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EFFECTS OF U.S. POLICIES ON THE INTERNATIONAL TRADE IN LAUNCH SERVICES

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ABSTRACT

The international trade in launch services takes place in a highly regulated market environment. For many years the United States has taken the lead in creating regulatory barriers to entry and access to that market by foreign launch providers. The Executive branch has always tried to balance the commercial importance of export of high technology goods and services with national security and foreign policy concerns. At the same time they had to find a way to balance the interests of the U.S. launch industry with the U.S. satellite manufacturing industry. The resulting policy decisions through the years have been reflecting both the difficulties connected with these balancing acts and varying foreign policy considerations, The latter depended not only on the identity and the behavior of the countries concerned but also on Congressional priorities and preoccupations, as a recent example affecting inter alia the Chinese launch industry shows. These developments have created elements of unpredictability which affect the competitive position of the U.S. satellite manufacturing industry and are not favourable to a healthy development of the international trade in launch services.

For a proper perspective of the issues surrounding the international trade in launch services it may be helpful to first have a look at the size and importance of the business we are talking about.

According to a market study performed in 1997, global space industry revenues in 1996 totalled about $77 billion and are expected to exceed $121 billion annually by the year 2000.[1] Those $77 billion, the result of at least 20 percent annual growth for the past several years, can be divided in two major parts:

- infrastructure (satellites, incl. the space station, and launch vehicles): $47 billion (growing to $59 billion in the year 2000), and
- telecommunications services: $23 billion, which will double to $46 billion in 2000.

For many years to come, commercial communications satellites for the bulk of the launch payloads: through the year 2006, some 275 such satellites will be launched into geostationary orbit and more than 1000 satellites will be launched into either low earth orbit or medium earth orbit; total value of these satellites alone: almost *$50* billion.[2]

For the year 1998 alone worldwide commercial launch revenues are projected to be around $3 billion.

One would imagine that scores of launch companies would jump into this rich and promising market and would offer their services both to the satellite manufacturers

and to the prospective owners/operators of these satellites and satellite systems (in the same way as thousands of airlines try to sell their services to shippers and forwarders of cargo all over the world). After all, it only takes an airport and a number of wet-leased aircraft to start an airline! So would not a launch pad, a dozen launch vehicles and a group of launch specialists be sufficient to enter the space launch business? Particularly where, contrary to the global regulatory system of aviation, space is free for exploration and use and not subject to claims of sovereignty?

In practice, this is not at all what happened. An FAA report, released on the 31st of July of this year[3], gives the following launch data covering the second quarter (April-June) of 1998:

The U.S. conducted nine (successful) launches, the Russians eight, seven of which were successful, Europe performed one (successful) launch, and China conducted two successful launches.

Twenty launches by four countries (if we treat Europe as a country) in three months. *By* four countries?
A closer look at these data reveals that the nine U.S. launches involved a modest number of different launch vehicles and launch providers:
Boeing performed three launches with the Delta launch vehicle (developed by McDonnell Douglas), Lockheed Martin's Atlas, Titan 2 and Titan 4 were each launched once, Orbital Sciences used its Pegasus launch vehicle for one launch, and NASA was responsible for two space shuttle launches.

The eight Russian launches were conducted with Proton (3), Molniya (1), Cyclone (I) and Soyuz (3) launch vehicles respectively, each operated by a (semi-) government entity. China has one government-owned launch company, China Great Wall Industries Corporation which operates the Long March family of launchers.
And Europe has the private company Arianespace which sells Ariane launch services to the market,

So those are the only competitors for the above 1300 satellite launch market? Not quite. On the one hand there are slightly more launch countries or launching states in the world (and the U.S. has more -small- launch companies than the ones already mentioned). On the other hand, not all of the above 'launch providers' compete (fully) in the international commercial launch market.

To take the latter aspect first, the space shuttle is not available for commercial launches: since the 1986 Challenger accident, in principle only government payloads, and, more specifically, only those government missions that *require* the shuttle will be admitted onto the launch manifest[4]. This policy put a formal end to a practice which had severely handicapped private launcher developments in the U.S., *i.e.* that of sole reliance on the shuttle for all U.S. launch needs, both government and private, and, in the first years of the return of the private launch vehicle manufacturers, that of price competition between these private companies and NASA. And some of the non-U.S. launch providers lack the freedom to go all-out in competing for international launch contracts. (We will revert to this latter aspect below).
Secondly, there are some more players in the launch market, both countries and companies:
this year, Ukraine will enter the international commercial launch market through a joint venture of its launch industry with Boeing, of which also a Russian and a Norwegian

firm form part: under the name Sea Launch they will - once all regulatory hurdles have been overcome - operate from a mobile launch platform in the Pacific Ocean using an upgraded Ukrainian *Zenit* launcher.
Japan has conducted a number of launches with the H2 rocket, and already concluded contracts (with Hughes Space and Communications) for the commercial use of an upgraded, more powerful version, the H2A.
India has also shown that it is capable of launching satellites into orbit and has the ambition to sell its launch services commercially. And Israel and Brazil appear to share commercial launch goals as well, though being less successful in practice.

While trying to answer the question why so relatively few countries have a (government or private) launch industry, one should recall where the origin of launching lies: in the (military) missile manufacturing industry.

When President Kennedy was asked the difference between the Atlas rocket that put John Glenn into orbit and an Atlas rocket armed with a nuclear warhead and aimed at the Soviet Union, he replied with one word: "attitude".
Countries with a full-fledged missile industry, like the U.S. and Russia, had both the hardware and the technology base to switch to civil uses or 'peaceful purposes'. That is not to say that without such a background it is impossible to construct a launch vehicle, but the road and the learning curve, in the latter case, is definitely much longer.

And there were and are other barriers.

First, the advent of the satellite communications era in the early 1960s and the concomitant (rapidly increasing) use of the geostationary orbit was linked to an international organization, Intelsat, whose members were first and foremost interested in having well-functioning satellites at their disposal. The U.S. government, the biggest shareholder, for a long time had the monopoly in launching the Intelsat satellites into geostationary orbit and the other members paid relatively little attention to the commercial aspects of the U.S. launch services. And, where NASA was in principle and practice always prepared to launch other countries' satellites or have collaborative programs involving joint scientific endeavors (with the U.S. as the launch provider), there was little incentive for other countries, whether possessing a missile industry or not, to engage in the development of launch vehicles for non-military uses. An additional argument was undoubtedly that launching as a commercial activity lacked the existence of a -future-satellite market promising enough to warrant sizeable government investment in a new domestic launch industry, which would compete with the U.S. government (NASA).

Which begs the question why a country would start a launch industry without the support of (or separate from) a missile industrial base in the first place.
Europe is an interesting case in point.
in the mid-I 960s, two European organizations were active in space, ESRO and ELDO. The first one had a research background and purpose and bartered (and later bought) U.S. launch vehicles for its scientific satellites. The latter organization had a more military-strategic on gin and aimed at building launch vehicles, without however giving too much thought to the (possible) demands of the prospective users (such as ESRO) or the economic viability of the project. That attitude, combined with the complications caused by having several European countries each working on a part of the launcher, plus repeated failures and

cost-overruns, resulted in ELDO being almost constantly threatened with liquidation. In the end, indeed, only ESRO survived and might have happily continued using American launch services if the U.S. had not attached conditions considered onerous, if not insulting, by the European organization. The problems surrounding the requested U.S. launch of a French-German telecommunications satellite ("Symphonie") confirmed the suspicions on the European side: if the U.S. did not like the purpose, the satellite would not be launched. Obviously, you cannot draft a long term plan for European space exploration and use on such a shaky basis. So, what was originally (and traditionally) a French concern turned into a new European paradigm, that of *independent access to space.*

Moreover, the European countries had recognized the economic (and geo-political) value of owning applications satellites in general and telecommunications satellites in particular, and wanted to be part of this promising development of the commercial use of space.

As a consequence, the ESRO member states, in July 1973, decided to 'go it alone' and develop a European launch vehicle, the "Ariane". (Without, it should be added, a European missile base or defense industry comparable to the American or Russian situation.) It took a major technological and organizational effort and substantial financial sacrifices for the Europeans to get Ariane operational and ready for both European uses and foreign clients. In late 1981, Arianespace signed its first commercial launch contract with a U.S. company. Earlier in the same year the U.S. space shuttle had made its maiden flight. For 5 years it would the Ariane's main competitor. The development of the space shuttle had cost billions of dollars. High development cost is a good reason for *not* starting a launch business!

There were (and still are) several reasons for the level of cost involved,

The space shuttle was meant to take care of all U.S. launch needs, including manned (crewed)

missions. The technology involved was novel and extremely complicated.

The Ariane launcher was built from scratch for geostationary launches from the Kourou, French Guyana, launch base, and had to be very powerful.

And all essential systems or parts need back-ups to take over in case of failure.

Few countries have the technological base and the financial means to build their own launch vehicle. Those who go ahead with such a project anyhow will usually have a very strong incentive to do so. One of the incentives is the recognition of the value of 'own' space activities coupled with uncertainty about the availability of foreign launchers (the case of Europe). Other reasons may be of a geopolitical, strategic, 'regional leadership' or national prestige nature. Defense and national security may also play an important role: to be able to have your own reconnaissance or spy satellite in orbit without unfriendly or curious foreigners taking care (or not taking care!) of the launch. Israel probably comes under the latter category. South Africa, internationally isolated in the mid- I 980s because of its apartheid policy, also started but soon terminated, the development of a launcher. The wish to strengthen or emphasize regional leadership may have been an *added* reason for large countries like Brazil and India to develop an indigenous launch vehicle,

The above countries all had a good reason to develop a launch vehicle. But to build everything from scratch would take ages. So the countries concerned all tried to buy

launch vehicles or at least the hardware and the technology to build launch vehicles from other countries possessing these goods and this know-how.
This is where the identical technologies of missiles and 'peaceful' launchers created (and still create) problems:
missiles and missile technology are weapons or arms and so are, at least potentially, launchers and launcher technology. Most countries have laws and policies governing the sale of arms or of goods and technologies that could (also) be used as arms, the so-called 'dual-use' goods and technologies.
The U.S. has a strict and wide-ranging export control legislation which is geared at preventing the proliferation of any of the above goods and technologies.
The philosophy behind these controls is a simple one: "thou shalt not arm thy (today's or tomorrow's) enemy." And 'enemy', in this context, is widely interpreted to include almost any country which is not a long-time trusted friend or ally.

During the cold war the concept was refreshingly clear: all communist countries were considered enemies. The State Department's so-called Munitions List contained all the 'controlled' arms or 'defense articles', the Department of Commerce published the Commodities Control List, containing all controlled 'dual-use' goods' And both Departments, charged with the licensing of U.S. exports of 'their' goods to foreign countries, published lists of (categories of) countries which should not (without a specific license) receive these goods and technologies from U.S. exporters.
Apart from the communist countries, there were others which at some time or other appeared on the list of forbidden destinations, for reasons related to *e.g.* global or regional security/stability (India and Pakistan, Iran and Iraq), the fight against terrorism (Libya, Iran, Sudan), political reasons (South Africa, Cuba), human rights (China), etc., with various degrees of restrictions depending on the seriousness of the foreign country's behaviour and the depth of U.S. concerns.

Missiles, launch vehicles and component parts and subparts and all relevant technologies and know-how appear on both lists and will, as a rule, not be exported to any of the above mentioned countries. And, since 1990, U.S. law and policy provides for a presumption of denial of licenses for the export of any of these items to *any* country, whether friend or foe, if there is a chance that the transfer of these items *could* make a contribution to delivery systems for weapons of mass destruction, that is missile or launch systems.

This is not only a U.S. law and policy.
Shortly after the second world war, a group of Western countries, assembled in CoCom, the Coordinating Committee on Multilateral Export Controls, started to coordinate and strengthen national controls on exports of dual-use goods to communist countries.
These multilateralized controls lasted until the demise of the Committee in 1994, and were replaced by a both enlarged (also covering conventional arms) and reduced (not directed at specific groups of countries and mainly focused on information exchange) regime called the *Wassenaar* arrangement.
And, since 1987, an increasing number of countries which possess missile/launcher equipment and technology have enacted rules which severely restrict the export thereof. Basis for the national legislation in these countries is an internationally agreed set of guidelines called the Missile Technology Control Regime (MTCR) of 1987, revised in 1993.
It is important to realize that even *among* the

approximately 30 members of the MTCR group the export restrictions apply. As Brazil experienced when it joined the group in 1995, their accession did not result in launch technology becoming freely and abundantly available. And, more recently, Japan initially also faced difficulties on the part of the State Department when it bought a U.S. built (Thiokol) engine to power its H2A launch vehicle.

The U.S. policy on the matter is relatively simple and can be summed up as follows:
--if a country has a missile (development) program and wishes to buy launch vehicles and/or technology for a separate civil/commercial launch industry, the latter know-how will, one way or the other, end up strengthening the missile program, particularly because the economic prospects for a separate launch industry are -as a rule- very poor;
--if a country does *not* possess a missile (development) program and wishes to buy launch vehicles and/or technology for a civil/commercial launch industry, it is doomed to end up starting a missile development program anyhow or selling this technology to third countries with the same aspirations, because the economic prospects for a separate launch industry are -as a rule- very poor!

Which explains the U.S. "no" to new MTCR member Brazil. (And Brazil had to obtain the
technology from Russia, which, though already adhering to the principles of MTCR, had a
slightly more relaxed interpretation of the rules and definitely more pressing financial needs)

The same rules and regulations barred other space launch 'have-nots' from quickly (and openly) acquiring the necessary launch products and know-how. This contributed to a limited and slowed-down entry of new launch nations (and fresh competitive blood) into the market (and of course also hampered and continues to hamper legitimate space launch cooperation for peaceful purposes).

The U.S. export regulations covered yet another high tech item of relevance to our subject, i.e *satellites* and satellite components and the related know-how (any high tech product bought by the 'enemy' makes the latter not only smarter and more effective, but also faster and possibly cheaper so, because he does not have to develop the product or technology himself). This has had a double effect:
(1) the U.S. satellite manufacturers are limited in their sales possibilities to those countries and entities which the Departments of State and Commerce consider acceptable; this affects their competitive position vis-a-vis European companies whose governments have shorter/different lists of 'prohibited countries or destinations' or apply a different interpretation to the restrictions;
(2) the U.S. satellite manufacturers are limited in their choice of foreign launch providers: if the manufacturer or the owner/operator of the satellite would for instance choose a launch company from India, the transfer of the satellite to India for that purpose would have to be approved (licensed) under the same export regulations as in the case of India buying in stead of launching the satellite.

This is what happened in 1988, when the Australian telecom firm Aussat bought two satellites from Hughes Space and Communications and demanded that they be launched with a - very attractively priced - Chinese Long March launch vehicle. (And Asiasat, a Chinese-Singaporean firm did

likewise with respect to one Hughes telecommunications satellite). Hughes was more than willing to comply because it welcomed entry of a new launch provider into the market at a time when both U.S. launchers and the Ariane were hardly available. Moreover, being able to sell a low-cost package of satellite plus launch to foreign customers would give it a competitive advantage over European companies offering a more expensive package of a European satellite plus Ariane launch. And, finally, Hughes saw additional foreign competition facing the U.S. launch companies as a way to force its compatriots to raise launch quality and reliability and lower the cost of launching.

The observation that the U.S. *launch* companies were far from happy with this development is probably superfluous. The fact that this question thus pitted US. satellite manufacturers and launch companies against each other is also predictable. But it also forced NASA, Defense, State Department, Commerce, Transportation and the CIA to also discuss the defense, national security and foreign policy aspects of the transfer of high-tech satellites to China and entry of China into the international commercial launch market. In the end, those in the Administration who favoured a policy of 'engagement' with China (as opposed to isolation) won the battle: China would be allowed to launch these satellites, provided that both the question of liability for damage (China was not a party to the Space Liability Convention of 1972) and of transfer of sensitive technology were adequately addressed.
And the U.S. launch companies had to be protected against unfair trade practices, including subsidization, price-dumping, briberies, discrimination and other market distorting practices which foreign companies in general and companies from non-market economies in particular are inclined to engage in... After all, the U.S. companies had barely started selling their services on the international market. Catching up with Arianespace was already difficult enough and an additional, experienced low-cost launch company, with an unknown number of launch vehicles ready for sale, was a very threatening prospect.

As a result the Chinese were told that they would have to conclude an agreement with the U.S. covering the above aspects as the price for entering the international launch market. Without such an agreement the Chinese would be barred from launching any U.S.-built satellite or foreign-built satellite containing U.S. components. On the other hand, the agreement would not overrule or stand in the way of the U.S. government's continued right to grant or deny satellite export licenses by virtue of the above national export regulations

The ensuing U.S.-China launch trade agreement of 1989[5] formulated a number of fair trade principles, and basically asked the Chinese to behave like a (well-behaved) private Western launch company. Thus, government support to the launch company had to be "in accord with practices prevailing in the international market", and government "inducements" to international customers, which would create discrimination against other launch providers, were forbidden, But most important were the provisions on the *prices* and the *capacity* which the Chinese were allowed to offer. The agreement provided that prices, terms and conditions had to be "on a par" with those prevailing in the international market for comparable commercial launch services,' although the term 'on a par' was not defined, it basically meant: do not (dramatically) undercut

Arianespace and the U.S. launch companies. Whether the China Great Wall Industry Corporation's launch services were indeed comparable with those of Western companies remained a matter of debate. To justify their lower launch prices the Chinese referred both to the more simple design of their launch vehicles and the low salaries paid to their personnel, and Hughes referred *inter alia* to the 'hidden' extra cost incurred by the poor facilities at the launch site and the extensive technology transfer safeguards they had to put into place in China by virtue of the safeguard provisions of the agreement. During the six years of the validity of the agreement, *i.e.* until December 31,1994, the Chinese launch company was allowed to launch a maximum of 9 communications satellites for international customers (which included 2 Aussat and 1 Asiasat satellite launch contracts already concluded). And the Chinese were to distribute the launch contracts proportionally over the full period of the agreement, the so-called (anti-) bunching provision, in order to reduce the commercial impact of a concentration of Chinese launch contracts.

Where the U.S. satellite manufacturers were happy with this modest but important expansion of launch possibilities, neither Arianespace nor the U.S. launch companies felt satisfied with the protection the agreement offered against unfair competition: particularly the pricing condition was seen as vague and (therefore) ineffective. And the first test case which arose in 1991, when both CGWIC and Arianespace fought a bitter competitive fight over the conclusion of a satellite launch contract with the Arabsat Organization, only confirmed the European suspicions: Arianespace complained with the U.S. Trade Representative about Chinese price dumping, but soon realized that U.S.-Chinese relations were too important and too sensitive for the U.S. Administration to actively intervene in this pricing conflict.

Already in July 1989, the Tiananmen Square killings resulted in an immediate suspension, by the U.S. Administration, of the export licenses for the three satellites falling under the agreement. And Congress, intent on creating its own controls, adopted legislation which forbade any export of U.S. satellites to China (for launch) unless and until it had received assurance of a clear improvement of the human rights situation in China or unless the President decided that such export was in the national interest of the U.S.[6] Already in December of 1989, President Bush, highly valuing a further 'engagement' with China, took a decision to that effect and released the above three satellites for export. But the Tiananmen legislation continues to be applicable until today, and export licenses for U.S. satellites to China are still only issued when the President decides that national interest justifies this exception.

The above shows two important complications in connection with the application of the launch trade agreement: I. it is part of and subject to the overall political relations between the U.S. and China, and 2. the agreement is (only) an Executive Agreement, not a formal treaty (which would require approval by the Senate), and can therefore not override or set aside national legislation. This implies that (changing) policies and political priorities, both of the Administration and of Congress, continue to determine the fate of the agreement's application and to effect the reliability of the U.S. satellite manufacturers vis-a-vis their customers and thus their international competitive position whenever they contract with the Chinese for a Long March launch,

Chinese *Silkworm* missile sales to countries like Iran and Pakistan, its human rights record (in China and Tibet) and trade-related behavior (copyright violations) resulted not only in heated annual debates between the Administration and a - highly critical - Congress on the renewal of China's MFN status, but also repeatedly led to U.S. sanctions affecting the export licenses (to be) granted by virtue of the launch trade agreement.
Particularly after the Republican victory in the mid-term elections of November 1994, Congress increased its pressure on the Clinton Administration to be more national security and human rights conscious when dealing with China,

This did not prevent the Administration, in March 1995, from concluding a revised agreement with China which put the number of agreed Chinese satellite launches for international customers to geostationary earth orbit (GEO) at eleven for the period January 1, 1995 through December 31, 2001, with the possibility of further increases of the quota in case of significantly greater launch market developments during the period of validity of the agreement. A new pricing provision gave CGWIC the freedom to price its launches 15 percent below its commercial "market economy" competitors, and introduced "pricing comparability factors" to judge the acceptability of still lower Chinese price quotes.
The revised agreement also took into account the emerging low earth orbit (LEO) launch market (and China's participation in the launching of satellites for *e.g.* the 66-satellite Iridium constellation) and introduced general behavioral guidelines and criteria, but not (yet) specific pricing or launch quota provisions.

Through this new and flexible agreement, coming on top of similar arrangements with Russia and Ukraine went a long way to satisfying the needs of the U.S. satellite manufacturers and satellite system operators for years to come, recent political developments affecting the U.S.-China agreement show that Congressional priorities and/or preoccupations may stand in the way of giving the regulatory certainty and predicability which private industry requires and would expect to get from the U.S. government. (This is the more remarkable where also Congress has always been a staunch supporter of the commerciallization of the U.S. space industry and in particular the U.S. launch industry, witness, *inter alia*, the adoption of the 1984 Commercial Space Launch Act and its 1988 (liability limitations) Amendment)

In February 1996, a Long March launch failed, resulting in the destruction of a U.S.-built satellite. Not only was one of the circuit boards containing sensitive encryption information never recovered, but the report of an investigating committee of experts came into the hands of CGWIC through the manufacturer of the satellite, Loral. The latter event was cause for a criminal investigation as it appeared to amount to an illegal transfer of sensitive technology, in violation of the Arms Export Control Act, and harming, according to a Pentagon report of May 1997, U.S. national security because it enhanced the reliability of Chinese ballistic missiles. In February 1998, with the criminal investigation still under way, Loral obtained again a license for the export of one of its satellites to China for launch by a Long March. Some Republican Congressmen found the latter less than appropriate in the circumstances, and a New York Times article published in May 1998 suggested a link between the granting of this license, through a Presidential waiver of the Tiananmen

sanctions, and donations on the part of Loral's chairman to the Democrats.[7]

The above issue, coming on top of an approval of the sale of a fairly sophisticated Hughes satellite to a Chinese owned communications company, which could possibly lead to military use, was reason for Congress to hold a veritable plethora of hearings to not only investigate the national security aspects of the above cases but to review the 1988 Reagan decision allowing the Chinese to launch U.S. satellites (from the point of view of national security and the effects on the U.S. launch industry). Also target of the investigations is the Clinton Administration's decision of 1996 to transfer the licensing of the export of commercial communications satellites from the State Department to the Department of Commerce, which is seen by a substantial number of Congressmen as an unfortunate relaxing of national security controls a claim strongly denied by the Administration and not supported by much evidence so far).

The first result of these largely partisan congressional (committee) discussions, which showed a strong national security versus trade and commercial interests dividing line, was the introduction of two pieces of legislation, one of which would transfer export licensing of commercial communications satellites back to the State Department, and the second of which would put a complete ban on exports of U.S. satellites for launch on China's Long March launch vehicle. Both bills, which at the time of writing had not been approved by Congress *in toto* as yet would, because of their being part of the 1999 Defense Authorization Bill, force the U.S. President to veto the latter bill to prevent these somewhat xenophobic measures from becoming law.

The possibly unintended, but nevertheless worrysome side effect of (the tone of) these hearings, which will continue for some time to come, is a concern on the part of the U.S. Administration bordering on paranoia to license or otherwise permit any contacts between the U.S. satellite and launch industry on the one hand and their foreign partners or customers on the other hand to the extent these might be construed as permitting or creating the possibility for a transfer of sensitive technology to foreign interests and thus for a threat to the national security of the U.S.[8] It goes without saying that both the above allegations, which have yet to be proven, and the - rather hasty - ensuing Congressional legislation and, additionally, the reactions of the Administration thereto have already now been damaging to the U.S. companies concerned. Not only the U.S. satellite manufacturers' freedom of action and launcher choice are at stake, also the U.S. launch companies are affected. Thus Boeing's Ukranian and Russian Sea Launch partners were recently denied access to the joint facilities and discussions between the parties were banned by the State Department.[9]

The possibility, however that, of the few launch companies available worldwide, one would indeed become as seriously handicapped to compete in the international market as the Chinese launch provider, is a most unfortunate effect of the above Congressional interventions, and will send a strong 'anti free trade' message to the world space community.

The international launch industry and its multi-billion dollar telecommunications client base will surely suffer. And so will the image of the U.S. government as a responsible, stable and predictable regulator and contract/trade partner *in rebus spatialibus.*

[1]See State of the space industry - 1997 outlook, developed and published by Space Vest, KPMG Peat Marwick, Space Publications and Center for Wireless Telecommunications

[2] See World Space Systems Briefing, Teal Group Corporation

[3] Quarterly Report of the U.S. FAA Associate Administrator for Commercial Space Transportation

[4] U.S. Launch Strategy, National Security Deciscion Directive (NSDD) 254, Dec. 27, 1986, enacted in NASA Authorization Act, FY1991, Publ. L. 101-611, Nov. 16, 1990, 104 Stat. 3190, Sec. 112:
"(1) It shall be the policy of the United States to use the Space Shuttle for purposes that
(i) require the presence of man,
(ii) require the unique capabilities of the Space Shuttle or
(iii) when other compelling circumstances exist.
(2) The term "compelling circumstances" includes, but is not limited to, occasions when the [NASA] administrator determines, in consultation with the Secretary of Defense and the Secretary of State, that important national security or foreign policy interests would be served by a Shuttle launch."

[5] *Memorandum of agreement between the Government of the [USA] and the Government of the [PRC] regarding international trade in commercial launch services*, 28 I.L.M. 596 (1989); additionally, *Memorandum of Agreement on satellite technology safeguards* and *Memorandum of Agreement on liability for Satellite launches*, *ibid.*

[6] See Depts of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act, FY 1990, Pub.L. 101-162, 103 Stat. 988, 1038 (Nov 21, 1989), Sec. 610.

[7] "How Chinese won rights to launch satellites for U.S. – Tie to donations denied – Easing of rules in 1996 was a shift of balance between security and commerce", N.Y.T (May 17, 1998) at 1, 18.

[8] This also affects normal business behavior of the U.S. companies concerned, See Space News Online (Sep 21-27, 1998): "Scrutiny chills Great Wall's relations with customers – The controversy in the [U.S.] over the use of Chinese rockets by U.S. satellite builders has all but prevented the head of [CGWIC] from shaking hands with his U.S. customers.", <http://www.spacenews.com/smembers/sweek>

[9] See Space News Online (Jul 20, 1998):"Russians, Ukrainians barred from Sea Launch", <http://www.spacenews...members/sarch/sarch98/sn0720r.htm>