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International space commerce in the United States (U.S.) has entered into a period of great uncertainty regarding its current and future competitiveness and marketability of its products. This question arises because the U.S. with regard to space commerce remains frozen in a posture established first during the Cold War. The concern then was that no critical technologies be made available to U.S. enemies and their fellow travelers. The former were obvious while the latter were more problematic since that group also included states with which the U.S. wished to establish more positive relations including international trade. The mechanism used to monitor and control that trade process is the International Traffic in Arms Regulations (ITAR) regime applied by the U.S. Department of State. The issue is whether ITAR is still of the same value in a post-Cold War world and whether their enforcement might take a different approach. As will be discussed, changes in their application began especially toward the Cold War's end, but those changes were largely reversed due to a combination of domestic politics and international uncertainty. The question is whether the ITAR as presently implemented meets the strategic interests of the U.S. or is their unintended effect one of undermining the U.S. ability to influence international trade with regard to space technologies. For other categories related to arms, the ITAR supports U.S. policy objectives even though their application is often characterized by excessive slowness and rigidity in application.

ITAR and the Cold War

In the aftermath of World War II, the U.S. along with other states constructed a number of international and national institutions aimed at fostering international trade and economic growth. The Bretton Woods meeting during World War II led to agreements in 1944 establishing a system of international financial institutions to govern monetary policy among states. U.S. national interests led to this effort, building strong trading partners and allies in the post-war world. However, subsequent political events in Europe and Asia raised concerns about the future, the Cold War. The Cold War was a global military-economic-ideological competition between the U.S. and its allies, and the Soviet Union and those states aligned with it. In this context, a third collection of states emerged who professed nonalignment with either antagonist; a group that grew in numbers with the dismemberment of the colonial empires.

Trade between the U.S. and the Soviet block countries also incorporating the People's Republic of China was at best minimal and usually virtually nil. For these other states that were not U.S. allies, the U.S. established trade relations based on demand for their products. That meant that most underdeveloped states had very limited trade with the U.S. except for extractive industries. Cold War competition often brought the U.S. and the Soviets into direct political competition - a competition in which trade relations became an important foreign policy tool. The argument made was that expanding trade with a nonaligned state would incline its leadership to favor the U.S. in other matters. The difficulty was that in many instances, the products desired by the underdeveloped state were such that they might have military value and could be forwarded on to U.S. adversaries. Such items included various electronic goods and services. The U.S. for

reasons of national security and protection of its existing trade advantage wished to monitor and control these items sales and their future export. Allies were considered less of a problem, but there was the possibility that corrupted officials could facilitate export of otherwise forbidden items. The U.S. wanted to ensure that the prohibitions were enforced so recipients of otherwise controlled items would be on notice that forwarding those items to states otherwise forbidden would have consequences, no further exports to the offending state and criminal penalties for individuals violating the law.

The mechanism used during the Cold War was the Coordinating Committee on Multilateral Export Controls (CoCom). Technology transfer questions were resolved through this process, which later was incorporated into the Arms Export Control Act of 1976. This Act identifies those items that should be regulated because they are deemed defense articles and defense services. The result is the ITAR licensing process through the Munitions Control List (MCL) of space technologies that are explicitly covered under the Missile Technology Control Regime. MCL became the mechanism through which trade can be controlled and channeled. Evaluation of proposed sales was handled by the U.S. Department of State with significant input from the Department of Defense (DOD). This combination of reviewers, it was confidently expected, would provide the strongest control over leakage of military secrets since both departments define themselves as protectors of U.S. national interests as an institutional priority. What was more intrusive is the requirement that government monitors had to authorize and often attend any meeting where technical information was to be exchanged.

The task before the regulators grew more complicated over time as dual use technologies became more prevalent. For example, computer technologies from their onset had clear military applications. As the commercial sector grew and information technology became more sophisticated, the commercial versions were often more powerful than the military ones, capable of ever more powerful operations. Their value to potential adversaries became more apparent with the implication that their dissemination needed to be monitored and regulated to prevent hostile parties gaining access. However, political realities were such that information technologies were more easily exported with few exceptions than space technologies. This reflected in part the reality that U.S. computer and chip makers were competing in a global market where their success was not guaranteed. Space technologies in the West were dominated by the U.S. until the 1980s and early 1990s as the Europeans first followed by the Japanese at a distance became strong competitors. As that occurred, rules became looser.

In the early days of ITAR, friend or foe in principle was comparatively easy to determine. Over time the picture grew more complicated in that many states were friendly with the Soviets and Chinese. That included North Atlantic Treaty Organization (NATO) members such as Great Britain who for example had diplomatic and trade relations with mainland China while the U.S. recognized the Republic of China (Taiwan) as the legitimate government. All this made applying ITAR more complicated since the evaluation becomes once removed. Clear language was placed in the regulations to prohibit transfer of certain exports to third parties, closing a backdoor method of technology acquisition. In principle, the loophole was closed, but clearly was not air-tight. Enforcement of indirect regulations remained an issue, but the disincentive for the foreign partners was that U.S. technology products were valued so that access to them was strongly preferred even if that mean enforcing U.S. rules seen as onerous: that was the price of access.

information technologies were more easily exported than space technologies

Until the 1980s, ITAR met its purpose of denying militarily useful technologies from U.S. adversaries and their allies. Any hindering of U.S.

trade was accepted as a necessary price to sustain national defense. Complaints arose in academic circles, but were generally discounted although a few exceptions were carved out to accommodate them, especially those doing scientific work employing spacecraft of differing types. Those objections by the academic community were met by Presidential National Security Decision Directive 189 dated 21 September 1985, that exempted fundamental scientific research from ITAR and MCL regulations.[1] This exception was reaffirmed by the Bush administration on 21 November 2001.[2] Earlier, in the Reagan Administration in 1984, U.S. satellites could be launched by international companies, explicitly Arianespace at their French Guiana launch faculty. Gradually, application of the prohibitions lessened in their strictures as the Cold War waxed and waned in intensity. Less advanced products including older computer types were sold to states formerly prohibited. This occurred in response to the rise of economic competitors to the U.S. among its allies; primarily Europe and Japan. Their perspective was more purely trade oriented demonstrated by their willingness to sell products to states that the U.S. would not. These products were not controllable by the U.S. since they had developed independently. The actual degree of independence is unclear given the increasing internationalization of many areas of science and technology. In fact, in the late 1980s, the U.S. was lagging in certain technology areas, especially computer-based technologies. So, any U.S. trade restrictions were receding in importance given these alternative sources.

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

[2]Julie T. Norris, *Restrictions on Research Awards, Troublesome Clauses*. A Report of the AAU/COGR Taskforce. Washington: Association of American Universities, 2004, http://www.aau.edu/research/Rpt4.8.04.pdf (accessed 6 September 2007).

Cracks Within the "ITAR Wall"

Given that national security drove the development and implementation of ITAR, changes in that environment could impact their application. Over time, the resurrection of Europe and Japan as major economic agents subtlety changed their role. The U.S. found that its strictures against export of various technologies were increasingly ignored. By the late Reagan administration, the general issue of how to treat such exports to formerly embargoed states had risen to levels within the U.S. government that a presidential decision was required. President Reagan agreed to the possibility of using Chinese or Soviet launch vehicles. This debate took place within a context in which the U.S. and the Soviet Union and China were moving toward more normal relations including economics. This included the possibility that their lift vehicles could be used to launch U.S. built communication satellites (COMSATs) into orbit. This presented an interesting situation since the U.S. was by far the dominant builder of communications satellites– a status the U.S. had aggressively defended for years.[3]

Using other states' launch vehicles was a major gesture toward globalizing the world economy. On the other hand, this willingness to reconsider the question reflected a perception that in the aftermath of the January 1986 Space Shuttle Challenger accident, the U.S. launch industry had fallen behind its international competitors.[4] The debate whether to lessen ITAR to accommodate proved an extremely contentious debate. The debate was between what could roughly be described as the controllers and those interested in expanded world trade. The controllers were those who argued that national security should trump any trade considerations regardless of temporary lessening of tensions. The risks of transferring

[3]Roger Handberg, *International Space Commerce: Building from Scratch* (Gainesville, Florida: University Press of Florida, 2006).

[4]Roger Handberg, *The Future of Space Industry: Private Enterprise and Public Policy* (Westport, Connecticut: Quorum Books, 1995).

militarily relevant technologies to potential adversaries were still considered too great.

Expanded trade supporters argued that the U.S. benefited from the opening up of this area of economic activity. That expanded economic ties would help ameliorate long term antagonisms and foster closer cooperative ties, a win-win situation. The risks of any inadvertent technology transfers could be mitigated by establishing certain procedures limiting what was made known to the launch operator. Clearly, some tech transfer would occur simply because U.S. companies would have to insure that Soviet or Chinese launch operations could properly handle the payloads.

The then President Bush authorized the licenses to be issued as the trade advocates successfully argued that normalized trade relations were in the national interest. Licenses to export were authorized, but protective measures were taken.[5] The payloads traveled in sealed containers with U.S. security personnel constantly present to stop any attempts to examine the satellites. Sufficient information was provided to allow the satellite to be properly mounted for release once orbit is achieved. The understanding was that whatever information was released would not materially assist the Chinese or Russians.

Chinese Long March boosters were thought less reliable, and thus less of a competitive threat

An integral part of the controversy was the growing schism between the satellite builders and the launch companies. The latter were under intense stress as the Europeans with the Ariane 4 lifters were dominating the launch markets. The Chinese and Russians added even more competition since until the security restrictions were lifted in the late 1980s and early 1990s, their launchers were excluded from carrying U.S. payloads. The split also came over the question of costs – U.S. launchers were legacy carriers from earlier generation converted missiles and more expensive than their international competitors. Opening the doors to new launch vendors did not totally eliminate U.S. launch providers' advantages since U.S. government payloads were still only flown on U.S. flag carriers. The new competitors also benefited from cost differentials between western prices and the artificial price structures of authoritarian states. The collapse of the Soviet Union further expanded this price gap when the Russian economy effectively went into free fall.

U.S. launch providers may have lost the fight over entry of new competitors into the field, but other restrictions were imposed. Given the artificial pricing structures inherent in socialist political systems, the U.S. demanded that quotas be imposed on each– without such a quota, American COMSATs would be available as payloads. Since U.S. COMSAT payloads constituted ninety percent of those available worldwide, failure to agree to these quotas meant "de facto" no market because Arianespace handled most European payloads, the balance of the available payloads. The quotas differed with the Soviets-Russians being the most intense since their lifters were seen as the most reliable and competitive. Given the mystery associated with the Chinese space program, Chinese Long March boosters were thought less reliable, and thus less of a competitive threat. Both quotas were for a specified time period. In fact, neither competitor used up its quota with the collapse of the COMSAT boom in the 1990s, the quotas were not renewed.[6]

Ironically, the schism between the satellite builders and the launch providers faded as mergers ended with Boeing and Lockheed Martin as the major vertically integrated players. Through their mergers and launch alliances, the two dominated American space industry. Their international alliances, Sea Launch (Boeing) and

[5]Eric Choi and Sorin Niculescu, "The Impact of US Export Controls on the Canadian Space Industry," *Space Policy* 22 (2006).

[6]Handberg, 2006.

International Launch Services (Lockheed Martin) tied various former Soviet launch providers into American space industry.[7] Competition was not eliminated as Arianespace remained the industry leader, but was severely constrained. Over time, the Chinese through aggressive marketing and price competition became major players in launching U.S. satellites to orbit. This can be seen in their incorporation into the Iridium launches, sixty-six satellites plus six spares. All the major launch competitors were involved.

Walls Fall, But Are Rebuilt

With the arrival of the Clinton administration in office in January 1993, licensing under ITAR was eventually moved to the U.S. Department of Commerce in 1996. Earlier in October 1992, a subset of COMSAT technologies had been moved from the Department of State to the Department of Commerce for licensing purposes. This was in line with both administrations' desire to foster trade relations in the aftermath of the Soviet Union's collapse. The goal was engaging the world through strong economic linkages, especially former socialist states including Russia and China. Given the Department of Commerce's mandate toward expanding trade, the obvious outcome was a general loosening of ITAR restrictions.[8] These moves were not universally greeted with acclaim by the controllers who felt the U.S. was giving away the store while incurring great risks to national security. Their concerns were shared by many Republican conservatives whose views of the former Soviet Union and China were much more negative than was official policy. The situation was ironic in that the skeptics were among those who usually strongly supported business interests of which trade was a major component.

[7]Andrew J. Aldrin, "Technology Control Regimes and the Globalization of Space Industry," *Space Policy* 14 (1998).

[8]This was heightened by the presence of Ron Brown, a close personal associate of President Clinton as Secretary of Commerce, whose primary mission was growing U.S. trade with other states.

Reversal came disguised in the shape of launch accidents in which Chinese Long March vehicles failed during lift off. American COMSAT payloads were total losses. In addition, lives were lost in the villages just outside the spaceport; the exact total was never officially announced although twenty seven was the number given for one accident. As is customary with such flight failures, a post accident investigation was launched. For the Chinese, conducting this investigation successfully, meaning finding a cause for the accident that could be corrected, was absolutely essential. An incomplete or otherwise distorted investigation would fail to satisfy the insurance investigators, meaning Long March vehicles became uninsurable. No insurance meant any possible western payloads became unavailable. Government payloads are effectively self insured while commercial payloads owners normally purchase insurance on the open market. Flight failures raise future insurance rates or make the vehicle uninsurable.[9]

The subsequent investigation included participation from all involved parties, meaning primarily the Chinese government as operators of the launch vehicle and the payload owners, meaning the satellite builders. Most satellite contracts give up control over the satellite after its safe arrival and check out on orbit to insure proper operations before the customer assumes control. Hughes Aerospace was the COMSAT builder and participated in the investigation – Boeing later bought Hughes and assumed its role in the joint investigation and its aftermath. Given the economic stakes, the investigation had to be thorough, which meant delving into technical aspects which raised flags among skeptics of trade with China. In the resulting process, technical information beyond that already made available was exchanged in part because the Chinese initially claimed the accident had been possibly caused by some defect with the payload itself. In order to refute this possibility, technical information was exchanged in greater detail. The resulting investigation indicated that launch vehicle operations were the cause.

[9]Handberg, 2006.

However, as knowledge of the investigation and the extent of the technical information exchange became known, a drumbeat of criticism arose in the U.S. Congress fueled by the growing perception of China as a future military rival akin to the old Soviet Union. The argument was that the Chinese, in launching U.S. COMSATs, were obtaining knowledge that helped upgrade their missile capabilities.[10] In addition, Republican politicians' animosity toward President Clinton added to the intensity of the debate. The debate grew larger into a charge that Chinese industrial-military espionage was penetrating the trade process and U.S. national weapons labs. In fact, a scientist, Wen Ho Lee, at Los Alamos National Laboratory of Chinese heritage was accused of nuclear espionage; the charges were ultimately dismissed. The political storm over China and its efforts to gain American secrets waxed in intensity.

The U.S. House of Representatives established an investigatory commission to examine the entire question of Chinese spying. The Cox Commission report completed in 1998, but not made public until 1999, became the basis for congressional action.[11] An amendment was added to the 1999 DOD authorization act ending the Department of Commerce's primary role in ITAR licensing. The Department of State was returned to its previous position as licensing agency with major input from the DOD. This change was aimed at increasing national security scrutiny of any license requests. There were no directions to stop or severely reduce trade with China specifically or any other state. However, the greatly heightened political sensitivity of license requests to export to China was obvious– a fact the bureaucracy was fully aware of and prepared to act on immediately.

United States Space Commerce in the Bubble

Changing the approver meant at least a more restrictive or cautious view of export applications of space technologies to China regardless of any precautions taken. The crunch came almost immediately with an export license for a Chinese COMSAT built by Hughes was put on indefinite hold. That particular license had too many political negatives to allow immediate approval. In fact, the parties eventually gave up and the COMSAT was sold elsewhere. Symbolically, the political point was made almost immediately even though implementation of the new process proved more complicated than expected.[12]

In addition, the Department of State encountered issues regarding its personnel and their competence and uncertainty as to what was politically acceptable. State lacked sufficient trained personnel able to process the license applications. Hiring and training staff represented a major challenge, which was only slowly overcome given federal hiring procedures. What proved more unsettling was the narrow view by the license examiners. The political sensitivity of the question heightened their caution with rules being interpreted in the closest manner possible. The result was a classic example of unintended consequences.[13]

…the Chinese …were obtaining knowledge that helped upgrade their missile capabilities

As indicated above, high-technology exports to China were immediately quashed generally with any exceptions carefully vetted. Other results of the change were more unsettling. First, there was a dramatic slowdown in the time necessary to gain approval.[14] For U.S. space industry, this delay

[10]Joan Johnson-Freese, "Alice in Licenseland: U.S. Satellite Export Controls since 1990," *Space Policy* 16 (2000).

[11]*Report of the Select Committee on U.S. Security and Military/Commercial Concerns with the People's Republic of China* (Cox Report), House Report 105-851, Washington: U.S. House of Representatives, 25 May 1998.

[12]Johnson-Freese.

[13]Ibid.

[14]Joan Johnson-Freese, "Life After the Cox Report: Technology Transfer and Export

generally hurt their ability to compete globally. Each exchange of technical information or meeting to discuss such information with international personnel had to be sanctioned in advance through Technical Assistance Agreements, imposing significant disruptions upon normal business operations. These procedures made U.S. space technologies less competitive or not competitive as other states, such as the Europeans, aggressively moved in to fill the void. U.S. space technologies could now be replaced without degradation in performance, something not true earlier.

Second, Great Britain, Canada, and NATO allies were placed under the same degree of scrutiny as China – the original impetus for the change. Beyond embarrassment, the treatment of class allies as adversaries put a temporary crimp in U.S. high-technology trade with them, a restriction that was quickly lifted but the political and trade damage was done.[15] Given the perceived erratic nature of the ITAR process, at least one European space company removed any U.S. content from its products – removing U.S. ability to compete with other suppliers for that company's COMSATs.[16] Other manufacturers of space technologies began to reduce the amount of American content in their products as a way to reduce U.S. interference in their ability to sell to whomever they wished. In fact, the European Space Agency advertises on its website regarding an "ITAR-free SpaceBus 4000B2."[17]

Third, efforts by space industry to reverse this negative outcome by reusing the statute fell on deaf ears in Congress. Why these efforts failed is a mix of motives including reaction to events after September 11, 2001 and heightened concerns about a resurgent Russia and surging China. The latter raised fears of possible future military confrontations in which space technologies would be major assets in the event of war. Administration policy emphasized a go it alone approach to many world issues– an approach that required the U.S. be dominant. Loss of its technological edge would leave the U.S. exposed to its enemies. Weakening the ITAR regime was seen as counterproductive to long term security interests.

Ironically, ITAR from its initiation was premised on a world in which U.S. space technologies were the cutting edge. Successive presidential administrations worked to sustain that edge, which then could - with caution - be used in trade. The effect, it was thought, was to discourage other states with a few exceptions from competing with their own space technologies. U.S. policy consistently tried to keep its allies and others tied to the U.S. The costs of competition were sufficiently high that most states would not compete if they had ready access to high quality U.S. products.

Beginning in 1986 with the Space Shuttle Challenger accident, that strategy has been chipped away. First in launch technologies, the U.S. fell behind in the global marketplace – that dominance had been artificially sustained by Space Shuttle subsidies that evaporated in the aftermath. Second, the changes in ITAR implementation cut U.S. trade ties with its existing customer base and rendered U.S. space technologies much less competitive in world markets. Customers lost are difficult to recover since satellite contracts come at intervals, not continuously. Assuming that the quality is roughly comparable customers are unlikely to return to a supplier thought more difficult and arbitrary.

The Future, Such As It Is

What has occurred is that the U.S. has succeeded in placing its space technology export trade in a "bubble." Penetrating the bubble requires buyers to negotiate an often slow and arbitrary ITAR

Controls," *Pacific Telecommunications Review* (August 1999), web.ptc.org/library/ptr/3q99/freese.html (accessed 15 August 2005).

[15]Peter de Selding, "Satellite Buyers Blast US Rules," *Space News* (5 April 1999).

[16]Antonella Bini, "Export Control of Space Items: Preserving Europe's Advantage," *Space Policy* 23 (2007).

[17]SeeThales-Alena, telecom.esa.int/telecom/www/object/index.cfm?fobjectid=28086 (accessed 15 September 2007).

licensing process. Potential customers are being driven to other suppliers, and states capable of developing such space technologies, now as a result of U.S. actions, are encouraged to further develop their own equivalents. Once those steps are taken, it is difficult for those states to reverse their course. The reality is that choice, the U.S. has chosen to render its space industry less competitive.[18]

By less competitive, we refer to the reality that other states are replacing the U.S. in the market place. In addition, U.S. policy, contrary to ITAR's purpose, is forcing other states to become more heavily engaged in developing their own space technologies. The U.S. loses out when it becomes isolated within the global market place. Other states and their space professionals can no longer interact easily with U.S. professionals. Both sides lose, but the damage affects the U.S. more in the loss of cross-fertilization of ideas and technologies.

[18]See Aldrin, 1998; and Taylor Dinerman, "Fixing ITAR: The Saga Continues," *The Space Review*, 16 May 2005, http://www.thespacereview.com/article/374/1 (accessed 16 September 2007).