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The evolution of U.S. satellite and space launch technology export control policy

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THE EVOLUTION OF U.S. SATELLITE AND SPACE LAUNCH
TECHNOLOGY EXPORT CONTROL POLICY

A Thesis

Presented to

The Faculty of the Department of Public Administration

San Jose State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Public Administration

by

Christopher Byron Erickson

August 2002

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ABSTRACT

THE EVOLUTION OF U.S. SATELLITE AND SPACE LAUNCH TECHNOLOGY EXPORT CONTROL POLICY

by Christopher B. Erickson

This thesis describes the evolution of U.S. space and missile export control policy from WWII to 2000. This system of policies involves legislation, directives, and regulations, and is shaped by political, economic, and technological factors.

Domestic political pressure, crisis events, and the global political-economic environment influence this policy. The end of the Cold War, foreign events, ideology, defense industry changes, the nature of space technology, and a culture of international arms sales contribute to policy change.

Competing factors contribute to policy change, and the future may depend on the new President, or on a crisis that galvanizes public opinion. Export controls are strengthened in times of war, and relaxed in times of peace. Continuing global stability will likely relax the control regime, potentially accelerating the international arms trade, and increasing the proliferation of weapons of mass destruction.

A constrained export control regime could have negative impacts on the economy and commercial space industry. Dual-use technology export controls must carefully balance national economic and security interests.

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INTRODUCTION

This paper describes and analyzes the evolution of U.S. export control policies and their objectives from World War II (WWII) to the end of the twentieth century. Export controls affect dissimilar technologies - anything from farm goods and raw materials to computers and space age technology. This study focuses on what is known as "dual-use" technology, especially as relates to the space launch and satellite industry. Although the elaborate system of unilateral and multilateral policies which make up the U.S. export control regime involves national legislation, presidential directives, departmental regulations, and international agreements, this study is limited to exploring the process of presidential policymaking and its role in shaping this policy regime because most aspects of export control policy are determined primarily by decisions made by the chief executive and executive branch agencies.

Dual-use technologies are those trade items and technical know-how that can be used for either peaceful or military purposes. Examples of dual-use technologies are: scrap iron sold to Japan prior to World War II which could be used to build either civilian automobiles or battleships for their navy; high-speed computers that could be used by the Moscow University math department for education or for Russian nuclear weapons simulations; and rocket technology capable of improving China's civilian space launch program or targeting their growing fleet of nuclear missiles.

Nations that fail to prevent their advanced technology from falling into the wrong hands do so at their own risk. Soon after WW II, a British Rolls-Royce jet engine was

sold to the Soviet Union. In 1948, the U.S. military was then astonished to encounter the MiG-15, which used the modified "Nene" Rolls Royce jet engine and was piloted by North Korea, China and the USSR during the Korean War.¹ As modern weapons technology becomes even more advanced, the consequences to the United States and its allies of failing to protect their more sensitive nuclear, chemical, biological, space, and missile delivery technology may prove to be more costly than ever in future combat. Export of dual-use technology for commercial purposes during times of peace could result in dangerous military capabilities ending up in the hands of potential adversaries.

In times of war, export of U.S. dual-use technology is tightly controlled with little or no controversy. In times of peace, however, a strong tendency to decontrol those same items dominates presidential policy judgment. Given the huge U.S. involvement in the global marketplace, this sometimes dry, technical policy area therefore frequently finds itself the focus of attention for Congressional, Presidential and international policy-makers. These elements make for a continually evolving set of policies that are under a near-constant pressure to change.

Theoretical Approach. In order to examine the process of public policy formulation and evolution over time, this paper relies on the theory called "Regime dynamics" to provide context in identifying and examining key agents for policy change.

¹ USAF Museum (http://www.wpafb.af.mil/museum/air_power/ap42.htm). Also noted in Sept 1, '95 book review of "Decontrolling Strategic Technology, 1990-1992" by Peter M. Leitner, University Press of America, Sept 1995. (Review by D.W. Filli).

Regime dynamics theory describes policy systems as being consistently influenced by domestic political and economic variables and international factors.²

The scope of this topic encompasses half a century, many leaders, and a number of policy variations. The framework used here to tackle this issue is therefore similar to a series of minor case studies. By using a chronological approach, issues are presented as they were actually presented to the chief executives in the political context of the time. Previous studies on the topic of presidential decision making in foreign policy problems pointed me in the direction of some obvious influencing factors such as the presidents' relationship to Congress. The role of Congress is not always sufficiently highlighted in this process. Past work also helped me to focus on the issue of unintended consequences that sometimes result as the chief executive struggles to arrive at the best foreign policy decisions.³

One approach used while researching this topic was to specifically consider the impact that individual leaders have on shaping export control policy in this area. Leadership is an important, often critical, factor in foreign policy decision making.⁴ In the case of space and missile export control policy, prominent leaders such as Presidents Truman, Reagan, and Clinton and some Congressional leaders did have some impacts to the direction of policy. Larger, more independent, factors, however, tended to overshadow the efforts of even the most influential leaders. Collective Choice Process

² "Rendering Unto Caesar: How Legal Pluralism and Regime Theory Help in Understanding Multiple Centers of Power" by Robert Wolff - paper presented to the Project on Trends Workshop on Multiple Centers of Power, University of Victoria, May 1999.

³ Drachman, Edward R., et. al., Presidents and Foreign Policy: Countdown to Ten Controversial Decisions, Albany: State University of New York Press, 1998.

theory helps to explain how the influence of an individual leader can be transformed into group decisions in collective foreign policy decision-making processes.⁵ The approach used here of using applied historical research to identify and assess policy influencing factors is consistent with this process model of decision-making. Understanding these factors led to my focus in the final chapters of this thesis on examining independent variables that tended to exercise the most control over evolutions through history in this policy area. Focusing on these historical factors make it possible to explore likely changes in technology and the direction of export controls in the future and the - often unintended - implications of specific policy choices.

⁴ Editorial, "International Decision Making: Leadership Matters," *Foreign Policy*, Spring 1998, Issue 110, (1 March 1998) p.124.

⁵ Gallhofer, Irmtraud N., and Willem E. Saris, "Collective Choice Processes: A Qualitative and Quantitative Analysis of Foreign Policy Decision-Making," *Perspectives on Political Science*, Fall 1998, (Vol. 27, Issue 4), p.246.

CHAPTER I:

U.S. EXPORT CONTROL POLICY HISTORICAL OVERVIEW

In order to best understand current U.S. export control policy for space and missile technology and the powerful pressures that shape its evolution, it is necessary to first examine the birth of the modern policy in the World War II era and its subsequent changes. U.S. government policy historically tended not to interfere with the affairs of private industry and encouraged the unfettered export of its goods and services. A complex system of unilateral and multilateral economic policies is now actively used to achieve foreign policy and strategic objectives, often at significant cost to private industry. My goal in this chapter is to provide the historical perspective necessary to understand this controversial policy regime in its current and -by historical standards - unrestrained context. During the short history of this modern public policy a number of significant legal and political precedents were forged that give modern policy its current shape and momentum. Recognizing the political, economic and technical forces that gave rise to these key precedents is the first step in understanding current policy and gauging its future direction.

HISTORICAL PERSPECTIVE

Restricting the flow of militarily sensitive technology by governments to their potential enemies is not a new phenomenon. As far back as 455, the Eastern Roman Emperor Marcian prohibited the export of the superior Roman weapons, and the

materials necessary to make them, to the barbarians.⁶ The United States prior to World War I (WWI) generally only prohibited export of dual-use technologies during time of war or national emergency. Peacetime trade policy tended to vigorously promote exports of all types rather than restrict them.

During WWI Congress authorized the Wilson administration to restrict exports he deemed vital to U.S. interests. The Export Council and an Export Administration Board (which became the War Trade Board) were created to oversee the new controls. Thus the modern bureaucratic tools were created to manage a comprehensive wartime export control policy that included hundreds of dual-use items not explicitly military in nature. To illustrate the scope of the task, nearly 500,000 trade applications were processed in a six-month period.⁷

THE INTERWAR YEARS AND WORLD WAR II

Shortly after WWI the U.S. withdrew from multilateral trade control cooperation efforts with its allies and abandoned its monumental wartime trade control effort with few exceptions, returning to its historical hands-off approach to export control matters. (This was also the time when the isolationist Congress blocked U.S. membership in the League of Nations.) Then in 1935, the first Neutrality Act allowed President Franklin D. Roosevelt to establish the interagency National Munitions Control Board to register and

⁶ Thompson, E.A. "A History of Attila and the Huns." Oxford: Clarendon Press, 1948. Quoted in: Colin S. Gray, "Arms Control Does Not Control Arms." *Orbis*. Vol. 37/3 (Summer 1993): 333.

⁷ Harold J. Berman and John R. Garson, "United States Export Controls—Past, Present, and Future," *Columbia Law Review* 67, 5 (May 1967): 791.

license imports and exports of certain limited weapons and other items used in war.⁸

Congress and the president almost immediately began squabbling over how much discretion the president had in determining which items fell on the controlled items list. This on-going controversy over presidential authority continues as an issue today.

In 1937 the U.S. government had no legal means to prevent an American aircraft company from selling to Japan a complete advanced aircraft that had been withdrawn from a U.S. Army procurement contest two years earlier. Key design features of this aircraft later turned up in the famous Japanese "Zero."⁹ During Cold War debate over trade with communist states, Congressional policy makers remembered this, along with pre-war sales of scrap iron and other valuable resources used to build Japan's military.

The second Neutrality Act in 1937 expanded the number of dual-use items controlled. In 1939 the State Department first introduced technical information to the list. (Today, technical data is among the most controversial and important items debated as a technology transfer issue, especially in the field of space and space launch technology.) By this time, export controls had been used by the administration in support of various policies from protecting domestic supplies of key resources to taking a moral stand against the Italian invasion of Ethiopia.¹⁰

It took WWII to catapult the historically reluctant Congress to pass the Export Control Act (ECA) of 1940 which began wholesale limits to the export of war-related

⁸ Thomas N. Guinsberg, The Pursuit of Isolationism in the United States Senate from Versailles to Pearl Harbor, New York: Garland Publishing, 1982, p.183.

⁹ Eugene E. Wilson, "Slipstream", New York: McGraw-Hill, 1950, pp.192-193 (as quoted in Balancing the National Interest, p.101).

¹⁰ Richard T. Cupitt, Reluctant Champions – U.S. Presidential Policy and Strategic Export Controls, New York: Routledge, 2000, p.44.

items. Restrictions began with aviation fuel to Japan, machine tools, then iron and steel scrap were added, and finally a full-scale wartime blockade emerged. Lawmakers at the time saw these measures as temporary and intended to discontinue them after the war. As with earlier policy, the Secretary of State was charged with administering the new ECA controls. Since Congress continued to be uncomfortable giving all this new power to the president, his authority was limited to one-year increments. A pattern began with Congress extending the necessary authority for specified periods of time.¹¹ The ECA was amended in 1942 to include – among many other items - technical data. This shows that even at that early time there was serious concern about protecting technical ‘know-how’ in addition to actual critical goods.

Through the 1930’s, U.S. export controls were mainly unilateral. During WWII, the U.S. began working together with its allies to manage the controls more effectively. This cooperation extended beyond the war years and today is absolutely essential to the success of any export control regime, especially in a global high-tech economy.

THE EMERGING COLD WAR

After WWII, Congress quickly began to decontrol exports. Except for critical items in short supply, the Commerce Department led an effort to eliminate wartime controls and aggressively promote trade – including exports to the potentially huge Russian market. By October 1947 the list of controlled items was down to just 352 items from its wartime high of about 3,000 in 1944.¹²

¹¹ Ibid., p.45.

¹² Ibid., p.62.

The administration of President Harry S. Truman initially wanted to cooperate with the Soviet Union and avoid trade restrictions in order to help the U.S. economy recover from the war. But growing tensions between the U.S. and Soviet Union coupled with increasing anti-Communist sentiment at home guided Truman down the path of continuing export controls. Restrictions were used to prevent the export of critical items experiencing severe postwar shortage such as pig iron and freight cars. Restrictions were also used to funnel scarce resources to the reconstruction of Europe, and eventually they were used to deliberately hinder the Soviet military build-up. Mainly for these reasons, by 1951 a peacetime multilateral export control regime was built up, which then dominated Cold War trade policy for decades.¹³ In time, the Truman Doctrine and its policy of containment emerged to resist the advance of communism, which the Truman administration believed to be a serious and dangerous threat to democracy.

Truman did not want to use controls on dual-use technology items because he felt they ultimately would be ineffective (especially if applied unilaterally) and also would hinder a fragile U.S. economy. Strong bipartisan anti-Communist and isolationist forces in Congress, however, pressured Truman to apply broad economic sanctions against the Soviet Union. Criticism of Truman's initial reluctance to restrict export of dual-use items to the Soviet Union recalled the lack of an embargo on Japan in the 1930's, and even appeasement with Hitler. When the criticism finally threatened passage of the Marshall Plan and other unrelated legislation important to Truman, he undertook reforms that eventually led to a near total U.S. embargo of dual-use items to the Soviet Union and its

¹³ Office of Technology Assessment, *Technology and East-West Trade* (Montclair, New Jersey: Allenheld,

allies. Eventually, multilateral arrangements to enforce the controls were reached with the key countries in Western Europe and Japan.¹⁴

Revelations in 1948 that the Department of Commerce approved large-scale sales of advanced aircraft engines to Russia resulted in congressional hearings to investigate trade policy. (Congressional outrage at the time reads remarkably similar to when it was discovered that President William J. Clinton's Commerce Department approved transfers of rocket technology to China.) The resulting Export Control Act of 1949 established a new Advisory Committee on Export Policy. ECA of 1949 also declared national security to be the rationale for export control policy, replacing the rationale of short supply in critical items. For the first time in U.S. history, control of exports during peacetime had been established by federal legislation.¹⁵

In November 1949, a permanent multilateral working group was established in Paris to coordinate Western export control policy. The Coordinating Committee on Multilateral Export Control (CoCom), including the U.S. and its key European allies, acted as the de facto economic arm of the North Atlantic Treaty Organization (NATO) for four decades. CoCom, which was to be confidential, informal, and officially separate from NATO, maintained a list of militarily significant items embargoed to the Soviet Union and Eastern Europe.¹⁶

Osmun and Company, 1981): pp.111-170.

¹⁴ John G. Stoessinger, Crusaders & Pragmatists: Movers of Modern American Foreign Policy, New York: WW. Norton, 1979, p.60.

¹⁵ Gary K. Bertsch (ed.), Controlling East-West Trade and Technology Transfer: Power, Politics, and Policies, (Durham, North Carolina: Duke University Press): 1988, pp.30-36.

¹⁶ Cupitt, Reluctant Champions – U.S. Presidential Policy and Strategic Export Controls, p.77.

COLD WAR POLICY

With a now nuclear-capable Soviet Union and a communist Chinese mainland, the National Security Council produced NSC 68. The April 1950 policy document identified the Soviet Union and its political-economic system as the primary threat to U.S. security, and advocated a hard-line strategy to “reduce the power and influence” of the USSR. Cold War U.S. policy, together with multilateral CoCom enforcement, sought to tighten export controls on both the Soviet Union and China by using a sort of economic warfare in spite of their domestic economic costs.¹⁷

The on-going massive Soviet military buildup convinced NATO democracies to make an important change in their military strategy with implications that reach into military planning into the 21st century. The U.S. and its western allies could not match, tank for tank, the Soviet cold war arms buildup. Instead, the western powers depended on the superior capabilities of a more compact military. NATO decided not to try to keep up with Soviet mass and instead rely on the technological superiority of their weapons.¹⁸ This characteristic of U.S. and western defense policy remained during the post-cold war years and to this day.¹⁹

The Korean War, and especially the involvement of communist Chinese soldiers, served to harden U.S. export control policy to all communist countries. In October 1951 a reluctant Truman signed the Battle Act (Mutual Defense Assistance Control Act of 1951). Enjoying overwhelming wartime Congressional support, the act named after Rep.

¹⁷ Larry D. Strawser, “Conflicts in East-West Trade and Technology Transfer (1949-1989): Were Export Controls Worth the Cost?,” 1994, paper to Air War College, Air University, Maxwell AFB, Alabama.

¹⁸ Stephen P. Ferris, “Economic Influences on the Development of U.S. Policy and Military Strategy,” *Strategic Review*, Fall 1994, p.57.

Laurie C. Battle (D-AL) required the U.S. to deny military, economic or financial aid to any state that ships controlled items to a communist country. The Battle Act, together with strong pressure from the U.S., served to tighten CoCom multilateral controls on controversial dual-use items, but it also damaged the relationship between the U.S. and its European allies.²⁰

Upon taking office President Dwight D. Eisenhower wasn't very happy with the tight export controls he inherited from (the perhaps equally unhappy) Truman. After Stalin's death in 1953, Eisenhower began a policy known as the "New Look," which included loosening controls on dual-use items he termed "non-strategic trade." His goal was to only focus controls on key areas which could retard Soviet military advancement. He had his new director of Mutual Security programs, Harold Stassen, recategorize most dual-use items into a list that didn't fall under the Battle Act, effectively defeating the intent of Congress! Although his Secretary of Defense and much of Congress continued to see export controls on dual-use items as a necessary tool in the struggle against communism, Eisenhower didn't believe that they would ultimately succeed in their goals, such was his awe of the power of the global economy.²¹ This turned out to be an important precedent later duplicated by President Clinton.

With the Korean War over, U.S. public opinion gradually shifted to support increasing trade in peaceful goods to the East. This gave U.S. officials latitude to join their enthusiastic European allies in reducing the total number of CoCom controlled

¹⁹ Colin L. Powell, "The National Military Strategy of the United States," January 1992, p.10

²⁰ John McIntyre and Richard Cupitt, , "COCOM and Strategic Trade Controls: Crumbling Consensus?," *Survey*, 25, 2 (1980):92

items, shedding many dual-use items. Had the U.S. not relaxed their position, the future of European support for CoCom and possibly even NATO itself would have been placed in jeopardy. In 1955 Democrats won control of the House and President Eisenhower enjoyed their support for more trade liberalization. The influence of Senator Joseph McCarthy and his extreme anti-Communist allies gradually gave way to the era of “peaceful coexistence.” A 1959 review of CoCom multilateral controls reduced the number of items to a minimal level that was quietly maintained until the late 1970s.

DÉTENTE AND EXPORT CONTROLS

President John F. Kennedy asked the State Department to conduct a comprehensive review of U.S. policy. In July 1964 the review generally concluded that increased trade with the Soviet Union would not harm national security. A new export control strategy known as “tactical linkage” evolved to adjust trade according to changes in target behavior. This constructive approach replaced the 1950s style economic warfare that had dominated export control policy. The 1969 Export Administration Act (EAA) was then passed to help U.S. firms compete for Eastern European and Soviet markets. Export controls were only mandatory if the product would significantly contribute to an adversary’s military capability, and even then only if that product wasn’t otherwise available in the global market!

During the 1970s the administrations of both President Richard M. Nixon and President Jimmy Carter hoped that a substantial transfer of technology to the East would

²¹ Richard T. Cupitt, Reluctant Champions – U.S. Presidential Policy and Strategic Export Controls, New

result in better behavior from the Soviets. Few controls were enforced. During this time the State Department regarded the symbolic value of trade to be as important to the Soviets as its economic value.²² The CoCom partnership became less effective, and export control policy gradually garnered less and less attention from senior officials. This all-carrot approach isn't generally regarded as having been successful.²³

Since 1965 official Warsaw Pact policy was to obtain Western technology, even illegally. The Soviet Union maintained a staff of over 100,000 just to translate Western documents. It is estimated that the Soviet Union saved the equivalent of several billion dollars from technologies obtained from the West. According to a later Defense Department study, "(t)he assimilation of Western technology is so broad that the United States and other Western nations are thus subsidizing the Soviet military buildup."²⁴ During this period, there was little recognition at high levels of the problem of technology transfers, and export control policy was mainly tinkered with to achieve foreign policy concessions.

The influential 1976 Bucy Report called for reform of export control policies to strengthen and streamline them with a focus on key technologies where the U.S. had a particular lead. The idea was to increase the effectiveness of controls by narrowing them to only the most important items. The purpose was to slow Soviet modernization in those

York: Routledge, 2000, pp.84-85.

²² William P. Bundy, Tangled Web: The Making of Foreign Policy In The Nixon Presidency, (New York: Hill and Wang, 1998).

²³ Robert Cullen, The Post-Containment Handbook: Key Issues in U.S.-Soviet Economic Relations, Boulder, Colorado: Westview Press, 1990, pp.1-18 and 39-74.

²⁴ "Soviet Acquisition of Militarily Significant Western Technology: An Update" Washington, D.C.; U.S. Government Printing Office, 1985, p.i.

key areas and to maintain the U.S. lead.²⁵ After years of failed technology transfer policies, the Carter administration eventually abandoned détente and began a more confrontational stance toward the Soviet Union after the U.S.S.R. invaded Afghanistan. The Export Administration Act of 1979 was intended to provide greater policy coherence, eliminate licensing delays caused by a bulky bureaucratic process, and incorporate some of the Bucy recommendations.

REAGAN AND THE END OF THE COLD WAR

According to Richard Perle, formerly Assistant Secretary of Defense for President Ronald Reagan, there was not a single computer dedicated to administering the system of export controls in 1981. Over 120,000 license applications per year were processed by hand.²⁶ The Reagan administration put the question of technology transfer on a very fast track and reoriented U.S. technology transfer policy 180 degrees from the policy of the 1970s. New policy objectives included expanding the definitions of specific “dual use” technologies, eliminating the backlog of license applications built up over the last decade, strengthening COCOM and its enforcement procedures, and communicating to the business community that the costs resulting from the tighter controls were necessary. Reagan administration policy clashed with the European allies over this new version of economic warfare through export controls. Policy clashes included imposing sanctions in

²⁵ Defense Science Board, “An Analysis of Export Controls of U.S. Technology – A DOD Perspective,” Washington, D.C.: Office of the Director of Defense Research and Engineering, 1976.

²⁶ Perry, Charles M. and Robert L. Pfaltzgraff, Jr., ed., Selling the Rope to Hang Capitalism? Washington: Pergamon-Brassey, 1987, p.6.

response to the Polish crisis, restricting Western export credits to the Soviets, and constructing the Siberian pipeline.²⁷

Technology export control policy was used in the Reagan administration as one tool of a broader U.S. cold-war foreign policy. Export control policy was seen as especially critical given Western dependence on high technology for defense superiority and the aggressive Soviet effort to obtain that technology. The result was a transformation of the dismal policy during détente into a determined attempt to both cut off technology transfer and influence Soviet and Chinese policies.²⁸

In 1985, after two years of heated partisan debate in Congress, the 1979 EAA was extended to 1989. This represented a major compromise between two camps. The Department of Defense (DOD) and Department of Commerce fought each other to gain authority over license applications to friendly countries, and Commerce and Customs fought each other over enforcement authority. Although in 1985 the U.S. suffered from its highest trade deficit ever, the DOD began its generally more cautious approval role over free world licensing applications. In the face of tightening restrictions, the licensing process came under greater domestic criticism eventually leading to the 1987 Allen Report which severely criticized the bulky and bureaucratic licensing process.

Despite the existence throughout the Cold War of a largely isolated defense industry, Reagan administration policies nevertheless imposed a severe opportunity cost on the U.S. economy. Specifically, high technology companies suffered most due to

²⁷ Ibid., p.156.

²⁸ Perry, Charles M. and Robert L. Pfaltzgraff, Jr., ed., Selling the Rope to Hang Capitalism?. Washington: Pergamon-Brassey, 1987.

Cold War export and other restrictions. The sacrifices of the U.S. high-technology industry during this period served as a backdrop for the policy changes favoring business interests directed by Clinton in 1995 and 1996.²⁹

CHINA POLICY

Motivated both by national self-interest and idealism, U.S. policy toward China has resulted in a particularly complex relationship. During the Cold War, U.S. technology export policy goals toward China included the desire to bind China to the West, assist Chinese leaders liked by the U.S., and help advance China's economic and defense modernization in ways that could offset the Soviet advantage.³⁰ U.S. policy toward China has not always been consistent, and U.S. interests have not been clearly defined. This historical ambiguity in policy goals and definitions ultimately became an important contributing factor to the export problems in 1998/9 involving commercial space launch technology.

The U.S. began treating China differently than the Soviet Union in 1980, in part due to the Soviet invasion of Afghanistan. The Reagan administration introduced a major liberalization in trade policy toward China in 1983, although this had many exceptions including nuclear delivery systems. In 1985, the U.S. and its COCOM partners further relaxed restrictions. In March 1985, the Chinese Central Committee adopted the "Decision on the Reform of the Science and Technology Management System" which, among other provisions, emphasized the "important role of importing technology" from

²⁹ Gansler, Jacques S., Defense Conversion: Transforming the Arsenal of Democracy. Twentieth Century

the West. The Chinese modernization program sought to use foreign technology as a complement to its own.³¹

Export restrictions of dual-use technologies under Reagan and throughout the Cold War cost U.S. industry potentially billions of dollars in lost profit while foreign competitors happily picked up much of the slack. The estimated cost of controls on dual-use items range from \$9.3b in 1985 to \$30b in 1989.³² These enormous costs, borne mostly by the high-tech industry, were argued to be necessary in the face of a potential enemy as powerful as the Soviet Union. Given the potential for profit, there was an equally strong pressure to eliminate the export controls once the Soviet Union collapsed.

THE END OF HISTORY?

With the post-1989 geopolitical changes, export control policy initially remained unchanged in the administration of President George W. Bush. But a rationale soon emerged to replace the policy of Soviet containment: because proliferation of nuclear, chemical, biological and delivery system technologies became an unavoidable threat, some level of export control would have to stay in place. Post Cold-War defense budget cuts and downsizing, however, created a powerful pressure for the U.S. to engage in unprecedented global arms sales. By the end of 1992, utilization rates of defense plants

Fund, 1995.

³⁰ Selling the Rope (p.138)

³¹ Selling the Rope (p.132)

³² Richard T. Cupitt, Reluctant Champions – U.S. Presidential Policy and Strategic Export Controls, New York: Routledge, 2000, p.3.

were averaging only 35 percent and falling.³³ An enormous increase in arms exports took place to maintain the necessary economy of scale for U.S. defense firms. From 1987 to 1993, American foreign military sales grew from \$6.5 billion to \$32 billion! U.S. arms exports even included \$1.5 billion in advanced technology and products to Iraq with one sale taking place the day before Iraq invaded Kuwait.³⁴

As U.S. defense spending continued to fall in the 1990s, arms exports became ever more critical to U.S. companies. Asian and European competitors became increasingly successful in many high-tech industries, and American high-tech companies saw unilateral restrictions on export of dual-use technology as especially harmful to them. With the argument that it was no longer necessary to keep dual-use technology from the Soviet Union, companies like Loral, Hughes and others actively lobbied Congress and both Presidents Bush and Clinton to eliminate those restrictions.

Other important post-cold war developments took place that significantly influenced the continuing evolution of dual-use technology export control policy. One of these was the revolution in modern technology. A dramatic transformation of the American military and civilian industrial sectors began to take place creating a largely integrated civil/military structure. The Clinton administration actively promoted the integration of civil and military production and technology. Officials thought it could enhance both the competitiveness of U.S. industry and national security by fostering "a greater integration of the Defense industrial base into the commercial economy."

Undersecretary of Defense for Acquisition and Technology John M. Deutch and Defense

³³ Gansler, Jacques S., Defense Conversion: Transforming the Arsenal of Democracy. Twentieth Century

Secretary William J. Perry actively promoted reforms seen as radical at the time to address the problem of sustaining military readiness on static or declining budgets. Their strategy included base closings to reduce infrastructure, and new weapons acquisition policies to encourage greater integration of civil and military products and technology. This effort was known as the "Blueprint for Change."³⁵

The Blueprint for Change contributed to the increasing commonality of military and civilian technologies in high-tech areas. Common products were equally military and civilian in nature. For example, computers used by kids in the West to play games were also used for military command and control of forces, enhanced weapons system design, and simulated nuclear explosions for weapons testing. The satellite system providing civil aviation with accurate navigation data was also used to pinpoint troop locations and even to guide smart bombs onto targets through clouds. The capability to deliver cell phone or TV signals via satellites also provided encoded communications capability to deployed troops worldwide. And the rocket technology used to place civilian commercial objects into space also served to accurately target and deliver complex, multiple warhead capable long-range nuclear missiles. The resulting need to restrict commercial high-tech items to prevent their inherent military technology from falling into the wrong hands became a blueprint for controversy.

Fund, 1995, p.51.

³⁴ Ibid., p.p. 60-62.

³⁵ Ibid., p.p.152-3.

TRANSITION TO A NEW WORLD ORDER

The intense pace of exports in high technology weaponry made the danger of exporting to undesired countries all the more alarming. In this environment of intense pressure to promote arms and high-technology exports, CoCom was formally disbanded in March of 1994 with no replacement organization.³⁶ Given the inherent militarily sensitive capabilities of commercial high-tech products, and now no strategic rationale or enforcement mechanism for export controls, the world was left with a dangerous mix. For example, the U.S. satellite industry views the commercial satellite as any other product eligible for export. In his 1998 testimony before Congress, C. Michael Armstrong, Chairman and CEO AT&T (former Hughes chairman) stated:

“The commercial communicating satellite is not a munition and does not belong on a munitions list. As a commercial product and with embedded technology fully protected, commercial communicating satellites belong on the commerce control list administered by the Commerce Department.”³⁷

President Reagan opened the floodgates by first allowing U.S. satellite manufacturers to launch their products from Chinese launchers due to the growing demand for satellite launches not met by U.S. launch service providers. In the context of the perceived Soviet threat, a small amount of unavoidable technology transfer to China's space program was deemed acceptable. Bush and Clinton continued the policy (which required presidential approval per event) despite growing evidence that critical U.S. military technology was in danger of being lost to China.

³⁶ Steven F. Kraemer, “America's Ten Deadly Strategic Gambles: Arms Control or Unilateral Disarmament?,” *Strategic Review*, Fall 1994, pp.7-8.

³⁷ U.S. Congress. Senate, Committee on Governmental Affairs, The Adequacy of Commerce Department Satellite Export Controls. 105th Cong., 2nd Sess., 18 June and 8 July 1998. p.6.

No effective technology transfer regime operated since COCOM was disbanded in March 1994 without a replacement. The Missile Technology Control Regime (MTCR) had no enforcement mechanisms and was purely a voluntary arrangement. To make matters worse, the Export Control Act allowed technology transfers to take place even when the DOD objected on grounds of national security concern. Clinton administration policy during this period focused predominantly on the Cold War's end, while ignoring strategic threats from proliferation, especially by Russia and China.³⁸

In September 1995, 28 countries agreed to establish the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies. This new multilateral system controls conventional arms and related dual-use items. The only countries of concern to which exports are restricted, however, are Iran, Iraq, Libya, and North Korea. Unlike CoCom, Wassenaar focuses very narrowly on those four countries, and there is no enforcement mechanism. Although it was a huge diplomatic feat to get nearly 30 countries to agree to monitor and share information on arms sales, the Wassenaar Arrangement is unlikely to have any real affect on the danger of proliferation – if only because it focuses on so few targets.

During Congressional testimony, Peter Leitner, an official of the DOD Defense Technology Security Administration (DTSA), described the removal of the DOD from a lead position in technology control decisions and the increased influence of the Commerce Department during the Clinton administration. Leitner claimed that Clinton Administration policy resulted in a politicization of the export control process. His

³⁸ Sven F. Kraemer, 'America's Ten Deadly Strategic Gambles: Arms Control or Unilateral

criticism was of the dominance of commercial interest over national security. There was no effective control against countries like China from gaining advanced U.S. missile technology and re-exporting that technology to rouge regimes like Iran.³⁹

“IT’S THE ECONOMY, STUPID”

In response to the active lobbying of space and technology companies, the Clinton administration stepped up efforts to eliminate unilateral restrictions on many dual-use technologies, especially in computers and telecommunications (satellite) equipment. Undersecretary of Commerce William Reinsch oversaw the decontrolling of a vast array of strategic technologies. For example, in 1995 the Commerce Department removed controls on most supercomputers, allowing them to be sold directly to Chinese military purchasers. White House thinking at the time saw technology controls for high technology as “hopelessly expensive” and “ineffective.”⁴⁰

A December 1995 Executive Order handed over control to the Commerce Department of licensing authority for all commercial satellite launches to China, deliberately leaving the Defense Department out of the loop. Two technology transfer incidents involving Loral and Hughes eventually became public and then became the focus of multiple intense 1998 congressional hearings. The focus of the hearings was to determine what impact to national security, if any, took place. In one case sensitive cryptographic technology is alleged to have been lost in an accident to the Chinese. If

Disarmament?,' *Strategic Review*, (Fall 1994): 7.

³⁹ Leitner, Peter M., *Decontrolling Strategic Technology, 1990- 1992: Creating the Military Threats of the 21st Century*. University Press of America, 1995.

true, Chinese domestic military satellite communications capabilities stand to benefit significantly, and the possibility exists that U.S. code technology may in part be compromised. In the other case, Hughes provided sensitive technical information to the Chinese space launch company which can directly improve the accuracy and reliability of Chinese long-range nuclear missiles. These incidents were investigated and reported in a 1997 General Accounting Office Study. Congress requested this GAO report in response to the significant 1996 export control policy changes made by President Clinton. Notable conclusions of the report include the fact that DOD influence was diminished and that technical information (i.e., technical data) is not clearly controlled.⁴¹

Two instances were widely reported in the media of possible technology transfers to China taking place from U.S. satellite companies doing business with China. These hearings sought to determine how the Chinese military could benefit from that relationship, and whether export control policies were adequate to protect national security interests. It was determined that the similarities between commercial space launch activities and ICBM capabilities are nearly identical, and that any improvements gained by the Chinese from U.S. satellite companies could be directly applied in improving Chinese nuclear launch capabilities. Of special concern is the fact that that technology could also, in turn, be proliferated. It was also determined that the Chinese military satellite production capabilities could also benefit greatly from U.S. companies. A significant concern to the Senators was the 1996 Clinton decision to remove satellites

⁴⁰ (p.5 of JI '98 American Spectator)

⁴¹ General Accounting Office. National Security and International Affairs Division. Export Controls: Change in Export Licensing Jurisdiction for Two Sensitive Dual-Use Items, by Katherine V. Schinasi. Report to Congressional Requesters, GAO/NSIAD-97-24. January 1997.

from the U.S. Munitions List and transfer export control authority from the State Department to the Commerce Department.⁴²

Additional Congressional hearings determined that, during the period between 1993 and 1995, there was significant confusion over how export control policy was to be administered. As a result, there were multiple foreign launches of U.S. satellites which were not monitored at all by DOD monitors. It was impossible to positively determine whether or not a significant transfer of militarily sensitive technology took place. Senators expressed many broad concerns, especially regarding the fact that commercial interests dominate those of national security. One glaring example of this was that the Commerce Department approved the release to China of a Hughes technical accident investigation report which might have directly improved Chinese rocket capabilities of its strategic nuclear forces. Commerce never even notified State or DOD of that approval. These hearings looked into why DOD monitors were not required by Commerce, and why they were not present.⁴³

Still other congressional hearings focused on the Clinton administration policy to marginalize the DOD role in the licensing process. Specifically, as noted earlier, Executive Order 12981 removed the ability of DOD to veto a license application for national security reasons. This order also tightened export control mechanisms used by the Commerce Department, including mandating the use of DOD monitors. It was

⁴² U.S. Congress. Senate, Committee on Governmental Affairs, Benefits of Commercial Space Launch for Foreign ICBM and Satellite Programs. 105th Cong., 2nd Sess., 21 May 1998.

⁴³ U.S. Congress. Senate, Committee on Governmental Affairs, The Adequacy of Commerce Department Satellite Export Controls. 105th Cong., 2nd Sess., 18 June and 8 July 1998.

determined that the 1996 shift in authority from the State Department to the Commerce Department marked a profound shift in export control policy. It was claimed that the previous presumption of denial became a presumption of approval. Also, by removing satellites from the U.S. Munitions List, the administration circumvented sanctions imposed after the Tiananmen incident. Finally, concerns were raised about the planned Defense Reform Initiative which was expected to realign the DOD DTSA agency under the newly created Defense Threat Reduction Agency (DTRA).⁴⁴

As a result of the Cox Committee hearings, licensing authority was given back to the State Department and the Defense Department now routinely reviews license applications and actively monitors licensed U.S. space industry contact with foreign companies. The DTRA performs its technology security role today hand-in-hand with its other non-proliferation and other missions to protect the US from non-traditional threats.

This chapter described the development of modern U.S. export control policy for space and missile technology since its wartime inception through its most significant periods of evolution. This constant process of policy development is most dynamic during periods of crisis, but it changes just as surely during times of peace and stability. At each point in the evolution of this public policy, various factors influenced the changes taking place, different players and stakeholders were involved, and the impacts of the changes varied. Chapter III, Policy Evolution Analysis, will examine specific strategic, political, economic, and technical forces that shaped and continue to shape this policy development process. Chapter I also introduced and defined the problem of dual-

use technology transfer, which will be discussed in greater detail later with the issue of secondary proliferation.

Historical perspective alone, however, is not sufficient to adequately understand the nature of this public policy or the agents that work to shape its development. Unlike most other areas of public policy, a field of technology particularly influences satellite and missile export control policy. Understanding the aspect of technology, together with historical perspective, will make it possible to fully explore and analyze those agents that influence the development of this public policy. Chapter II, Dual-Use Space and Missile Technology, will explore the general technology involved in the space launch (missile) and satellite industry, and the particular influence that the highly complicated and rapidly accelerating nature of this technology exerts over this field of public policy. Chapter II will also examine the related issue of secondary proliferation, in part, as a byproduct of the nature of the technology involved.

⁴⁴ U.S. Congress. Senate, Committee on Governmental Affairs, The Role of DTSA in Approving Critical Technology Exports. 105th Cong., 2nd Sess., 25 June 1998.

CHAPTER II:

SPACE & MISSILE TECHNOLOGY

The actual technology involved in the satellite and space-launch industry exerts its own influence over how export controls governing it are perceived, implemented, and ultimately how they are developed. The nature of the technology plays such an important role in understanding the policy and some of its associated problems that it merits special attention. Satellite and space launch technology advances rapidly, similar to related computer and encryption technologies. Satellite and space launch technology also largely overlap in military and civilian uses, a recent trend that caught policymakers off guard. Preventing the spread of technical 'know-how' to primary target countries is a challenging policy objective made more difficult by the problem of secondary proliferation to countries such as Pakistan or Iran. This chapter examines aspects of space and missile technology which are especially important for evaluation of export control policy and understanding of the agents influencing its development.

DUAL-USE NATURE OF THE TECHNOLOGY

Society has become increasingly more information-based, and space systems are therefore of growing importance. Today, space systems are used for a wide variety of purposes ranging from communications to navigation to overhead imaging. Military technology applications are increasingly applicable to civilian uses, and the industries producing military technology are increasingly integrated in the civilian economy. For

example, the Global Positioning System (GPS) initially provided a very accurate space-based navigation capability only to the military. Naval vessels use it to precisely determine their location on the oceans, ground troops know their location better than their opponents, and precision guided munitions use it to find their targets. This last application was witnessed enthusiastically by television viewers throughout the world during the Gulf War and more recently during the Kosovo air campaign. This valuable military application was made available for use by the commercial sector, including civilian shipping, marking real-estate boundaries, and even automobile navigation systems. The civil aviation industry is now absolutely dependent on this space-based capability for the safety of millions of civilian airline passengers every day.

Another example is imaging from space. After decades of governments enjoying the sole ability to observe the globe from space, commercial companies in the U.S. and France now have a similar technical capability for sale to anyone willing to pay. There is virtually no difference between the essential means used to provide spy photos for a government and the means to provide images used by the real estate sector in mapping our countryside. Not only does our government now have to monitor and control to whom commercial images are sold, it must also ensure that the ability to manufacture and deploy imaging satellites doesn't fall into the hands of a potential adversary.

A third example of the dual-use nature of space technology is global communications. During the early Cold War, only military forces facing each other around the world needed secure, global telecommunications. Today, society takes for granted the ability to talk on the phone while driving a car through a desert, or receive a

page anywhere the customer may be travelling. Space systems are now routinely used by the commercial sector to transmit radio and television broadcasts, voice and other communication, and even provide Internet access!⁴⁵ When the Chinese military recently acquired thousands of Motorola pagers, no eyebrows in the export control community were raised. The Chinese military intends nevertheless to use the pagers as a sort of command and control system for forces deployed over large areas.⁴⁶ Although not a significant threat to US national security, this example illustrates another way in which military and civilian uses of space technology are indistinguishable.

INFLUENCE OF TECHNOLOGY ON EXPORT CONTROL POLICY

Export control policy goals included a number of different objectives, such as making a symbolic political statement or narrowly focusing on inhibiting a specific military capability of an opponent. Over time, however, the nature of the technology itself has generally exerted the greatest single influence on policy development. For example, fields of high technology - most notably computing - tend to advance according to anticipated rates of progress. Due to this industry characteristic, COCOM controls sought to simply delay Soviet bloc technology development. This is very different from traditional export controls that focus on a specific, or static capability. Over time, COCOM is thought to have been successful in delaying Soviet bloc development in key areas by 5 to 10 years.⁴⁷

⁴⁵ A closely related technology with similar dual-use qualities is cryptographic encoding.

⁴⁶ Mark Landler, "Last Word in China's Phone Industry" New York Times, Dec 6, 2000, p.B3.

⁴⁷ Richard T. Cupitt, Reluctant Champions – U.S. Presidential Policy and Strategic Export Controls, New York: Routledge, 2000, p.10.

Starting in the late 1980s a major technological revolution became evident which complicates export control policy to this day. Critical military and civilian technologies increasingly overlapped. Historically, military and civilian technologies were distinctly different. With the advent of information-based warfare, and as the information age moved the civilian economy into the high-tech environment, there has been a growing merger in critical technologies. In 1995, for example, the annual critical technology lists of the DOD and DOC overlapped by over 80 percent.⁴⁸

An area where the nature of the technology especially influences export control policy is the overlap between technology used for civil space launch activities and the technology used for accuracy and development of intercontinental ballistic missiles. Chinas' space launch industry benefited substantially from their cooperation with Western satellite manufacturers during the late 1980's and into the 1990's. Since improvements to civil space launch vehicles may be applied directly to ICBM capabilities, a number of specific Chinese military capabilities enjoyed corresponding advances during this period. The same technology that balances commercial satellites on a rocket during flight can be applied to multiple independently targeted re-entry vehicles (MIRVs). The same can be said of satellite apogee kick motors (used to maneuver satellites into their desired orbit immediately after launch), and satellite-booster system

⁴⁸ Gansler, Jacques S., *Defense Conversion: Transforming the Arsenal of Democracy*. Twentieth Century Fund, 1995.

integration know-how. This knowledge of delivery systems may also then be transferred to Iran, Pakistan and other countries striving for the means to deliver nuclear weapons.⁴⁹

THE ISSUE OF SECONDARY PROLIFERATION

A modern problem, increasingly evident as Western controls loosened, was the related problem of secondary proliferation of missile technology from China to countries of concern such as Pakistan, Iran, and others.

Shortcomings in the U.S. launch industry led to an increasing business partnership between U.S. satellite manufacturers and China. Chinese space launches are significantly cheaper and offered launch capacity to the growing satellite market. The increasing interaction between U.S. satellite manufacturers and the Chinese government led to a GAO investigation and congressional hearings into the subject of whether technology transfers to China in fact hurt U.S. national security. Senators looked into the 1997 GAO report, and also focused on the lack of a multilateral regime for export controls. After several classified sessions, Congress determined that the Executive branch did not effectively control or monitor U.S. technical transfers to China.⁵⁰

The perception of increasing secondary proliferation resulted in the 1987 Missile Technology Control Regime (MTCR), which sought to control the spread of missile

⁴⁹ J. Barry Patterson, China's Space Program and its Implications for the United States, Air War College Paper, Air University, 1995.

⁵⁰ U.S. Congress. Senate, Select Committee on Intelligence, Investigation of Impacts to U.S. National Security From Advanced Satellite Technology Exports to China and Chinese Efforts to Influence U.S. Policy. 105th Cong., 2nd Sess., 10 June and 15 July 1998.

technology and missiles capable of delivering weapons of mass destruction. The MTCR is an informal political agreement among 22 nations to limit the emerging threat of the proliferation of missile technology. It also aims to reduce or eliminate international transfers of associated components and technologies. Significantly, there are no enforcement mechanisms, or inspections. (Governments are expected to simply implement the MTCR “in accordance with national legislation.”)⁵¹ In 1987 the U.S. also made a unilateral attempt to stop the export of space launch technology, although these controls and those of the MTCR remained loose.

In an interesting mix of the secondary proliferation issue and the problems of controlling dual-use technology, China is reported to be providing fiber optic cable to Iraq in an apparent violation of United Nations sanctions. Although not space technology, this timely example helps to illustrate both dual-use nature of some modern technology and the problem of secondary proliferation. The fiber optic technology is being used to rebuild Saddam Hussein’s command and control network for his integrated air defense system which routinely targets and fires on patrolling U.S. and allied warplanes. U.S. companies have sold fiber optic communications equipment to China. The “know-how” was resold to Iraq to improve its air defense network. Fiber optic cable networks also provide valuable civilian applications - opening the door to military application. The United Nations allowed Chinese companies to repair severe damage to Iraq’s electrical power grid system from the Gulf War.⁵²

⁵¹ Keller, William W., Arm in Arm: The Political Economy of the Global Arms Trade. Basic Books, 1995, p.18.

⁵² Bill Gertz, “China Fortifying Iraq’s Air Defense System” Washington Times, February 20, 2001, Pg.3.

This chapter discussed the dual-use nature of space technology and the widespread applications in navigation, communications, and other common civilian and military uses of space systems. In many ways the growing dependence of governments and commercial entities alike on space is not obvious to general publics, but is nevertheless commonplace. A key feature of space launch technology is that it is virtually inseparable from the intercontinental ballistic missile technology used to deliver nuclear and other weapons of mass destruction. The issue of secondary proliferation exacerbates the problem of spreading this sensitive technology, especially when it is characterized as civilian.

The lasting message of this chapter is the ultimate importance of this technology to both the economic well being of our country and its military security, and the complicated nature of preventing the spread of space and missile capabilities to countries of concern. Chapters I and II defined and discussed the issues surrounding space and missile technology export control policy, and provided relevant background and perspective. Chapter III, Policy Evolution Analysis, will identify key factors contributing to changes in export control policy of space and missile technology and assess the importance of each factor as an agent for policy change.

CHAPTER III:

POLICY EVOLUTION ANALYSIS (SPACE & MISSILE TECHNOLOGY)

This chapter will identify and assess the impact of specific factors which, over time, contributed to policy change. To do this, it is important to first understand how export control policy is developed and the environment faced by policy-making institutions. As with any public policy formulation process, there is an institutional or bureaucratic context that serves as the focus for competing interests.

This chapter will describe the most significant shifts in historical policy trends that can be used to extract more narrow factors. Policy justifications changed over time, usually coinciding with major changes in the policy itself. Often, these policy changes were the result of institutional conflict and competing interests in the political process.⁵³ These policy rationales broadly fall into broad economic, political/ideological, and military/strategic categories that can be used to identify individual contributing factors. The nature of individual factors influencing policy change (either to liberalize or strengthen it) can be further characterized as crisis, or wartime, and peacetime.

An important aspect in examining these individual factors is their frequent overlap. Policy decisions must take into account their impacts to diverse areas, and factors influencing those decisions often come from diverse sources.⁵⁴ In the case of export control policy, it is often nearly impossible to distinguish the economic aspects of issues from their national security implications.

⁵³ Peter Trubowitz, Defining the National Interest: Conflict and Change in American Foreign Policy, Chicago: University of Chicago Press, 1998.

⁵⁴ Deborah Stone, Policy Paradox: The Art of Political Decision Making, New York: W.W. Norton, 1997.

POLICY FORMULATION PROCESS

Legislative authority to control technology exports manifests itself in two laws: the Arms Export Control Act (AECA) of 1976 and the Export Administration Act (EAA) of 1979. The AECA covers the import and export of military weaponry - as identified on the U.S. Munitions List - and is administered by the State Department through its International Traffic in Arms Regulations (ITAR). The Defense Department assists with monitoring and maintains the U.S. Munitions List. The EAA covers "dual use" goods and technology and is administered by the Commerce Department by its Export Administration Regulations.⁵⁵ Much of the national debate in 1998 and 1999 centered on which list, and therefore which departments' regulations, should cover commercial communications satellites.

Congress and the Executive Branch. Among the most pressing problems of the presidency in foreign policy decision-making is the congressional-presidential relationship. Strengthening the presidency in foreign-policy usually means weakening others who may be a president's competitors.⁵⁶ This institutional aspect of an inverse relation of strength to others in foreign policy decision-making is most clearly seen in the extreme caution exercised by Congress in authorizing presidential authority to implement export controls first in 1940 and ever since during the periodic reauthorization process.

⁵⁵ Panel on the Impact of National Security Controls on International Technology Transfer, Committee on Science, Engineering, and Public Policy. Balancing the National Interest. Washington, D.C.: National Academy Press, 1987.

⁵⁶ "Reinventing What for Whom? President and Congress in the Making of Foreign Policy." Presidential Studies Quarterly, March 2000

Ever since the Roosevelt administration began using its discretion in determining exactly how to categorize controlled items under the Neutrality Act, presidents have frequently found themselves at odds with their congressional counterparts. President Eisenhower defied the intent of the Battle Act by placing many dual-use items in a list not covered by that legislation. President Clinton performed a similar executive sleight of hand by removing many U.S. commercial satellite launches from an export control list requiring continued Congressionally imposed sanctions for the Tiananmin Square incident. Congress therefore tends to find it necessary to keep a close eye on executive behavior in the export control area, requiring frequent reports and status updates. This on going political struggle between executive and legislative branches seems characteristic, regardless of political affiliation. This dynamic offers an important perspective through which to view the publicly stated reasons behind policies and policy shifts.

Another common characteristic of the executive branch as relates to this issue is its tendency for internal struggle between disparate agencies with sometimes conflicting charters. The staffing and organization of the executive branch to promote effective presidential foreign policy making is a similar recurring institutional issue. Institutions, however, facilitate rather than make policy. The need for presidential leadership is vital in generating consensus in these situations. Unfortunately, this issue doesn't always command presidential attention. In 1987 a government panel produced a study which

was very critical of the ongoing conflict between executive branch agencies and a lack of presidential policy leadership.⁵⁷

Policy Justification. Since nearly the beginning of the modern U.S. export control regime, various rationales have been called upon to justify restricting trade in dual-use items. Individual justifications fall into the broad categories of economic, military (strategic), and political/ideological. These policy rationales help identify which factors shaped changes in policy. Recurring individual themes include:

- Protecting national security interests;
- Stressing U.S. neutrality by withholding export to foreign belligerents;
- Protecting domestic supplies of critical items (i.e., helium in 1938);
- Taking a moral stand (i.e., embargo against Italy when it invaded Ethiopia);
- Containing the spread of communism;
- Fostering non-proliferation of nuclear, chemical and biological items.

Non-proliferation is the prevailing rationale today. Policy makers used export controls to support each of these goals, and in the future, export control policy will continue to support whatever geopolitical issues are facing the nation at that time.

⁵⁷ Panel on the Impact of National Security Controls on International Technology Transfer, Committee on Science, Engineering, and Public Policy. Balancing the National Interest. Washington, D.C.: National Academy Press, 1987.

Policy Justification Categories

Economic

Political

Military

Various policy rationales have been used to justify changes to export control policy. Examining categories is one way to understand the influence of individual agents for policy change. Military justifications sought to expand controls, economic justifications sought to reduce or eliminate controls, and political justifications can support either goal.

OVERVIEW OF SIGNIFICANT PUBLIC POLICY SHIFTS

A number of significant policy shifts over the years introduced legal and political precedents, the importance of which extends out to this day. World War II set the stage for the rest of the century by profoundly altering the national paradigm on the scope and role of export control policy. Although originally intended to be temporary wartime measures, the drastic wartime restrictions introduced by Congress served as a catalyst to push the country away from its unregulated, hands-off past. The wartime export control regime also served in a smaller way as a mechanism for U.S. policymakers to step beyond their traditional isolationist tendencies.

The introduction of the Cold War radically transformed how both U.S. policymakers and the public perceived and utilized export controls. Instead of restricting only the transfer of items and technology of a directly military nature, the scope of controls extended to include non-military items. The precedent was set of using economic policy as a peacetime weapon against other states for ideological purposes.

Another major shift in policy took place via the 1969 Export Administration Act. The U.S. abandoned the principles of economic warfare and the belief that broad controls could have tangible impacts on the military advancement of its opponents. In its place, export control policy began to focus on symbolic utility and act as a tool to achieve specific foreign policy objectives, especially to try to narrowly influence Soviet behavior. Business interests opposed the use of export controls as a foreign policy tool due to the costs they had to bear. They also complained that their reliability to customers suffered every time the federal government unpredictably imposed controls in response to foreign

policy events such as those later imposed after the invasion of Afghanistan or the Tiananmen incident.

The next major shift in how the policy was used took place during the Nixon and Carter administrations. During this period, thinking went a step further by focusing on the potential dependency that might result if massive infusions of valuable western technology into the East took place. This liberalization did not have the desired effect of opening the Eastern Bloc to the West, or of creating any dependency on western technology.

During the period when Reagan tightened controls, policy again focused on tangible impacts to Soviet military capability rather than symbolic statements. The authority of the Defense Department to review the export of dual-use items was extended to include non-communist destinations in the effort to ensure technology did not flow eastward contrary to U.S. controls.

The end of the Cold War left the policy regime looking for a new rationale. Non-proliferation was not initially a major concern of U.S. policy makers. The Reagan administration generally encouraged sales of dual-use items to Iraq. Companies from most Western powers, including the U.S., participated in the Iraqi buildup of weapons of mass destruction. At least 24 countries made 240 deals that contributed to Iraqi missile or nuclear programs.⁵⁸ As the Bush administration was groping around for a rationale to justify its imminent war on Iraq, they first promoted the “New World Order” rationale of respecting the sovereignty of Kuwait. The public did not embrace that rationale, and

eventually opinion polls identified to policy-makers the cause of non-proliferation of weapons of mass destruction (and their delivery systems). When it became evident to the policy establishment that the public would strongly support non-proliferation, they adopted this as the primary rationale not only during the Gulf War, but also for on-going global export controls.

The next significant policy shift took place with the special attention the Clinton administration placed on economic growth. National security was overshadowed for the first time in the history of this policy regime by the newly preeminent national interest of economic expansion.⁵⁹ Clinton administration policy was not quite so simplistic, though. Instead of merely reversing the importance of two sometimes conflicting priorities, the concept of national security itself was really re-defined. Clinton saw the economic strength of our democratic system as the very foundation for military power itself. By encouraging exports of sensitive and high technology items, the policy sought to actually strengthen national defense.

The "Defense Reform Initiative" marked a significant organizational change. DTSA (Defense Technology Security Administration, whose focus was Cold War export controls) was absorbed into DTRA (Defense Threat Reduction Agency, whose focus is on modern asymmetric threats such as biological terrorism, secondary proliferation, etc.). This change represented a profound shift in official U.S. treatment of technology controls. This is the point where the interests of ideology, Cold War thinking, and anti-

⁵⁸ Richard T. Cupitt, *Reluctant Champions – U.S. Presidential Policy and Strategic Export Controls*, New York: Routledge, 2000, p.2.

⁵⁹ Warren Christopher, *In the Stream of History: Shaping Foreign Policy for a New Era*, Stanford, CA: Stanford University Press, 1998.

communism most clearly were institutionally replaced by the current concern for asymmetric threats - nonproliferation, terrorism, and other non-traditional threats to US security.⁶⁰

The final major shift took place via the Cox Committee and other Congressional investigations in the wake of the Chinese technology gains in 1996. In response to the flurry of hearings and testimony, Congress shifted licensing jurisdiction for export of U.S. built satellites from the more lenient Commerce Department to the State Department in early 1999. As a result, commercial communications satellites are now categorized as munitions just as missiles and fighter aircraft. Since then, the U.S. space industry is estimated to have lost over \$1 billion of new international contracts.⁶¹

After a those politically charged years of conflict between the President and Congress and among executive branch agencies, Clinton had no choice but to enforce a stricter policy than his earlier permissive export control policies. The current (2001) export control regime is largely this post-Cox Committee status quo.

The following table highlights the most significant policy shifts and years of specific policy changes:

⁶⁰ William G. Hyland, Clinton's World: Remaking American Foreign Policy, Westport, Conn.: Praeger, 1999.

⁶¹ Thompson, David W., "Commercial Space Policy Needs to be Reviewed in the US," Space News, January 22, 1991, p.19.

Major Policy Shift:	Key Dates:
World War II restrictions	1940 and 1942
Cold War shift in focus to national security	1949 and 1951
Easing of 1969 Export Administration Act	1969
Nixon and Carter liberalization	1970s
Reagan tightens controls	1981 and 1985
Clinton liberalization	1993, 1994 and 1995
Cox Committee crisis	1998 and 1999

KEY FACTORS CONTRIBUTING TO POLICY CHANGE

This complex public policy is constantly experiencing influences from multiple sources varying from the conventional (domestic political-economic interests) to more subtle factors (the role of ideology or the fundamental way in which the technology itself tends to influence policy-makers). This section provides a summary of key factors that exerted important influences on presidential space and missile technology export control policy.

Domestic Political Pressures. A common factor to each of the many significant shifts in export control policy was domestic political pressures. Different policy rationales were called upon by political leaders to justify changes in policy, usually to satisfy public opinion. Political pressures on export control policy include:

- Wartime hysteria during WWII (total economic embargo)
- Isolationist pressures and tendency toward neutrality (post-war decontrol)

- Anti-Communist ideology during the Cold War
- Industry lobbying by affected companies, especially high-tech companies
- (Foreign lobbying, including by allies, tended to moderate U.S. policy).

Public reaction to crisis is the most powerful domestic political factor to influence export control policy. It took the war hysteria of WWII to shatter the old paradigm of isolationism and economic laissez-faire policy and create in its place a policy establishment that could take on a bureaucratic life of its own. It took Cold War public hysteria, including the strong influence of Senator McCarthy and his allies, to at first establish and then maintain export control policy based on the principles of economic warfare. It took the Gulf War to rally the public around the policy rationale of stopping the proliferation of weapons of mass destruction to rogue states. Finally, it took a crisis mentality to galvanize the Cox Committee hearings (and other related Congressional hearings) to tighten export controls in 1998 and 1999. On a smaller scale the Cox Committee crisis echoed the ideological thinking of the Cold War (anti-communism) and merged it with the modern, more practical concerns of non-proliferation of missile technology.

At the start of the Gulf War, the U.S. public became aware of the widespread nature of the problem of proliferation of weapons of mass destruction and the systems to deliver them over long distances. The Bush administration took some initial steps to tighten export controls in response, but nothing strong. Why was the Bush administration reluctant to tighten its controls? Restrictions impose concentrated costs on powerful domestic industries, and only provide diffuse political and security benefits. For this

reason, even when individual companies are not actively lobbying the President or Congress, their influence still casts a moderating effect on policy-makers in this field.

This constant, often quiet, pressure of the private sector on policy-makers to liberalize export controls may be less dramatic than crisis thinking, but it may be more powerful over the long term.

In nearly every major shift in this public policy, domestic political interests exerted some form of pressure on either congressional actors, the President, (or both), and even directly pressured individual executive branch agencies - especially the Department of Commerce. This characteristic of a democratic government to react to such pressures is a constant factor that will continue to be important in the future.

Foreign Events. Presidential policy-making does not take place in a domestic vacuum. Although domestic political and other concerns usually weigh most heavily on decision-makers, foreign events may reverse the balance. Both the Soviet expansion into Eastern Europe and the Iraqi invasion of Kuwait had a strong influence on the choices of the Truman and Bush administrations to implement export controls as a policy response. The Truman and Bush administration policy changes both also had multilateral aspects. Truman created a multilateral system of export controls to focus on the Soviet Union and its satellite states, while Bush focused mainly on proliferation to countries of concern.

The concerns of other countries are also taken into account by U.S. policy-makers. A powerful example of the influence from this source is the decision by the Eisenhower Administration after the Korean War to allow relaxing COCOM export restrictions. Restrictions were thought to be so draconian that allied European support for

the whole COCOM effort was in danger of falling apart, and the continuation of the NATO alliance itself was in jeopardy. There can be no doubt that the desires of U.S. allies weighed heavily in the Presidents decision to relax export controls. Similar considerations are likely to have driven Clinton Administration efforts when it agreed to create the largely symbolic MTCR in lieu of a more capable enforcement regime.

The Dynamic of Control and Decontrol. As a result of these competing domestic and international forces, these policy controls are constantly swinging between the two extremes of relaxing and restricting. Export controls tend to only be imposed or significantly tightened as a reaction to unusual pressures such as wars, crises, and particularly intense political events. Controls always tend to be relaxed in the absence of such turmoil. The constant pressure from industry and the domestic economy during peacetime invariably unwinds existing controls that developed in times of crisis. The most dramatic example of this tendency is the wholesale decontrol of space and missile technology exports that took place under the Clinton administration to benefit the growth of the domestic economy during the extended peace following the Cold War. These tendencies remained regardless of the political party holding the White House. In the current extended period of peace, it is reasonable to expect further pressure to decontrol despite any resulting additional proliferation of militarily sensitive technology.

Ideology. The perceived danger of communism resulted in the first peacetime export restrictions in the form of containment policy. The first Bush administration's vision of a New World Order, shared in large part by the Clinton administration, was a driving force behind shaping of the post-Cold War export control regime. This regime

emphasizes international voluntary cooperation and claims as its rationale preventing the proliferation of weapons of mass destruction and the means to deliver them over long-distances.

Anti-communism and anti-proliferation are not the only ways that ideology impacted this policy area. The creation of the MTCR was based on the hope that international cooperation could slow or stop the proliferation of missile delivery systems capable of delivering nuclear, chemical, and biological weapons. The MTCR is flawed in many ways - due in large part to its ideological genesis. There is no organization to join and no treaty or document to sign. The regime was also originally designed to openly permit trade in missiles that fall below a certain range and payload limit providing a sort of loophole. Most significantly, there are no enforcement mechanisms. For these reasons, the MTCR may have had more to do with the US desire to establish a 'New World Order' in which nations of equal standing cooperate amicably to achieve international goals. This liberalism, especially the economic strand of liberal thinking embraced by Clinton Administration policy-makers, argues that economic interdependence discourages states from using force against each other and encourages "globalization" generally and the spread of global communications technology specifically. It also encourages embracing Russia and China as a way to promote prosperity and peace.⁶² This helps to explain at least part of the reasoning behind the Clinton relaxation in export control policy on satellite and space launch technology.

⁶² Stephen M. Walt, "International Relations: One World, Many Theories," Foreign Policy, Spring 1998, (Issue 110, p.29).

Another example of the impact of this strand of ideology could be the International Space Station, which has less to do with science and space exploration than with international cooperation in the post-Cold War environment.

National Space Launch Policy. Arguably the single most important event to influence the export control policy for satellites was the 1986 explosion of the Space Shuttle Challenger and the policies leading up to that disaster. The loss of the Space Shuttle had ripple effects that impact the U.S. space launch industry to this day. The U.S. had initially placed all of its hopes on using the Space Shuttle as a robust and frequent means of placing not only government but also commercial satellites on orbit. The U.S. space launch industry fell behind and domestic capacity has not been able to satisfy the growing needs of its satellite manufacturers since then. The inadequacy of this national capability, coupled with the much higher expense associated with U.S. launch companies, made the U.S. dependent on using foreign launch providers.⁶³

During the 1980's and 1990's the commercial satellite market experienced a dramatic rate of growth. Russian, Chinese, and European launch companies stepped in to fill the growing unmet need. U.S. manufacturers increasingly contracted to launch their satellites with foreign providers. After extensive lobbying of both Congress and President Reagan, the first of many waivers were granted allowing sensitive U.S. satellites to be exported to communist China in order to be launched. Had U.S. policy vigorously encouraged a vibrant commercial space launch industry over the last couple decades, domestic capacity might have been sufficient to meet the needs of a growing

market. Issues of export control in this area would not exist today if it were not for this failure in national policy and national capability.

Foreign Capabilities. The technical capabilities of various actors on the international scene invariably play into the military and other strategic decision-making of the President and his policy-makers. This geopolitical aspect of policy development is perhaps the most complex of all the factors involved in policy formulation as it varies from nation to nation and does not stay constant over time. For example, one of Reagan's considerations in granting the early waivers allowing export of sensitive U.S. satellites for launch by China was geopolitical. Strengthening accuracy and reliability of the relatively primitive Chinese nuclear rocket forces, an unavoidable byproduct of commercial interaction with U.S. satellite companies, was seen as a way to bolster a major rival of Soviet expansionism. Unfortunately the waivers continued long after that consideration was no longer relevant. In the decade following the end of the Cold War, Chinese rocket reliability, once an austere 75% launch success rate, now rivals its global competitors thanks to technology obtained from the West.⁶⁴

A major geopolitical consideration today affecting export controls of missile technology is secondary proliferation. The long-range missile capabilities of rogue states (those not happy to be a part of the New World Order?) are a primary consideration in any decisions affecting export control policy. The Clinton Administration went to great pains to encourage China to voluntarily adopt MTCR norms and stop spreading missile

⁶³ Courtier, Jim, 'Military Space Policy: The Critical Importance of New Launch Technology,' Strategic Review, (Summer 1994): 14.

technology to countries such as North Korea, Iran and Pakistan. Ironically, increased U.S. commercial cooperation in space launches was one of the carrots offered to China to encourage them to join the MTCR.⁶⁵

Export controls in Satellite technology are also subject to similar geopolitical considerations. Many other countries aggressively seek to challenge U.S. dominance in the space industry. Notably, France actively engages in industrial espionage to enhance its domestic space industry and acts as a leading force in mobilizing the European Community to develop space capabilities in satellites and launch to challenge the U.S. hegemony. Russia, which began the post-Cold War era with the benefit of inheriting the Soviet space program, also places high hopes for commercial success in its space industry. U.S. export controls in satellite and missile technology attempt to protect its unique advantages from these competitors.

The President is also under pressure in the foreign affairs arena to relax or remove export restrictions. When commercial satellites are prohibited from launching on Russian rockets, for example, in addition to economic opportunity cost and technology transfer issues, there is a diplomatic cost. Great offense is given to countries like China and Russia by export control policies. The desire by diplomats to “normalize” relations is strong, and Russia and China are both important countries for the U.S. to keep somewhat unoffended.

External Environment. The Post Cold War environment and the resulting changes to the global defense industry had a huge impact on export control policy and the

⁶⁴ J. Barry Patterson, China's Space Program and its Implications for the United States, Air War College

problem of proliferation in general. Defense budgets were slashed creating economy of scale problems for arms manufacturers.⁶⁶ The natural solution to maintain the necessary economies of scale was to increase exports of defense items and for defense related companies to merge. The U.S. government and the Defense Department especially encouraged both an increase in arms exports and the mergers in the defense industry to keep its own costs down. The results included an increase in the globalization of the defense industry, and an increased pressure to export high-technology defense items, including satellites. The new globalization and devolution of the defense-industrial base blurred the institutional lines between military and civilian companies, and increased the number of dual-use products and technology.⁶⁷

Since the early 1990's, the U.S. has exported more things of military significance in the face of a radical budget decline. From 1984 to 1994 the share of the U.S. arms export market more than doubled. The post cold war rapid consolidation of the defense industry, supported by national policy to help U.S. defense firms, was also accompanied by a trend for the DOD to adopt commercial practices. In order to maintain U.S. defense industry production capability and to maintain economies of scale, defense companies must, and are encouraged by government, aggressively market abroad.⁶⁸

Paper, Air University, 1995.

⁶⁵ Jun 26, 98 Heritage Backgrounder

⁶⁶ Keller, William W., Arm in Arm: The Political Economy of the Global Arms Trade Basic Books, 1995, p.152-4.

⁶⁷ Gansler, Jacques S., Defense Conversion: Transforming the Arsenal of Democracy. Twentieth Century Fund, 1995, p.47 & p.91.

⁶⁸ John J. Dowdy, 'Winners and Losers in the Arms Industry Downturn,' Foreign Policy, (Summer 1997): 88.

Another side effect resulting from this changed environment was that U.S. allies became economic competitors, further complicating export control policy to those countries.⁶⁹ This aspect of the problem sharpened with the Clinton administration emphasis on economic security. Former deputy assistant secretary of defense, Jacques S. Gansler, wrote in 1995 that "Today, by placing economic competition on an equal or greater footing than military security, it becomes necessary to reassess the question of technology transfer because our principal military allies are also our principal economic competitors."⁷⁰

The international political-economic environment beyond the post-Cold War period will always help shape this policy area due to the global nature of proliferation issues and the international character of the emerging space industry of the future.

Technology. The nature of satellite and space launch technology plays a greater role in shaping export control policy than technology alone normally exerts on public policy development. The dual-use character of these modern technologies makes policy making especially difficult, and the resulting policies especially complex. The speed of the changing technology often catches the government off guard. As commercially available capabilities improved exponentially, government export restrictions became obsolete and had to be adjusted. For example, some computer-based games for children were actually prohibited for export due to the speed of the processor – much to the delight at the time of the media and critics of restrictions. The revolutionary developments in telecommunications technology forced changes in public policy as well.

⁶⁹ Gansler, Jacques S., Defense Conversion: Transforming the Arsenal of Democracy. Twentieth Century

As military technology migrated into the commercial communications satellite sector, the problem of how to decide what to control in dual-use items and technologies become more common. Those decisions also began to generate much more controversy than previously. The increasing overlap of critical military and civilian technologies also complicated the administration of export policy. Knowing which agency should manage the export of a dual-use item often confused government officials and commercial applicants equally. With the advent of information-based warfare, and as the information age moved the civilian economy into the high-tech environment, the problem of not having distinctly different military and civilian technologies expanded. In 1995, for example, the annual critical technology lists of the DOD and DOC overlapped by over 80 percent.⁷¹ Former Hughes chairman, C. Michael Armstrong, testified to the Senate that commercial communications satellites are not munitions and do not belong on a munitions list (State control). He asserted that, despite having embedded sensitive technology, if properly controlled these items are no different than telephone wire or television cable.⁷² The inherent transfer of rocket technology to countries such as China that takes place when U.S. companies are permitted to export communications satellites for foreign launches is unavoidable. If Iraq, for example, had obtained better rocket

Fund, 1995.p.47.

⁷⁰ Ibid., p.47.

⁷¹ Ibid., p.91.

⁷² Hearing Before The Subcommittee on International Security, Proliferation, and Federal Services of the Committee on Governmental Affairs, U.S. Senate, 105th Congress, 2nd Session, July 29, 1998 "An Industry View of the Satellite Export Licensing Process."

capabilities through secondary proliferation, then the SCUD missile that killed American troops in their barracks during the Gulf War might have been even more deadly.⁷³

Finally, there are inherent difficulties in attempting to define and control intangible technology. "Know-how" is not always captured in technical drawings or manuals. The very fact that engineers of two countries work side by side for weeks at a time exposes procedures, standards and practices to potential exploitation. This of course is one of the reasons why monitors have to observe technical interchange events when export licenses are granted. A great deal of technology was passed to both Russia and China in the early years of satellite launch cooperation not because the technology lost wasn't valuable, but because it never occurred to policy makers to control it. For example, Russia did not use clean-room facilities as western manufacturers understand them until exposed to them by U.S. satellite companies in the 1980s. Such a basic concept never was considered as a technology to control, but sharing that technology (legally) resulted in a vastly improved Russian capability to manufacture sensitive space vehicles. Chinese launch capabilities were improved in a similar manner through the exchange of concepts in safety and electrical engineering that were never considered for control due to their basic nature.

⁷³ Kraemer, Sven F., 'America's Ten Deadly Strategic Gambles: Arms Control or Unilateral Disarmament?', Strategic Review, (Fall 1994): p.8.

Key Factors Contributing to Policy Change:

This chapter examined the relationship, over time, among significant policy changes, stated policy justifications, individual factors contributing to change, and the institutional or bureaucratic environment that serves as a focus for these competing factors. The executive and legislative branches of government constantly struggle with each other, as do individual executive branch agencies whose charters often conflict. Individual agents for policy change generally seek to expand export controls or limit and even remove them. These factors meet with different levels of success depending on whether there is a crisis environment or a peacetime environment. Generally, export controls tend to be strengthened or expanded in times of crisis or war, and they are usually weakened or removed during times of extended peace and stability.

Chapter IV, Conclusion, will discuss current trends in space and missile technology and attempt to determine characteristics likely for the near future. It will then examine current policy trends, especially in light of the recent U.S. elections and other current events, and attempt to assess where future export control policy is headed.

CHAPTER IV:

CONCLUSION

Public policy has important consequences, and the implications of export control policy in the area of space and missile technology directly affect U.S. economic prosperity and national security, often inversely. This chapter will examine where space and missile technology is likely to be going in the future, and discuss ramifications to civil and military sectors. This chapter will then explore, based on current policy trends and recent current events, how export control policy is likely to change in the future with an eye to expected and unintended consequences. Future policy choices need to balance competing interests and carefully consider their implications, especially in the areas of secondary proliferation and improving the capabilities of the nuclear delivery systems of potential strategic adversaries.

THE FUTURE OF SPACE & MISSILE TECHNOLOGY

Spacelift. The U.S. position as the world's leading space launch power quickly began to erode after the Challenger Shuttle explosion in 1986. Ever since then, U.S. and international companies have increasingly used foreign launch providers to place their satellites in orbit. U.S. launch capabilities continue to be costly while foreign (French, Chinese, and Russian) businesses made significant inroads in the global launch market. Since U.S. and other satellite makers want to use cheaper foreign launch services, U.S. launch companies could be in danger of being squeezed out of the market. To make matters worse, the global capacity for launching commercial satellites may exceed

demand in the coming decade, placing additional pressure on the generally more costly U.S. suppliers.⁷⁴ The failure of the government to formulate a coherent, long-term space policy threatens its own continued reliable and affordable access to space.⁷⁵

Despite this gloomy background, the future of U.S. spacelift could prove to be more positive. A recent high-level commission recently recommended a number of reforms in how the government space sector is organized and operates.⁷⁶ Donald Rumsfeld was a member of the commission until he was selected to be the new Secretary of Defense under President George W. Bush. This could be an indicator that the U.S. will achieve the coherent, long-term space policy it needs. In any case, the importance of space launch technology to the U.S. will become even more evident as the economy of the 21st century becomes more reliant on space based capabilities.

Dependence on space based capabilities. The U.S. military strategy and commercial economy both currently depend on the use of space systems to support nearly every aspect of their activity. This dependence is likely to become even greater as the capabilities of technologies continue to develop and are applied for practical purposes. This dependence on space offers both advantages and disadvantages. Space capabilities will make the U.S. more efficient, dynamic, and capable in both warfighting and economics. Reliance on these sensitive and vulnerable systems presents a danger to the security of the country – making the U.S. a softer target for attack by terrorists or

⁷⁴ "Launch Supply Could Exceed Demand for Next Decade," Space News, January 22, 1991, p.8.

⁷⁵ Jim Courtier, 'Military Space Policy: The Critical Importance of New Launch Technology,' Strategic Review, (Summer 1994): 14.

⁷⁶ Report of the Commission To Assess United States National Security Space Management and Organization, January 11, 2001.

adversaries alike. This trend for the future will likely reinforce existing export controls on space and missile technology.

Trends in International Arms Trade. The global arms trade is so robust that it poses a continual threat to the fragile framework of agreements on non-proliferation of weapons of mass destruction. ⁷⁷ This situation coincides with a time when civilian and military technology are more merged than ever. U.S. policy toward the transfer of military technology is not always consistent, and Europeans and others are quick to jump on the competitive opportunity created when U.S. companies are prevented from trading high technology to countries of concern. The resulting proliferation is an increasing global problem and controls aren't now adequate to stem the tide. ⁷⁸

No global policy exists, and the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (signed by 33 countries in 1996) is ineffective, languishing from lack of support and leadership, and is the source of ridicule from the arms lobby.

This vibrant global arms trade shows every indication of continuing since the U.S. and its other western allies benefit the most from massive arms exports. The significance of this trend is that it places a strong pressure on western, technologically advanced countries to sell modern high-tech weaponry to stay competitive. This trend will continue to encourage elected officials to relax trade restrictions on sensitive items.

⁷⁷ William W. Keller and Janne E. Nolan, 'The Arms Trade: Business as Usual?,' Foreign Policy (Winter 1997-1998): 113.

⁷⁸ Keller, William W., Arm in Arm: The Political Economy of the Global Arms Trade. Basic Books, 1995.

International Cooperative Efforts. The current trend in both the government and commercial space sectors is one of increasing international cooperation. U.S. space policy, along with that of many of its western allies, is committed to the continuing construction and long-term operation of the International Space Station. It is characteristic of this massive international effort that technology be shared, most notably with Russia, which stands to benefit greatly from this technology transfer. NASA, the lead agency in this effort, has for years shared space technology throughout the globe. During the Cold War, the Soviet Union was able to develop a near replica of the U.S. space shuttle based on information gained from NASA and its culture of sharing technology.⁷⁹

This trend of sharing technology with Russia means that the ability to manufacture highly sophisticated spacecraft and other technical capabilities will not be a luxury enjoyed solely by the U.S. in the future. There is a strong desire on the part of the Europeans to challenge U.S. dominance in space wherever possible, and this trend will be even stronger as enabling capabilities spread to other countries.

The commercial space sector is increasingly made up of international consortia. The trend is moving away from national space companies, similar to the internationalization of the arms industry and the globalization of the economy in general. The international nature of the space industry makes it more likely that technology will spread. The trend also makes multilateral technology control efforts more important than ever in order for technology restrictions to work.

⁷⁹ Perry, Charles M. and Robert L. Pfaltzgraff, Jr., ed., Selling the Rope to Hang Capitalism?. Washington:

Technical know-how in producing cutting edge weaponry is already spreading to the point that leading arms-producing nations like the U.S. are at risk of losing their strong lead. This diffusion is possible because of the lack of an effective multilateral regime to coordinate arms export policies.⁸⁰ The lack of such a regime can only be the result of a lack of national will. Given the profit to be had by U.S. companies, it will take a crisis event to stop or reverse the “New World Order” trend of sharing national “know-how.”

Secondary Proliferation. The recent trend of secondary proliferation may prove to be more common in the near future. Countries such as Pakistan, Iran, and India that obtained weapons through outside assistance are turning around and re-selling their new capabilities to other states. Director of Central Intelligence, George J. Tenet, told the Senate Intelligence Committee: “The secondary proliferation issue is the one that I worry about the most.”⁸¹

Short-range ballistic missiles are already in the hands of many countries. The number of longer-range theater ballistic and cruise missiles will increase over the next decade. The accuracy and destructive impact of newer systems will be far greater than current systems. Ballistic missile technology has flowed from Russia to Iran; from China to both North Korea and Pakistan. North Korea already re-exports much of its weapons of mass destruction technology as a means of raising money. Iraq continues to

Pergamon-Brassey, 1987.

⁸⁰ Ann Markusen, ‘The Rise of World Weapons,’ *Foreign Policy*, (Spring 1999): 40.

⁸¹ Robert Wall, “CIA Details Proliferation Concerns, Other Threats,” *Aviation Week & Space Technology*, 12 Feb 2001.

aggressively seek a weapons of mass destruction capability, and now without United Nations inspectors Iraq has rebuilt its missile and chemical production facilities.⁸²

As globalization continues to take effect, the future promises greater access to high-technology weaponry for those willing to pay.⁸³ This trend of secondary proliferation means that export control policy will continue to remain on the national agenda. Not only will restrictions have to limit export of space and missile technology, future administrations will have to work to make multilateral enforcement a reality in the face of the ongoing threat of secondary proliferation.

POLICY TRENDS AND FUTURE CONTROLS

Normally, a crisis or fundamental problem is required to make a major change to policy or any systemic changes.⁸⁴ For this reason, current developments alone probably will not drive significant changes in this policy area. Some of these developments include the emergence of Chinese and Indian technical, economic, and military power; and the growing dominance of European, Chinese, and Russian commercial space launch efforts.

But the 2000 presidential election may have a meaningful impact on the course of continuing export controls because it replaced Liberal ideology with Realist ideology. Conservative Republicans tend to favor using export controls as a foreign policy weapon especially against countries such as Iran, Iraq, Cuba, North Korea, Libya, and others.

⁸² Ibid.

⁸³ Jeffrey Sachs, "International Economics: Unlocking the Mysteries of Globalization," Foreign Policy, Spring 1998, Issue 110, p. 97.

Under the Clinton administration, it is estimated that as many as 75 countries were targeted by unilateral U.S. economic sanctions. It is also estimated that these policies cost the U.S. \$19 billion annually and as much as 200,000 jobs. Colin Powell, the new U.S. Secretary of State, already began a review of current sanctions policies, and is likely to ease many of them. However, Powell is also interested in "re-energizing" certain sanctions such as those against Iraq.⁸⁵ Making sanctions against Iraq (and other high-priority targets) work will require the support of U.S. allies and other countries. By shedding many lesser-priority economic sanctions, Powell may seek to both lessen the ongoing cost to the U.S. economy and win the necessary support of international partners such as France and others who may then support key sanctions efforts.

This new administration appears likely to formulate its foreign-policy decisions according to the dominant theoretical tradition during the Cold War, Realism. This ideological break from Clinton administration tendency to base its decisions on Liberal theory promises to emphasize economics and especially military power, instead of promoting international institutions and economic exchange.⁸⁶ Controls on the export of missile technology will probably not be relaxed as the ability to deliver weapons of mass destruction is an ability no administration will want to see fall into the wrong hands. Satellite and other space technology, however, may benefit from the likely Powell

⁸⁴ Barber, Benjamin R, "Three Scenarios for the Future of Technology and Strong Democracy," Political Science Quarterly, 113 (4): 573-89.

⁸⁵ "Powell Mulling Drastic Changes In U.S. Sanctions Policy," Fox News, www.foxnews.com/world/012601/sanctions_palkot.sml, January 26, 2001.

⁸⁶ Stephen M. Walt, "International Relations: One World, Many Theories," Foreign Policy, Spring 1998, (Issue 110, p.29).

relaxation. This area offers the most economic benefit and has the most advocates lobbying for relaxation in export controls.

Another indicator that the new Bush Administration may tighten export controls on space and missile technology is his campaign statement to Arms Control Today:

“...we must strengthen America’s intelligence and counterintelligence capabilities to staunch the theft of sensitive military technology at home and identify threats before they arise. The U.S. must also lead its allies in establishing new, binding rules to prevent the export of sensitive military technology.”⁸⁷

Nevertheless, export restrictions inflict *concentrated* costs on powerful, domestic industries. “Public Choice” theory tells us that these types of policy decisions are most heavily influenced by the activities of special interests acting on policy-makers.⁸⁸ Also, bureaucratic interests predispose any new administration to maintain current policies, and Bush will face that pressure, making it somewhat less likely to strengthen export controls.⁸⁹

Significance of future technology transfer. Continued U.S. reliance on its superior technology in the modern age for its security, which originated in the decision not to match, tank for tank, the Soviet Cold War buildup, makes technology transfer and export control issues critical in future policymaking. Democratic and Republican policy makers alike prefer smaller, compact, and more lethal military capabilities to large, expensive standing armies.⁹⁰ It appears that this characteristic will be typical of defense

⁸⁷ Campaign Interview, “Presidential Election Forum: The Candidates on Arms Control,” *Arms Control Today*, September 2000, p.3.

⁸⁸ Peter Trubowitz, *Defining the National Interest: Conflict and Change in American Foreign Policy*, (Chicago: University of Chicago Press, 1998).

⁸⁹ Bok, Derek, “Measuring the Performance of Government,” in *Why People Don’t Trust Government*, edited by Joseph S. Nye, Cambridge, MA: Harvard University Press, 1997.

⁹⁰ refer here to the Powell book, and also to current US defense policy

policy in the coming century, and so the transfer of sensitive dual-use technologies to potential adversaries is an ever more dangerous prospect to the continued military superiority over its adversaries enjoyed by the U.S. As Russia, China, and rogue states gain access to controlled space and missile technology, their ability to threaten U.S. space systems and space-dependent operations increases.

The U.S. could also one day find itself no longer the dominant economic space power if its key technical advantages are simply given away to aggressive European, Russian, and Chinese business competitors. U.S. companies currently enjoy a very profitable position as the sole providers for certain space products such as GPS and manufacture of highly capable satellites. Irresponsible export controls could undermine that national economic advantage. Both economic and national security interests depend on a responsible public policy in this area.

SIGNIFICANCE TO OTHER POLICY AREAS

The danger of proliferation. Many people thought that with the end of the cold war they saw the end of arms races and the threats that come from the spread of weapons of mass destruction. In fact, the globalization of military industries and sensitive technology accelerated with the end of the cold war, it did not decrease.⁹¹ The global diffusion of our most powerful weapons and the technologies to manufacture them may become an increasingly dangerous problem to U.S. security.

⁹¹ Keller, William W., "Arm in Arm: The Political Economy of the Global Arms Trade." Basic Books, 1995, p.ix.

Another way in which this subject significantly impacts the country can be seen in those costs not normally considered when weighing the value of export controls. Such costs include concerns about freedom of speech, freedom of press and privacy rights (e.g., encryption software). Each of these principles is lessened when technology export controls are strengthened. These issues are of increasing importance to the American public. Future government controls on sensitive high-technology trade could therefore have unintended consequences to this aspect of our culture, and in turn bear on our domestic political future.

CONCLUSION

Export control policies put in place in WWII and maintained as a Cold War tool are now being used to prevent the transfer of advanced military technology to potential adversaries and to safeguard against the proliferation of nuclear, chemical, and biological weapons technology to rogue states. This dramatic shift from the historical hands-off approach to peacetime export control policy is now necessary because of the even more dramatic and dangerous advances in military technologies in modern times.

Both Eisenhower and Clinton attempted significant reforms of their inherited export control policies to help U.S. industry. Eventually, though, both administrations ended up with even tighter controls. This demonstrates just how powerful the forces acting on public policy-makers can prove to be. Those forces push in both directions. In the rush to find the peace dividend, encouraged by those factors desiring less restriction,

strategic and highly sensitive advanced military technology might have been handed over to potential enemies.

The global spread of knowledge and industrial capability brings with it associated dangers of proliferation in nuclear, chemical, biological, aerospace, information and other technologies. As the world economy continues to grow and know-how becomes more widespread, these dangers will follow. Also, as modern (space-age) weaponry becomes increasingly expensive, countries such as the U.S. will continue to try to sell billions of dollars worth of advanced technology to maintain economies of scale and to protect the jobs that will depend on them. In a buyers' market, the U.S. (and its European and Asian competitors) will face increasing pressure to sell its most critical military technology at ever-lower prices. Federal export control policies and technology transfer issues will become an increasingly important topic for policy makers dealing with national security, trade and diplomacy.

SELECTED BIBLIOGRAPHY

Books & Textbooks:

- Bok, Derek, "Measuring the Performance of Government," in *Why People Don't Trust Government*, edited by Joseph S. Nye, Cambridge, MA: Harvard University Press, 1997.
- Bundy, William P., *Tangled Web: The Making of Foreign Policy In The Nixon Presidency*, (New York: Hill and Wang, 1998).
- Christopher, Warren, *In the Stream of History: Shaping Foreign Policy For a New Era*, (Sanford, CA: Stanford University Press, 1998).
- Cupitt, Richard. *Reluctant Champions: U.S. Presidential Policy and Strategic Export Controls*. New York: Routledge, 2000.
- Drachman, Edward R., et. al., *Presidents and Foreign Policy: Countdown to Ten Controversial Decisions*, Albany: State University of New York Press, 1998.
- Gansler, Jacques S., *Defense Conversion: Transforming the Arsenal of Democracy*. Twentieth Century Fund, 1995.
- Hyland, William G. *Clinton's World: Remaking American Foreign Policy*, Westport, Conn.: Praeger, 1999.
- Keller, William W., *Arm in Arm: The Political Economy of the Global Arms Trade* Basic Books, 1995.
- Leitner, Peter M., *Decontrolling Strategic Technology, 1990- 1992: Creating the Military Threats of the 21st Century*. University Press of America, 1995.
- Lodgaard, Sverre (Ed.) and Robert L. Pfaltzgraff, *Arms and Technology Transfer: Security and Economic Considerations Among Importing and Exporting States* (96)
- Panel on the Impact of National Security Controls on International Technology Transfer, Committee on Science, Engineering, and Public Policy. *Balancing the National Interest*. Washington, D.C.: National Academy Press, 1987.
- Perry, Charles M. and Robert L. Pfaltzgraff, Jr., ed., *Selling the Rope to Hang Capitalism?*. Washington: Pergamon-Brassey, 1987.

Schlesinger, J. R. and Weidenbaum, M., Defense Restructuring and the Future of the Defense Industrial Base. Washington, D.C.: Center for Strategic and International Studies, 1998.

Stone, Deborah, Policy Paradox: The Art of Political Decision Making, New York: W.W. Norton, 1997.

Trubowitz, Peter, Defining the National Interest: Conflict and Change in American Foreign Policy, Chicago: University of Chicago Press, 1998.

Government sources:

"An Analysis of Export Control of U.S. Technology – A DOD Perspective" (Feb 4, 1976) J. Fred Bucy, Chairman of Task Force of the Defense Science Board

"Assessing the Effect of Technology Transfers on U.S. Western Security: A Defense Perspective" Washington, D.C., Office of the Under Secretary of Defense for Policy, 1985

General Accounting Office. National Security and International Affairs Division. Export Controls: Change in Export Licensing Jurisdiction for Two Sensitive Dual-Use Items, by Katherine V. Schinasi. Report to Congressional Requesters, GAO/NSIAD-97-24. January 1997.

"Global Arms Trade: Commerce in Advanced Military Technology and Weapons" Office of Technology Assessment, June 1991

"The Military Critical Technology List" Washington, D.C., Office of the Under Secretary of Defense for Acquisition, 1992

Powell, Colin L., "The National Military Strategy of the United States," January 1992, p.10.

"Strategic Plan 2000" Defense Threat Reduction Agency, Office of Public Affairs, Dulles, VA.

U.S. Congress. Senate. Select Committee on Intelligence. Report on Impacts to U.S. National Security of Advanced Satellite Technology Exports to the People's Republic of China (PRC). 106th Cong., 1st Sess., May 1999

U.S. Congress. House. Committee on International Relations. The Cox Committee: Report of the Select Committee on U.S. Security and Military/Commercial Concerns with the People's Republic of China. 106th Cong., 1st Sess., 26 May 1999.

U.S. Congress. Senate, Committee on Commerce, Science, and Transportation, Transfer of Satellite Technology to China. 105th Cong., 2nd Sess., 17 September 1998.

U.S. Congress. Senate, Subcommittee on International Security, Proliferation, and Federal Services, An Industry View of the Satellite Export Licensing Process. 105th Cong., 2nd Sess., 29 July 1998.

U.S. Congress. Senate, Select Committee on Intelligence, Investigation of Impacts to U.S. National Security From Advanced Satellite Technology Exports to China and Chinese Efforts to Influence U.S. Policy. 105th Cong., 2nd Sess., 10 June and 15 July 1998.

U.S. Congress. Senate, Committee on Governmental Affairs, The Adequacy of Commerce Department Satellite Export Controls. 105th Cong., 2nd Sess., 18 June and 8 July 1998.

U.S. Congress. Senate, Committee on Governmental Affairs, The Role of DTSA in Approving Critical Technology Exports. 105th Cong., 2nd Sess., 25 June 1998.

U.S. Congress. Senate, Committee on Governmental Affairs, Benefits of Commercial Space Launch for Foreign ICBM and Satellite Programs. 105th Cong., 2nd Sess., 21 May 1998.

Journals, Reports, and Papers:

Barber, Benjamin R., "Three Scenarios for the Future of Technology and Strong Democracy," *Political Science Quarterly*, 113 (4): 573-89.

Berman, Harold J., "United States Export Controls - Past, Present, and Future," *Columbia Law Review* 67, 5 (May 1967): 791.

Chen, Yanping, "China's Space Commercialization Effort" from *Space Policy*, vol.9 #1 (February 1993) p.45

Cordesman, A., *Weapons of Mass Destruction in Iran*. Washington, D.C.: Center for Strategic and International Studies, 1998.

Courtier, Jim, 'Military Space Policy: The Critical Importance of New Launch Technology,' *Strategic Review*, (Summer 1994): 14.

- Dowdy, John J., 'Winners and Losers in the Arms Industry Downturn,' *Foreign Policy*, (Summer 1997): 88.
- (Editorial) "Reinventing What for Whom? President and Congress in the Making of Foreign Policy." *Presidential Studies Quarterly*, March 2000
- Ferris, Stephen P., "Economic Influences on the Development of U.S. Policy and Military Strategy," *Strategic Review*, Fall 1994, p.57.
- Gallhofer, Irmtraud N., and Willem E. Saris, "Collective Choice Processes: A Qualitative and Quantitative Analysis of Foreign Policy Decision-Making," *Perspectives on Political Science*, Fall 1998, (Vol. 27, Issue 4), p.246.
- Gray, Colin S., "Arms Control Does Not Control Arms." *Orbis*, Vol. 37/3 (Summer 1993): 333.
- Hirsh, Michael, 'The Great Technology Giveaway?,' *Foreign Affairs* 77 no 5(Sep/Oct 1998): 2-9.
- Hoyt, Timothy D., 'Prioritizing Strategic Proliferation: New Definitions and the Need for New Approaches,' *National Security Studies Quarterly* (Summer 1999): 1.
- "International Decision Making: Leadership Matters," *Foreign Policy*, Spring 1998, Issue 110, (1 March 1998) p.124.
- Keller, William W. and Janne E. Nolan, 'The Arms Trade: Business as Usual?,' *Foreign Policy* (Winter 1997-1998): 113.
- Keller, William W., "The Political Economy of Conventional Arms Proliferation.: from Current History, April 1997
- Klotz, Frank G., *Space, Commerce, and National Security*, Council on Foreign Relations monograph, 1998.
- Kraemer, Sven F., 'America's Ten Deadly Strategic Gambles: Arms Control or Unilateral Disarmament?,' *Strategic Review*, (Fall 1994): 7.
- Markusen, Ann, 'The Rise of World Weapons,' *Foreign Policy*, (Spring 1999): 40.
- Moran, Theodore, "Foreign Acquisition of Critical U.S. Industries: Where should the U.S. Draw the Lines?" from *Washington Quarterly*, Spring 1993
- Patterson, J. Barry, *China's Space Program and its Implications for the United States*, Air War College Paper, Air University, 1995.

- Sachs, Jeffrey, "International Economics: Unlocking the Mysteries of Globalization," Foreign Policy, Spring 1998, Issue 110, p. 97.
- Sokolski, Henry, "U.S. Satellites to China" International Defense Review, Vol.27 (April 1994) p.21
- Strawser, Larry D., Conflicts in East-West Trade and Technology Transfer (1949-1989): Were Export Controls Worth The Costs?, Air War College Paper, Air University, 1994.
- Thompson, Loren B., 'Military Supremacy and How We Keep It,' Policy Review, (Oct/Nov 1999): 21.
- Tolchin, Susan J. "Halting the Erosion of America's Critical Assets" Issues in Science and Technology, Spring 93, vol. IX #3 p.65-72
- Walt, Stephen M., "International Relations: One World, Many Theories," Foreign Policy, Spring 1998, (Issue 110, p.29).
- Wolff, Robert "Rendering Unto Caesar: How Legal Pluralism and Regime Theory Help in Understanding Multiple Centers of Power" Paper presented to the Project on Trends Workshop on Multiple Centers of Power, University of Victoria, May 1999.
- Zhang, Jialin, 'U.S. – China Trade Issues After the WTO and the PNTR Deal: A Chinese Perspective,' Essay in Public Policy Series, Hoover Institution, August 2000.