future predicted launches by the Chinese government and covers their domestic communications satellite launches as well as support for both their lunar exploration and manned space launch programs:

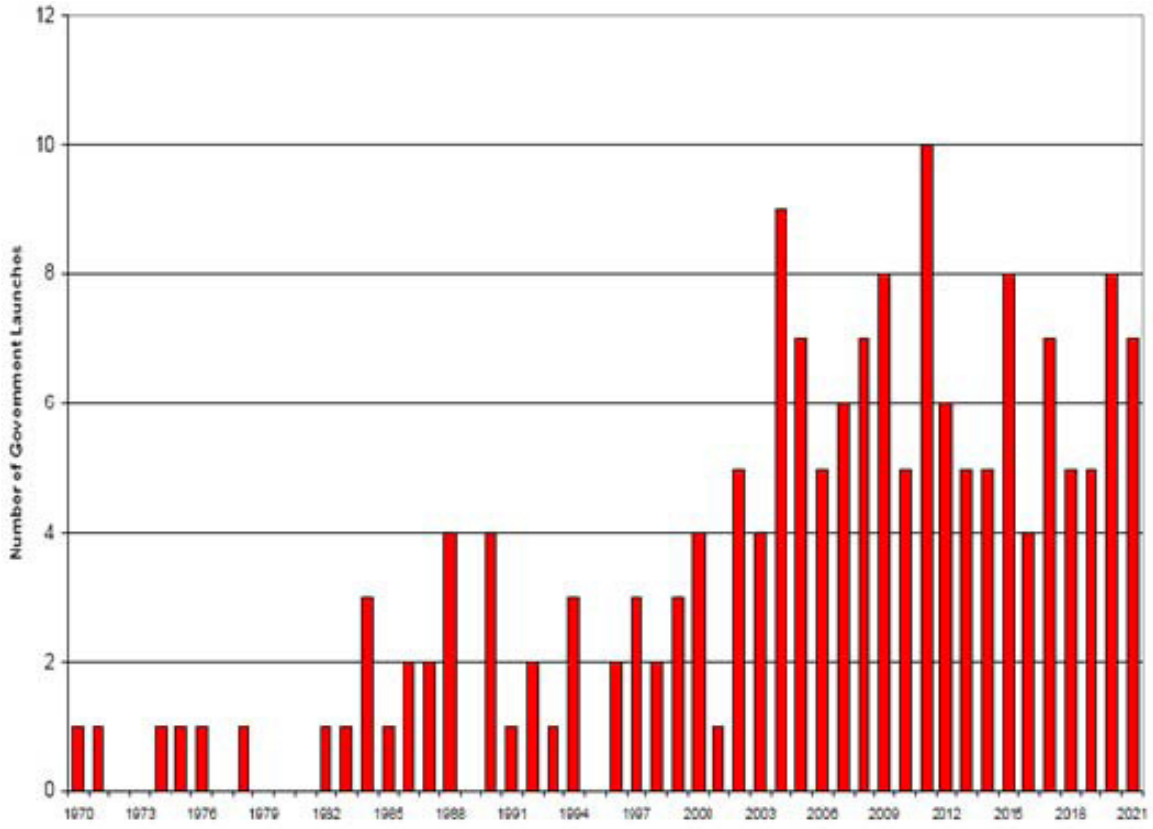


Figure 1: Chinese Government Launches (1970-2021): Future Launch Projection from Futron's ASCENT Study[67]

With 115th of its Long March rockets in December, China achieved 11 successful flights in 2008, surpassing the number predicted above by four launches and establishing a new domestic record. It is also interesting to note that China also surpassed the total number of U.S. launches (10) for 2008.[68]

The other study by FUTRON covered the world's top 10 leading nations involved in space activities, and analyzed them "using 40 measures of government spending, human

---

U.S.-China Cooperation," May 21, 2008.

[67] FUTRON, "China and the Second Space Age," October 15, 2003, available online at: http://www.futron.com/pdf/resource_center/white_papers/China_White_paper.pdf (accessed January 6, 2009).

[68] Unattributed, "China Launches for Record 11th Time in 2008" http://www.space.com/missionlaunches/sfn-081224-china-record-launch.html (accessed January 6, 2009)

expertise, and the private sector".[69] The resulting document became known as a "Space Competitive Index," with one telling illustration as follows:

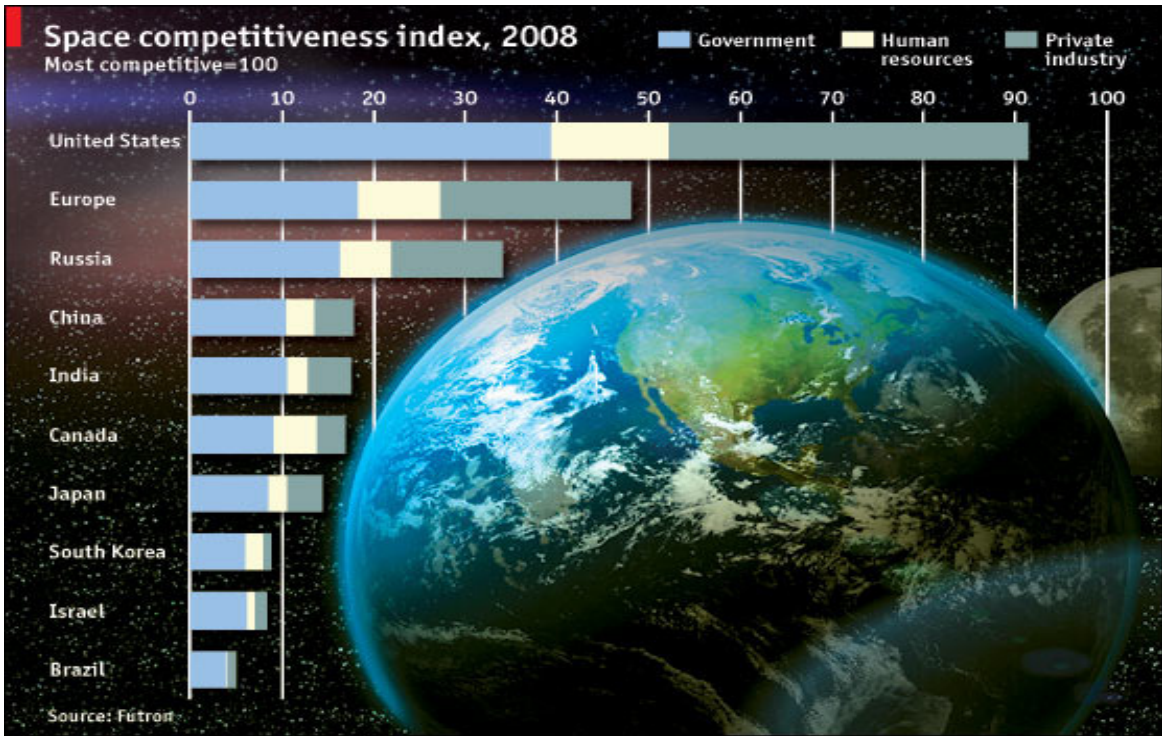


Figure 2: FUTRON Corporation's Space Competiveness Index, 2008[70]

China was specifically highlighted as, "emerging as a major space power with ambitious and visionary goals backed by heavy investment, centralized decision making, and techno-nationalistic programs".[71] Although it is clear from Figure 2 that China has a way to go before it comes close to the United States, it's also noteworthy that it enjoys a fourth-place ranking ahead of U.S. space allies Canada and Japan.

A more recent study by FUTRON covered the same world's top 10 leading nations involved in space activities, and analyzed them "using 50 individual metrics that represent the underlying economic determinants of space competitiveness measures of government, human capital, and industry."[72] The resulting document became known as a

[69] Unattributed, "Stars in Their Eyes," *The Economist.com*, April 7, 2008.
[70] Ibid. The full version of the report is available at FUTRON's website: http://www.futron.com/resource_center/store/Space_Competitiveness_Index/FSCI-2008.htm
[71] "Insight: The FUTRON Competitiveness Index," *Satmagazine.com*, May 2008.
[72] "Insight: The FUTRON Competitiveness Index," *Satmagazine.com*, December 2009.

2009 Space Competitive Index: Total Aggregate Scores by Country, with one telling illustration as follows:

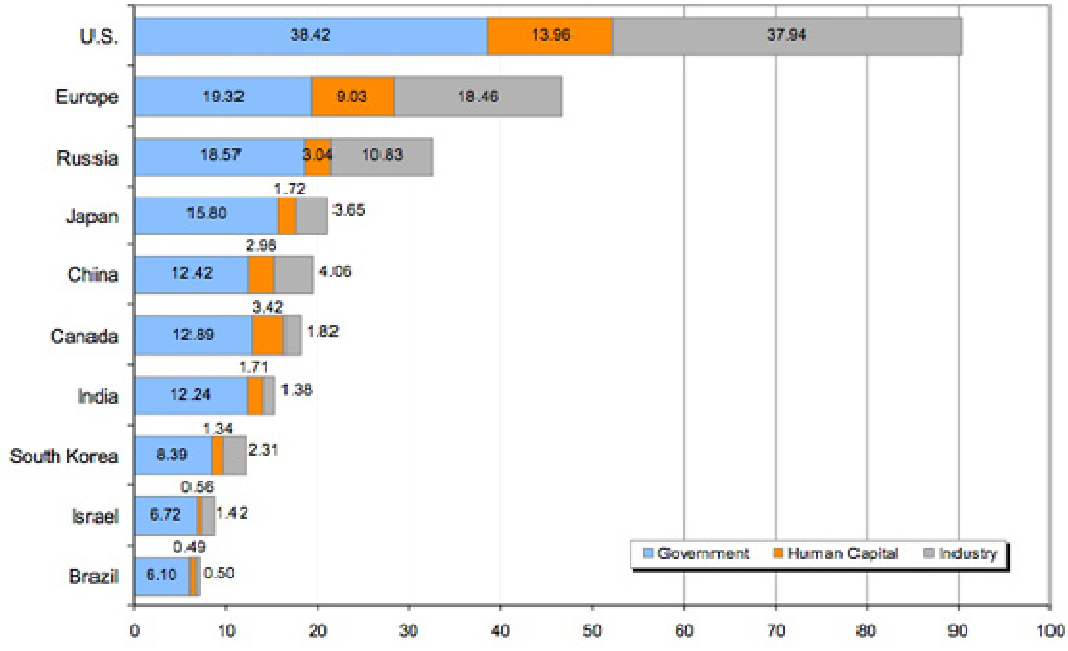


Figure 3: 2009 Space Competitiveness Index: Total Aggregate Scores by Country[73]

The United States remains the current leader in space competitiveness, but its relative position has declined marginally based on increased activity by other space faring nations. The U.S. still leads in each of the major categories: government, human capital, and industry, however, its comparative advantage is narrowing across all categories.

Japan posted major gains between the 2008 and 2009 Space Competiveness Index (SCI) metric evaluations, due to substantial changes in its space strategy as well as its new space law. This resulted in the country jumping from the seventh position in the 2008 SCI to the fourth position in the 2009 SCI.

India had a strong year of space activity, registering double-digit improvements in government metric scores, but lagged in industry scoring.

China posted gains of nearly 10 percent in SCI points overall, fueled by government activity and metrics, but fell behind Japan in its overall ranking. The transparency of the Chinese environment remains a hurdle for the country, which publicly seeks greater international cooperation and commercial activity.

[73] "Insight: the FURTON Competitiveness Index," *Satmagazine.com,* December 2009.

For 2009, I found that Asian space powers -- China, India and Japan -- are in close competition with one another, even as they challenge traditional leaders such as Europe, Russia and the U.S.

China's space program is poised to surge ahead at a brisk pace in 2010. In fact, over the 12 months, China's activities in space may be such that when all is said and done, 2010 could well rank as one of China's top years thus far in terms of the total number and variety of missions launched. Part of the reason for this is the sense, created by reports that two or three major Chinese space programs are running behind schedule, that China has some catching up to do. This might help to explain the rapid sequence of launches of the Yaogan 7 and Yaogan 8 remote sensing satellites by China in December 2009.

After 2009, which is best described as relatively uneventful with the exception of the successful completion of the Chang'e-1 lunar mission last March and the dual Yaogan launches, 2010 could prove to be exciting for observers of China's space program.

The decision of Obama administration to scrap Nasa's plans to return to the moon leave China well placed to become the second nation to land humans on the lunar surface. "The moon is an obvious target for China and they could be there in 2020," said Ken Pounds, professor of space science at Leicester University, England. [74]

Chinese Lunar Exploration Program, also known as Chang'e program is a program of robotic explorations and human missions to the Moon undertaken by CNSA.
According to CNSA, the program will go through three phases:

- **Phase I:** Orbital mission Chang'e 1 & 2 -- Chang'e 1 was the first to be successfully launched as scheduled on October 24, 2007 and Chang'e 2 is an un-manned lunar probe scheduled for launch in October 2010. It will be China's second lunar orbiter, part of the first phase of the Chinese Lunar Exploration Program.
- **Phase II:** Soft lander **--**Chang'e 3 these missions were originally planned for 2012 requiring the use of the CZ-5/E heavy launch vehicle.
- **Phase III:** Automated sample return Chang'e 4--the third phase of the lunar exploration program is planned for 2017 with the use of the CZ-5/E heavy

[74] http://www.guardian.co.uk/science/2010/feb/02/lunar-us-china-race-moon (accessed in February 5, 2010).

launch vehicle. After that a manned lunar landing might be possible in 2025–2030.[75]

II. 3. CHINA'S SPACE FACILITIES

As clearly illustrated from the above figures, China is going to be a major (and increasing) space launch provider in the future. Where will all this occur? China currently has three main facilities to conduct space launches, with a fourth site (Wenchang) under construction on Hainan Island just off China's southern coast. Table 2 breaks down each site's location and type of launch capability it provides:

Name (alternate name)	Location	Orbit Type	Associated Launch Vehicles	Other comments
Jiuquan (Base 20) (Shuangchengzi)	Gansu province (Gobi desert) South of Mongolia	LEO	CZ/LM-2 variants CZ/LM-2F (manned)	- China's 1st launch site - Manned space - Previous missile test base for DF-4/5 - FSW recoverable satellites
Xichang (Base 27)	Southern China near Chengdu, Sichuan province	GEO	CZ/LM-2/3	- Communication satellites - Chang-E lunar probe - Commercial satellites - Will serve as backup to Wenchang
Taiyuan (Base 25) (Wuzhai)	South of Beijing	Polar Sun-synch	CZ/LM-2C CZ/LM-4 CZ/LM-1D (small launch) KT-1 (2 unsuccessful)	- Weather satellites - Earth Observation - Motorola Iridium launches - Military reconnaissance - DF-5 ICBM
Wenchang	NE Hainan Island (only 19 deg. north of equator)	GEO	CZ/LM-5 (heavy-lift)	- 1st-phase construction done by 2010; will replace Xichang - large GEO communication satellites - space station modules - deep space exploration

Table 2: Overview of China's Space Launch Centers[76]

The addition of Wenchang was specifically designed to give the Chinese a favorable site close to the Equator for geosynchronous launches. Since it will be a coastal facility, it

[75] Chinese Lunar Exploration Program, See http://english.people.com.cn/90002/91752/index.html (accessed in February 6, 2010)

[76] Derived from: Marcia S. Smith, *China's Space Program: An Overview*, CRS Report RS21641, October 18, 2005; various Sinodefence.com pages on Chinese space launch centers.

will be able to take advantage of ship-borne rocket stages and avoid having to negotiate China's cramped domestic railways. Wenchang will also likely serve as the permanent launch facility for the *Long March-5* heavy booster when it comes on line.

This new design, which will be able to boost 25-ton payloads (lunar program projects, large satellites, and space station modules), "China's fourth space center, Wenchang, will be put into service between 2014 and 2015, not in 2013 as it was previously announced, the CCTV channel," [77] will also compete for launching commercial satellites on the international market.

II. 4. CHINA'S SPACE TRACKING CAPABILITY

Beyond the ability to launch a satellite into orbit, it is even more important to be able to manipulate and control it to actually derive any benefit from it. Otherwise, it will be just another piece of floating debris in space and of no use to anyone. In order to establish satellite control, a network of Telemetry, Tracking and Control (TT&C) stations are required. This is especially critical for a manned-space program where a global network is needed to ensure consistent communications all at times with the capsule. Currently, China operates 10 ground observation sites and TT&C stations in China, and has agreements with other nations (France, Norway, Sweden, for example) to complement their domestic capability. It also employs a small fleet of space tracking ships, called "*Yuan Wang"* (literally, "far observe"), that "conduct surveying and controlling operations for spaceship's orbit transfer and maintenance, attitude adjustment, and video and audio transmission".[78] Altogether, China has five *Yuan Wang* ships in the Pacific, Atlantic, and Indian oceans to provide worldwide coverage of its space assets. It also recently launched a *Tianlian* (literally, "heaven/sky link") satellite that will provide improved data relay between its satellites and manned space capsules with its supporting ground stations, and help to quickly diagnose any malfunctions that may occur while astronauts are on board.[79]

---

[77] http://www.spacedaily.com/reports/Chinas_Fourth_Space_Center_To_Be_Completed_By_2015_999.htm (accessed in March 17, 2010)

[78] Unattributed, "New Space Tracking Ship to Serve Shenzhou VII," Xinhua News Agency, (April 13, 2009).

[79] Unattributed, "*Tianlian* China Launches First Data Relay Satellite," Xinhua News Agency, (April 26, 2009).

II. 5. CHINA'S MANNED SPACE PROGRAM

China began "Project 921" in 1992 in an earnest effort to send humans into space. It is somewhat mirrored on the U.S. and Soviet manned space programs and divided into three distinct phases:

- **Phase I:** Technology demonstration; launch *Shenzhou 1-5* to test capsule design, highlighted by Lt Col Yang Liwei becoming the first Chinese man in space on October 15, 2003.[80]
- **Phase II:** Docking, maneuvering, extra-vehicular activities (EVA); launch *Shenzhou spacecraft 6-14* to establish space station and docking capability; practice spacewalk activities.

  The *TianGong* ("Heavenly Place") will have two docking ports:
  TianGong 1 is scheduled for late 2010. *ShenZhou 8* will then be launched unmanned to add to the station. Manned missions will then follow with *ShenZhou 9* and *ShenZhou 10;*
  TianGong 2 is projected for 2013 with *ShenZhou 11* and *ShenZhou 12* providing crews in 2013/14.
  This would be followed by *TianGong 3* in 2015 and *ShenZhou 13* and *ShenZhou 14* in 2015/16, after that will be upgraded to a cargo spaceship. The cargo spaceship will not only have rendezvous and docking functions, it will provide refueling for the space station.[81]
- **Phase III:** Establish permanent space station (less defined currently).[82] This is expected to be completed by 2020/2025 timeframe.

Project 921 entered its second phase in 2006. The programme was listed among the China's medium- to long-term outline for science & technology development (2006-2020). The China Human Spaceflight Project Office is responsible for the overall management and budgetary concerns of the project. China Aerospace Science & Technology Corporation (CASC) is responsible for design and development of the

---

[80] Note: The Chinese borrowed the Russian Soyuz design for their own Shenzhou modules, making them able to dock with the ISS if that option becomes politically viable in the future.
[81] http://www.worldspaceflight.com/china/station.htm#tiangong (accessed in February 15, 2010)
[82] Dean Cheng, "China's Space Program: Civilian, Commercial, & Military Aspects," CAN Conference Report, (May 2006), 6; also Marcia S. Smith, *China's Space Program: An Overview*, CRS Report RS21641 (October 18, 2005), 3.

manned spacecraft and launch vehicle. China Academy of Sciences (CAS) is responsible for development of the application systems onboard the spacecraft.[83]

The number of sub-systems has increased from 7 in the Project 921 Phase-I to 8 in the Project 921 Phase-II. They are: Astronaut System (Project 921-1), Application System (Project 921-2), Shenzhou Manned Spacecraft System (Project 921-3), Launch Vehicle System (Project 921-4), Launch Site System (Project 921-5), Tracking, Telemetry & Command (TT&C) System (Project 921-6), Landing Site System (Project 921-7), and Space Lab System (Project 921-8).[84]

China has taken a step-by-step approach in flying its astronauts, mimicking the American program along the way. They started with a single-person flight in 2003, (Lieutenant Colonel Yang Liwei, China's First "Taikonaut" in Space) similar to the *Mercury* (1962) single-seat missions. They followed that with a two-person launch in 2005 for five days, akin to the *Gemini* missions (1965). In September 2008, they flew a three-person crew with a successful spacewalk attempt, akin to the *Apollo* missions of 1968. Now, the Chinese are looking to establish a *Spacelab*-type of orbiting observatory to conduct follow-on experiments for an eventual permanently manned space station.[85]

II. 6. CHINA'S SATELLITES

Table 3, below, provides an overview of the current family of Chinese satellite types, their names and functions, orbits, and other comments about each particular system. Most started out as direct purchases from abroad or jointly developed with another country. However, the recent trend is that many of these, especially those that have direct military application, are designed and manufactured solely in China. Currently, China ranks fifth in the world in number of satellite payloads in space with 83, trailing Russia (1398), the United States (1042), and Japan (123) respectively.[86]

---

83 http://www.sinodefence.com/space/project/project921-phase2.asp (accessed in February 25, 2010)
84 Ibid.
85 See "China Plans Space Station With Module Launch in 2010," SpaceDaily.com, March 1, 2009, for more on this relatively new program. Also see Chapter III for more analysis of this program.
86 From: http://www.celestrak.com/satcat/boxscore.asp (accessed February 27, 2010). Rounding out the top ten are: France (44), India (34), Germany (27), United Kingdom and Canada (tied at 25 each), and Luxembourg (15).

Name	Function	Orbit	Other comments
Fengyun ("Wind & Cloud")	Meteorological	Polar GEO	– FY-1D polar orbit – FY-2C geostationary – FY-3 series polar, sun-synch
Beidou ("Northern Dipper")	Navigation	GEO (4) MEO (1)	– All-weather, two positional navigation; 5 on orbit – Will include 5 GEO and 30 MEO satellites
Yaogan ("Remote Sensing")	Land survey, crop yield assessment, disaster monitoring	LEO(?)	– Synthetic Aperture Array (SAR); 2 on orbit – All-weather imaging through clouds, certain materials – Likely reconnaissance role for military
Tianlian ("Sky Link")	Data relay (similar to U.S. TDRSS)	GEO	– Data relay to support space launch, manned space – Augments *Yuanwang* space support ships & TT&C stations – Provides 50% global coverage; 2nd satellite launch = 85%
Shentong ("Divine Communication")	Secure comms	GEO	– Secure Ku-band communications – Primarily for military and high-level leadership – Secure uplink; 1st comms with multiple steerable spot beams
Fenghuo ("Beacon Fire")	Tactical military comms	GEO	– 1st-ever tactical comms; digital voice & data for C3I network – Based on Dongfanghong-3 vehicle
Ziyuan ("Resource")	Remote sensing & earth observation	LEO	– Three on orbit; Joint development with Brazil – Also called "Jianbing", used for military reconnaissance(?)
Dongfanghong ("East is Red")	Telecommunications	GEO	– C-, Ku-, Ka-, L-band transponders – Dedicated high-capacity comms; direct TV broadcasting – Sold system to Nigeria and Venezuela
Shijian ("Practice")	Scientific experiments	LEO	– Used for space experiments, e.g. plant seeds in zero-gravity – SJ-2 possible ELINT capability;
Haiyang ("Ocean")	Oceanographic microsatellite	GEO	– Carry radar altimeters, ocean color scanners, multichannel ocean radiometers, etc. – HY-1 & 2, high circular sun-synch

Table 3: Overview of Chinese Satellites[87]

Space is no longer merely the playground of the Cold War superpowers. Nor is it anymore about a race between two competing ideologies than a logical response to the current global demand for worldwide information and telecommunication services. More and more nations see the need to either develop their own capability or buy their way into space access. As noted in the 2009 Space Competitiveness Index:

> A convergence of space technologies combined with a divergence of space actors—among both national space agencies and commercial space companies—is stimulating competition, creating new products and services, and driving innovation throughout government, business, and

[87] Data from: Daphne Burleson, *Space Programs Outside the United States: All Exploration and Research Efforts, Country By Country* (Jefferson, North Carolina: McFarland & Company, Inc. Publishers, 2005); Sinodefence.com: http://www.sinodefence.com/strategic/spacecraft/default.asp; and Global Security: http://www.globalsecurity.org/space/world/china/index.html . See Chapter IV for more information on China's satellite projects with other nations.

society. As a result of these dramatic and worldwide changes to the information and communication landscape, access to space and space based assets are no longer viewed as a luxury, but rather as a strategic necessity.[88]

[88] "Insight: The FUTRON Competitiveness Index," *Satmagazine.com* (December 2009).

CHAPTER III: CHINA'S "SOFT POWER" IN SPACE: DOMESTIC ASPECTS

With an understanding of the background of China's space program and how countries seek soft power advantages from their own space programs from the previous chapter, this chapter now focuses directly at how China is "selling" its space program domestically. It covers China's space program as a legitimizing tool for the Chinese Communist Party (CCP), how it is played up in order to recruit future space scientists and technicians needed to fulfill its ambitions plans for manned space and unmanned Martian exploration with Russia, and also highlights some of the domestic applications and spin-off technologies that it hopes to reap from its space program effort.

To date, the Chinese government has only released two white papers concerning its space activities, respectively released in 2000 and updated in 2006. In both versions, there are clear goals directed at the domestic Chinese audience. The 2000 version, under "Aims and Principles," notes that "the Chinese government has all along regarded the space industry as an integral part of the state's comprehensive development strategy (*guojia zhengti fazhan zhanlue*)," and lists some of the following key principles:[89]

- Revitalizing the country with science and education;
- [sic] Self-reliance, self-innovation, breakthroughs in space technology on its own strength (*kao ziji de liliang*);
- Selecting projects vital to the national economy and social development; and
- Enhancing the social and economic returns of space activities.[90]

This opening section of "Aims and Principles" speaks more to China's own citizens then to an outside audience. While there is brief mention of international cooperation and exchanges, the real thrust of this document clearly outlines that China's space program will help it modernize and have stable progress into the 21st century. It calls upon the Chinese to blaze this trail mostly on their own, and that they can expect to reap a host of benefits from space.

---

[89] White Paper, "China's Space Activities," People's Republic of China, Information Office of the State Council (November 2000). Chinese pinyin in parentheses hereafter where I am comparing the English version to the original Chinese version, available from the CNSA website at: http://www.cnsa.gov.cn/n615708/n620168/n750545/index.html (accessed February 27, 2010).
[90] Ibid.

How does China get there from here? Under "Development Concepts," the White Paper outlines several points, to include "speeding up the development of 'talented people in the space industry' (*hangtian rencai*), developing space education (*fazhan hangtian jiaoyu*), training qualified personnel, and motivating 'all levels of society' (*shehui gejie*) to support the development of the space industry".[91] Clearly, China is reaching out to its massive populace to enlist its support for their ambitious space program.

The White Paper released in 2006 has some upgrades from its 2000 counterpart, but still carries a heavy focus on the domestic purposes behind China's space program. The standard ideas of "economic construction (*jingji jianshe*), development of science and technology (*keji fazhan*)…social progress (*shehui jinbu*)"[92] remain, but a slight variation on the 2000 version's "comprehensive national strategy (*zhengti guojia zhanlue*)" is simply rendered as "comprehensive national strength (*zonghe guoli*)".[93] In strong contrast to the 2000 version, it goes into much greater detail on how China expects to make all this happen by listing some specific "Development Policies and Measures":

- Construct a comprehensive chain of space industry covering satellite manufacturing, launching services, ground equipment, and operational services;
- Give support to key laboratories and engineering research centers of space science and technology;
- Accelerate building of world-class (*guoji yiliu*) large space corporations;
- Increase funding for space and establish a diverse, multi-channel space investment system (*duoyuanhua duoqudao de hangtian touzi tixi*);
- Encourage industrial enterprises, scientific research institutes, *commercial corporations*…to play an active part in space activities; and
- Foster talented people for the space industry. In particular, pay attention to fostering *young and highly qualified space scientists and engineers.*[94]

[91] White Paper, "China's Space Activities," (2000).
[92] White Paper, "China's Space Activities in 2006."
[93] Ibid.
[94] Ibid. Italics emphasis added.

In addition to these two White Papers, the Chinese government also recently released a report on "China's National Defense in 2008." While most of the White Paper focuses on non-space military items, there are several portions that connote space-derived capabilities, such as "surveying and mapping, navigation, weather forecasting, hydrological observation and space environment support systems have been further optimized".[95] Thus, space assets contribute to not only the national economy but also to national security as well.

III. 1. SHENZHOU: LEADERSHIP LEGITIMIZER?

Out of all the projects one could embark upon regarding space exploration, it is *manned space* that is by far the most expensive and challenging. It is much easier, safer, and less risky to send robots, computers, or rodents into space for experiments and applications, rather than humans. Given the high cost of entry and other risk factors, it can be said the idea of a manned space program is more of a luxury than a real beneficial commodity.

High costs and unknown risks did not prevent Russia or America from launching long-term, expensive, national programs whose sole purpose was to put mankind into the heavens. These efforts, however, took place against the backdrop of the Cold War and represented the ideological challenge of communism versus capitalism. With the breakup of the former Soviet Union in the early 1990s and the current trend of globalization, why would China want to put people into space?

There are a variety of reasons behind Chinese motivations for manned spaceflight, and one of them has a domestic political spin: the Chinese Communist Party (CCP). Dean Cheng comments, "Just because there aren't elections, doesn't mean that there are no means for the population to express its displeasure".[96] As Peter Aldhous notes:

> Its [the Chinese space program] value in promoting a domestic feel-good factor should not be underestimated. Even China's authoritarian rulers have to worry about keeping the country's billion-strong population

[95] White Paper, *China's National Defense in 2008*, People's Republic of China, Information Office of the State Council (January 2009).
[96] Peter Aldhous & Anil Ananthaswamy, "Asia Blazes Trail to the Final Frontier," *New Scientist*, Vol. 188, No. 2522 (October 22-28, 2005): 8.

> reasonably happy. A successful space program could paper over the cracks for a while.[97]

Noting China's semi-obsessive behavior with its national image and prestige, as well as the CCP's determination to retain absolute control of the country, William Martel and Toshi Yoshihara echo the conventional wisdom:

> Success in China's manned space program will confer a strong sense of national dignity and international status on the country, which are viewed as crucial elements to sustain the legitimacy of the Communist Party and replace its declining ideological appeal. This intangible yet powerful expression of Chinese nationalism partially explains why Beijing invests substantial resources into its space program.[98]

Morris Jones, an Australian-based space analyst says, "China's space program reflects the power and legitimacy of the Communist Party. They are using manned space exploration as a political demonstration of their legitimacy".[99] Jones also notes that the launch date of the *Shenzhou-7* came on the heels of not only the Beijing Olympics, but also close to the conclusion of the Paralympics and Chinese National Day on October 1, "making the space mission a nice bridge between two major nationalistic events".[100]

Roger Launius, senior curator of space history at the National Air and Space Museum, focuses more on the symbolism of Chinese technological achievements in his perspective:

> It [China's space program] is a prestige program, no question. I think China has entered the [manned spaceflight] arena for the same reasons that the United States and Soviet Union did in 1961. It is a demonstration of technological virtuosity. It's a method for showing the world they are second to none – which is a very important objective for them.[101]

David Chandler echoes similar sentiments in his analysis:

---

[97] Ibid.
[98] William C Martel & Toshi Yoshihara, "Averting a Sino-U.S. Space Race," *The Washington Quarterly* (Autumn 2003): 23.
[99] Unattributed, "China's Rulers Look to Space to Maintain Olympic Pride." *SpaceDaily.com*, September 9, 2008.
[100] Ibid. Note that both previous manned flights were in October as well. Shenzhou-5 was launched on October 13, 2003, and Shenzhou-6 was launched on October 17, 2005.
[101] Paul Rincon, "What's Driving China Space Efforts?" *BBC News* (September 25, 2008).

> The Chinese government expects its manned space program to enhance the reputation of China's high-tech exports, giving it greater diplomatic and commercial power. It also sees space technology as critical to achieving technological parity with western nations and Japan. Specifically, it hopes the manned space programme will raise standards in computing, materials science, manufacturing and electronics.[102]

With the tumultuous events of the Sichuan earthquake, inflation at decades-high levels, a stock market that was at a 21-month low, and seemingly incessant protests over government corruption and social injustice, Willy Lam, a Hong Kong-based political scientist, said that "a successful *Shenzhou-7* mission would help distract China's 1.3 billion people from serious economic and social concerns…and will further consolidate the [Chinese Communist] Party's claim that they can get things moving".[103] Lam also commented that, "the leadership is banking on patriotism and nationalism to pull them through".[104]

Whether China's first spacewalk truly "distracted" China's massive population from their woes or not may never be truly known, but the event was certainly maximized for full propaganda value. Most newspapers carried "two or three pages devoted to the spacewalk," and tens of millions watched the 15-minute spacewalk live broadcast on government-run China Central Television (CCTV), "witnessing the symbolic moment when he [Zhai Zhigang] waved a Chinese flag in the weightlessness of low orbit".[105] Internet blogs were full of patriotic postings, such as, "I'm proud of the great achievement of the motherland" and "I'm full of confidence in the future of the motherland!"[106]

Quoting the old Chinese idiom of, "When riding a tiger, it is difficult to get off" (*qihu nanxia*), Stacey Solomone notes that:

> The CCP, and subsequently, the PLA would lose face should they decide to back off from developing the space program. It would appear to as if the CCP and PLA were conceding to the Chinese people that they were not advanced as the United States or Russia.

---

[102] Paul Rincon, "What's Driving China Space Efforts?" http://news.bbc.co.uk/2/hi/science/nature/7635397.stm *BBC News* (September 25, 2008).
[103] Ibid.
[104] Ibid.
[105] Unattributed, "China Hails Spacewalk 'Heroes' and Sets Eyes on Moon." *SpaceDaily.com*, September 29, 2008.
[106] Ibid.

> The CCP and PLA would risk losing face in the international community and popular support at home. The Chinese space program provides an ample amount of legitimacy to the CCP which so often totes how the space program is aiding the national economy and security.[107]

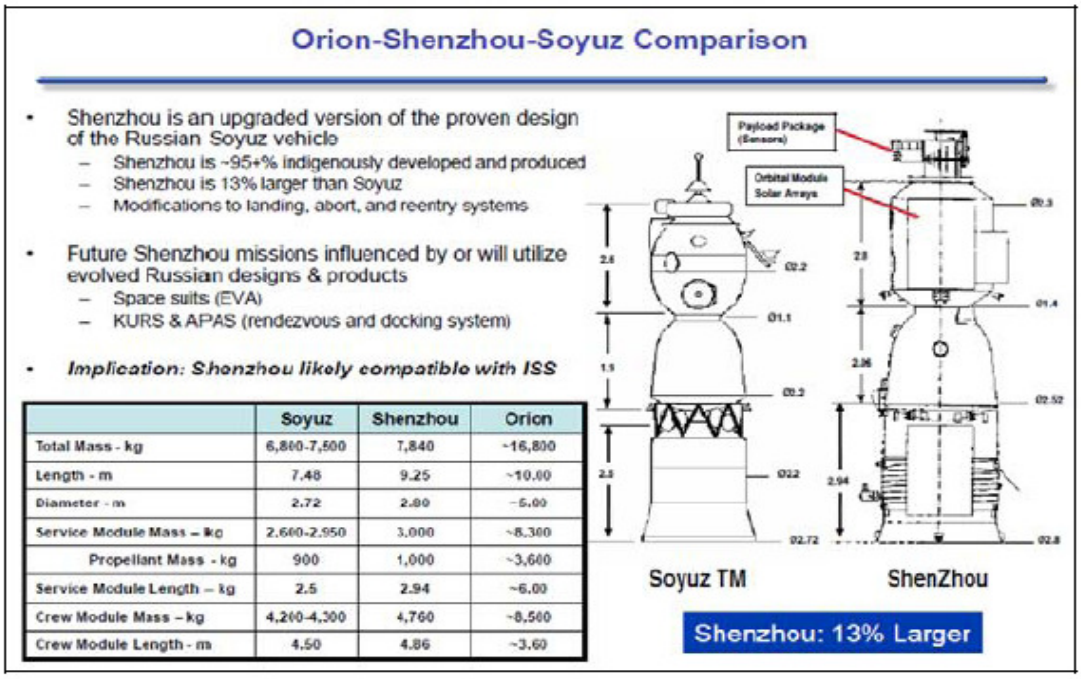
Perhaps another reason the Chinese were willing to get into the manned space business was confidence in their Shenzhou capsule. Man-rated capsules and their associated carrier rockets typically go through long series of expensive testing and "dummy launches" to ensure their space worthiness before actual humans are brought on board. Usually this requires a dozen flights, but the Chinese sent Col. Yang Liwei on only the fifth flight of the Shenzhou.[108] Clearly, the Chinese thought their capsule was ready and fully man-rated well ahead of the typical schedule for placing humans in new spacecraft.

Shortly after the successful Shenzhou-5 flight, China not only received a hearty congratulatory telegram from the Russian President Vladimir Putin at that time emphasizing "Russian-Chinese space cooperation is an important trend [that] will bear more fruit for the benefit of our nations," but the European Space Agency's director-general offered congratulations and expressed, "this mission could open a new era of wider cooperation in the world's space community".[109]

Although much has been written about the *Shenzhou* being a mere copy of the Russian *Soyuz* design, closer inspection reveals significant differences. Dean Cheng noted, "*Shenzhou* is not so much a copy of the *Soyuz* as the next evolutionary step".[110] First, it is larger by approximately 13% (see Figure 5 below), and has an additional capability for increased onboard electricity generation. While the *Soyuz* used only one main engine and a backup, the *Shenzhou* boasts four separate engines.

---

[107] Stacey Solomone, "China's Space Program: The Great Leap Upward," *Journal of Contemporary China*, Vol. 15, No. 47 (May 2006):322.
[108] David L. Chandler, "Confident China Joins Space Elite," *New Scientist*, Vol. 180, No. 2418 (October 25-31, 2003): 6.
[109] Ibid., 12. Europe briefly considered lifting the arms embargo against China (in place at U.S. leadingpost-1989 Tiananmen Square) in 2005.
[110] Ibid.



	Soyuz	Shenzhou	Orion
Total Mass - kg	6,880-7,500	7,840	~16,800
Length - m	7.48	9.25	~10.00
Diameter - m	2.72	2.80	~5.00
Service Module Mass – kg	2,600-2,950	3,000	~8,300
Propellant Mass - kg	900	1,000	~3,600
Service Module Length – kg	2.5	2.94	~6.00
Crew Module Mass – kg	4,200-4,300	4,760	~8,500
Crew Module Length - m	4.50	4.86	~3.60

Figure 4: Russian *Soyuz,* Chinese *Shenzhou*, and U.S. *Orion* Capsules Comparison[111]

Perhaps most significant in its design was the placing of additional solar panels and a guidance system *on the orbital module*, "…allowing it to remain on orbit as an autonomous satellite. This could provide a target for rendezvous and docking practice, and over time, several modules could be linked as part of a developing space station".87

III. 2. AMBITIONS FOR THE MOON, MARS & A SPACE STATION

Shooting for the Moon

China is not just resting on its laurels of becoming only the third nation in history to successfully send someone to space, but also has plans for lunar exploration, research on Mars, as well as establishing a permanent presence in space. Luan Enjie, director of Chinese counterpart to NASA, the China National Space Administration (CNSA), said, "Exploring the Moon is the first stepped in exploring deep space".[112] But it is important to note that China is not on a "Moon or bust" trajectory and is moving at a measured pace towards fulfillment of its lofty space ambitions. Hu Shixiang, deputy in charge of China's manned space flight program, said "I think about 10 to 15 years later, we will have the ability to build our own space station and carry out a manned Moon landing".[113] Hu also

[111] Pace, "China's Human Spaceflight Program: Achievements and Prospects," slide 4.
[112] Chandler, "Confident China Joins Space Elite,"6.
[113] Min Lee, "China Aims to Put Man on Moon by 2020,." *Space.com* , November 27, 2005.

added that, "China is developing its space program at its own pace, not competing with the U.S. It's not the competition of the Cold War era".[114]

On October 24, 2007, the Chinese launched the *Chang'E-1* lunar probe, which was designed to map the Moon's surface and serve as the first of three stages for follow on lunar missions.[115] After orbiting the Moon for over a year, its "charged-coupled device (CCD) camera was able to create a high-resolution map of the Moon, to include the dark side of the Moon".[116] A second probe, the *Chang'E-2*, is an un-manned lunar probe scheduled for launch sometime before the end of 2011, and will "conduct experiments involving five core technologies such as orbital adjustments and soft landings".[117] As part of this second stage of lunar research, it will be followed by another probe, *Chang'E-3*, which will also be used to test "soft landings and inspection of the lunar surface".[118]

The final stage of lunar exploration will involve a "Moon landing and launch of a Moon rover [which] will land on the Moon and return to Earth with lunar soil and stone samples for scientific research in about 2017."[119]

Follow-on analysis of *Chang'E-1*-derived data will be carried out by unusual partnership between Macao's University of Science and Technology (MUST) and the National Astronomical Observatories, Chinese Academy of Sciences (NAOC).[120] This joint lab will be involved in "data analysis, develop relevant software," and "also launch another two projects concerning the water detection [sic] on the Moon surface and data processing".[121] So, not only is Hong Kong working directly with Beijing on space projects, but now Macao has joined the Chinese "space team" and can start garnering prestige from the lunar exploration program. With Macao's and Hong Kong's joint participation in China's space program, here is another clear example of China using space for soft power and political (nationalistic) purposes.

---

[114] Ibid.
[115] Unattributed, "China Launches Its First Moon Orbiter," *Xinhua News Agency*, October 24, 2007.
[116] Unattributed, "China Reveals its 1st Full Map of Moon Surface," *Xinhuanet.com*, November 12, 2008.
[117] Unattributed, "China to Launch Second Lunar Probe Before End of 2011," *Spacedaily.com*, November 13, 2008. The *Chang'E-2* is noted as an improved design from the first probe.
[118] Ibid.
[119] Ibid.
[120] Unattributed, "Macao University to Analyze Data from China's Moon Probe." *SpaceDaily.com*, December 15, 2008.
[121] Ibid.

Aiming for Mars

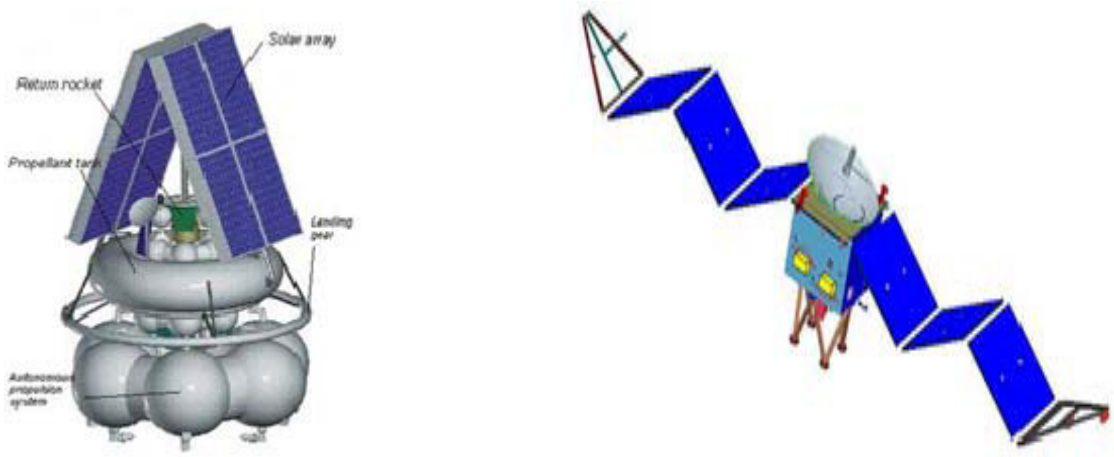


Figure 5: Mars Missions: (L) *Phobos-Grunt* and (R) *Yinghuo-1*[122]

Since Chinese ambitions for a Mars project have only recently surfaced, there is not a lot of information on the topic. What is notable about the Martian mission is that it will be a joint Sino-Russian endeavor that had been scheduled for late 2009, and now is delayed because of Russia's decision to postpone the launch of its mission Martian moon Phobos in 2011. The Chinese payload is called the *Yinghuo-1 ("Yinghuo"* means light from the firefly in Chinese.), which will ride piggyback on a Russian designed module called *Phobos-Grunt* ("Phobos-Soil").[123] The Russian portion is actually going to the Martian satellite Phobos to take a soil sample and then return to Earth, but will drop the *Yinghuo* payload into a Mars orbit.[124] Figure 5, above, from the Planetary Society's website, shows early design models for both of these payloads.
Figure 6, below, shows a composite payload.

---

[122] Image from Planetary Society's website: http://planetary.org/explore/topics/our_solar_system/mars/missions.html (accessed March 1, 2010).
[123] Unattributed, "China's First Mars Mission Delayed," *MarsDaily.com*, October 2, 2009. "*Yinghuo*" can also be a play on the Chinese pronunciation for "welcome to Mars" ([*huan*]*ying huo*[*xing*]).
[124] Data from Planetary Society's website: http://planetary.org/explore/topics/our_solar_system/mars/missions.html (accessed March 1, 2010).

Figure 6: Artist Illustration of Sino-Russian Mars Probe[125]

The two-year delay will affect the orbiter's scientific tasks, and the delay will also increase costs to China, according to Pang Zhihao, a researcher and the deputy editor-in-chief of the monthly Space International. The incident has shown the disadvantages of space international cooperation, according to Ye Peijian, chief designer of the nation's first moon probe said that China would be capable of exploring Mars by 2013 if a proposed space program received the government support. Ye, said that the most suitable time to launch the Mars probe would be in the years 2011, 2013 and 2016 when the distances between Mars and the Earth are the shortest.[126] Two large satellite ground-tracking control stations are now under construction for the second stage of China's lunar program, which can enable scientists to track and control a Mars probe. As long as China develops a more powerful rocket, calculations show China can send a Mars probe into orbit on its own, he said. But, since China lacks experience in exploring as far as Mars and since such a mission usually has huge costs, international cooperation is a good way to carry out China's first Mars probe mission, Pang Zhihao said.[127] Once successfully placed in a Martian orbit, *Yinghuo-1* photographs and data will allow "Chinese space

[125] Image from http://planetary.org/explore/topics/our_solar_system/mars/missions.html#yinghuo1 (accessed in March 1, 2010)
[126] http://www.spacedaily.com/reports/Russian_Launch_Issues_Delaying_Chinas_First_Mars_Probe_999.html (accessed in March 12, 2010)
[127] http://english.cas.cn/Ne/CN/200910/t20091010_44888.shtml (accessed in March 14, 2010)

researchers to…study the magnetic field of Mars and the interaction between ionospheres, escape particles, and solar wind".[128]

A "Heavenly Palace": The Chinese Spacelab

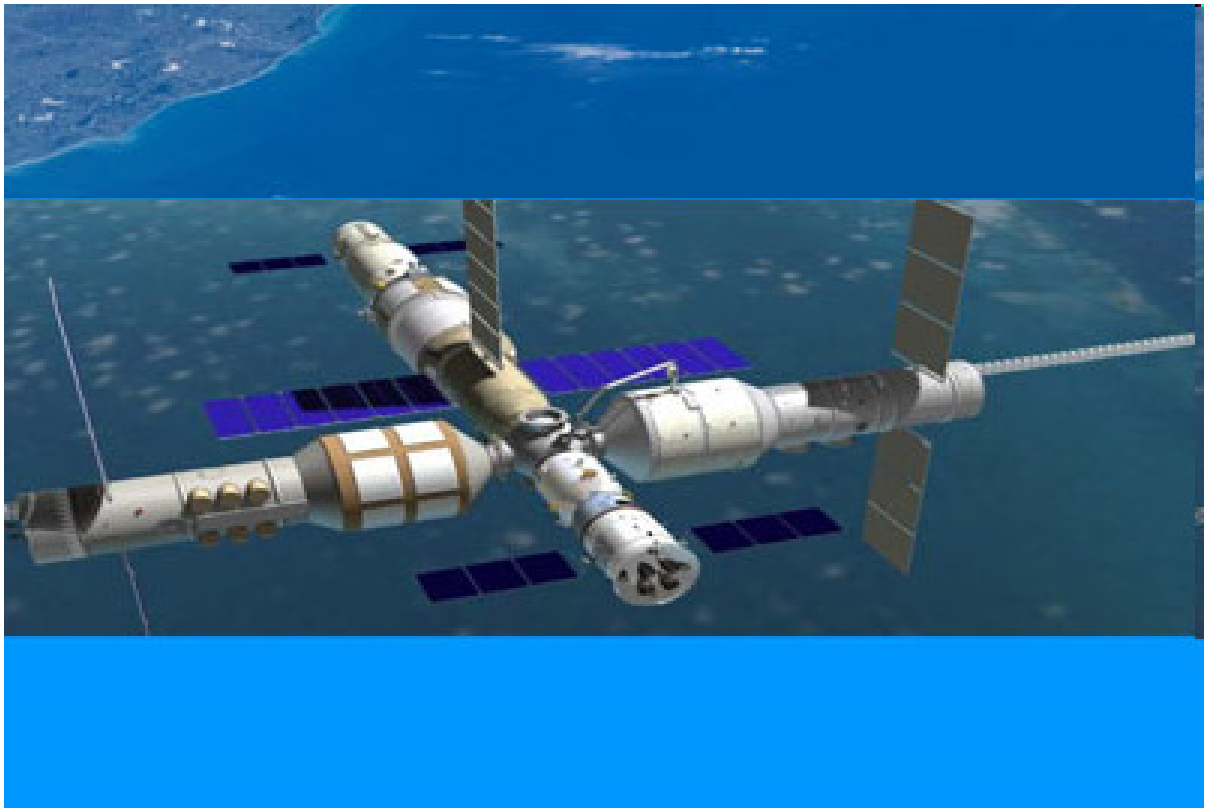


Figure 7: An illustration of a proposed Chinese space station planned for by 2020 (credit: Chinese Society of Astronautics)[129]

Now that the Chinese have demonstrated a successful spacewalk, or "extra vehicular activity" (EVA), on the *Shenzhou-7* mission, it seems like putting up a space station is the next logical step. Shortly after the *Shenzhou-7* capsule returned to Earth, Wang Zhaoyao, a spokesman for the Chinese manned program, said, "The ability to maneuver and work

[128] Unattributed, "China to Launch Probe to Mars With Russian Help" *RIA Novosti* (May 12, 2008).
[129] http://www.thespacereview.com/article/1231/2 (accessed in March 12, 2010)

outside a spacecraft is essential to China's goal of putting an astronaut on the Moon and having a permanent outpost in space".[130]

The China National Space Administration has announced plans to launch the first module of a space station in 2011. The station, named *Tiangong* "Heavenly Place", will consist of several modules, the first being Tiangong-1. The first module, weighing 8.5 tons and launched aboard a modified China's Long March 2F rocket, will be unmanned. Over the next two years, three additional modules on Shenzhou spacecraft, each with two or three taikonauts, will dock with Tiangong-1. The final configuration will be smaller than the Soviet station, Mir.

Tiangong-1 is able to perform long-term unattended operation, which will be an essential step toward building a space station. When transformed into a manned space lab, Tiangong would provide a "safe room" for Chinese taikonauts to live in and conduct research in zero gravity.[131]

Space Laboratory, after accomplishing rendezvous and docking test, space laboratory and cargo spaceship will be launched around 2015. More science experiments will be carried out with the participation of taikonauts. By operating the space laboratory, China will accumulate experiences in building, managing and operating the future space station.[132]

Manned Space Station will be around 2020; China will launch and assemble a space station with the combination of 20-ton modules. By that time, China will master the technology of building and operating LEO space station. The taikonauts will stay in space for a long duration and carry out large scale space application and technological experiments. The lifetime of the space station is 10 years.[133]

Tiangong-1 was scheduled to launch by the end of 2010, but was delayed for technical reasons. It represents the culmination of a larger project, Project 921, started by the Chinese space program in 1992. Completion of the space station will be the third and

---

[130] Ed Johnson, "China, Following Astronauts' Return, Plans Space Lab for 2011," *Bloomberg.com*, (September 28, 2008).
[131] http://news.xinhuanet.com/english2010/china/2010-03/03/c_13195325_3.htm (accessed in March 18, 2010)
[132] China Manned Space Flight Program. For more coverage on the algae cleanup, see:. http://thespacereview.com/archive/1565a.pdf (accessed in March 22, 2010)
[133] Ibid

final phase of Project 921, and China says it will be the beginning of international cooperation.

The *Xinhua News* report also discusses China's plans for a rocket-production base in the northern municipality of Tianjin:

With a total investment of 10 billion yuan and covering an area of more than one million square meters, the base would be capable of producing 12 carrier rockets each year once completed, [Liang Xiaohong, a member of the National Committee of the Chinese People's Political Consultative Conference (CPPCC), and Party chief of the China Academy of Launch Vehicle Technology] said.

The base will be able to produce two carrier rockets each year after the first stage of construction is completed next year. Liang said experts are currently developing China's new generation of carrier rockets, the Long March V, in the Tianjin base, adding that research on the initial model of the large-thrust rocket is already underway. Earlier report said Long March V, with a maximum payload capacity of up to 25 tonnes, would be put into service in 2014.

"The Long March V should satisfy China's need in its space technology development and the peaceful use of space resources in the coming 30 to 50 years, and would meet both domestic and overseas market demands for satellite launches before 2030," Liang said.[134]

Most recently, China has selected its second batch of taikonauts, including five men and two women, the first time women have joined the country's space mission. This is the first time for the Chinese to select and train women taikonauts. The two women taikonauts, both aero-transport pilots from the People's Liberation Army (PLA) Air Force, might take part in manned docking of China's future space lab, said Zhang Jianqi, former deputy commander of the country's manned space program.[135]

Although this appears to be from an authoritative source, it would be unwise to take this as serious as a government directive issued from the Politburo Standing Committee. Nevertheless, it does reflect China's growing ambition and strong desire to have a permanent place in space.

---

[134] http://news.xinhuanet.com/english2010/china/2010-03/03/c_13195325_3.htm (accessed in March 14, 2010)

[135] http://www.spacedaily.com/reports/China_chooses_first_women_astronauts_999.html (accessed in March 14, 2010)

III. 3. DOMESTIC SPACE APPLICATIONS & SPINOFFS

Given the resource constraints on its budget and personnel, China needed to find the proverbial "biggest bang for the yuan" for space technology investment. It smartly chose communication satellites to start with, which could support a wide range of government services as well numerous civilian and commercial applications. Yardley writes, "Satellites have become status symbols and technological necessities for many countries that want an ownership stake in the digital world dominated by the West."[136] Earth-imaging (or "remote sensing") and weather satellites, which can also support a variety of applications are of almost equal importance. Growth in these areas, as well as other space-related industries, have had positive side-effects for the Chinese economy, commercial growth, and laid a solid foundation for space science and high-technological research and development.

In the mid-1990s, China was losing its own market for telecommunications. Zhu Yilin, then-Secretary-General of the Science and Technology Commission from the Chinese Academy of Space Technology, commented, "…about 80% of the domestic communication transponder market is occupied by foreign satellites. There is indeed a danger of losing whole domestic markets if China cannot build and launch its satellites better, faster, and cheaper".[137] Looking at the present state of domestic Chinese space capabilities, it seems that the telecommunications satellite and carrier rocket industries have responded well. Not only is China basically self-sufficient to meet the needs of its domestic customer base, but it also has exported its satellites to other nations.[138]

China also intends on developing its own version of the U.S. Global Positioning System (GPS), called *Beidou* ("Big Dipper"). Zhang Xiaojin, CAST director of astronautics, commented that "the [*Beidou*] system will shake off the dependence on foreign systems".[139] While the implied "dependence" likely refers to GPS, it may also be viewed as freeing China from having to buy into either the European *Galileo* program or

---

[136] Jim Yardley, "Blocked by U.S., China Finds Its Own Way to Space," *International Herald Tribune*, May 23, 2007.
[137] Yilin Zhu, "Fast-track Development of Space Technology in China," *Space Policy*, Vol. 12, No. 2 (May 1996): 139.
[138] China has sold telecommunications satellites and their associated ground segment components to Nigeria and Venezuela. This is covered more in-depth in Chapter IV.
[139] Unattributed, "China Plans Own Satellite Navigation System by 2015," *SpaceDaily.com* (January 19, 2009).

the Russian GLONASS GPS variants. Currently, there are only five *Beidou* satellites providing regional PNT services, but 10 more will be launched over the next two years with a total of 30 additional satellites to be in orbit by 2015, providing full coverage for China.[140]

In addition to space-based navigation, remote sensing has also seen a recent growth spurt in applications and an ever-growing list of countries that want access to space-derived *geological* data. In the Chinese case, this is particularly acute. Since China has "a relatively small proportion of arable land to feed its one billion populations, assessing the health of the small fields that dominate Chinese agriculture is critical to the country's economic development".[141] China already had limited access to U.S. *LANDSAT* data, but with the launch of its own recoverable remote sensing satellites in the mid-1980s, it was able to exploit its own imagery and "no longer rely on the United States for satellite imagery of arable land within China's borders".[142] The results were remarkable with some illustrative examples as follows:

- Saved scarce financial resources by producing a geological study on 55,000 square kilometer area of Beijing, Tianjin, and Tangshan, which allowed for analysis of cultivated land, residential areas, and soil erosion at 1/13 to 1/3 the cost of typical processes;
- Opened new areas for natural resource extraction by space-based mineral and geological prospecting analysis, to include discovery of oil in Tarim Basin, division of the Datong coal fields and discovery of seven new ones in Beijing suburbs, as well as the discovery of chromite and iron ores in Inner Mongolia;
- Revised maps of major river deltas, which enabled analysis of mud-sand flow in the Yellow, Luanhe, and Haihe rivers and aided port and river course construction; and
- Uncovered heretofore unknown historical artifacts with discovery of an Ancient boundary moat from Jin Dynasty (265 – 420 A.D.) and ruins of ancient city of Yingchang from Yuan Dynasty (1271 – 1368 A.D.) in Inner

[140] Ibid.
[141] Gilks, "China's Space Policy: Review and Prospects," 219.
[142] Solomone, "China's Space Program: The Great Leap Upward," 318.

Mongolia.[143]

Chinese *Fengyun* weather satellites were also crucial in the run-up to the Beijing Olympics. According to the Chinese Meteorological Administration, *Fengyun*-derived data "provided detailed mapping of the algae outbreak at the sailing competition site in Qingdao".[144] Armed with accurate data, Chinese authorities proactively managed to clear the algae from the sailing regatta course and avoid a loss of face.

Space-borne experimentation with seeds is also bearing much fruit. Over the course of seven years during the late 1980s and early 1990s, Chinese sent "more than 300 varieties of seeds of 51 kinds of plants" on recoverable satellites.[145] Once back on Earth, these seeds were out through a series of breeding tests that "can produce a favorable genetic variation that might greatly increase the outputs".[146] These purported "giant pumpkins, tomatoes, cucumbers" grown from space-bred seeds had "281.5 percent higher [vitamin content] than that of ordinary vegetables."[147] One may see these agricultural applications, which have not yet reached a mature stage to date, through a skeptical lens and dismiss them as nothing more than wildly exaggerated and unverifiable claims. Nevertheless, even the small and remote potential promise of strains of "super seeds" would have a major political impact in trying to appear to be addressing the continual problem of feeding the world's most populous nation.

In order to consolidate and achieve greater output of civil applications of space related technologies, China has started to construct two main aerospace industrial bases. The first one is the Shanghai Aerospace Science and Technology Industrial Base, and will support a space science park, an aerospace museum, and an aerospace research and development center.[148] It will "jointly promote the growth of civil aerospace business,

---

[143] Zhu Yilin and Xu Fuxiang, "Status and Prospects of China's Space Programme," *Space Policy*, Vol. 13, No. 1 (February 1997): 71.
[144] Unattributed, "China's Fengyun-3A Satellite Starts Trial Business Operation," *SpaceDaily.com*, November 19, 2008. For more coverage on the algae cleanup, see: http://www.bjreview.com.cn/science/txt/2008-11/19/content_165344.htm
[145] Zhu and Xu, "Fast-track Development of Space Technology in China," 71.
[146] Ibid.
[147] Jill Drew, "Space Inspires Passion and Practicality in China," *Washingtonpost.com*, September 25, 2008. Also, Stacey Solomone, "China's Space Program: The Great Leap Upward," *Journal of Contemporary China*, Vol. 15, No. 47 (May 2006):324, adds rice, wheat, and asparagus to the list of vegetables the Chinese are experimenting with.
[148] Unattributed, "Space Sci-Tech Industrial Base Launched in Shanghai," *People's Daily* (January 23, 2006).See also: http://www.shanghaidaily.com/minhang/business2.asp

technological innovation and the application of such technologies".[149] The second one is going to be built in Xi'an, which is already home to China's Satellite Control Center and "more than 200 aerospace research centers and enterprises in the city",[150] to include China Academy of Space Technology (CAST) and its associated research institutes. The Xi'an center will "focus on developing satellites, new materials, energies, IT and other technologies for the benefit of civil application".[151] With hopes of attracting future space-related businesses and research facilities to plant roots there, Zhao Hongzhuan, currently the director overseeing the Xi'an base construction, said, "We will build it into a world class aerospace base".[152]

This "build it [aerospace base] and they will come" approach is also being supported by a slightly different, "capitalist" tactic. During the 11th Convention of Overseas Chinese Scholars held in Guangzhou last December, there was an announcement that a "financial incentive of up to 5 million yuan (US$731,000), among other things, will be offered to overseas Chinese entrepreneurs and professionals who settle in Guangzhou and open new [space-related] businesses".[153] What is unclear is whether this was devised at the Guangzhou provincial-level to attract high-tech firms to the area, or a more strategic decision made back in Beijing.

In addition to the creation of civilian-focused space research centers, China is also reaching out to the civilian space scientific community for future missions in space. Although the first taikonauts were PLA Air Force pilots, it seems China realizes the need for putting civilians in space, and may mark the beginning of a departure from what has historically been a military-led effort. Zhang Jianqi, deputy chief commander of China's manned space program, said "China's manned space project will start setting up space laboratories and stations after 2012, and by that time [civilian] scientists will be needed

[149] Unattributed, "China's 2nd Civil Aerospace Industrial Base to be Established in Xi'an" *China Radio International*, April 8, 2008.
[150]Ibid. For an excellent history of China's space program, see Brian Harvey's, *China's Space Program – From Conception to Manned Spaceflight*, (UK: Praxis Publishing, 2004).
[151] Ibid.
[152] Unattributed, "China's 2nd Civil Aerospace Industrial Base to be Established in Xi'an" *China Radio International*, April 8, 2008.
[153] Brown, "China Making Leaps in Space."

for a large number of experiments in space".[154] Zhang also extended the invitation to scientists from both Hong Kong and Macao Special Administrative Regions, since the *Shenzhou-8* "still had the space for more experiments".[155] Thus, Beijing is trying to recruit from all parts of China, especially those with high-technology connections.

In December, 2008, only a few months after the successful *Shenzhou-7* mission, Zhang Jianqi headed a small delegation of several taikonauts to Hong Kong. During an open session with reporters, he announced that "…one day, by which I mean some day in the near future, Hong Kong will have its [own] astronaut in space on our [Chinese] spacecraft."[156] He also noted that there has already been cooperation between Beijing and Hong Kong on several space projects, and even alluded to having China's "first women astronaut in the future phases of strategy that are expected to involve more laboratory works [sic]".[157] Betty Fung, director of information services in Hong Kong, commented that "People in Hong Kong are proud of the success [of the Chinese space program]".[158] The trip seemed to serve both as a propaganda effort promoting China's recent success in space as well as a recruiting campaign aimed at younger scientists and engineers currently studying at Hong Kong's prestigious universities.

In order to support future *Shenzhou*, *Tiangong* and future lunar-related missions, China needs to develop a new heavy-launch booster. On March, 2008, the Chinese Academy of Launch Vehicle Technology (CALT) announced that it "finished most of the designing work for the country's Long March-5 large thrust carrier rocket and will soon present an initial model".[159] CALT Vice President Liang Xiaohong said that the Long March-5 will have a "maximum payload capacity up to 25 tons…is expected to be able to send lunar rovers, large satellites and space stations into space after 2014".[160] What the

---

[154] Unattributed, "China's Future Astronauts Will Be Scientists," *SpaceDaily.com*, December 5, 2008.
[155] Ibid. See also, "HK [Hong Kong], Macao Scientists Expected to Participate in China's Aerospace Project." *SpaceDaily.com*, December 11, 2008.
[156] Unattributed, "Space Mission Commander Gives Clues on First Hong Kong Astronaut." *Spacedaily.com*, December 8, 2008.
[157] Unattributed, "Space Mission Commander Gives Clues on First Hong Kong Astronaut." *Spacedaily.com*, December 8, 2008.
[158] Ibid.
[159] Unattributed, "China's Future Astronauts Will Be Scientists," *SpaceDaily.com*, December 5, 2008. See also "China to Start Making Trial Model of 'Long March 5' Carrier Rocket," *China Radio International*, March 28, 2008.
160 "China to Start Making Trial Model of 'Long March 5' Carrier Rocket." China Radio International, March 28, 2008.

article also noted was that this new heavy-lift rocket was not just for domestic satellites and supporting CNSA's lunar and deep space programs, but that it will position China to "compete for launching commercial satellites on the international market".[161] Thus, China will be able to offer complete "cradle to grave" space services packages for the now-in-demand large GEO communications satellites, from design, manufacture, launch, and follow-on TT&C ground segment services.

Figure 8: Map of Hainan Island and Wenchang Satellite Launch Facility[162]

Liang Xiaohong confirmed that, "The Long March-5 rockets will be made in Tianjin and launched in Hainan".[163] Since Tianjin is a port city close to Beijing, it will be easy to transport the mammoth 5-meter fairing of the new carrier rockets via cargo ship

161 Ibid.
162 Data pulled from Google Earth. Small balloon with "A" marks future location of launch site. I zoomed in on the location and created a smaller inset map. Photo in lower center from: "China Completes Enclosure of Land for Fourth Satellite Launch Center," SpaceDaily.com, November 19, 2007.

down to Hainan Island and avoid the narrow network of railways and tunnels that sometimes constrain rocket and payload size. The new Wenchang space launch facility's, which will replace Xichang, between 2014 and 2015, not in 2013 as it was previously announced, and will give China its southernmost launch facility. Being only 19 degrees off the equator has the added benefit of the Earth's rotation, or "Earth assist," which means it can convert that extra kinetic "push" into greater payload mass (satellite bus size or extra fuel). Given the launch facility's far eastern location and the prevailing trend to launch prograde (eastward), there will be minimal risk to the neighboring communities about fallout or other launch-related hazards.

Wenchang will boast China's newest rocket command center, rocket-launch pad, rocket assembly plant, and China's first-ever visitor center.[164] The actual rocket launching site will be in Longlou Town, with the launch tower "800 meters (just under half a mile) away from the seaside".[165] One nice spin-off from the Wenchang launch center will be the construction of "China's sole space-science theme park, at a cost of seven billion yuan (approx. $1,023,593,570 USD)".[166] Although the article did not go into detail as to what the space park would consist of, such a large plan that is almost triple the expenditure allotted for the Shanghai aerospace industrial base (Wenchang will receive seven billion yuan compared to only 2.2 billion for Shanghai) will have a major impact in the local economy and may attract both domestic and international aerospace businesses to the southern Chinese island.

China's space program has brought immense benefits to its industrial, commercial, and agricultural programs. Johnson-Freese notes, "Having studied the *Apollo* playbook, China understands there are multiple rewards to be reaped from a successful manned space program. China sees a space program as generating technology and technology as spurring economic development".[167] As the demand on "telecommunications industry and demand for remote sensing services continue to grow," China will see an "increase [in]

---

163 Unattributed, "China's New Carrier Rocket to Debut in 2014." Xinhuanet.com, March 2, 2008.
[164] Jill Drew, "Space Inspires Passion and Practicality in China."
[165] Unattributed, "China Completes Enclosure of Land for Fourth Satellite Launch Center," *SpaceDaily.com*, November 19, 2007.
[166] Ibid.
[167] Joan Johnson-Freese and Andrew S. Erickson, "The Emerging China-EU Space Partnership: A Geotechnological Balancer," *Space Policy*, Vol. 22, No. 1 (February 2006):12.

future financial revenues, as well as the quality and number of available jobs produced in China".[168]

The manned space program alone has brought significant benefits, to include "new capabilities in computers, aerospace materials, fabrication technologies, electronics and integration and test as well as experience in developing major subsystems such as guidance, attitude control, propulsion and life support".[169] One recent article boasts that "nearly 80 percent of new materials developed by Chinese scientists were first used in space…and almost 2,000 space-related inventions have been used in other sectors".[170] One example of this was the "Outer Space Cup" or "Dislin Cup" that the first Chinese taikonaut, Yang Liwei, drank tea from during his journey in outer space.[171] As the cup was "designed to withstand extreme temperatures and the rugged environment of space" as well as being "leakproof which alleviates problems in microgravity," the special cup was an immediate hit after Yang landed back on Earth and is still being marketed today.[172]

In addition to the technical side of space-derived products, there have been a number of cultural spin-offs from the space program as well. Prior to the spacewalk of *Shenzhou-7*, there were nationwide contests for "schoolchildren to create artwork to commemorate the feat".[173] Clearly, the Chinese government aimed to plant seeds in the young minds that will hopefully grow up to be pioneering CNSA space scientists! On a slightly more offbeat angle, there was also a "black-market cell phone handset maker…doing brisk business selling a rocket-shaped mobile device painted red with '*Shenzhou VII*' stamped on the side".[174]

Beyond economic impact, China's manned space program has created more general domestic interest in space sciences. According to Yan Feng, chief editor of the Chinese edition of *Science & Vie*, a popular European science magazine, the *Shenzhou* program

---

[168] John J. Klein, *Space Warfare: Strategy, Principles and Policy* (New York, NY: Rutledge 2006), 38.
[169] Craig Covault, "Manned Program Advances Chinese Space Technology," *Aviation Week & Space Technology*, Vol. 151, No. 22 (November 29, 1999): 28. The recent *Shenzhou-7* also provided Chinese scientists with samples of solid lubricants and experiments for space tribology.
[170] Unattributed, "China's Space Industry Takes Off," *SpaceDaily.com*, November 6, 2008.
[171] "Dislin" refers to the Shanghai-based "Taizhou Huangyan Disilin Plastic Co. Ltd" that manufactured the cup. See http://www.chinadislin.com/products1.asp
[172] Solomone, "China's Space Program: The Great Leap Upward," 317-318.
[173] Drew, "Space Inspires Passion and Practicality in China."
[174] Ibid.

has helped astronomy become "the top interest of science readers the past two years".[175] Most of the manned space launches have been by ardently watched live by junior astronomic buffs that make the long trek to the launch site in Hebei province to see each launch with their own eyes.[176] China's spacewalk in 2008 left an especially deep impression on China's massive population. The event, estimated by AGB Nielsen Media Research to have been watched by more than half of available Chinese households, compelled Shanghai-based computer technician Qu Yin to say, "I really wanted to cry when I saw the national flag Zhai [Zhigang] wave in space and the red characters 'Fei Tian' on the [sic] homemade [Chinese-made] spacesuit he wore".[177] Li Lunchang, who currently lives in Qiqihar, Heilongjiang Province, beamed, "I feel very proud of the three taikonauts on board the craft [Shenzhou-7], especially because two of them [Zhai Zhigang and Liu Boming] came from Qiqihar".[178]

Success of the *Shenzhou-7* space walk also spurred Chinese youth to launch their own rockets to commemorate the flight. A group of students from the Harbin Institute of Technology launched 16 "self-made micro-rockets" from a *Shenzhou-7* capsule-shaped launch pad. He Mingjie, one of the participants, said, "The success of the Shenzhou-7 mission has made us even more enthusiastic about the space programs [sic]. I hope someday I can join the program, too".[179]

China's burgeoning online community, now the largest in the world, also avidly watch space launches and use weblogs to show their enthusiasm and support.[180] Online forums were "packed with warm remarks left by Chinese netizens, many of whom watched the landing of the Shenzhou-7 vessel through live video broadcast at major

---

[175] Unattributed, "China's 'Divine Vessel' Carries Nation to Space of Wonder," *People'sDaily.com* (English), September 28, 2008.
[176] Ibid.
[177] Ibid. "*Fei*" means "flying" and "*tian*" means "heaven" or "space." The Chinese were proud that they did not have to borrow a Russian spacesuit but rather used a Chinese-engineered (albeit likely based on Russian designs) spacesuit for this flight. See http://www.agbnielsen.net/aboutus/aboutus.asp (accessed in April 4, 2010) for more info on AGB Nielsen in Asia.
[178] Cong Wang, "China Beams With Pride, Joy After Successful Space Mission," *People's Daily.com* (English), September 29, 2008.
[179] Wang, "China Beams With Pride, Joy After Successful Space Mission."
[180] See http://www.cnn.com/2009/TECH/01/14/china.internet/index.html (accessed in April 4, 2010) for estimates that China's online community is almost 300 million, closing in the on the entire U.S. population!

portals".[181] One patriotic netizen wrote, "Even though China's space technology is still not as strong as the United States and Russia [sic], our future is bright. Just look at how many young people are interested in the [sic] space technology".[182]

So, China's space program has far-reaching impacts across the nation. From helping the Chinese Communist Party garner prestige and legitimacy, serving as a beacon for attracting and inspiring the next generation of space scientists and engineers, to having numerous positive civilian applications, the space program indeed is living up to its role as "an integral part of the state's comprehensive development strategy".[183] Speaking at Harvard's Fairbank Center China Current Events Workshop in November 2005, Johnson-Freese noted:

> The Chinese government… [is] banking on the effort generating a burst of economic development from spin-off technologies. The program itself is an employment program as well as a space program, providing work and training for thousands in the Chinese technology sector.[184]

Indeed, China has been successfully marketing its space program for domestic consumption and is reaping its rewards. China, however, also realizes that a successful space program can also bring potential rewards beyond its borders. Thus, the next chapter shifts focus to the *international* dimension of the Chinese space program and how China is maximizing its rising clout in space to have a *global* impact as it interacts with other nations.

---

[181] Wang, "China Beams With Pride, Joy After Successful Space Mission." "Netizens" is a clever English rendering of the Chinese "*wang min*" or literally "(Inter) net people."
[182] Ibid.
[183] White Paper, "China's Space Activities," (2000).
[184] Joan Johnson-Freese, quoted in Alvin Powell, "Questions Remain About China in Space," *Harvard University Gazette*, November 3, 2005.

CHAPTER IV: CHINA'S "SOFT POWER" IN SPACE: INTERNATIONAL ASPECTS

China's space program got its initial start with Russian assistance back in the 1950s, but has come a long way since then, becoming a global exporter of space technologies and applications. Since announcing that it would be "entering the [international] commercial satellite launch market at the UNISPACE Conference in Geneva in August 1982,"[185] its growing space-related research, development, and industrial bases have allowed it to build "sophisticated launchers and satellites…conservatively aiming to capture 15 percent of the global market for such services".[186] Looking out from its ambitious 1982 mandate, this chapter will analyze who China has been working with in space internationally, in what capacities, and how it applies space-focused soft power to maintain and exploit its international relations agenda. It will also examine how other countries, especially in Asia, view its rapid rise as a space power. Finally, it concludes by assessing three different U.S. perspectives on the rise of Chinese space activities.

Since there are only two official Chinese government documents concerning its own space program that also contain language concerning its role in the international arena, it makes sense to use these key documents as a starting point. Specifically, the 2000 version spells out some of the key guiding concepts and principles and sheds light on Chinese intent to:

- Emphasize international exchanges and cooperation in the area of space [technology] (*zhongshi hangtianlingyu de guoji jiaoliu yu hezuo*);
- Renovate [space science and technology] institutions and technology and establish an operational mechanism geared toward both domestic *and international markets*;
- Increase simultaneously the capability of space development of all countries, *especially the developing countries*, and enable all countries to enjoy the benefits of space technology;
- Emphasize Asia-Pacific regional space cooperation; and

[185] Wayne C Thompson & Steven W. Guerrier, ed., *Space: National Programs and International Cooperation* (Boulder, CO: Westview Press, 1989), 93.
[186] Drew, "Space Inspires Passion and Practicality in China."

- Support Chinese space enterprises to participate in *international space commercial launch services* in line with the principles of equality, equity and reciprocity.[187]

Although the 2006 White Paper does not deviate from these points, it does highlight more of the cooperative projects in the intervening years (2000-05) with other countries. It also boasts that China has:

- Signed cooperation agreements on the peaceful use of outer space and space project cooperation agreements with Argentina, Brazil, Canada, France, Malaysia, Pakistan, Russia, Ukraine, ESA, and the European Union Committee;
- Signed space cooperation memorandums with space organizations of India, and Great Britain; and
- Conducted exchanges with space-related bodies of Algeria, Chile, Germany, Italy, Japan, Peru, and the United States.[188]

What is more curious is that China's recently published "White Paper on National Defense" contained the following language: "Major breakthroughs have been made in developing the international market for space products. China has exported its first satellite, and the Earth resources satellite project with Brazil [CBERS] has played an important role in both countries' economic development".[189] It seems slightly out of place for a primarily defense-focused white paper to contain any reference to a joint space project. While hawkish-minded China watchers may see this as confirmation as to the true military intent driving the space program, I see it more as a poke in eye for America as well as a point to brag about. The sentence right before it is, "China's defense-related science, technology, and industry actively conduct cooperation with other countries in the field of hi-tech industries, combining military and civilian needs, and

---

[187] White Paper, "China's Space Activities," (2000). Original white paper (Chinese "*baipishu*") in Chinese at: http://www.cnsa.gov.cn/n615708/n620168/n750545/index.html (accessed in April 4, 2010). Italics emphasis mine. Pinyin in parentheses hereafter for terms as I compared the original Chinese text to the English translation.

[188] White Paper, "China's Space Activities" (2006). See also, "China Signs 16 Int'l Space Cooperation Agreements, Memorandums in Five Years." *People's Daily (Online)*, October 12, 2006.

[189] White Paper. *China's National Defense in 2008*. People's Republic of China, Information Office of the State Council, January, 2009, 33. See section under "Enhancing Cooperation with Other Countries."

makes great efforts to develop hi-tech civilian products with high added value,"[190] thus it seems like China is merely highlighting one of its showcase cooperative ventures with another country, which happens to be space-related. Kevin Pollpeter echoes this idea behind the 2006 White Paper as he notes that, "…the document serves as a venue to tout China's accomplishments in space not only for domestic political and bureaucratic reasons, but also to advertise China's viability as an international partner in space".[191] He also noted China's space program will help it "achieve great power status within a system dominated by the United States and to increase its international influence without triggering a counterbalancing reaction".[192]

Clearly, for a nation to successfully achieve manned spaceflight is a tremendous accomplishment with significant second-order impacts. Dean Cheng, CNA China space expert, notes, "At the very least it seems the manned programme is about international prestige. China's space capability says to the world, 'We are an advanced nation'".[193] Cheng also asserts that "Another driver is diplomacy. A wide-ranging space programme showed the rest of the world that China had arrived on the international stage. That fits with hosting the Olympics, that fits with a burgeoning economy, and that fits with the world's largest foreign capital reserves".[194] William Burrows offers the label of "international power," and that for China to develop such a complex, multi-faceted program with ambitions for a space station and the Moon "requires a huge, advanced scientific and technological base that suggests a stable and powerful political system; what used to be called national 'might'".[195]

Below is a region-by-region breakdown of Chinese international cooperation and joint ventures in space.

---

[190] White Paper, *China's National Defense in 2008*.
[191] Kevin Pollpeter, "Competing Perceptions of the U.S. and Chinese Space Programs," *China Brief*, Vol. 7, No. 1 (January 10, 2007): 4.
[192] Ibid, 6.
[193] David L. Chandler, "Why Do the Chinese Want to Conquer Space?" *New Scientist*, Vol. 180, No. 2418, (October 25-31, 2003): 8.
[194] Rincon, "What's Driving China Space Efforts?"
[195] William E Burrows, *The Survival Imperative: Using Space to Protect Earth* (New York, NY: Forge, Tom Doherty & Associates, 2006), 217.

IV. 1. CHINA WITH EUROPE

China has had a long history of space project interaction and cooperation with European countries. Its first satellite, the *Dongfanghong-1* ("East is Red," communications satellite) was built largely with German-engineered high-technology subsystems, to include power-generation and attitude control, along with French assistance.[196] Vincent Sabathier, a former Space Attaché at the French Embassy, sees a growing trend of space cooperation between the European Space Agency (ESA) and China, especially since "European manufacturers have now invested in ITAR-free technology that allows them to export systems with the previous tedious, and some say prohibitive, ITAR rules."[197]

In July 2001, the Chinese National Space Administration (CNSA, similar to NASA) partnered with ESA to collaborate on a joint mission to study the Earth's magnetic environment, China's first cooperative international project with another space agency. ESA provided a four-satellite *Cluster* mission while the Chinese provided two small *Double Star* satellites.[198] One of the *Double Star* satellites circles the poles while the other remains in equatorial orbit to collect data. As an incentive for Chinese cooperation and data sharing, ESA has "handed over 10 spare *Cluster* instruments worth $ 6.8 million."[199]

In 2004, ESA joined with the National Remote Sensing Center of China (NRSCC, under the PRC Ministry of Science and Technology, or "MOST") and started the ESAMOST Dragon program, which is a "three-year science and exploitation…in the field of Earth observation application development".[200] This program was so successful that it has been expanded for another four years under the "Dragon 2" title and now includes "25 projects exploiting ESA, TPM, and Chinese EO [electro-optical] data for

---

[196] Chris Bulloch, "China's Satcoms: Relying on the West," Interavia, (April 1998), 44. Deutsch Aerospace Airbus (DASA), successor to Messerschmitt-Bölkow-Blohm (MBB) worked closely with Alenia Aerospazio on the Sinosat program, with most of the actual construction taking place at the Aerospatiale facility in Cannes, France.

[197] Vincent G. Sabathier, "Europe and China," *adAstra*, Spring 2005, online at: http://www.space.com/adastra/china_europe_0505.html (accessed in April 4, 2010). See Chapter V for more discussion on ITAR.

[198] Constance Holden, "East of ESA," *Science*, Vol. 293, No. 5529 (July 20, 2001): 423.

[199] Ibid.

[200] See the project website at: http://earth.esa.int/dragon/. Results from this initial cooperation can be viewed at: http://earth.esa.int/dragon/symp2008/proceedings/.

land, ocean, and atmospheric science and application development".[201] Also in 2004, the EU surpassed Japan as China's largest trading partner with Sino-EU trade accounting for over $160 billion.[202] Although the economic ties are very strong, China's grander strategy with Europe is based on "science and technology diplomacy" (*keiji waijiao*) over normal "economic diplomacy" (*jingji waijiao)*, since much of the technical space know how that China lacks can be found in Europe and is free from U.S. export restrictions.[203]
It seemed to be in that spirit that China recently purchased a satellite made by the French firm, Alcatel, which was proudly announced to be "ITAR-free" and impervious to U.S. badgering.[204]

Beyond mere satellite purchases, China recently scored what some space industry analysts are calling a "commercial coup" with its recent agreement to launch a five-ton French satellite for Eutelsat Communications. Since the satellite has no U.S.-made components, it is not bound by U.S. policy restrictions and will mark the first Chinese launch of a Western satellite in more than a decade. Although the launch will not take place until late 2010, it "could prompt owners of other large commercial satellite fleets to enter similar arrangements with Chinese launch providers."[205] Citing China's comparative advantage in lift services and strong launch record, which is usually "40% less than the $100 million [price tag] for the most expensive launches on European rockets," there is a chance to lure other potential customers away from considering more expensive and, perhaps more politically complicated, U.S. launch options.[206]

Shortly after this deal was announced, Congressman Dana Rohrabacher (R-California) launched a lowbrow attack on China. He referred to China as a proliferator of weapons of mass destruction and stated, "Ten years ago, the Cox Report clearly

---

[201] See http://dragon2.esa.int/objectives.html and http://dragon2.esa.int/ for more details. TPM stands for "ESA Third Party Missions."
[202] Johnson-Freese and Erickson, "The Emerging China-EU Space Partnership: A Geotechnological Balancer," 13.
[203] Ibid. The U.S. has two main bodies that control trade restrictions with China, the U.S. State Department International Traffic in Arms Regulations (ITAR) and the U.S. Commerce Department Export Administration Regulations (EAR).
[204] Carl E. Behrens, *Space Launch Vehicles: Government Activities, Commercial Competition, and* Satellite Exports, Congressional Research Service Report IB93062 (March 20, 2006): 9.
[205] Andy Pasztor, "China to Launch Satellite For France's Eutelsat," *WallStreetJournal.com*, February 25, 2009. There was an interesting "Comment" on this article online, which read: "Good for China and the world. US can choose to isolate itself or engage the world." Admittedly, this is but one opinion, but nonetheless reflects a powerful sentiment that the U.S. space policies may actually be self-defeating.
[206] Pasztor, "China to Launch Satellite For France's Eutelsat."

demonstrated that U.S. technology transfers to the PRC helped to improve and enhance the efficiency of China's arsenal of missiles that were aimed at us".[207] He also added that despite needed changes to ITAR, America should ensure "that these scofflaw and rogue nations are barred from receiving our high tech systems,"[208] and called for sanctions on Eutelsat. While one can expect some measure of high-level political response in order to show patriotic support for the U.S. aerospace industry, his comments may end up driving more business away from America.[209] Only time will tell to see if either France-based Eutelsat, or the French-Italian space consortium of Thales Alenia Space, which currently has several contracts for Pentagon satellites and military communications, will end up being "punished" by Congress for "promoting Chinese space interests".[210]

Chinese space relations with Europe, despite potential political fallout with the United States, seem to be moving along at an excellent pace well into the next decade. With the expansion of the successful Dragon program with ESA, purchases of French-built satellites, and the upcoming launch of the Sino-German jointly-developed Solar Space telescope and French Eutelsat satellites, China has established a significant foothold on the European continent for some time to come.[211]

IV. 2. CHINA WITH SOUTH AMERICA

After China was hit with sanctions following the 1989 Tiananmen Square incident, it had to look for non-Western partners to help its then-nascent aerospace industry. Its search led to it to South America, starting with Brazil's National Institute of Space Investigations (INEP).

Brazil started researching space in the 1960s and launched its first satellite, the

---

[207] Unattributed, "Rohrabacher Condemns Use of Chinese Rockets," *SpaceMart.com*, February 26, 2009, http://www.spacemart.com/reports/Rohrabacher_Condemns_Use_Of_Chinese_Rockets_999.html (accessed in April 12, 2010).
[208] Ibid.
[209] As noted in Introduction, a rebuttal to the Cox Report from Stanford University's Center for International Security and Cooperation largely dismissed this notion (see: http://iisdb.stanford.edu/pubs/10331/cox.pdf, accessed April 12, 2010). The Cox Committee Rebuttal to the "Stanford Assessment," as well as the Stanford "response" to the Cox rebuttal are also conveniently located at: http://www.people.fas.harvard.edu/~johnston/cox.html (accessed April 12, 2010).
[210] Pasztor, "China to Launch Satellite For France's Eutelsat."
[211] For more on the Solar Space Telescope, see: http://www.globalsecurity.org/space/world/china/sst.htm (accessed April 12, 2010).

SCD-1 Data Collection Satellite, on February 9, 1993.[212] When the United States decided to switch the management of LANDSAT data from NASA and NOAA over to the Earth Observation Satellite Company (EOSAT, a joint venture of Hughes and RCA) and financial problems that affected data availability started to emerge, Brazil, among other nations, started to look elsewhere for reliable remote sensing data.[213] With a focus on joint development rather than trying to go it alone, they joined forces with the Chinese and started work on the Chinese-Brazilian Earth Resources Satellite (CBERS, also called "*Ziyuan*" by the Chinese) in July, 1988, after President José Sarney visited China.[214]This marked China's "first international cooperative space technology venture with another developing country," and eventually led to the successful launch of two satellites, *Ziyuan-1* in October 1999, and *Ziyuan-2* in September 2000.[215] The CBERS project was an effort to:

> Use advanced space remote sensing techniques to inventory, develop, manage, and monitor the Chinese and Brazilian Earth resources in agriculture, forestry, geology, hydrology, geography, cartography, meteorology, and environment, etc. [as well as] promotion [sic] of the development and application of space remote sensing and space technology in China and Brazil.[216]

Brazil saw additional benefits from this new relationship with China. First, the CBERS program offered a cheaper alternative to its original plan to build four satellites under the Brazilian Complete Mission (MECB). Given budgetary constraints, teaming on a joint project could help stretch scarce space program dollars out even further. China also benefited for this reason as well, especially since its own indigenous capability and

---

[212] José Monserrat Filho, "Brazilian-Chinese Space Cooperation: An Analysis," *Space Policy*, Vol. 13, No. 2 (May 1997): 153. China and Brazil signed twelve joint documents regarding space which are further detailed and analyzed in this article. See also Craig Covault's, "China's Space Encore." *World News & Analysis*, Vol. 159, No. 17 (October 27, 2003): 30.

[213] Carlos de Olivera Lino et al., "CBERS: An International Space Cooperation Program," *Acta Astronautica*, Vol. 47, Nos. 2-9 (July-November 2000): 560. See pp. 560-561 for comparison and analysis of the CBERS imagery capability versus LANDSAT and SPOT.

[214] Daphne Burleson, *Space Programs Outside the United States: All Exploration and Research Efforts, Country By Country,* 36. See pp. 36-37 for detailed breakdown of the CBERS satellite. The U.S. intelligence community refers to Chinese reconnaissance satellites as "*Jianbing-X*" series.

[215] Yun Zhao, "The 2002 Space Cooperation Protocol between China and Brazil: An Excellent Example of South-South Cooperation," *Space Policy*, Vol. 21, No. 3, (August 2005): 213. The *Ziyuan-2* was not classified as a *CBERS* satellite, but simply as a Chinese launch.

[216] Burleson, Space Programs Outside the United States: All Exploration and Research Efforts, Country By Country, 160.

its "services and operations in the field of meteorology, navigation, and remote sensing were essentially dependent on foreign satellites".[217] For part of this program, China turned to England for assistance. Audrey Nice, a spokesperson for the University of Surrey, stated that "[CBERS] was built under a know-how transfer and training program between the UK and China".[218] The CBERS project also involved "ten Chinese engineers and scientists spending a full year at the Surrey Space Centre in England, working with British engineers on the design, construction, and test of the payload. British experts also installed a Space Mission Control ground station at Qinghua University in Beijing".[219] Currently, the CBERS program has successfully launched three satellites, with an agreement to launch two more through 2013. It is considered part of the world's main Earth-observation satellite constellations, comparable to the "U.S. LANDSAT, French SPOT, and the Indian ResourceSat".[220]

Recently, China has pursued greater relations with Venezuela centered on oil imports and national defense issues. Venezuela stands out as the "most prominent example" of the "leftist, anti-American governments" in the region.[221] Venezuelan President Chavez notes his country has "100 satellite technicians training in China…radars, tracking stations, and air defenses are being installed right now".[222] The satellite, officially called the *VENESAT-1*, but also named the "Simon Bolivar" after the South American revolutionary hero, will be used for "government and military communications and to give remote parts of the country access to telephones and the Internet."[223] The *VENESAT-1* marks China's "first contract for satellite manufacturing and launch service for a Latin American country".[224] Nuris Orihuela, Venezuelan Vice

---

217 Ibid.
218 James Oberg, "Year of the Rocket," IEEE Spectrum, Spring 2001.
219 Oberg, "Year of the Rocket".
220 Unattributed, "Brazil, China to postpone joint satellite launching to 2011" see http://news.xinhuanet.com/english2010/sci/2010-02/11/c_13172079.htm (accessed in April 12, 2010) CBERS-1 was launched on October 14, 1999; CBERS-2A was launched on October 21, 2003; CBERS-2B was launched on September 19, 2007; CBERS-3 was scheduled to launching from 2010 to mid-2011. To date, there has been no mention of a launch date for CBERS-4.
221 Martin Arostegui, "Chavez: Venezuela to Launch Defense Satellite," *Washington Times*, September 12, 2007.
222 Ibid.
223 Unattributed, "Venezuela and China to Build Satellite," *Space Daily*, November 1, 2005.
224 Unattributed, "China to Hand Over Satellite to Venezuela," *Spacemart.com*, January 23, 2009.

Minister of Science and Technology, confirmed that there will actually be 90 technicians who will be working on the satellite, to include "30 [specialists] who will carry out special studies in China".[225]

Although *VENESAT-1* was successfully launched from China's Xichang Satellite Launch Center on October 30, 2008 (watched by millions of Venezuelans), it had to first undergo several months of testing before being declared fully operational. Finally, on January 24, 2009, in a ceremony "held in one of the satellite's mainland stations in the town of El Combrero, it was officially handed off to Venezuelan satellite control operators," enabling Venezuela to become only the fourth nation in Latin America with any capability in satellite communications.[226]

Now that the satellite is operational, President Chavez's $406 million-dollar investment seems to be stirring up considerable enthusiasm for future space-based applications, to include:

- Expanding the reach of the Caracas-based Telesur television network;
- Bringing telecommunications to remote and rugged areas of southeastern Venezuela where standard landlines are expensive and difficult to operate; and
- Bringing "tele-medicine" and "tele-education" to remote areas, especially the Warao Indians in the Orinoco river basin.[227]

Socorro Hernandez, Minister of Telecommunications and Information, said that "during the first year of its operation [*VENESAT-1*] will focus on domestic needs. This includes over 100 towns that have poor or no access to basic telephone services".[228] Uruguay, although coming late to the project, provided approximately ten percent of the overall $241-million project cost.[229] It will likely be able to access a proportional number of transponders for its domestic communication requirements. More importantly, however, it also "traded" its orbit slot at 78 degrees west to gain satellite access, which

---

[225] Ibid.
[226] Jorge Rueda, "Chavez Cheers Satellite Launch," *Washington Times (online)*, October 30, 2008. Also, "China to Hand Over Satellite to Venezuela," *Spacemart.com*, January 23, 2009.
[227] Ibid. See also: Sam Logan, "Venezuela's Space Escort," *International Relations and Security Network (ISN)*, November 7, 2008. Telesur is the pan-regional news and information network that includes 24 television stations and 25 radio frequencies.
[228] Unattributed, "China to Hand Over Satellite to Venezuela," *Spacemart.com*, January 23, 2009.
[229] Unattributed, "China to Orbit Venezuela-Uruguay Satellite in 2008." *RIA Novosti*, February 4, 2008.

allows for "north-south coverage from southern Mexico to Chile and Argentina, and east-west coverage from Brasilia, Brazil, to well past Lima, Peru, in the Pacific Ocean".[230]

Venezuela recently asked China for assistance to obtain imagery capability after it failed to buy its way into the Israeli-led ImageSat program. Though details are currently sketchy, it appears that China will launch an Earth-observation satellite for them sometime in 2013, giving Venezuela its first-ever organic capability of direct-downlinked imagery from space.[231]

More recently, China has pursued relations with Bolivia to create a space agency to manage and execute a satellite project of Chinese companies to improve communications in the country. In October 2009, the Bolivian government, China's Great Wall Industry Corporation and the International Telecommunication Union signed a memorandum to construct and set a satellite in orbit. Bolivia is investing some 300 million U.S. dollars in this project.[232]

"This program is very important for Bolivia, because with the improvement of the communication system, the development of production, education, health, detection of natural phenomena, technology and other sectors will be boosted," Delgadillo said.[233]

The satellite, "Tupac Katari," is named in honor of an indigenous leader of 18th-century Bolivia. It is expected to be in orbit in 2013.

IV. 3. CHINA WITH AFRICA

China, in what some analysts have viewed as both a display of soft power as well as natural resource diplomacy, negotiated a deal with Nigeria to build, launch, and operate a communications satellite. The Japan-based *East Asian Strategic Review 2008* cited this project as an example of "China's exploitation of space activities as a diplomatic tool".[234] Ahmed Rufai, CEO of Nigerian Communication Satellite Ltd., said that after Nigeria put the project up for international bidding in April 2004, "21 bids

---

[230] Logan, "Venezuela's Space Escort."
[231] Peter J. Brown, "China Needs Sharper Eyes in Space," *Asia Times Online*, October 16, 2008.
[232] Unattributed, "Bolivia creates space agency for Chinese satellite," http://www.chinadaily.com.cn/china/2010-02/11/content_9463814.htm (accessed May 4, 2010)
[233] Ibid.
[234] Unattributed, "China's Space Development—A Tool for Enhancing National Strength and Prestige," *East Asian Strategic Review 2008*, National Institute for Defense Studies, Tokyo, Japan: Japan Times (2008): 26.

arrived from major aerospace companies, but nearly all of failed to meet a key requirement: a significant financial package".[235] China generously loaned Nigeria most of the money for the project, likely banking on the fact that Nigeria's rich oil deposits will serve as collateral. With a successful satellite launch on May 14, 2007, there are now talks of a possible follow-on satellite to help Nigeria break into the "digital world dominated by the West".[236] Xu Jianguo, Chinese ambassador to Nigeria commented that this launch will serve to, "[enhance] mutual political trust, and economic and trade relations".[237] Rufai hopes to improve Nigeria's "communication quality, including Internet services," and is "actively working with its Chinese partners to prepare *NIGCOMSAT-2* and *NIGCOMSAT-3*".[238]

China's space endeavors in Nigeria have endured some criticism, though. Kayode Fayemi, who leads the Nigerian policy think tank, the Center for Democracy and Development, stated that, "It looks like what could be a white elephant. In the scale of preference, this [space program] doesn't qualify as the most-needed project".[239] A space program in a country where there is still much poverty, lack of basic infrastructure (e.g. running water, electricity, paved roads) appears to be misdirected government spending. But given the upward momentum in space-related activity and talk of future satellites to come on board, it seems like the Sino-Nigeria space cooperation will continue for some time to come, despite serious domestic political challenges.[240]

One unexpected challenge to this promising relationship occurred last November, when the *NIGCOMSAT-1* had a malfunction.[241] Nigerian Communications Satellite

---

[235] Jim Yardley, "Blocked by U.S., China Finds Its Own Way to Space," *International Herald Tribune*, May 23, 2007.
[236] Jim Yardley, "Snubbed by U.S., China Finds New Space Partners," *New York Times*, May 24, 2007.
[237] Unattributed, "China Helps Nigeria Develop Communication Technology." *Xinhua People's Daily Online*, June 14, 2008.
[238] Ibid.
[239] Peter Pae, "Third World Sets Sights on Space," *Los Angeles Times* (October 14, 2003): A1.
[240] For a detailed look at China's involvement in Africa (beyond cooperation in the space sector), see: http://www.fastcompany.com/magazine/126/special-report-china-in-africa.html; also Carmen Gentile, "Analysis: China Dedicated to Nigerian Oil," *Energy Daily*, July 18, 2008, http://www.energydaily.com/reports/Analysis_China_dedicated_to_Nigerian_oil_999.html (accessed April 13, 2010); Chris Alden, *China in Africa*, London: Zed Books (2007); and Robert I. Rotberg, ed., *China Into Africa: Trade, Aid, and Influence*, Washington D.C.: Brookings Institution Press (2008).
[241] Unattributed, "NIGCOMSAT-2: Fifty Nigerian Engineers Back From China," August 15, 2007. The satellite was based on the Chinese *Dongfanghong-4* bus design, built in the U.K. but launched by China.

Limited, which is responsible for satellite TT&C, issued a statement saying, "*NIGCOMSAT-1* is not missing, but rather powered down. When we observed abnormal battery discharge in a non-eclipse situation. The satellite was put into an emergency mode operation in order to effect mitigation and repairs".[242] After further analysis was done, it was moved into a permanent parking orbit and was determined to be beyond recovery.[243] People are first agitating for a quicker delivery for the follow-on *NIGCOMSAT*s-2 and -3, since the satellite was supposed to last for 15 years, and was to provide not only "phone, broadband Internet and broadcasting services to rural Africa," but also was used for "intelligence, security surveillance and other sectors such as the oil and gas industry".[244]

Given the relatively recent timing of this event, it may be premature to assess whether this malfunction with ties back to China will have a negative impact on Beijing's future satellite business. The same satellite design was sold, built, and launched for Venezuela and was recently handed over in January 2009. Perhaps the successful *VENESAT-1* project will help allay concerns over the *NIGCOMSAT-1* failure and minimize any impact to China's standing in the commercial space arena.

Politically, the *NIGCOMSAT* project still has support thus far despite the failure. The Nigerian House of Representative's Committee on Science and Technology recently concluded a two-day public hearing concerning the loss of NIGCOMAT-1. Despite having initial doubts about spending money on new space projects, both expert testimony and "a clause committing them [China Great Wall Industry Corporation] to replace the satellite in the event of failure" seemed to have carried enough weight in order to help pass a resolution asking for "more communication satellites…to strengthen Nigeria's participation in space exploration".[245]

---

[242] Unattributed, "'Technical Problems' Shut Down Nigerian Satellite," *SpaceMart.com*, November 12, 2008.
[243] Unattributed, "Damaged Nigerian Satellite Can't Be Recovered," *SpaceDaily.com*, November 12, 2008.
[244] Ibid. See also: Remmy Nweke, "Experts Agitate for NIGCOMSAT 2, 3," *ITREALMS Online*, November 26, 2008, http://itrealms.blogspot.com/2008/11/experts-agitate-for-nigcomsat-2-3.html (accessed April 13, 2010).
[245] John Ameh, "Reps Make U-Turn On *NigComSat-1* Project," *SpaceDaily.com*, February 24, 2009.

IV. 4. CHINA WITH ASIA

One of the current problems facing the Asian region, which was highlighted in a recent conference on "Collective Security in Space: Asian Perspectives on Acceptable Approaches," is the "lack [of] any regional consensus on space security".[246] There have been attempts at trying to consolidate some kind of space-focused space forum in Asia, starting with the Asia-Pacific Multilateral Cooperation in Space Technology and Applications (AP-MCSTA). AP-MCSTA was born from a Memorandum of Understanding (MoU) between China, Pakistan, and Thailand in February, 1992, with the hopes of achieving greater cooperation in the region. Per its official website:

> [Viewing] the immense potential of space technology and its spin-off benefits in the socio-economic uplift of the countries resulting in the transformation of quality of life of the society as a whole, and in order to pursue and to strengthen the multilateral cooperation among the countries of the Asia-Pacific Region in the peaceful applications of Space Science and Space Technology [establish AP-MCSTA].[247]

At the initial AP-MCSTA workshop in Beijing, China, over "120 government officials, decision-makers, experts and scholars…from 16 countries including mainly Australia, China, Pakistan, India, Indonesia, Japan, Republic of Korea, Thailand and other Asia-Pacific countries and international organizations" participated and decided to establish a Liaison Committee with China serving as its coordinator.[248] The Liaison Committee was established in 1994, and a Preparatory Committee for an Asia-Pacific Space Cooperation Mechanism and a Secretariat were established in 1999, both in China. During that interim five-year period and leading up to 2003, seven more AP-MCSTA conferences were held in Thailand, Pakistan, Republic of Korea, Bahrain, Iran, China, and Thailand, and all participating nations "unanimously recommended to speed up the process of institutionalization of the Cooperation Mechanism".[249] Finally on October 28,

---

[246] James Clay Moltz & Erik Quam, "Asian Approaches to Space Security," James Martin Center for Nonproliferation Studies, May 10, 2007.
[247] See http://www.apmcsta.org/CommonWeb/foreword.aspx for more details on AP-MCSTA or see http://www.apmcsta.org/Apsco/Motives.aspx to see the evolution of AP-MCSTA into APSCO.
[248] Background from AP-MCSTA website: http://www.apmcsta.org/CommonWeb/foreword.aspx (accessed April 16, 2010).
[249] Ibid. See also http://www.suparco.gov.pk/pages/apsco.asp (accessed April 16, 2010), website for the National Space Agency of Pakistan website (note: not current in that it does not reflect Turkey

2005, eight nations signed the Asia-Pacific Space Cooperation Organization (APSCO) Convention.[250]

China, by leading the initial discussion in 1992 to establish the MoU and then to host several more conferences to discuss the AP-MCSTA goals, then to serve as the coordinating nation for the AP-MCSTA Liaison Committee and Secretariat, and then offer to host the headquarters for APSCO, has firmly established itself as a leader of space-related matters in Asia. Its forward-leaning presence and foresight to take the reins in the formation, coordination, and sponsorship of an Asian-focused space organization will likely translate to an increase in soft power and prestige throughout the region. As part of his address to the 59th International Astronautical Congress held in Glasgow in October, 2008, Sun Laiyan proudly declared that "China was prepared to lead the APSCO".[251]

Before APSCO fully came online in 2005, Beijing also started a separate project titled the "Cooperation in Small Multi-Mission Satellite (SMMS) and Other Related Activities" in April, 1998, with Iran, the Republic of (North) Korea, Mongolia, Pakistan, as well as Thailand.[252] The SMMS concept is built around a "three-axis stabilized small multi-mission satellite platform [that] will support many kinds of payloads [to include a] multi-spectral CCD camera and hyper-spectrum imager that performs Earth observation, Ka-band communication experiment equipment, data collection and store and forward data transmission (DCS/SAF) and middle ultraviolet backscatter radiometer to do space science research".[253] Zhang Nu, one of the lead Chinese engineers working on the SMMS project commented, "We want the program to be a model for space cooperation in the

---

joining in 2006).

[250] Ibid. The eight nations were: Bangladesh, China, Indonesia, Iran, Mongolia, Pakistan, Peru, and Thailand. Turkey became the ninth country to sign the APSCO Convention on 1 June, 2006.

[251] Andrei Kislyakov, "Outside View: Asian Missile Power," *Spacewar.com*, October 24, 2008. Note: Sun Laiyan is currently the head of CNSA, China's counterpart to NASA.

[252] Bangladesh joined the SMMS project over a year later, in July 1999. The resolutions of CCD camera, the infrared camera and the synthetic aperture radar are 30m, 150m, and 20m, respectively, with an average re-visit time of 32 hours. For more technical aspects on the SMMS program, see: http://www.globalsecurity.org/space/world/china/smms.htm (accessed April 16, 2010). For the official AP-MCSTA background on SMSS, see: http://www.apmcsta.org/Projects/SMMS_Management.aspx (accessed April 16, 2010).

[253] See website of the Iranian Department of International Affairs: http://dia.ict.gov.ir/english/Site.aspx?ParTree=16141412 (accessed April 16, 2010).

Asia-Pacific region".[254] Despite being touted as being used for purely civilian purposes, especially in the areas of environmental and disaster monitoring, some people are concerned about the growth of space-imaging capability among so many nations, and to what extent the SMMS might enhance Iran's "military reconnaissance capability".[255]

China has also pushed its space agenda into the Association of South East Asian Nations (ASEAN), which by original design is more of an economic forum than one for space issues, and does not include China. Using the AP-MCSTA as top cover, China organized a "China-ASEAN Training Course on Applications of Satellite Remote-Sensing and Satellite Communication Technologies in Disaster Reduction" for nine ASEAN countries.[256] Sponsored by the China-ASEAN Cooperation Fund, the 13-day training covered a series of topics:

- Enhance the capacity of ASEAN Member Countries in applying satellite remote-sensing and satellite communication technologies in disaster reduction;
- Facilitate the role of these technologies in the practice of disaster reduction; and
- Promote the cooperation between China and ASEAN Member Countries in disaster reduction using space technology.[257]

Given the apparent success of this project, it is likely that other training courses or space-based educational opportunities will arise with China as a leading organizer, sponsor, or participant. China's continual investment in training foreign students in space applications and sharing space-derived data has huge soft power potential, such as the Thai students who trained on remote sensing applications through China's "Master Program on Space Technology and Applications" and can now take full advantage of their own Thailand Earth Observation Satellite (THEOS).[258] China is also sharing data with Myanmar so it can "better monitor opium cultivation within its borders," as well as weather data, which is "still being used by several Asian countries including Laos,

---

[254] Craig Covault, "China, Iran Pursue Imaging Spacecraft," *Aviation Week & Space Technology*, Vol. 155, No. 14 (October 1, 2001): 45.
[255] Covault, "China, Iran Pursue Imaging Spacecraft."
[256] See http://www.apmcsta.org/CommonWeb/AriticleView.aspx?Id=73 (accessed April 16, 2010). Although China is not an ASEAN member, it is part of the ASEAN Regional Forum (ARF).
[257] Ibid.
[258] Peter J Brown, "China Needs Sharper Eyes in Space."

Philippines, Vietnam, Indonesia, and Thailand as well as other South and Central Asian countries".[259] As fellow APSCO members Thailand and Indonesia have now launched their own satellites by other nations, APSCO, "with China as its leader…has a good chance of becoming very successful [organization]".[260]

China solidified its position as an end-to-end satellite service provider when it concluded a deal with Pakistan in October 2008 to build and launch a telecommunication satellite. During a state visit in Beijing, newly elected Pakistan President Asif Ali Zardari negotiated a deal with Chinese President Hu Jintao for the *Paksat-1R*, which will provide "domestic telecommunication and broadcast services" for Pakistan sometime in 2011.[261] Thus, Pakistan has now joined Nigeria and Venezuela as countries for which China has provided "cradle to grave" space-based telecommunication services.

IV. 5. CHINA WITH THE UNITED NATIONS

China's 2000 White Paper on its space activities proudly declares that China "supports strengthening the function of the United Nations Office of Outer Space Affairs (OOSA) and supports the outer space application programs of the United Nations".[262] It also starts out the section on "International Cooperation" with:

> The Chinese government holds that international space cooperation should follow the fundamental principles listed in the "Deceleration [sic] on International Cooperation on Exploring and Utilizing Outer Space for the Benefits and Interests of All Countries, Especially in Consideration of Developing Countries' Demands," which was approved by the 51st General Assembly of the United Nations in 1996.[263]

The idea that all international space cooperation and activities should follow U.N. guidelines is continued in the 2006 version, which states that China "supports activities regarding the peaceful use of outer space within the framework of the United Nations".[264]

---

[259] Ibid.
[260] Kislyakov, "Outside View: Asian Missile Power."
[261] Unattributed, "China to Deliver Telecom Satellite to Pakistan." *SpaceDaily.com*, October 17, 2008.
[262] White Paper, "China's Space Activities" (2000), under "Section IV. International Cooperation, Guiding Principles."
[263] Ibid.
[264] White Paper, "China's Space Activities" (2006).

On the surface, it seems like there are noble intentions behind their statements. Digging deeper, it is more likely that China would like to use the U.N. as a counterweight to U.S. space hegemony and ideally, use the U.N. "Prevention of Arms Race in Outer Space" (PAROS) and Conference on Disarmament (CD) to gently nudge Washington away from developing space weapons. Dean Cheng furthers this idea by stating:

> Thus, unlike the Missile Technology Control Regime (MTCR), [where] China perceived itself as subject to rules it had had no hand in formulating. Beijing has sought a seat at the table on space issues, in order to help establish the fundamental "rules of the road." In essence, China is intent on being a full participant in determining the international terms and conditions for space operations.[265]

Since joining the United Nations Committee on the Peaceful Uses of Outer Space (U.N. COPUOS) in 1980, as well as participating in the U.N.-sponsored Regional Space Application Programme (RESAP), China has maintained a presence in all space-related agencies within the U.N. It has supported both the 2000 U.N. General Assembly's resolution for PAROS and the 2003 resolution calling for "negotiations toward preventing an arms race in space".[266] With America standing out as the only nation voting against *both* resolutions, China "…has taken advantage of that [opposing] stance [by the United States]" and is undercutting U.S. soft power. The U.N. venue not only gives China "positive public relations exposure" but also "offers China considerable negotiating leverage with a low risk of being held to task for potential follow-through".[267] Thus, it appears that China is in the mainstream of global opinion while Washington is isolated and opposing the majority.

During the 1999 CD in Geneva, China tried to further its space agenda by calling for "…a special committee for developing a treaty against space weaponization".[268] Over the subsequent years, it has followed that by submitting more working papers on "Possible Elements for a Future International Legal Agreement on the Prevention of the

---

[265] Cheng, "China and the Int'l Space Community: A Brief Overview," 2.
[266] Johnson-Freese, "Strategic Communication with China: What Message About Space?", 47. The United States has voted no on both resolutions since 2005.
[267] Ibid.
[268] "China's Space Development—A Tool for Enhancing National Strength and Prestige," 26. China filed the papers alone in 2000, but in 2001 and 2002 was joined by Russia, Vietnam, Indonesia, Belarus, Syria, and Zimbabwe.

Deployment of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects".[269] In addition to offering a similar proposal at the March 2007 meeting of U.N. COPUOS by Chinese Ambassador Tang Guoqiang, China joined forces with Russia and offered another draft space treaty on February 12, 2008, to the U.N. CD.[270] While nothing in the language of the draft treaty appeared to be terribly inflammatory towards America, the U.S. response to the treaty was a scathing eight-page analysis that called the Sino-Russian effort "vague," a "significant departure" from a previous 2002 working paper, and seemed intended only to limit U.S. weapons in space (or the proposed U.S. National Missile Defense program), while allowing China or Russia's ground-based anti-satellite programs.[271] Some analysts feel these efforts were deliberately targeting the United States, since China "needs to place a check, even if limited, on the further expansion of those capabilities" and that this proposed ban "may just be an expediency designed to contain the United States".[272]

The 2009 CD meeting had been three sessions (January 19-27, May 18–July 3, and August 3–September 18), and PAROS is currently on the draft agenda.[273] Although China has not mentioned PAROS yet in its remarks, it was actually the Egyptian representative, Ambassador Hisham Badr, who stated that the U.N. should "establish ad-hoc committees as negotiating subsidiary bodies of the Conference for the four core issues, namely: Nuclear Disarmament, Negative Security Assurances (NSAs), Prevention of an Arms Race in Outer Space (PAROS) and a Fissile Material Cutoff Treaty (FMCT)".[274] Only time will tell any future Prevention of the Placement of Weapons in Outer Space Treaty (PPWT) will be brought up for discussion this year.

---

[269] Ibid.
[270] Ibid, 27. Draft treaty text available at: http://www.reachingcriticalwill.org/political/cd/papers08/1session/Feb12%20Draft%20PPWT.pdf (accessed April 16, 2010).
[271] U.S. response was brought to the Third Session of the CD on September 2, 2008. Text is available at: http://www.reachingcriticalwill.org/political/cd/papers08/3session/CD1847.pdf (accessed April 16, 2010).
[272] "China's Space Development—A Tool for Enhancing National Strength and Prestige," *East Asian Strategic Review 2008*.
[273] Agenda text at: http://www.reachingcriticalwill.org/political/cd/papers09/WP552.pdf (accessed April 16, 2010).
[274] Speech text at: http://www.reachingcriticalwill.org/political/cd/speeches09/1session/20January_Egypt.pdf (accessed April 16, 2010).

IV. 6. CHINA AND POSSIBLE SPACE CHALLENGERS IN ASIA

How should countries in Asia respond to the rise of China as a space-faring power? Cooperative engagement? Hostility? Waiting cautiously and patiently in the background? For nations with poor space capabilities or little space "infrastructure" engagement with China seems to be more beneficial than avoidance. With modest investment in a data reception site and minimal training on data interpretation, even low-tech nations can start to receive real-time meteorological data and imagery to assist with weather prediction, disaster monitoring, etc. Given the currently flagging world economy, it does not make economic sense for each country in Asia to build its own space agency from scratch or its own satellites independently, or construct a TT&C ground segment for satellite maintenance. Nor could the limited geosynchronous orbital slots accommodate multiple satellites for each country. Thus, both for limitations on financial resources and because of constraints on physical "room in space," space *cooperation* in Asia seems to be the better road to pursue.

Despite the potential benefits of cooperation, however, there appears to be jockeying for a leading role in the direction of space in Asia apart from China. India, which has enjoyed recent successes in its *Chandrayaan-1* lunar orbiter program, continues to research and develop its own space program without Chinese involvement. But, in an interview with Press Trust of India, Indian Space Research Organization (ISRO) Chairman Madhavan Nair disagreed with any idea of a "space race" between China and India, stating:

> Our priorities have been in providing the societal services, based on the space assets. There, we have been concentrating on Earth observation and communication areas. Launch vehicles which are appropriate for these missions have been developed. That's why we have developed technologies and systems required for national development.[275]

India has also enjoyed benefits from the United Nations Economic and Social Commission for Asia and the Pacific's (UNESCAP) establishment of a Center for Space

[275] Unattributed, "India Not Engaged in Space Race With China," *SpaceDaily.com*, October 13, 2008. See http://www.isro.org/ for more information on India's space program and current initiatives in space.

Science and Technology Education in Asia and the Pacific (CSSTEAP), headquartered at the Indian Institute of Remote Sensing in Dehradun, India.[276] This gives India a measure of regional clout in space, especially since there are 15 signatory nations currently participating in the program.[277] This is nearly double the size of the Chinese-led APSCO, with three nations (Indonesia, Mongolia, and Thailand) having signed both the Chinese and Indian space conventions.

India is also eyeing the growing demand for commercial space launches. *Jane's Defence Weekly* analyst Rahul Bedi says, "the success of India's space program represents a technological evolution of the whole space programme in India".[278] He also notes, "India is very competitive in launching satellites and it further cements that reputation".[279] Since its inception, the ISRO has earned approximately 2.5 billion dollars from its commercial launches and is poised to continue its success not only in launches but also in satellite manufacturing.[280] ISRO is already getting preparing to launch several payloads from France and Russia in 2009 and 2010, which would constitute a direct challenge to China.[281]

One recent event that might dampen India's rise in the arena of commercial space is the recent malfunction of one of its satellites that it had sold to Europe's Eutelsat. Although the satellite was part of a joint venture between the European Astrium and ISRO's Antrix, the problem "can almost certainly be traced to the Antrix-provided platform".[282] Similarly to the recent Chinese loss of *NIGCOMSAT-1*, only time will tell if there is any negative backlash from this satellite failure for India.

In addition to India, Japan is also another Asian nation that may have concerns about China's growing space prowess. Since Japan is not officially associated with either

---

[276] CSSTEAP, For more detailed information, see their website at: http://www.cssteap.org/
[277] The CSSTEAP signatory nations are: DPR Korea, India, Indonesia, Kazakhstan, Kyrgyzstan, Malaysia, Mongolia, Myanmar, Nauru, Nepal, Philippines, Republic of Korea, Sri Lanka, Thailand, and Uzbekistan.
[278] Unattributed, "India Eyes Larger Slice of Satellite Launch Sector," *SpaceDaily.com*, October 23, 2008.
[279] Ibid.
[280] Ibid.
[281] Unattributed, "India Poised to be Major Player in Satellite Manufacturing," *SpaceDaily.com*, October 30, 2008.
[282] K.Y. Jayaraman, "ISRO-Built Satellite Fails After Five Weeks," *SpaceDaily*.com, February 2, 2009. Antrix serves as the commercial arm of ISRO, similar to the China Great Wall Industry Corporation serving as China's commercial space arm.

APSCO or CSSTEAP, it created its own Asian-focused space organization in 1993, the Asian-Pacific Space Agency Forum (APRSAF).[283] One key distinction between APRSAF and APSCO or the CSSTEAP is that there are no requirements to sign a convention in order to participate. Interested nations are free to attend annual conferences as they deem necessary. According to the APRSAF website, its official mission statement is to:

> Discuss current space related issues and possible cooperation among countries mainly from the Asia-Pacific region. APRSAF intends to ensure wider participation of space agencies, government officials, regional and international organizations and institutions responsible for applying space technology, as well as space agencies from outside the region and private sectors as observers.[284]

One recent APRSAF-led initiative that is gaining soft power momentum is the SENTINEL Asia program, which is designed to provide advance warning for the disproportionate number of natural disasters that plague the Asia-Pacific region. This Japanese-led effort is an excellent example of bringing space-derived information into a usable format that can have dramatic, life-saving applications for all Asian nations. Since it draws on "satellite derived products and imagery from all available Earth observing geostationary, or low-earth orbiting satellites, including meteorological satellites that provide routine data to the region," it can be a powerful tool for alerting nations of impending floods or other natural disasters that are going to affect their region.[285] Since it is an idea of Japanese origin, it can also be a powerful reminder that Japan also wants to exert a measure of influence in the region using space-based assets.

Table 4, below, lists the Asian countries that either have signed or simply are participating members in the four main Asia-focused space organizations. SCOSA membership is defined by ASEAN membership, so this is likely a fixed group. APSCO and CSSTEAP are not defined by outside organizations, so the number of nations may

---

[283] Asia-Pacific Regional Space Agency Forum, for more detailed information, see their website at: http://www.aprsaf.org/

[284] See website for Asia-Pacific Regional Space Agency Forum, http://www.aprsaf.org/ , under "About APRSAF."

[285] SENTINEL Asia website: http://dmss.tksc.jaxa.jp/sentinel/ (accessed May 5, 2010). According to the website, users can "also 'trigger' dedicated satellite-data acquisitions through their participating and cooperating space agencies during major disasters in their countries."

increase or decrease. APRSAF, while the largest in pure numbers, also has the loosest structure. Without a binding agreement from other countries, Japan relies solely on the goodwill of other nations to be willing to support APRSAF objectives. Note that the ASEAN nations of Indonesia and Thailand are the only two that are full-fledged members of all four groups.

	APSCO (9)	APRSAF	CSSTEAP (15)	SCOSA (10)
China	X	X		
Iran	X			
Mongolia	X	X	X	
Peru	X			
Bangladesh	X	X		
Pakistan	X	X*		
Turkey	X			
Japan		X		
India		X	X	
S. Korea		X	X	
Nepal		X	X	
Sri Lanka		X	X	
Kazakhstan			X	
Kyrgyzstan			X	
Nauru			X	
N. Korea			X	
Uzbekistan			X	
Bhutan		X		
Brunei		X		X
Cambodia		X		X
Indonesia	X	X	X	X
Laos		X		X
Malaysia		X	X	X
Myanmar		X	X	X
Philippines		X	X	X
Thailand	X	X	X	X
Singapore		X		X
Vietnam		X		X

Table 4: Asian Space Organizations: Member Nations[286]

[286] Data derived from each organization's website: http://www.apmcsta.org/CommonWeb/foreword.aspx, http://www.aprsaf.org/text/members01.html, http://www.cssteap.org/links.html, http://scosa.lapan.go.id/membership.htm. (all accessed May 5, 2010). Note: Numbers in parentheses indicates current total of member nations. Since APRSAF

Due to long-standing political reasons, the four aforementioned space organizations may still remain autonomous in some respects; yet they have already displayed a willingness to work together on several projects of mutual benefit. However, they may still present a soft power challenge to China in the space arena. Beijing will likely see enduring competition occurring in the *commercial* space sector, especially with regard to telecommunications satellites and services and, more importantly, reliable space lift. India and Japan both possess indigenous launch capabilities, with North and South Korea planning to join them as 2010.

IV. 7. CHINA AND THE UNITED STATES: RIVAL, COMPETITOR, OR PARTNER ?

If Asia, in general, is cautiously accommodating China's rise as a space power with a watchful eye, what stance should Washington take? U.S.-Chinese space cooperation started on September 9, 1988, when the Reagan administration approved the first-ever export licenses allowing Chinese rockets to launch U.S.-built satellites.[287] China and the United States later joined efforts in space in 1992 when the China Telecommunications & Broadcast Satellite Corporation purchased the orbiting *Spacenet-1*.[288] This relationship grew to the point where China was allowed to launch U.S.-built satellites on its rockets, until the Space Systems/Loral "scandal" broke out in 1996, resulting in years of political aftershocks and stringent satellite export restrictions following the release of the Cox Commission Report's investigation in 1999. China's ASAT "scientific experiment" in January 2007 still lingers in the minds of many policy makers in Washington. Given this once positive and now more negative relationship of

---

participation does not require written acknowledgment or ratifying a convention, no number is given. I also intentionally left off *non-Asian* nations that were listed on the APRSAF site (e.g. U.S., Canada, etc). *Note: Pakistan is a participating nation in APRSAF, but not in the Joint Project Team (JPT), and thus does not have access to SENTINEL Asia data.

[287] Shirley Kan, *China: Possible Missile Technology Transfers Under U.S. Satellite Export Policy—Actions and Chronology*, Congressional Research Service Report 98-485F (October 6, 2003): 45. This is very detailed and comprehensive overview of U.S.-Chinese space cooperation and resulting Congressional actions from 1988-2003.

[288] Chris Bulloch, "China's Satcoms: Relying on the West," *Interavia* (April 1998): 44. China renamed the satellite *Chinasat-5* and moved it to the 115.5E slot.

space relations, how should Washington view China and its space program: rival, competitor, or possible cooperative partner?

China as a Military Space Rival

Viewing the Chinese space program as hostile and Beijing a future rival in space seems to be the predominant line of thinking amongst U.S. politicians and many think tanks. The Chinese ASAT test still rings loudly in their ears, tainting each judgment that is made on China's aspirations in space. The 1997 Loral scandal in which missile technology was allegedly transferred to China against standing U.S. satellite export policy is another black mark against any mention Chinese space cooperation. More vitriolic statements were issued during the March 2006 House Appropriations Committee subcommittee hearing on "Science, the Departments of State, Justice, and Commerce, and Related Agencies" when Rep. Tom DeLay quipped, "We have a space race [with China] going on right now and the American people are totally unaware of this".[289] Frank Wolf, representative from Virginia and subcommittee chairman, added, "If China beats us there [to the Moon], we will have lost the space program. They are basically, fundamentally in competition with us".[290] This is further evidenced in Senator Kyl's January 29, 2007 speech at the Heritage Foundation in which he claimed that China's rhetoric and insistence on the Prevention of an Arms Race in Outer Space (PAROS) was merely a ruse to prevent "further progress by the United States in space while allowing it to covertly catch up".[291] Despite repeated remarks by Chinese Premier Wen Jiabao that the test was not directed at anyone nor did it change China's position on the peaceful use of space, many remain skeptical of the test's true intent. While this may have been an attempt to drum up the China threat in order to secure more funding for NASA's lunar programs, it may also reflect a more general trend of regarding any Chinese effort in space with the utmost suspicion.

---

[289] Jeff Foust, "China, Competition, and Cooperation," *The SpaceReview.com*, April 10, 2006.
[290] Ibid.
[291] Jeffrey Logan, *China's Space Program*, CRS RS22777 (May 21, 2008), 2. See also Joan Johnson-Freese, *Space as a Strategic Asset*, on "The Conundrum of Dual-Use Technology" for an excellent explanation of this issue.

Johnson-Freese's address to the April 2007 conference "Collective Security in Space: Asian Perspectives on Acceptable Approaches" explained the more pessimistic outlook in greater detail. She cited the three main commissions that color U.S. space policy, namely the "Rumsfeld," "Cox," and "Rumsfeld Space" Commissions as bolstering a purported China "threat" in space.[292] After the 2007 ASAT test, the "U.S. voices of moderation [which had] made some progress [against the 'China threat' camp]…had [been] drowned out".[293] Thus, while there were positive efforts to keep the threat perceptions from spiraling out of control, they were effectively extinguished by the Chinese ASAT demonstration. In her analysis of the 2004 DoD report on Chinese space activities, Johnson-Freese noted that "five out of six Chinese launches were considered militarily relevant breakthroughs, though all but one were *civilian* launches".[294] Given the downward trend in U.S.-China space relations and the strong anti-China bias from the Pentagon, she pessimistically concluded that chances would be grim for any real improvement "in the near-term and even in the next administration".[295]

In addition to the ASAT test and issue of technology transfer are China's track record on human rights and less-than-effective governance of intellectual property rights, which are often cited as moral and economic reasons to keep Beijing isolated. The "crystal clear" message that China continues to receive from the United States is that the "[U.S.] is not interested in cooperative space programs with China".[296] Thus, the prevailing sentiment that China is a space rival and *not* a country that the United States can work with in space seems firmly entrenched in some circles, at least for the time being.

---

[292] Moltz and Quam, "Asian Approaches to Space Security." The Rumsfeld Commission is officially the "Commission to Assess the Ballistic Missile Threat to the United States." The Cox Commission is the "Commission on U.S. National Security and Military/Commercial Concerns with the People's Republic of China." The Rumsfeld Space is the "Commission to Assess U.S. National Security Space Management and Organization."
[293] Ibid.
[294] Joan Johnson-Freese and Andrew S. Erickson, "The Emerging China-EU Space Partnership: A Geotechnological Balancer," 14, emphasis added.
[295] Moltz and Quam, "Asian Approaches to Space Security."
[296] Johnson-Freese, "Strategic Communication with China: What Message About Space?" 37.

China as an Economic Space Competitor

Despite a general worldwide trend of nations' space budgets either remaining static or in decline, China is actively building, buying and launching satellites into space. Although there may not be tremendous growth in actual sales of satellites, there is an increase in the demand for satellite applications and services.[297] Relying on U.S. export licenses to regulate purchases abroad of satellite or satellite components to "influence over how other countries participate in the commercial launch services market" may be a strategy that is backfiring.[298] With the recent purchase of a French Alcatel-built satellite, proudly announced as "ITAR-free," as well as Chinese space launches for Brazil, Nigeria, now Venezuela and soon Bolivia, the U.S. space industry is going to face more and more competition.[299] This view was recently echoed by Jim Albaugh, president and CEO of Boeing Integrated Defense Systems. In an address to the 2008 National Space Symposium, he stated that "[in space]…like the business world you have to be worried about the threat of that new guy who just opened up a shop down the street…of course, I'm talking about China and India".[300] John Hamre, former deputy secretary of defense, in his introductory comments at an April 3, 2006 Center for Strategic and International Studies event titled "Global Space Agenda: China," also noted, "somehow, our strategy of containment, if its goal is to prevent you [China] from becoming a spacefaring nation, it isn't working".[301]

China's competitive edge in space launch is due to several factors. First, it offers insurance for all launches in case of failure through the China Insurance Company.[302] Second, its lower wage scales allow it to underbid competing offers by "at least 10 to 15 percent".[303] Third, as part of its outreach to developing nations, it allows a "flexible

---

[297] Cheng, "China's Space Program: Civilian, Commercial, & Military Aspects," 5.
[298] Carl E. Behrens, *Space Launch Vehicles: Government Activities, Commercial Competition, and Satellite Exports*, Congressional Research Service Report IB93062 (March 20, 2006), 9.
[299] Ibid., viii. ITAR stands for "International Traffic in Arms Regulations" legislation initially enacted to prevent export of strong cryptography and other sensitive military technology outside the U.S., but was modified to include space and satellite technology following the February 1996 failed Chinese launch of the U.S. Intelsat satellite and subsequent indictment of Loral Space Systems of allegedly transferring sensitive technology to Chinese which could also be used to advance their military space capability.
[300] Jim Albaugh, "Reaffirming U.S. Leadership in Space," *Space News*, May 26, 2008, 19.
[301] Jeff Foust, "China, Competition, and Cooperation," *The SpaceReview.com*, April 10, 2006.
[302] John Rhea, "Need for More International Cooperation," in Wayne C. Thompson & Steven W. Guerrier, ed., *Space: National Programs and International Cooperation*, (Boulder, CO: Westview Press, 1989), 112.

payment method" as part of the package.[304] Taking these factors as a whole, the launch portion can save prospective customers "$50 million per rocket" over the average higher-priced U.S. and European alternatives.[305] The French-based Thales Aleniaspace has already taken advantage of this and had China launch six of its satellites since 2006.[306]

From this perspective, unless Washington starts modifying its space policy (see recommendations in Conclusion), other nations, including China, will continue to eat away at U.S. lead in space. This becomes all the more critical with the decommissioning of the shuttle and U.S. inability to get manned missions to the ISS without paying for Russian flights. Looking to private space enterprises such as Space X, which finally had a successful launch on its fourth Falcon-1 launch, may be a short-term solution. But especially when it comes to manned missions, launcher reliability is paramount. The Russian Soyuz and Chinese Shenzhou are both man-rated space vehicles that have a strong history of success thus far, and may be the only options for the U.S. to continue to send astronauts into space.

China as a Space Partner

If the United States truly wants to engage China in a positive and productive manner regarding space, this perspective argues that Washington needs to see China as a potential partner and not just as "rival" or "competitor." As Nicolas Peter notes, "…few if any countries in the world today can stand alone in space activities, demonstrating therefore the importance of cooperation".[307] Although Washington continues to snub Beijing's request to serve as a partner on the ISS, there may be some actual merit to allowing China to participate in the program. One obvious benefit would be China's ability to participate financially and allow for some cost-sharing. With its large foreign reserves and sovereign wealth fund, China is in a better position than other ISS participants (e.g., Brazil, Italy) to help offset some of the continual development and

---

[303] Patrick M. Mayerchak, "Asia in Space: The Programs of China, Japan, and Indonesia," in Wayne C. Thompson & Steven W. Guerrier, ed., *Space: National Programs and International Cooperation*, (Boulder, CO: Westview Press, 1989), 93.
[304] Mayerchak, "Asia in Space: The Programs of China, Japan, and Indonesia."
[305] Andy Pasztor, "China's Rocket Service Makes Inroads, Irks U.S.,"A13.
[306] Ibid. Also see Joan Johnson-Freese, *Space as a Strategic Asset*, on "The Politicization of the U.S. Aerospace Industry" for more on why U.S. companies are becoming less competitive.
[307] Peter, "The Changing Geopolitics of Space Activities," 108.

sustainment costs. Another potential benefit in Chinese collaboration would be greater insight and transparency into China's own space program and technical capabilities. Richard Fisher, vice president of the International Assessment and Strategy Center, offered a slightly puzzling, pessimistic argument in favor of denying Chinese participation in the ISS, as follows:

> When we look to our own potential future cooperation, dialogue, space dialogue with China, we have to keep this [potential for military dual-use purposes] in mind. That when we invite—if we were to invite—a Chinese astronaut onto the space shuttle, that the *information technology* that that single individual might pick up *could be turned into a potential Chinese military space platform.*[308]

There is scant evidence, however, that a man orbiting in space would truly add any significant military advantage, especially concerning information technology. Johnson-Freese dryly noted that neither the Americans nor Soviets could find any particular advantage to having a manned military presence in space and that "there seems little basis for such a fear [that Chinese ingenuity would find value in a military-man-in space that eluded the U.S. military]".[309]

On a more optimistic note, space cooperation between NASA and the CNSA, its Chinese counterpart, through increased contact and exchanges of information, could help overcome mutual mistrust and ambiguity. Over the long-term, it could potentially give way to strengthened confidence and assurance of each others' intentions and concerns about space, reducing ambiguity and increasing transparency across the board. Even during the height of the Cold War, America held a joint space docking exercise with the Soviet Union in 1975 which "achieved important technical and political breakthroughs".[310] If the United States could work with its bitter communist rival during the dark days of the Cold War, according to the "space partner" perspective, Washington could safely find a place for Sino-U.S. space cooperation in the 21st century.

Working in a more direct fashion with the Chinese, it could be argued, may also help keep their space program directed at peaceful objectives and dampen any secret

---

[308] Johnson-Freese, "Strategic Communication…," 46. Italics added for emphasis.
[309] Johnson-Freese, "Strategic Communication…," 47. For a more conservative perspective, see: Larry Wortzel, "The Rules of Engagement: The Russia Model," *adAstra*, Spring 2005.
[310] Jeffrey Logan, *China's Space Program: Options for U.S.-China Cooperation*, CRS RS22777 (May 21, 2008), 6.

ambitions to militarize outer space. Even some Chinese scholars would agree on this point, including Wu Chunsi from Fudan University's Center for American Studies. He suggests that Washington's active engagement China in space could help create a clean break between the civilian and military programs and that "the commercial and civilian elements of China's space program will see their capabilities grow along with a sense of *independence from the military*".[311] Furthermore, Wu argues, "if China follows a path of isolation, exclusion will only deepen its suspicion and resentment, and the commercial and civilian sectors…would be forced to seek help from the government, or even the military".[312] Thus, instead of acting as a "space hyper-power," a U.S. invitation to the Chinese to become a space partner could arguably soften its image as a global hegemon, and also increase U.S. soft power and credibility with the Chinese.[313]

So, I can say that China has a flexible approach to space projects and international cooperation, which is clearly a key component of its foreign policy. With the CBERS joint project with Brazil, it was a "two-way input of money and technology," whereas the *VENESAT-1* project with Venezuela was a "simple exchange of cash for products, services, and technology." Logan notes that this fluid approach to brokering space-related projects internationally reflects the Chinese "'win-win' approach to deal making".[314] As of 2001, China had "space-related technical and economic cooperation with over 70 countries," and that number has probably grown since then.[315] With Russian backing, China is also trying to shape the rules of the road for future space conduct through U.N. space organizations and fora. Thus, China has cleverly adapted a strategy of using space-related projects, programs, and agreements as a soft power tool of international relations. John Logsdon, former director of George Washington University's Space Policy Institute, comments, "It's no accident that these [Brazil, Venezuela, and Nigeria] are resource-rich

---

[311] Chunsi Wu, "Development Goals of China's Space Program," *China Security*, World Security Institute, Vol. 2, No. 2 (Summer 2006): 110. Emphasis added.
[312] Wu, "Development Goals of China's Space Program," 110.
[313] Term of the United States as "space hyper-power" from: Dean Cheng, "China's Space Program: Civilian, Commercial, & Military Aspects," 3.
[314] Logan, "Venezuela's Space Escort."
[315] Colonel David J. Thompson & Lieutenant Colonel William R. Morris, *China in Space: Civilian and Military Developments*, Maxwell Paper No. 24 (Maxwell AFB, Ala.: Air War College, August 2001): *iii*.

countries. China is using its space capabilities as part of its broader diplomatic efforts".[316] Thus, China is seeking out those nations that it can enter into mutually beneficial relations with, trading and sharing space technology for natural resources that it does not enjoy in abundance.

Other nations in Asia, namely India and Japan (but also North and South Korea and even Iran) also desire to have successful space programs that can bring international prestige and soft power influence in the region. While it appears that healthy competition will peacefully co-exist with cooperation in space, it is an area that demands faithful attention and monitoring to ensure it does not go down a more militaristic and destructive path. With a firmer grasp of China's space program from an international context, the final chapter returns to the United States to examine current U.S. space policy and to offer recommendations for a new approach aimed at addressing the challenges posed by China's rising soft power in space while better serving U.S. interests.

[316] Drew, "Space Inspires Passion and Practicality in China."

CONCLUSION

As mentioned at the outset of this thesis, the number of nations that recognize the advantages of space applications and are investing resources to join the space-faring elite is only on the increase. The explosion of downstream services provided by precision navigation and timing (PNT), the growth of direct-to-home telecommunications broadcasting, as well the positive impacts of remote sensing, weather forecasting, and monitoring for natural disasters continue to drive more interest into peaceful uses of outer space. Having an indigenous space capability also increases political prestige and "soft power" and satisfies techno-nationalism.[317] China, like many other nations, is not simply standing idly by on the sidelines. It is actively promoting itself as a provider of these services to others, especially technologically weaker nations.

With the rise of China's presence in both space and space-related commercial services, and their growth of space-derived soft power internationally, American interests, political, economic, and otherwise, are sure to be impacted. In a recent Air and Space Power Journal, Trevor Brown notes:

> The problem for the United States is that other nations believe it seeks to monopolize space in order to further its hegemonic dominance...[;] Poor U.S. diplomacy on the issue of space weaponization contributes to increased geopolitical backlashes of the sort leading to the recent decline in U.S. soft power…which, in turn, has restrained overall U.S. national power despite any gains in hard power.[318]

Focusing on the general decline of U.S. soft power and global influence, he adds, "Due to U.S. losses of soft power, the international community now views with suspicion any legitimate concerns that the United States may have about protecting critical assets in space".[319] Looking at current U.S. space policy and strategy, what choices does Washington make to encourage or restrain China's rise? What can America do differently

[317] Joan Johnson-Freese, *Space as a Strategic Asset*, 11.
[318] Trevor Brown, "Soft Power and Space Weaponization," *Air and Space Power Journal*, Vol. XXIII, No. 1 (Maxwell AFB, AL: Air University Press, Spring 2009), 67.
[319] Ibid.

to rebuild its own soft power? This final section examines that issue and offers recommendations for U.S. space policy.

CONSIDERATIONS FOR FUTURE U.S. SPACE POLICY

What follows is a list of considerations and recommendations for U.S. policy on space. It is my sincere hope that consideration and implementation of these suggestions will help restore confidence in U.S. intentions in space as well as promote U.S. space soft power worldwide.[320]

There are a number of areas that could be considered "low-hanging fruit" that are well within in other means to start rebuilding positive American influence and soft power and engendering amicable feelings with existing partners in space.

Unilateral Measures

Normally, the term "American unilateralism" connotes a sinister notion, especially for foreign audiences. However, there are areas in the context of space where unilateral measures may be extremely positive and productive. Washington should pursue a stated policy of no first-use of space weapons or, perhaps more directly, a policy of no first-deployment of space-based weapons. Ever since the United States walked away from the ABM Treaty in June 2002, placed missile interceptors at Fort Greeley, Alaska, and started negotiating first with Poland and Czech Republic about potential sites for future missile defense sites. Obama administration shifted gears from Bush administration plans that were confirmed in February that Romania would host the first deployment of Standard Missile-3 (SM-3) land-based interceptors in 2015 and that Poland would host the next site in 2018. Turkey and Bulgaria may play a role as well, according to administration officials, who are seeking to soothe Russian concerns by inviting Moscow to join U.S.-NATO missile defense plans many countries have begun to view U.S. as an aggressor.[321] Moscow has reacted by threatening to develop even more capable nuclear warheads.[322] China has also reacted strongly by reiterating its stance that National Missile

[320] Jeffrey Logan, China's Space Program: Options for U.S.-China Cooperation, 5-6.
[321] Tom Z. Collina, U.S. Taps Romania for Missile Defense. See http://www.armscontrol.org/act/2010_03/MissileDefense (accessed May 23, 2010).
[322] BBC News has a nice, concise summary of the U.S. missile defense plans in Europe and Russian

Defense (NMD) "does not contribute to global stability…and violates the ABM Treaty".[323] Although these are ground-based defensive systems, they also show American unwillingness to abandon any notion of placing similar weapons in space. By showing a willingness to support a joint resolution on "no space weapons" with Russia, and perhaps one that also involved China, Washington would be clearly demonstrating resolve that it is serious about keeping space peaceful for future generations.

The Obama administration may indeed be willing to take a lead with regards to cooperative space policy. According to the official White House website, "The Obama-Biden Administration will restore American leadership on space issues, *seeking a worldwide ban on weapons that interfere with military and commercial satellites*".[324] While that sounds good initially, that phrase is immediately followed with more language on "assess[ing] possible threats to U.S. space assets and the best options…for countering them".[325] Nonetheless, this still seems to be a step in the right direction and hopefully will be actually carried out in the near-term.

While any U.S.-led movement towards a ban on space weapons would be met with widespread international support, Washington also should issue a clearly stated moratorium on ASAT activities. The February 2008 U.S. shootdown of a malfunctioning satellite did not engender much goodwill. Although numerous statements were made that it was not in retaliation for the Chinese ASAT test, it did not appear that many people believed that the on-board hydrazine constituted a severe enough risk to humanity to justify even low-altitude satellite destruction. By promulgating a clearly-worded unilateral resolution or joint declaration with Russia and China to neither place nor use space weapons, coupled with a self-imposed ban, or at least a moratorium, on all ASAT testing, Washington would thereby broadcast a strong signal of intent to remain non-aggressive in space and maintain it as a sanctuary for the peaceful use of all mankind.[326]

---

responses at: http://news.bbc.co.uk/2/hi/europe/6720153.stm (accessed May 23, 2010).

[323] Chinese Ambassador Sha Zukang, text of speech, "Can BMD Really Enhance Security?", delivered to Second US-China Conference on Arms Control, Disarmament, and Non-Proliferation, April 28, 1999, text online in English and Chinese at: http://www.nti.org/db/china/engdocs/shabmd.htm (accessed May 23, 2010).

[324] Text from http://www.whitehouse.gov/agenda/defense/ (accessed May 23, 2010). emphasis mine.

[325] Ibid.

[326] See Mike Moore, *Twilight War: The Folly of U.S. Space Dominance* (Oakland, CA: Independent

Bottom line, these efforts could help counter China's own hawkish defense establishment policymakers who may be seeking to balance or hedge against any attempt of U.S. space dominance and shape a new direction for China's own space program.[327]

Debris Mitigation

One oddly positive result from the largely negative Chinese ASAT test was a new focus on space debris. This event served as a catalyst that galvanized more support and serious efforts to address this issue. More people are now aware that an "F-BOM" (Fratricide by Orbital Mechanics)[328] can be nearly as dangerous as an "H-bomb" in space. The recent collision of a U.S.-built Iridium communications satellite and an old Russian Cosmos relay satellite added more fuel to these concerns.[329]

In light of this new awareness of and concern about space debris, the U.S. should continue to proactively lead and guide full implementation of the Inter-Agency Debris Coordinating Committee (IADC) Debris Mitigation Guidelines to ensure they do not remain a passive, non-legally binding "voluntary" commitment as they are currently, but a true international standard for all future space launches and operations, including those from China.[330]

Rules of the Road or a "Space Code of Conduct"

To date, there is no real internationally recognized legal framework on how a nation should conduct itself in space. Given the recent U.S. trend to vote against U.N.

Institute, 2008), 213. Also see Chapter 12, "The Road Not Taken," for additional space policy recommendations.

[327] See also James A. Lewis, "China as a Military Space Competitor," *Perspectives on Space Security* (Washington, D.C.: Space Policy Institute, December 2005) available at: http://www.csis.org/media/csis/pubs/040801_china_space_competitor.pdf (accessed May 23, 2010). For more articles on the Chinese ASAT program not being a threat to the United States (and other related issues), also see: http://www.spacedebate.org/argument/1157/ (accessed May 23, 2010).

[328] My humorous play on "H-bomb" to illustrate the danger of space debris and how it can often damage much more than the intended "target" satellite. Since things in orbit tend to stay in orbit, ASATs are inherently risky for any space-faring nation with far-reaching consequences that can last decades.

[329] See Bill Hardwood, "U.S. and Russian Satellites Collide," *CBSNews.com*, February 11, 2009.

[330] See "Status of Activity of the Inter-Agency Space Debris Coordination Committee," IADC Document No. IADC 08-01, February 2008, http://www.iadc-online.org/index.cgi?item=docs_pub (accessed June 5, 2010). The recent collision of two satellites in space further heightens the need to address this sooner rather than later. See also op-ed article: James Clay Moltz, "Space Jam," *NewYorkTimes.com*, February 18, 2009.

resolutions (e.g., PAROS), perhaps a non-binding agreement that had a limited scope of very general and basic norms might be a good place to start. Michael Krepon, in an address to the U.N. NGO Committee on Disarmament, Peace and Security, offered some interesting priorities for establishing a "code of conduct":

- Prohibiting harmful interference with space objects;
- Sharing space surveillance data (space situational awareness or SSA);
- Abiding by the debris mitigation guidelines;
- Devising and implementing a traffic management system for space; and
- Providing accurate and timely launch notice and registration.[331]

Keeping the language simple and in a "rules of the road" format would allow for countries, including America, to sign on without much political risk. As time went along, the hope is that this could start to create a norm, or expected pattern of behavior, and eventually end up in a binding, codified treaty. If America took the lead in drafting and supporting such a "space code of conduct," it *could* serve as a positive message that would erase some of the stigma that currently taints other nations' views of our own space ambitions and, in the long run, could have a positive impact on keeping space a safer place.[332] It might also steal some of the thunder from Beijing and its efforts to curtail U.S. influence through the U.N. and help engender goodwill for Washington.

Discard Inflammatory Policy Language

A neutral observer who casually reviews both the official U.S. National Space Policy as well as prominent statements made by leading U.S. officials would easily arrive at the conclusion that America is intent on an aggressive, hegemonic approach to space security. Since the Rumsfeld Commission, one concept that received a lot of press was the idea of a "space Pearl Harbor".[333] Whether this was intended to refer to a surprise attack against the United States designed to cripple U.S. ability to wage war or to destroy

---

[331] Michael Krepon, "A Code of Conduct for Outer Space," paper presented at discussion held at United Nations Headquarters by the NGO Committee on Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs, New York, NY, April 12, 2007. SSA is all the more important given the recent collision of a U.S. *Iridium* and Russian *Cosmos* satellite.

[332] See also James R. Blaker, "Avoiding Another Cold War: The Case for Collaboration with China," *American Security Project Perspectives*, November 6, 2008, 8-9.

[333] See Jean-Michel Stoullig, "Rumsfeld Commission Warns Against 'Space Pearl Harbor'," *SpaceDaily.com*, January 11, 2001.

the American entire satellite constellation, or both, is unclear. What is clear is the misimpression it left on both uninformed citizens and members of Congress: U.S. space assets are at risk, a rogue nation can "blind" the U.S. military would be utterly helpless to fight. With one ASAT test under its belt, China appeared to fill the role of that rogue nation. In light of a U.S. response of intervention in a Taiwan Strait scenario, many war planners assume China will try to attack U.S. space assets.

While the U.S. military is indeed dependent in many ways on space assets, the notion of a "space Pearl Harbor," at least regarding attacking satellites, is overstated. Many of the military satellite communications (MILSATCOM) "birds" and Defense Support Program (DSP) early-warning satellites are out at Geosynchronous (GEO) orbit, approx. 35,000 km (22,300 miles) away. The Global Positioning System (GPS) is in Medium Earth Orbit (MEO), which is approx. 22,000 km (12,000 miles) away. Both the Chinese and American ASAT events occurred in Low Earth Orbit (LEO), roughly between 160 – 2000 km (100 – 1,240 miles). While America does operate sensitive reconnaissance satellites at LEO that are indeed vulnerable, the technology, both in tracking something *beyond* LEO and trying to "hit" it with a seeker-equipped killer satellite, as well as the required size of the launch vehicle due to the large amount of fuel to get something to MEO or GEO orbits, is not something a rogue nation would be able to easily access. Although it may seem rash to dismiss the "space Pearl Harbor" concept as "much ado about nothing," it is clear by applying simple orbital mechanics and space physics that it is nearly impossible to destroy all U.S. space assets without a tremendous number of large, multi-stage boosters and highly accurate, large kinetic-kill vehicles, and a lot of dead time where America does nothing in response. Having a capability to "kill a satellite" at LEO does not in any way portend any ability to do the same at MEO or GEO, which are 10-20 times further away, and several orders of magnitude more difficult to track, identify, and destroy.[334] Thus, the idea of a China "space threat" wiping out U.S. space resources seems less plausible and more unrealistic than previously imagined.

Similarly, looking at the 2006 version of U.S. National Space Policy, some of the language used in the "Principles" is ambiguous, borderline hostile, and disconcerting:

---

[334] Although I disagree with some portions of the article, see Geoffrey Forden, "Viewpoint: China and Space War," *Astropolitics*, Vol. 6, Number 2 (May-August 2008):138-153, for analysis of what China would have to do to attack U.S. space assets.

> The United States considers space capabilities -- including the ground and space segments and supporting links -- vital to its national interests. Consistent with this policy, the United States will: preserve its rights capabilities, and freedom of action in space; **dissuade or deter** others from either impeding those rights or developing capabilities intended to do so; take those actions necessary to protect its space capabilities; respond to interference; and **deny**, if necessary, adversaries the **use of space** capabilities hostile to U.S. national interests;
>
> The United States will **oppose the development of new legal regimes** or other restrictions that seek to prohibit or limit U.S. access to or use of space. Proposed arms control agreements or restrictions **must not impair the rights of the United States** to **conduct research, development, testing, and operations or other activities in space** for U.S. national interests.[335]

How exactly will Washington "deny" other people using space? If one buys the argument that a rogue nation will attack one of U.S. satellites, does that mean a nuclear retaliatory strike? And why is the United States the only country with a "right" to conduct activities in space? With China looking at its own GPS-like *Beidou* constellation, *Yaogan* remote-sensing satellites, *Shentong* and *Fenghuo* military communication satellites, does Beijing also have to right to "deny" the use of space if someone tries to interfere with its constellation? If not, Washington is assuming special privileges only for itself. This unilateral approach smacks of a schoolyard bully who insists on getting his own way without having to answer to anyone else, and cuts dangerously deep into America's soft power. Is this really the approach that Washington—the world's leading democracy—wants to take? Does this not make the previously stated principles of "peaceful purposes" mere fluff and leave us seeming to be hypocritical? I think there are more countries than just the United States that also believe "freedom of action in space is important" and also wish to derive "economic prosperity and national security" from space.[336] How could Washington use such innate desires to promote its security in space?

My simple recommendation is to drop the emotionally-charged rhetoric of "space dominance," "space superiority" and "space control." It is extremely divisive and

---

[335] *U.S. National Space Policy*, August 31, 2006. Bolded text added for emphasis.
[336] *U.S. National Space Policy*, August 31, 2006. Bolded text added for emphasis. See item 1, "Background."

unnecessary language that drives people away from U.S. side, and presumes that nations will forever willingly accept an inferior posture and subject themselves to whatever Washington decides. Some people advocate an "in your face from space" attitude, even to the point of stating in no uncertain terms that "the United States is the morally superior choice to **seize** and **control** space"[337] and "…deploying a space-based BMD would…*guarantee domination of space*".[338] Washington sincerely risks greater isolation and resistance if it thinks it can "seize and control" anything with no regard to world opinion in this manner, and may actually provide stimulus to Chinese hard-liners who may want to justify a more aggressive approach to space security vis-à-vis America.

Support PAROS & TCBM

Beyond changing the way U.S. signal intentions in space through policy and doctrine, continually being the only nation voting ***against*** the United Nations Resolution for the Prevention of an Arms Race in Space (PAROS) and the Transparency and Confidence Building Measures in Outer Space Activities (TCBM) sends a clear message that Washington is completely unwilling to abide by world consensus. American obstinance also potentially signals intentions of one day placing weapons in space by refusing to remove that option from the table. The language of the document states:

> Recognizing that prevention of an arms race in outer space would avert a grave danger for international peace and security, call upon all States, in particular those with major space capabilities, to contribute actively to the goal of the peaceful use of outer space, and of the prevention of an arms race in outer space, and to refrain from actions contrary to that goal and to the relevant existing treaties in the interest of maintaining international peace and security and promoting international cooperation.[339]

---

[337] Everett Carl Dolman, "Space Power and US Hegemony: Maintaining a Liberal World Order in the 21st Century," in John M. Logsdon and Gordon Adams, eds., *Space Weapons: Are They Needed?* (Washington, DC: Space Policy Institute, George Washington University, October 2003). Bolded emphasis mine.

[338] Everett Carl Dohlman, *Astropolitik: Classical Geopolitics in the Space Age* (London: Frank Cass, 2002), 165. Emphasis mine.

[339] United Nations 63rd General Assembly, GA/10792, Press Release, UN Department of Public Information, December 2, 2008. The TCBM in Space Activities document (A/C.1/63/L.44) was not yet available online when I checked.

Christina Rocca, U.S. Ambassador to the Conference on Disarmament, and Under Secretary of State for Arms Control and International Security Robert Joseph offer this standard reply to why Washington won't support it: "There is no arms race in space and therefore no problem for arms control to solve".[340] However, the interpretation of that carefully worded message is, "Why limit ourselves when it won't prevent other countries from developing space weapons technology?" As space policy expert Clay Moltz observed, "[the 2006 Policy] had walked to the threshold of weaponization but had failed to cross it overtly,"[341] leaving an ambiguous loophole to pursue space weapons if national security required it. If the United States is truly serious about the peaceful use of space for all nations, it should obligate itself, through voting for international resolutions, to cease and desist from developing space weapons. If Washington continues to vote against PAROS, it is possibly risking U.S. isolation in space due to Chinese soft power skills and space diplomacy, which currently track with world opinion.

Radical ITAR Reform

Finally, as many others do, I recommend a wholesale review and revision of the U.S. export control process, namely the International Traffic in Arms Regulations (ITAR).[342] The National Research Council's Committees on Science, Security and Prosperity and on Scientific Communication and National Security recently issued a brilliant report on the sad impact of U.S. export controls and how they negatively affect American national and economic security. Although export controls were originally intended to safeguard military technology and American supremacy, the unfortunate

---

[340] See "U.S. to China: No Arms Race in Space." *Newsmax.com*, February 13, 2007, and Robert Joseph, "Remarks on the President's National Space Policy," *Spaceref.com*, December 14, 2006, http://www.spaceref.com/news/viewsr.html?pid=22773 (accessed June 9, 2010).

[341] Moltz, *The Politics of Space Security*, 296.

[342] For more insights on ITAR-generated obstacles to U.S. space cooperation and competiveness, see "ITAR and the American Way." Spacewar.com, January 28, 2009; Andy Pasztor, "China's Rocket Service Makes Inroads, Irks U.S.," Wall Street Journal (October 5, 2007), A13; Craig Covault, "Building Great Wall: China is Offering the Sale of New Satellite Components to Europe and Asia to Compete Against U.S. Companies," Aviation Week & Space Technology, Vol. 158, No. 25 (June 23, 2003): 37; Johnson-Freese and Erickson, "The Emerging China-EU Space Partnership: A Geotechnological Balancer," 21; Vincent G. Sabathier, "Europe and China," adAstra (Spring 2005) ; Theresa Hitchens & David Chen, "Forging a Sino-US 'Grand Bargain' in Space," Space Policy, Volume 2 (2008), 3-4; "The Ongoing Erosion of the US Space Industrial Base," SpaceDaily.com, January 21, 2009; "Earthbound," Economist.com, August 21, 2008; and "Washington, We Have a Problem," Economist.com, August 21, 2008.

reality is that times have changed dramatically, and *not* in U.S. favor. Some of the report's findings include:

- The current system of export controls now harms our national and homeland security;
- The system of export controls is fundamentally broken and cannot be fixed by incremental changes below the Presidential-level; and
- A new system of export controls can be more agile and effective, recognizing that, under current global conditions, risks to national security can be mitigated but not eliminated.[343]

Over the past decade or so, the Bush administration and Congress, which "remained reluctant to loosen these [ITAR] restrictions," had the "net effect…to strengthen relations between other satellite producers (such as Russia and the United Kingdom) and a growing list of clients in East Asia, South Asia, and the Middle East".[344] This also includes France and China, which have teamed together to produce "small, communication satellites that don't include U.S. parts and therefore exempt from a complex web of U.S. technology-export controls [ITAR]. They are as much as 40 percent cheaper to assemble, test and launch than rival American models".[345] Even Europe, with its long military alliance and historical ties to the United States, is not reacting favorably to U.S. ITAR controls. Vincent Sabathier, former French space attaché, notes, "Very little cooperation regarding space-based security applications goes on between Europe and the United States. Meanwhile, ITAR itself has created barriers to prevent such cooperation".[346] In addition to the dramatic rise of "ITAR-free" space commerce, a report by the Center for Strategic and International Studies noted that "Not only have these requirements [ITAR] harmed our domestic technological and manufacturing base, but

[343] National Research Council Committees on Science, Security and Prosperity & Committee on Scientific Communication and National Security. Beyond Fortress America: National Security Controls on Science and Technology in a Globalized World. National Academies Press, Washington, D.C., 2009, 3-4. Findings pulled from Summary of "Prepublication Copy" available at: http://www.nap.edu/napcgi/report.cgi?record_id=12567&type=pdfxsum (accessed June 9, 2010).
[344] Moltz, *The Politics of Space Security*, 286.
[345] Pasztor, "China's Rocket Service Makes Inroads, Irks U.S.,"A13.
[346] Sabathier, "Europe and China."

they have had a drastic negative effect on both the hard and soft power utilization of space".[347]

Nobody recommends scrapping export controls altogether. But facing diminishing foreign demand for U.S.-built space technology and the growing loss of space technology and human capital, there needs to be radical changes. The "Beyond Fortress America" report recommends several solutions, as follows:

- The President should restructure the export control process within the federal government to prevent harm to national security and technology base and help promote U.S. economic competitiveness;
- A new coordinating center that would fall under the auspices of the National Security Advisor should be established; and
- There should be an economic competitiveness "exemption" that eliminates exports controls on dual-use technologies where they, or their functional equivalents, are available without restriction in open markets outside the United States.[348]

Changes of this magnitude would probably involve an uphill battle, potentially triggering turfs wars among State, Commerce, Defense, and the Congress, as well as fighting the dreaded inertia of bureaucratic path dependency and red tape. Though not an impossible effort, it will take considerable fortitude and bold leadership to overturn more than a decade of U.S. over-reaction to the Chinese threat and Draconian export controls regarding the space industry. Failure to make substantive changes in this area may bring about more "ITAR-free" satellites and space technology marketed not only by the Chinese, but also India, Japan, as well as allies in Europe, as well as cause more irreversible the already hemorrhaging U.S. space industry.

Where from here? Looking at the bottom line, space is no longer the Cold War race between the Americans and the Soviets. As Nicolas Peter notes, "major space-faring nations are now using space as a political tool to reach non-traditional partners in order to

---

[347] Vincent Sabathier & G. Ryan Faith, *Smart Power Through Space* (February 20, 2008), cited in Theresa Hitchens & David Chen, "Forging a Sino-US 'Grand Bargain' in Space," *Space Policy*, Volume 2 (2008), 3-4.

[348] National Research Council, 4-8. The summary goes into great detail how these changes should be enacted.

build trusting relationships across political borders, illustrating that foreign policy and space are now increasingly overlapping... [;] greater international cooperation is the way forward for major space activities".[349] And China certainly is making its mark in the space world, and is not going to leave the space arena anytime soon. Johnson-Freese comments that "They [the Chinese] want to play a leadership role for developing countries that want to get into space. It's just a win-win for them…they are making political connections, it helps them with oil deals and they bring in hard currency to feed back into their own program to make them even more commercially competitive".[350] The sooner Asia and the United States cautiously accommodate a more powerful, space-capable China, the more they will able to leverage and perhaps even shape its rise, weaning it away from a military race in space, and perhaps ensuring there is truly peaceful development and benefit from space for all nations.

America has shown the rest of the world far too much edgy "hard power" diplomacy, including in the space realm. In doing so, it has isolated itself and thereby harmed its own security. Especially with regard to China, the United States is in danger of mischaracterizing the motivations and rationales behind China's space program and, as a result, pursuing counterproductive policies that could actually create incentives for other countries to side with China against American interests in space. We have already seen a drop in U.S. dominance in commercial space and the rise of ITAR-free programs as a result of U.S. insecurities about technology transfer. The Chinese ASAT test is usually seen as a military test purely designed as an asymmetric capability to attack America's overdependence on space assets, normally in the context of a Sino-U.S. wartime scenario (i.e., over Taiwan).[351] But as China expands its number of military and civilians satellites and thereby incurring the same space-borne liabilities as the U.S., why is it not also vulnerable to a space attack? Bottom line, as Johnson-Freese argues, "…other countries are clearly interested in working with China on space, regardless of

[349] Peter, "The Changing Geopolitics of Space Activities," 106.
[350] Yardley, "Snubbed by U.S., China Finds New Space Partners."
[351] Baker Spring, "Satellite Shootdown Was a Necessary Operation," *Heritage Foundation Webmemo #1823* (February 22, 2008.

the American stance. Therefore, the United States can either be involved and retain some measure of control through leadership, or watch from the sidelines".[352]

It is time for America to shift permanently away from hegemonic ambitions in space, dismantle the idea of space-based weapons and space control, and instead turn towards promoting space cooperation through peaceful projects that can truly serve mankind and preserve the heritage of space as a sanctuary.[353] U.S. have no longer monopoly on space technology, and U.S. lead is precariously slipping away in commercial space. If Washington avoids inflammatory rhetoric and demonstrates a sincere willingness to usher in a new era of space cooperation, taking care to build in adequate verification and compliance mechanisms, the rest of the world will follow our lead. For the sake of U.S. own interests and long-term security, sitting on the sidelines is *not* an option.

---

[352] Joan Johnson-Freese, "Space *Wei Qi*: The Launch of *Shenzhou ,.*" *Naval War College Review*, Vol. LVII, No. 2, Newport, RI: Naval War College (Spring 2004), 121-145.

[353] See Lieutenant Colonel Bruce M. DeBlois, "Space Sanctuary," *Airpower Journal*, Vol. XII, No.4, Maxwell AFB, Alabama: Air University (Winter 1998), available online at: http://www.airpower.maxwell.af.mil/airchronicles/apj/apj98/win98/deblois.html (accessed June 9, 2010).

LIST OF REFERENCES

Albaugh, Jim."Reaffirming U.S. leadership in space." *Space News*, May 26, 2008.

Alden, Chris. "China in Africa", London: Zed Books 2007

Aldhous, Peter & Anil Ananthaswamy. "Asia blazes trail to the final frontier." *New Scientist*, Vo. 188, Iss. 2522, October 22-28, 2005, 8-9.

Ameh, John. "Reps make u-turn on *NigComSat-I* project." *SpaceDaily.com*, February 24, 2009, http://www.spacemart.com/reports/Reps_Make_U_turn_On_NigComSat_I_Project_999.html

Arostegui, Martin. "Chavez: Venezuela to launch defense satellite." *Washington Times*, September 12, 2007 http://www.washingtontimes.com/news/2007/sep/12/chavezvenezuela-to-launch-defense-satellite/

Asia-Pacific Multilateral Cooperation in Space Technology and Applications (APMCSTA). Website: http://www.apmcsta.org/

Asia-Pacific Space Cooperation Organization. Website: http://www.apmcsta.org/Apsco/Motives.aspx

Ball, Desmond. "China pursues space-based intelligence gathering capabilities," *Jane's Intelligence Review,* December 01, 2003.

Behrens, Carl E. Space *Launch Vehicles: Government Activities, Commercial Competition, and Satellite Exports*. Congressional Research Service Report IB93062, March 20, 2006.

Berkofsky, Axel. "EU, China: Honeymoon is over." *International Relations and Security Network*, May 29, 2008, http://www.isn.ethz.ch/isn/Current-Affairs/Security-Watch/Detail/?id=88403&lng=en

Blaker, James R. "Avoiding another cold war: the case for collaboration with China." *American Security Project* (online), November 6, 2008 http://www.americansecurityproject.org/files/Avoiding%20Another%20Cold%20War.pdf

"Bolivia creates space agency for Chinese satellite", *ChinaDaly, Xinhua,* February 2, 2010 http://www.chinadaily.com.cn/china/2010-02/11/content_9463814.htm

Brachet, Gerard. "Collective security in space: a key factor for sustainable long-term use of space." In *Collective Security in Space: European Perspectives*, edited by John M. Logsdon, James Clay Moltz, and Emma S. Hinds, 1-16. Washington D.C: Space Policy Institute, Elliot School of International Affairs, George Washington University, January 2007, http://www.gwu.edu/~spi/Collective%20Security%20in%20Space%20-%20European%20Perspectives.pdf

"Brazil, China to postpone joint satellite launching to 2011", *News Xinhuanet (English),* February 11, 2010 http://news.xinhuanet.com/english2010/sci/2010-02/11/c_13172079.htm

Brown, Peter J. "China gets a jump on U.S. in space." *Asia Times Online*, October 25, 2008, http://www.atimes.com/atimes/China/JJ25Ad02.html

_____. "China lost in SE Asian space." *Asia Times Online*, October 10, 2008, http://www.atimes.com/atimes/Southeast_Asia/JJ10Ae01.html

_____. "China making leaps in space." *Asia Times Online*, January 9, 2009, http://www.atimes.com/atimes/China/KA09Ad01.html

_____. "China needs sharper eyes in space." *Asia Times Online*, October 16, 2008, http://www.atimes.com/atimes/China/JJ16Ad02.html

Brown, Trevor. "Soft power and space weaponization." *Air and Space Power Journal*, Vol. XXIII, No. 1, Maxwell AFB, Alabama: Air University Press (Spring 2009), 66-72, http://www.airpower.au.af.mil/airchronicles/apj/apj09/spr09/spr09.pdf

Bulloch, Chris. "China's satcoms: relying on the West." *Interavia*, Volume 53, Issue 619, April 1998, 44-46.

Burleson, Daphne. *Space programs outside the United States: All exploration and research efforts, country by country.* Jefferson, North Carolina: McFarland & Company, Inc. Publishers, 2005.

_____. *Spacecraft launch sites worldwide*. North Carolina: McFarland & Company, Inc. Publishers, 2007.

Burrows, William E. *The survival imperative: using space to protect Earth*. New York, NY: Forge, Tom Doherty & Associates, 2006.

Casarini, Nicola. "Asia's space tigers bare their teeth." *Asia Times Online*, November 9, 2007, http://www.atimes.com/atimes/China/IK09Ad02.html

Chandler, David L. "Confident China joins space elite." *New Scientist*, Vol. 180, Iss. 2418, October 25-31, 2003, 6.

_____. "Why do the Chinese want to conquer space?" *New Scientist*, Vol. 180, Iss. 2418, October 25-31, 2003, 8.

"Chandrayaan-1 gets closer to Moon". *SpaceDaily.com*, October 31, 2008, http://www.moondaily.com/reports/Chandrayaan_1_Gets_Closer_To_Moon_999.html

"Chavez: Venezuela to launch defense satellite", *Washington Times*, September 12, 2007, http://www.washingtontimes.com/news/2007/sep/12/chavez-venezuela-to-launchdefense-satellite/

Cheng, Dean. "China and the international space community: A brief overview." *Chinese Military Update*, Volume 1, Issue 5, October 2003, 1-3.

_____. "China's space program: Civilian, commercial, & military aspects." CAN Conference Report, May 2006. http://www.cna.org/documents/china%20space%20conference%20final.pdf?from search=1

"China-Russia Mars mission set for takeoff." *MarsDaily.com*, January 5, 2009, http://www.marsdaily.com/reports/China-Russia_Mars_mission_set_for_takeoff_999.html

"China and the second space age." Futron Corporation, October 15, 2003, http://www.futron.com/pdf/resource_center/white_papers/China_White_paper.pdf

"China builds and launches a satellite for Nigeria." *Washington Post*, May 14, 2007: A11.

"China completes enclosure of land for fourth satellite launch center," *SpaceDaily.com*, November 19, 2007, http://www.spacedaily.com/reports/China_Completes_Enclosure_Of_Land_For_Fourth_Satellite_Launch_Center_999.html

"China hails spacewalk 'heroes' and sets eyes on Moon." *SpaceDaily.com*, September 29, 2008, http://www.spacedaily.com/reports/China_hails_spacewalk_heroes_and_sets_eyes_on_moon_999.html

"China helps Nigeria develop communication technology." *Xinhua People's Daily Online*, June 14, 2008, http://english.people.com.cn/90001/90776/90883/6430119.html

"China launches first data relay satellite." *Xinhua News Agency*, April 26, 2009, http://www.wsichina.org/morningchina/article.asp?id=2638

"China launches its first Moon orbiter." *Xinhua News Agency*, http://www.chinaview.cn/rygc/index.htm

"China plans own satellite navigation system by 2015," *SpaceDaily.com*, January 19, 2009, http://www.spacedaily.com/reports/China_plans_own_satellite_navigation_system_by_2015_state_media_999.html

"China plans space station with module launch in 2010." *SpaceDaily.com*, March 1, 2009, http://www.spacedaily.com/reports/China_Plans_Space_Station_With_Module_Launch_In_2010_999.html

"China reveals its first full map of Moon surface." *Xinhuanet.com*, November 12, 2008, http://news.xinhuanet.com/english/2008-11/12/content_10347379.htm

"China signs 16 int'l space cooperation agreements, memorandums in five years." *People's Daily (Online)*, October 12, 2006, http://english.peopledaily.com.cn/200610/12/eng20061012_311154.html

"China to deliver telecom satellite to Pakistan." *SpaceDaily.com*, October 17, 2008, http://www.spacemart.com/reports/China_To_Deliver_Telecom_Satellite_To_Pakistan_999.html

"China to hand over satellite to Venezuela." *Spacemart.com*, January 23, 2009, http://www.spacemart.com/reports/China_To_Hand_Over_Satellite_To_Venezuela_999.html

"China to launch FY-4 weather satellite around 2013," *SpaceDaily.com*, October 14, 2008, http://www.spacedaily.com/reports/China_To_Launch_FY_4_Weather_Satellite_Around_2013_999.html

"China to launch probe to Mars with Russian help in 2009." *RIA Novosti*, May 12, 2008, http://www.globalsecurity.org/space/library/news/2008/space-081205-rianovosti01.htm

"China to launch second lunar probe before end of 2011." *Spacedaily.com*, November 13, 2008, http://www.moondaily.com/reports/China_To_Launch_Second_Lunar_Probe_Before_End_Of_2011_999.html

"China to orbit Venezuela-Uruguay satellite in 2008." *RIA Novosti*, February 4, 2008, http://www.globalsecurity.org/space/library/news/2008/space-080402-rianovosti01.htm

"China to start making trial model of 'Long March 5' carrier rocket." *China Radio International*, March 28, 2008, http://www.wsichina.org/morningchina/article.asp?id=2371

"China's second civil aerospace industrial base to be established in Xi'an" *China Radio International*, April 8, 2008, http://www.wsichina.org/morningchina/article.asp?id=2477

"China's 'divine vessel' carries nation to space of wonder." *People'sDaily.com* (English), September 28, 2008, http://english.people.com.cn/90001/90776/90881/6507834.html

"China's *Fengyun-3A* satellite starts trial business operation," *SpaceDaily.com*, November 20, 2008, http://www.spacedaily.com/reports/China_plans_own_satellite_navigation_system_by_2015_state_media_999.html

"China's future astronauts will be scientists." *SpaceDaily.com*, December 5, 2008 http://www.spacedaily.com/reports/China_Future_Astronauts_Will_Be_Scientists_999.html

"China's growing involvement in Latin America." *Power and Interest News Report*, June 12, 2006, http://www.pinr.com/index.php (accessed under, "Reports by Region, "Asia," on April 25, 2008).

"China's new carrier rocket to debut in 2014." *Xinhuanet.com* (online), March 2, 2008, http://news.xinhuanet.com/english/2008-03/02/content_7702780.htm

"China's rulers look to space to maintain Olympic pride." *SpaceDaily.com*, September 9, 2008, http://www.spacedaily.com/reports/Chinas_rulers_look_to_space_to_maintain_Olympic_pride_999.html

"China's space development—A tool for enhancing national strength and prestige." *East Asian Strategic Review 2008*. National Institute for Defense Studies, Tokyo, Japan: Japan Times, 2008, 19-35, http://www.nids.go.jp/english/dissemination/east-asian/pdf/2008/eastasian_e2008_01.pdf

"China's First Mars Mission Delayed," *MarsDaily.com*, October 2, 2009 http://english.cas.cn/Ne/CN/200910/t20091010_44888.shtml

"China's fourth Space Center to be completed by 2015", *SpaceDaily,* March 9, 2010 http://www.spacedaily.com/reports/Chinas_Fourth_Space_Center_To_Be_Completed_By_2015_999.m

"China chooses first women astronauts", *SpaceDaily,* March 10, 2010 http://www.spacedaily.com/reports/China_chooses_first_women_astronauts_999.html

"China's space industry takes off." *SpaceDaily.com*, November 6, 2008, http://www.spacedaily.com/reports/China_Space_Industry_Takes_Off_999.html

"Chinese scientists start studying samples from *Shenzhou-7*." *SpaceDaily.com*, October 8, 2008, http://www.spacedaily.com/reports/Chinese_Scientists_Start_Studying_Samples_From_Shenzhou_7_999.html

"China to launch Tiangong-1 at the end of next year", *People's Daily (Online),* March 9, 2009 http://sinodefence.com/space/project/project921-phase2.asp

"Chinese Lunar Exploration Program". *People's daily online, February* 6, 2010 http://english.people.com.cn/90002/91752/index.html

Clark, Stephen. "China launches for record 11th time in 2008." *Space.com*, December 24, 2008, http://www.space.com/missionlaunches/sfn-081224-china-recordlaunch.html

Cliff, Roger. *The military potential of China's commercial technology*. Santa Monica, CA: RAND, 2001.

Cliff, Roger, Mark Burles, Michael S. Chase, Derek Eaton, and Kevin Pollpeter. *Entering the dragon's lair: Chinese antiaccess strategies and their implications for the United States*. Santa Monica, CA: RAND, 2007.

"Closer relations between ESA and China." *European Space Agency* website, http://www.esa.int/esaCP/SEMJL5ULWFE_index_0.html

Collina, Z. Tom. U.S. Taps Romania for Missile Defense. http://www.armscontrol.org/act/2010_03/MissileDefense

Convention of the Asia-Pacific Space Cooperation Organization (APSCO). http://www.apmcsta.org/File/pdf/Convention%20on%20APSCO%20.rar

Covault, Craig. "Building great wall: China is offering the sale of new satellite components to Europe and Asia to compete against U.S. Companies." *Aviation Week & Space Technology*, Volume 158, Issue 25, June 23, 2003, 37.

_____. "China, Iran pursue imaging spacecraft." *Aviation Week & Space Technology*, Volume 155, Issue 14, October, 2001, 45.

_____. "China's space encore." *World News & Analysis*, Volume 159, Number 17, October 27, 2003, 30.

____. "Manned program advances Chinese space technology." *Aviation Week & Space Technology*, Volume 151, Issue 22, November 29, 1999, 28.

_____. "Transparency crucial to Chinese international space role." *Aviation Week & Space Technology*, May 4, 2008, http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=awst&id=news/aw050508p2.xml

Cox, Christopher. *U.S. national security and military/commercial concerns with People's Republic of China*. Washington D.C.: U.S. House of Representatives, Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China, 1999.

"Damaged Nigerian satellite can't be recovered." *SpaceDaily.com*, November 12, 2008, http://www.spacedaily.com/reports/Damaged_Nigerian_satellite_cant_be_recovered_officials_999.html

Dinerman, Taylor. "China, the U.S., and solar space power." *The Space Review*, October 22, 2007, http://www.thespacereview.com/article/985/1

Dohlman, Carl Everett. "Space Power and US Hegemony: Maintaining a Liberal World Order in the 21st Century," in John M. Logsdon and Gordon Adams, eds., *Space Weapons:Are They Needed?* (Washington, DC: Space Policy Institute, George Washington University, October 2003).

_____. *Astropolitik: Classical Geopolitics in the Space Age* (London: Frank Cass, 2002), 165. Emphasis mine.

Dumbaugh, Kerry. *China-U.S. relations: Current issues and implications for U.S. policy*. Congressional Research Service Report RL33877, December 9, 2008.

Drew, Jill. "Space inspires passion and practicality in China." *Washingtonpost.com*, September 25, 2008, http://www.washingtonpost.com/wpdyn/content/article/2008/09/23/AR2008092302649.html

"Earthbound." *Economist.com*, August 21, 2008, http://www.economist.com/displaystory.cfm?story_id=11965352

East Asian Strategic Review 2006. National Institute for Defense Studies, Tokyo, Japan: Japan Times, June 2006.

Eckert, Paul. "U.S., China urged to work out space security regime." *Reuters.com* (online), September 18, 2008, http://www.reuters.com/article/worldNews/idUSN1837446920080918

"Envisat monitoring China floods as part of Dragon programme." European Space Agency website, http://www.esa.int/esaCP/SEM8MD808BE_index_0.html

"ESA-MOST Dragon cooperation programme." *European Space Agency* website: http://earth.esa.int/dragon/

Fahri, Paul. "U.S., media settle with Wen Ho Lee." *Washington Post*, June 3, 2006, A01, http://www.washingtonpost.com/wpdyn/content/article/2006/06/02/AR2006060201060.html

Filho, José Monserrat. "Brazilian-Chinese space cooperation: An analysis." *Space Policy*, Vol. 13, Issue 2, May 1997, 153-170.

Fisher, Richard D., Jr. "China's close call." *Wall Street Journal Asia*, October 31, 2008, http://online.wsj.com/article/SB122539460905385099.html?mod=googlenews_wsj

_____. "Shenlong space plane advances China's military space potential." *International Assessment and Strategy Center*, December 17, 2007, http://www.strategycenter.net/printVersion/print_pub.asp?pubID=174 (accessed October 18, 2008).

_____. "Space to manoevre – satellite attack upsets US space supremacy." *Jane's Intelligence Review*, March 01, 2007.

Ford, Peter. "What's behind Asia's Moon race?" *Christian Science Monitor*, October 25, 2007, http://www.csmonitor.com/2007/1025/p06s01-woap.html

Forden, Geoffrey. "Viewpoint: China and Space War," *Astropolitics*, Vol. 6, Number 2 (May-August 2008):138-153, for analysis of what China would have to do to attack U.S. space assets.

Foust, Jeff. "China, competition, and cooperation." *The SpaceReview.com*, April 10, 2006, http://www.thespacereview.com/article/599/1

Freeman, Ambassador (ret.) Chas W., Jr. "A China policy for the Twenty-First Century." *Strategic Studies Quarterly*. Maxwell AFB, Ala.: Air University Press, Fall 2008, http://www.maxwell.af.mil/au/ssq/2008/Fall/freeman.pdf

Gallagher, Nancy. "Towards a reconsideration of the rules for space security," in John Logsdon & Audrey Shaffer, eds. *Perspectives in Space Security*. Washington, D.C.: George Washington University, Space Policy Institute, December 2005, http://www.gwu.edu/~spi/PERSPECTIVES_ON_SPACE_SECURITY.pdf

Gauthier, Lieutenant Colonel Kathryn L. *China as peer competitor? Trends in nuclear weapons, space, and information warfare*. Maxwell AFB, Ala.: Air War College, July 1999.

Gentile, Carmen. "Analysis: China dedicated to Nigerian oil." *Energy Daily*, July 18, 2008, http://www.energydaily.com/reports/Analysis_China_dedicated_to_Nigerian_oil_999.html

Gertz, Bill. "New U.S. defenses sought to counter Beijing buildup." *Washington Times*, October 1, 2008, http://www.washingtontimes.com/news/2008/oct/01/new-usdefenses-sought-to-counter-beijing-buildup/

Gilks, Anne. "China's space policy: review and prospects." *Space Policy*, Vol. 13, Issue 3, August 1997, 215-227.

Hagt, Eric. "China's ASAT test: Strategic response." *China Security*. World Security Institute, Vol. 3 No.1, Winter 2007, 31-51, http://www.wsichina.org/cs5_3.pdf

Handberg, Roger and Zhen Li. *Chinese space policy: A study in domestic and international politics*. New York, NY: Routledge, 2007.

Hardwood, Bill. "U.S. and Russian satellites collide." *CBSNews.com*, February 11, 2009, http://www.cbsnews.com/stories/2009/02/11/tech/main4792976.shtml

Harvey, Brian. *China's space program – From conception to manned spaceflight*. UK: Praxis Publishing, 2004.

Hitchens, Theresa. "U.S.-Sino relations in space: From 'war of words' to Cold War in space?" *China Security*. World Security Institute, Vol. 3 No. 1, Winter 2007, 12-30, http://www.wsichina.org/cs5_2.pdf

Hitchens, Theresa & David Chen. "Forging a Sino-US 'grand bargain' in space." *Space Policy*, Volume 2, 2008, http://www.cdi.org/pdfs/HitchensGrandBargain.pdf

Hoey, James H. "The global reach of Chinese soft power: China's rise and America's decline?" M.A. Thesis, Naval Postgraduate School, September 2007.

Holden, Constance. "East of ESA." *Science*, Volume 293, Issue 5529, July 20, 2001.

"HK [Hong Kong], Macao scientists expected to participate in China's aerospace project." *SpaceDaily.com*, December 11, 2008, http://www.spacedaily.com/reports/HK_Macao_Scientists_Expected_To_Participate_In_China_Aerospace_Project_999.html

Hulse, Janie. *China's expansion into and U.S withdrawal from Argentina's telecommunications and space industries and the implications for U.S. national security*. Carlisle, PA: Strategic Studies Institute, U.S. Army War College, September 2007, http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=806

"India eyes larger slice of satellite launch sector." *SpaceDaily.com*, October 23, 2008, http://www.spacemart.com/reports/India_eyes_larger_slice_of_satellite_launch_sector_999.html

"India not engaged in space race with China." *SpaceDaily.com*, October 13, 2008, http://www.spacetravel.com/reports/India_Not_Engaged_In_Space_Race_With_China_999.html

"India poised to be major player in satellite manufacturing." *SpaceDaily.com*, October 30, 2008, http://www.spacemart.com/reports/India_Poised_To_Be_Major_Player_In_Satellite_Manufacturing_999.html

"Insight: The FUTRON competitiveness index." *Satmagazine.com*, May 2008, http://www.satmagazine.com/cgi-bin/display_article.cgi?number=197209387

"Institute for Defense Studies & Analyses", Space Technology and Soft-Power: A Chinese Lesson for India, http://www.idsa.in/node/3154/17

Inter-Agency Space Debris Coordination Committee (IADC) Debris Mitigation Guidelines:http://www.iadc-online.org/docs_pub/IADC-101502.Mit.Guidelines.pdf.

_____. "Status of activity of the Inter-Agency Space Debris Coordination Committee." IADC Document No. IADC 08-01, February 2008, http://www.iadconline.org/index.cgi?item=docs_pub

"ITAR and the American way." *Spacewar.com*, January 28, 2009, http://www.spacewar.com/reports/ITAR_And_The_American_Way_999.html

Jayaraman, K.Y. "ISRO-built satellite fails after five weeks." *SpaceDaily*.com, February 2, 2009, http://www.spacemart.com/reports/ISRO_Built_Satellite_Fails_After_Five_Weeks_999.html

Johnson, Ed. "China, following astronauts' return, plans space lab for 2011." *Bloomberg.com*, September 28, 2008, http://www.bloomberg.com/apps/news?pid=20601080&sid=aZJYoiU9yivw&refer=asia

Johnson-Freese, Joan. "A new US-Sino space relationship: Moving toward cooperation." *Astropolitics*, Volume 4, Issue 2, Summer 2006, 131-158.

_____. *China's space ambitions*. IFRI Security Studies Center Proliferation Papers, Summer 2007, http://www.ifri.org/files/Securite_defense/China_Space_Johnson_Freese.pdf

_____. *The Chinese space program: A mystery within a maze*. Malabar, Florida: Krieger Publishing, 1998.

_____. *Space as a strategic asset*. NY: Columbia University Press, 2007.

_____. "Space *Wei Qi*: The launch of *Shenzhou V*." *Naval War College Review*, Vol. LVII, No. 2, Newport, RI: Naval War College (Spring 2004), 121-145, http://findarticles.com/p/articles/mi_m0JIW/is_2_57/ai_n6112689%20

_____. "Strategic communication with China: What message about space?" *China Security*. World Security Institute, Vol. 2 No. 2, Summer 2006, 37-57, http://www.wsichina.org/morningchina/article.asp?id=1994

Johnson-Freese, Joan and Andrew S. Erickson. "The Emerging China-EU space partnership: A geotechnological balancer." *Space Policy*, Vol. 22, Issue 1, February 2006, 12-22.

Johnson-Freese, Joan and Roger Handberg. *Space, the dormant frontier: Changing the paradigm for the 21st Century*. Connecticut: Praeger Publishers, 1997.

John M. Logsdon, James Clay Moltz, and Emma S. Hinds, 17-27. Washington D.C: Space Policy Institute, Elliot School of International Affairs, George Washington University, January 2007, http://www.gwu.edu/~spi/Collective%20Security%20in%20Space%20-%20European%20Perspectives.pdf

Jones, Morris. "China sets sights on first space station." *SpaceDaily.com*, October 3, 2008, http://www.spacedaily.com/reports/China_Sets_Sights_On_First_Space_Station_ 999.html

_____. "Souped up rockets for *Shenzhou*." *SpaceDaily.com*, October 29, 2008, http://www.spacedaily.com/reports/Souped_Up_Rockets_For_Shenzhou_999.html

_____. "The politics of *Shenzhou*." *SpaceDaily.com*, September 8, 2008, http://www.spacedaily.com/reports/The_Politics_Of_Shenzhou_999.html

Joseph, Robert. "Remarks on the President's national space policy." *Spaceref.com*, December 14, 2006, http://www.spaceref.com/news/viewsr.html?pid=22773

Kagan, Robert. *The Return of History and the End of Dreams*. Great Britain, Atlantic Book, 2008.

Kan, Shirley. *China: Possible missile technology transfers under U.S. satellite export policy—Actions and chronology*. Congressional Research Service Report 98-485F, October 6, 2003.

Kaufman, Mark. "U.S. finds it's getting crowded out there: Dominance in space slips as other nations step up their efforts." *WashingtonPost.com*, July 9, 2008, A01, http://www.washingtonpost.com/wpdyn/content/article/2008/07/08/AR2008070803185_pf.html

Khalilzad, Zalmay M., Abram N. Shulsky, Daniel L. Byman, Roger Cliff, David T. Orletsky, David Shlapak, and Ashley J. Tellis. *The United States and a rising China: Strategic and military implications*. Santa Monica, CA: RAND, 1999.

Kislyakov, Andrei. "Outside view: Asian missile power." *Spacewar.com*, October 24, 2008, ttp://www.spacewar.com/reports/Outside_View_Asian_missile_power_999.html

Klein, John J. *Space warfare: Strategy, principles and policy*. New York, NY: Rutledge, 2006.

Krepon, Michael. "A code of conduct for outer space." Paper presented at Discussion held at United Nations Headquarters by the NGO Committee on Disarmament, Peace and Security, in cooperation with the UN Office for Disarmament Affairs, New York, NY, April 12, 2007, http://disarm.igc.org/april12krepon__untalk.pdf

_____. "China's military space strategy: An exchange." *Survival*, Vol. 50, Issue 1, 1 February 2008, 157- 98, http://dx.doi.org/10.1080/00396330801899512

Kurlantzick, Joshua. "China's charm: Implications of Chinese soft power." *Carnegie Endowment for International Peace*, Policy Brief No. 47, June 2006, http://www.carnegieendowment.org/files/PB_47_FINAL.

_____. "China's charm offensive." *Commentary*, Volume 122, Issue 3, October 2006, 35-39.

_____. 'Charm offensive: how China's soft power is transforming the world', *Yale University Press,* 2007, 6.

_____. "China's Latin leap forward." *World Policy Journal*, Fall 2006, http://www.carnegieendowment.org/files/latin_leap.pdf

Lambakis, Steven J. *On the edge of Earth: The future of American space power*. Lexington, KY: University of Kentucky Press, 2001.

Lampton, David M. *The three faces of Chinese power*. Berkeley, CA: University of California Press, April 2008.

Lee, Min. "China aims to put man on Moon by 2020." *Space.com*, November 27, 2005, http://www.space.com/missionlaunches/ap_051127_china_moon.html

Lewis, James A. "China as a Military Space Competitor," *Perspectives on Space Security* (Washington, D.C.: Space Policy Institute, December 2005) available at: http://www.csis.org/media/csis/pubs/040801_china_space_competitor.pdf

Lewis, Jeffrey G. "Engage China, engage the world." *adAstra*, Spring 2005, http://www.space.com/adastra/china_engagement_0505.html

_____. *The minimum means of reprisal: China's search for security in the nuclear age*. Cambridge, MA: MIT Press, 2007.

"Liftoff for China space mission." *BBC News*, September 25, 2008, http://news.bbc.co.uk/2/hi/science/nature/7634404.stm

Lino, Carlos De Oliveira, Maury Gonçalves Rodrigues Lima, and Genésio Luiz Hubscher. "CBERS: An international space cooperation program." *Acta Astronautica*, Volume 47, Issues 2-9, July-November 2000, 559-564.

Logan, Jeffrey. *China's space program: Options for U.S.-China cooperation*. Congressional Research Service Report RS22777, May 21, 2008, September 29, 2008.

Logan, Sam. "Venezuela's space escort." *International Relations and Security Network (ISN)*, November 7, 2008, http://www.isn.ethz.ch/isn/Current-Affairs/Security-Watch/Detail/?coguid=5AE5FE60-65CB-1031-3E09-DB38287013E8&lng=en&id=93564

Lozano, Leticia. "China's charm offensive." *Euromoney*, London (UK), March 2005.

"Macao University to analyze data from China's Moon probe." *SpaceDaily.com*, December 15, 2008, http://www.moondaily.com/reports/Macao_University_To_Analyze_Data_From_China_Moon_Probe_999.html

Manzo, Vince. "U.S. policy brief: The need for a strategic dialogue with China." *Center for Defense Information*, 2008, http://www.cdi.org/pdfs/StrategicDialoguePolicy.pdf

Martel, William C. & Yoshihara, Toshi. "Averting a Sino-U.S. space race." *The Washington Quarterly*, Autumn 2003: 19-35.

Mayerchak, M. Patrick. "Asia in Space: The Programs of China, Japan, and Indonesia," In Wayne C. Thompson & Steven W. Guerrier, ed., *Space: National Programs and International Cooperation*, (Boulder, CO: Westview Press, 1989), 93.

McDonald, Bruce W. *China, space weapons, and U.S. security*. Council on Foreign Relations, Council Special Report Number 38, September 2008, http://www.cfr.org/content/publications/attachments /China_Space_CSR38.pdf

Medeiros, Evan S., Roger Cliff, Keith Crane, and James C. Mulvenon. *A new direction for China's defense industry*. Santa Monica, CA: RAND, 2005.

Metzler, P. Gregory. "China in space: Implications for U.S. military strategy." *Joint Forces Quarterly*, Issue 47, Fourth Quarter 2007, http://www.ndu.edu/inss/Press/jfq_pages/editions/i47/22.pdf

Miller, Marc. *PLA mission beyond Taiwan*. Colloquium brief from U.S. Army War College, National Bureau of Asian Research, and The Bush School of Government and Public Service at Texas A&M University. Carlisle, PA: Strategic Studies Institute, U.S. Army War College, September 2008 (http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB897.pdf

Moltz, James Clay. "Space jam." *NewYorkTimes.com*, February 18, 2009 http://www.nytimes.com/2009/02/19/opinion/19moltz.html?_r=1&ref=opinion

_____. *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests*. Stanford, CA: Stanford University Press, 2008.

Moltz, James Clay & Erik R. Quam. "Asian approaches to space security." James Martin Center for Nonproliferation Studies, May 10, 2007, http://cns.miis.edu/pubs/week/070510.htm

Moore, Mike. *Twilight war: The folly of U.S. space dominance*. Oakland, CA: Independent Institute, 2008.

Mulvenon, James C., and Thomas J, Bickford. "The PLA and the telecommunications industry in China," in James C. Mulvenon and Richard H. Yang, ed., *The People's Liberation Army in the Information Age*, RAND Conference Proceedings, 1999, http://www.rand.org/pubs/conf_proceedings/CF145/

Nair, Kiran Krishan. *Space: The frontiers of modern defence*. New Delhi, India: Knowledge World (in association with Centre for Air Power Studies), 2006.

National Research Council Committees on Science, Security and Prosperity & Committee on Scientific Communication and National Security. *Beyond fortress America: National security controls on science and technology in a globalized world*. National Academies Press, Washington, D.C., 2009, http://www.nap.edu/catalog.php?record_id=12567

"New space tracking ship to serve *Shenzhou VII*." *Xinhua News Agency*, April 13, 2008, http://www.wsichina.org/morningchina/article.asp?id=2510

Ng, John. "China aims for the stars." *Asia Times Online*, October 14, 2006, http://www.atimes.com/atimes/China/HJ14Ad01.html (accessed May 6, 2008).

"NIGCOMSAT-2: Fifty Nigerian engineers back from China." August 15, 2007, http://www.mynaijanews.com/content/view/507/2/

Noichim, Chukeat. "Promoting ASEAN space cooperation." *Space Policy*, Volume 24, Issue 1, February 2008, 10-12.

Nweke, Remmy. "Experts agitate for *NIGCOMSAT* 2, 3." *ITREALMS Online*, November 26, 2008, http://itrealms.blogspot.com/2008/11/experts-agitate-for-nigcomsat-2-3.html

Nye, Joseph S., Jr. Soft power: The means to success in world politics. NY: Perseus Books Group, 2004.

____. Joseph S., Jr. 'Soft Power', Foreign Policy, No. 80, Fall 1990, p 153-170

____. Joseph S., Jr. 'Soft Power': A New Focus at China's Two Sessions, National People's Congress, People's Republic of China, URL: www.npc.gov.cn

____. Joseph S., Jr. 'The Rise of China's Soft Power', The Wall Street Journal-Asia, 29 December 2005.

____. Joseph S., Jr. "Think Again: Soft Power." See http://yaleglobal.yale.edu/content/think-again-soft-power

Nye, Joseph S., Jr. and James A. Schear, eds. Seeking stability in space: Anti-satellite weapons and the evolving space regime. Lanham, MD: Aspen Strategy Group and University Press of America, 1987.

Oberg, James. "Year of the rocket." IEEE Spectrum, Spring 2001, http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=00920033

Pace, Scott. "China's human spaceflight program: Achievements and prospects." PowerPoint slides, Space Policy Institute, Elliot School of International Affairs, George Washington University, October 17, 2008, http://www.gwu.edu/~cistp/news/PACE101708/Pandas%20in%20Orbit%20100808-presented.pdf

Pae, Peter. "Third world sets sights on space." *Los Angeles Times*, October 14, 2003, A1.

Pan, Esther. "China's soft power initiative." *Council on Foreign Relations Backgrounder*, May 18, 2006, http://www.cfr.org/publication/10715/chinas_soft_power_initiative.html

Pang, Zhongying. "The Beijing Olympics and China's soft power." *Brookings Institution*, September 4, 2008, http://www.brookings.edu/opinions/2008/0904_olympics_pang.aspx?p=1

Pasco, Javier. "Toward a future European space surveillance system: Developing a collaborative model for the world." In *Collective Security in Space: European Perspectives*, edited by John M. Logsdon, James Clay Moltz, and Emma S. Hinds, 51-62. Washington D.C: Space Policy Institute, Elliot School of International Affairs, George Washington University, January 2007, http://www.gwu.edu/~spi/Collective%20Security%20in%20Space%20-%20European%20Perspectives.pdf

Pasztor, Andy. "China to launch satellite for France's Eutelsat." *WallStreetJournal.com*, February 25, 2009, http://online.wsj.com/article/SB123550142763361701.html?mod=googlenews_wsj#articleTabs%3Darticle

_____. "China's rocket service makes inroads, irks U.S." *Wall Street Journal*, October 5, 2007, A13.

Patterson, Lieutenant Colonel J. Barry. *China's space program and its implications for the United States*. Maxwell AFB, Ala.: Air War College, April 19, 1995.

Peter, Nicolas. "The changing geopolitics of space activities." *Space Policy*, Volume 22, Issue 2, May 2006, 100-109.

Pollpeter, Kevin. *Building for the future: China's progress in space technology during the tenth 5-Year plan and the U.S. response*. Carlisle, PA: Strategic Studies Institute, U.S. Army War College, March 2008, http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=852

_____. "Competing perceptions of the U.S. and Chinese space programs." *China Brief*, Volume 7, Issue 1, January 10, 2007, 4-6, http://www.jamestown.org/terrorism/news/uploads/cb_007_001.pdf

_____. "The Chinese vision of space military operations." In *China's Revolution in Doctrinal Affairs: Emerging Trends in the Operational Art of the Chinese People's Liberation Army,* ed. James Mulvenon and David Finkelstein, 329-370, CNA Corporation, Alexandria, Virginia, December 2005, http://www.cna.org/documents/doctrinebook.pdf

_____. "The stars of China's space program: The rise of a "space gang"?" *China Brief*, Volume 7, Issue 17, September 19, 2007, 2-6, http://www.jamestown.org/terrorism/news/uploads/cb_007_017.pdf

Powell, Alvin. "Questions remain about China in space." *Harvard University Gazette*, November 3, 2005, http://www.news.harvard.edu/gazette/2005/11.03/11-space.html

Purnendra, Jain and Gerry, Groot, 'Beijing's Soft Power Offensive', *Asia Times Online*, May 17, 2006.

Puska, Colonel Susan M., ed. *People's Liberation Army after next*. Carlisle, PA: Strategic Studies Institute, U.S. Army War College, August 2000.

Rabinovitch, Simon. "The rise of an image-conscious China." *China Security*. World Security Institute, Volume 4, Issue 3, Summer 2008, 33-47, http://www.chinasecurity.us/pdfs/CS11_2

Rhea, John "Need for More International Cooperation," in Wayne C. Thompson & Steven W. Guerrier, ed., *Space: National Programs and International Cooperation*, (Boulder, CO: Westview Press, 1989), 112.

Rincon, Paul. "China 'could reach Moon by 2020'." *BBC News (online)*, July 15, 2008, http://news.bbc.co.uk/2/hi/science/nature/7506715.stm

_____. "What's driving China space efforts?" *BBC News (online)*, September 25, 2008, http://news.bbc.co.uk/2/hi/science/nature/7635397.stm

"Rohrabacher condemns use of Chinese rockets." *SpaceMart.com*, February 26, 2009, http://www.spacemart.com/reports/Rohrabacher_Condemns_Use_Of_Chinese_Rockets_999.html

Rotberg, I. Robert. ed., *China Into Africa: Trade, Aid, and Influence*, Washington D.C.: Brookings Institution Press 2008.

Rueda, Jorge. "Chavez cheers satellite launch." *Washington Times (online)*, October 30, 2008, http://www.washingtontimes.com/news/2008/oct/30/chavez-cheerssatellite-launch/

Sabathier, Vincent G. "Europe and China." *adAstra*, Spring 2005, http://www.space.com/adastra/china_europe_0505.html

Sample, Ian. "Lunar eclipse: US retreat leaves China leading way in race to return to moon" http://www.guardian.co.uk/science/2010/feb/02/lunar-us-china-race-moon

Saunders, Phillip. *China's global activism: Strategy, drivers, and tools*. Washington, D.C., National Defense University Press; Institute for National Strategic Studies, October 2006, http://www.ndu.edu/inss/Occasional_Papers/OCP4.pdf

_____. "China's future in space: Implications for U.S. security." *adAstra*, Spring 2005, http://www.space.com/adastra/china_implications_0505.html

"Second Chinese-Brazilian satellite fulfills 5-Year mission in orbit." *SpaceDaily.com*, October 23, 2008, http://www.spacemart.com/reports/Second_Chinese_Brazilian_Satellite_Fulfils_5_Year_Mission_In_Orbit_999.html

Sengupta, Somini. "India prepares Moon launch." *NewYorkTimes* (online), October 21, 2008, http://www.nytimes.com/2008/10/22/world/asia/22indiamoon.html?_r=1&ref=world&oref=slogin

Shachtman, Noah and Geoffrey Forden. "How China loses the coming space war." *Wired.com*, January 10, 2008, http://blog.wired.com/defense/2008/01/inside-thechin.html (part 1), http://blog.wired.com/defense/2008/01/inside-the-ch-1.html (part 2), http://blog.wired.com/defense/2008/01/inside-the-ch-2.html (part 3),

Sheehan, Michael. *The International Politics of Space,* Routledge, 2007

Smith, Marcia S. *Space launch vehicles: Government activities, commercial competition, and satellite exports*. Congressional Research Service Report IB93062, January 4, 2006.

Solomone, Stacey. "China's space program: The great leap upward." *Journal of Contemporary China*. Volume 15, Issue 47, May 2006, 311-327.

Space Industry Final Report 2007. Industrial College of the Armed Forces, National Defense University, Spring 2007, http://stinet.dtic.mil/cgibin/GetTRDoc?AD=ADA475093&Location=U2&doc=GetTRDoc.pdf

"Space mission commander gives clues on first Hong Kong astronaut." *Spacedaily.com*, December 8, 2008, http://www.spacetravel.com/reports/Space_Mission_Commander_Gives_Clues_On_First_Hong_Kong_Astronaut_999.html

"Space sci-tech industrial base launched in Shanghai," *People's Daily* (online), January 23, 2006 http://english.peopledaily.com.cn/200601/23/eng20060123_237625.html

Spencer, Jack & Kathy Gudgel. "The 2005 Quadrennial Defense Review: China and space—The unmentionable issues." *The Officer*, September 2005, 67-68.

Spring, Baker. "Satellite shootdown was a necessary operation." *Heritage Foundation Webmemo #1823*, February 22, 2008, http://www.heritage.org/research/nationalsecurity/wm1823.cfm

"Stars in their eyes." *The Economist.com*, April 7, 2008, http://www.economist.com/daily/chartgallery/displaystory.cfm?story_id=10976407

Stoullig, Jean-Michel. "Rumsfeld Commission warns against 'space Pearl Harbor'." *SpaceDaily.com*, January 11, 2001, http://www.spacedaily.com/news/bmdo-01b.html

Talpalariu, Dan. "NASA prefers US commercial rockets over Russian ones." *Softpedia Spacenews*, October 10, 2008, http://news.softpedia.com/news/NASA-Prefers-US-Commercial-Rockets-Over-Russian-Ones-95422.shtml

Taverna, Michael A. "India, China to expand Earth-observing nets." *Aviation Week & Space Technology*, October 29, 2001, 87.

"Technical problems' shut down Nigerian satellite." *SpaceMart.com*, November 12, 2008, http://www.spacemart.com/reports/Technical_problems_shut_down_Nigerian_satellite_999.html

Tellis, Ashley J. "China's military space strategy." *Survival*, Volume 49, Issue 3, 41 – 72, September 1, 2007, http://www.carnegieendowment.org/files/tellis_china_space1.pdf

"The ongoing erosion of the US space industrial base." *SpaceDaily.com*, January 21, 2009, http://www.gpsdaily.com/reports/The_Ongoing_Erosion_Of_The_US_Space_Industrial_Base_999.html

Thompson, Colonel David J. & Lieutenant Colonel William R. Morris, *China in space: Civilian and military developments*. Maxwell Paper No. 24, Maxwell AFB, Ala.: Air War College, August 2001.

Thompson, Wayne C. & Steven W. Guerrier, ed., *Space: National programs and international cooperation*. Boulder, CO: Westview Press, 1989.

"Top 50 space industry and manufacturing services." *Space News International*, August 6, 2007, http://a52.g.akamaitech.net/f/52/827/1d/www.space.com/images/Top502006_final.pdf

"U.S. freezes Chinese space company assets for Iranian missile aid." *Aviationweek.com*, June 26, 2006, http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=space&id=news/CHI06266.xml

"U.S. response was brought to the Third Session of the CD on September 2, 2008". Text is available at: http://www.reachingcriticalwill.org/political/cd/papers08/3session/CD1847.pdf

"U.S. said losing space markets, hobbled by own policy." *Reuters Online*, February 19, 2008, http://www.reuters.com/article/scienceNews/idUSN1928686200802l9?sp=true

"U.S. to China: No arms race in space." *Newsmax.com*, February 13, 2007, http://archive.newsmax.com/archives/ic/2007/2/13/132957.shtml?s=ic

Utomi, Pat. "China and Nigeria." Center for Strategic and International Studies, June 4, 2008, http://www.csis.org/media/csis/pubs/080603_utomi_nigeriachina.pdf

Vaccaro, David. "Who will lead the next space race?" *FUTRON Corporation* (online), October 1, 2008 http://www.futron.com/pdf/resource_center/articles/Who_Will_Lead.pdf

"Venezuela and China to build satellite." *SpaceDaily*, November 1, 2005, http://www.spacedaily.com/news/china-05zzzzzzzzzq.html

Wang, Cong. "China beams with pride, joy after successful space mission." *People's Daily.com* (English), September 29, 2008, http://english.people.com.cn/90001/90776/90881/6508481.html

"Washington, we have a problem." *Economist.com*, August 21, 2008, http://www.economist.com/opinion/displaystory.cfm?story_id=11965279

Weeden, Brian. "How China 'wins' a potential space war." *China Security.* World Security Institute, Vol. 4 No. 1 Winter 2008, 134-147, http://www.wsichina.org/cs9_9.pdf

Weitz, Richard. *China-Russia security relations: Strategic parallelism without partnership or passion?* Carlisle, PA: Strategic Studies Institute, U.S. Army War College, August 2008, http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB868.pdf

White Paper. *China's national defense in 2008*. People's Republic of China, Information Office of the State Council, January, 2009, http://www.china.org.cn/government/central_government/2009-01/20/content_17155577.htm

White Paper. *China's space activities*. People's Republic of China, Information Office of the State Council, November 22, 2000, http://www.fas.org/spp/guide/china/wp112200.html

White Paper. *China's space activities in 2006*. People's Republic of China, Information Office of the State Council, October 12, 2006, http://www.fas.org/spp/guide/china/wp2006.pdf

WMD Insights. "Special report: Chinese anti-satellite weapon test – The shot heard 'round the world." *WMD Insights: Issues and Viewpoints in the International Media* (http://www.wmdinsights.com/I13/I13_EA1_SP_PRC_ASAT.htm),

Wolter, Detlev. "Collective security in outer space and international law: A European perspective." In *Collective Security in Space: European Perspectives*, edited by Wortzel, Larry M. *The Chinese People's Liberation Army and space warfare: Emerging United States-China military competition*. American Enterprise Institute, October 17, 2007, http://www.aei.org/docLib/20071017_SpaceWarfare.pdf

_____. "The rules of engagement: The Russia model." *adAstra*, Spring 2005, http://www.space.com/adastra/china_russia-model_0505.html

Wu, Chunsi. "Development goals of China's space program." *China Security*. World Security Institute, Vol. 2 No. 2, Summer 2006, 107-115, http://www.wsichina.org/attach/cs2_9.pdf

Xin, Dingding. "Boom year for space launches." *China Daily*, February 19, 2008, http://www.wsichina.org/morningchina/article.asp?id=1994

Yardley, Jim. "Blocked by U.S., China finds its own way to space." *International Herald Tribune*, May 23, 2007 http://www.iht.com/articles/2007/05/23/news/china.php Also, "Snubbed by U.S., China Finds New Space Partners." *New York Times*, May 24, 2007, http://www.nytimes.com/2007/05/24/world/asia/24satellite.html

_____. 'China uses space Technology as Diplomatic Trump Card', *International Herald Tribune*, May 24, 2007.

_____. "Snubbed by U.S., China Finds New Space Partners," *New York Times*, May 24, 2007.

Yuan, Jingdong. *Asia-Pacific security: China's conditional multilateralism and great power entente*. Carlisle, PA: Strategic Studies Institute, U.S. Army War College, January

Zhao, Yun. “The 2002 space cooperation protocol between China and Brazil: An excellent example of South-South cooperation.” *Space Policy*, Vol. 21, Issue 3, August 2005, 213-219.

Zhu, Yilin. “Fast-track development of space technology in China.” *Space Policy*, May 1996, 139-142.

Zhu Yilin & Xu Fuxiang. “Status and prospects of China’s space programme.” *Space Policy*, Vol.13, Issue 1, February 1997, 69-75.

LIST OF FIGURES

Figure 1: Chinese Government Launches (1970-2021): Future Launch Projection from Futron's ASCENT Study 28
Figure 2: FUTRON Corporation's Space Competiveness Index, 2008……29
Figure 3: 2009 Space Competitiveness Index: Total Aggregate Scores by Country…...30
Figure 4: Russian *Soyuz,* Chinese *Shenzhou*, and U.S. *Orion* Capsules Comparison…...44
Figure 5: Mars Missions: (L) *Phobos-Grunt* and (R) *Yinghuo-l*……...46
Figure 6: Artist Illustration of Sino-Russian Mars Probe…….47
Figure 7: An illustration of a proposed Chinese space station planned for by 2020…….48
Figure 8: Map of Hainan Island and Wenchang Satellite Launch Facility……56

LIST OF TABLES

Table 1: Reported Spaceflight Launched by Country, 2003-2007.....…27
Table 2: Overview of China's Space Launch Centers…….....32
Table 3: Overview of Chinese Satellites……..36
Table 4: Asian Space Organizations: Member Nations……...82