

U.S.-CHINA COMMISSION EXPORT CONTROLS AND CHINA

THURSDAY, JANUARY 17, 2002

The Commission met at 9:08 a.m., in room SD-106, Dirksen Senate Office Building, First and Constitution Avenue, N.E., Washington, D.C.

Commissioners present: C. Richard D'Amato, Chairman, Michael Ledeen, Vice Chairman, George Becker, Stephen D. Bryen, June Teufel Dreyer, Kenneth Lewis, Patrick A. Mulloy, William A. Reinsch, Roger Robinson, Michael R. Wessel.

OPENING REMARKS OF VICE CHAIRMAN MICHAEL LEDEEN

Vice Chairman LEDEEN. Good morning. I am Michael Ledeen, Vice Chairman of this Commission, which is charged with investigating the overall strategic relationship between the United States and the People's Republic of China.

Today and tomorrow, we will hold the last in a series of hearings on various aspects of that relationship, from commercial and financial to political and military.

Today's hearing deals with export controls, which has long been one of the most contentious issues. During the Cold War, when we agreed that we had a determined enemy, there were still many who argued that wide-open trade, even in dual-use technologies, could only ease tensions and eventually pave the way for peace.

When President Reagan instructed his Cabinet secretaries to design a method to deny the Soviet Union access to advanced technology, much of the academic and business community believed it was folly, both strategically ill conceived and practically impossible. Yet COCOM was a considerable success, as demonstrated by the desperate attempts of Soviet leaders to weaken or destroy it.

Nobody is smart enough to know whether the People's Republic of China will be friend or foe 10 or 20 years from now, which makes the evaluation of technology transfer more difficult. Some believe that free trade in and of itself contributes mightily to other forms of freedom, including a free political system. Some believe that it really makes our trading partners wealthier. Others believe that if we permit China to become militarily more powerful by decontrolling militarily valuable technologies, we risk facing a mighty antagonist sometime in the future, while others still argue that in a globalize world, no one can control technology anymore and that if we don't sell it, somebody else inevitably will.

As we have learned in previous hearings, still others believe that money itself is a component in strategic trade and, consequently, that we should consider limiting access to our own capital markets.

As is our practice, we have strained to find effective advocates for different points of view so that the Commission will hear a full and open debate. Here, at least, there will be no controls on anything our expert witnesses believe we should hear, and we will be grateful for their candor and their passion.

Today's hearing will be jointly chaired by Commissioners Stephen Bryen and William Reinsch, with Commissioner Reinsch taking the chair for this morning's session.

Thank you all for coming. I am looking forward to it.
Commissioner Reinsch, please.

OPENING REMARKS OF CO-CHAIRMAN WILLIAM A. REINSCH

Co-Chairman REINSCH. Thank you.

I'm glad we're doing this. This is an important hearing and one that was unfortunately postponed, and I appreciate the forbearance of the witnesses in coming back. It is very hard to have an export control discussion without talking about China, so I think it is particularly appropriate that we are going to spend some time on this topic which, as the witnesses at the table in particular know, has been controversial in the past.

The last Administration, which I was honored to serve in, spent a lot of time trying to "revision" this issue and figure out how export controls could work best in an environment where our defense depends more on electronics and information technology than it ever has before and where, in turn, the purveyors of those goods are civilian companies, not military prime contractors, and they are companies in turn whose profits and therefore their ability to do further R and D depends on exports and certainly not on defense sales and in significant part not on domestic sales.

How do you integrate those realities into an export control system without crippling the very companies that you want to be at the cutting edge in order to maintain our national security?

That is a complex question, and I am hoping that our witnesses, particularly our Government witnesses, can reflect a little bit on what the new Administration thinks about that, what they are doing about it, and how they are approaching some of the difficult conundrums in this field that we face particularly with respect to China.

With that, Steve, do you have a statement?

OPENING REMARKS OF CO-CHAIRMAN STEPHEN BRYEN

Co-Chairman BRYEN. I don't have an opening statement. I agree with you it is a very difficult problem that is not just export controls. If you limit it there, you miss a lot of what is going on. It's just an element of the broader picture of whether or not there is an active effort to take from this country a lot of the know-how, whether it is technology or other know-how that can be used by a potential adversary. So I want to look at that a bit this morning as we go through the testimony and then try to see where we are going with our policy.

I welcome the witnesses this morning and look forward to their testimony. I am sure it will be interesting, and I know the Panel will have a lot to contribute to the dialogue.

Thank you.

Co-Chairman REINSCH. Does anybody else up here want to say anything?

[No response.]

Co-Chairman REINSCH. Good. Have you all decided what order you prefer to go in, or not?

Mr. JOCHUM. In true interagency fashion, we have not decided anything.

Co-Chairman REINSCH. I am tempted to comment, but I won't. Why don't we start, then, with Ms. Bronson and work our way across the table, if no one has an objection to that.

Try to keep within 10 minutes each, if you can, and then we'll have 5 minutes each for questions, and if there are more, we'll have another round after that if we still have time.

Ms. Bronson?

PANEL I: USG PANEL—U.S. EXPORT POLICY TO CHINA

STATEMENT OF LISA BRONSON, DEPUTY UNDER SECRETARY OF DEFENSE FOR TECHNOLOGY SECURITY POLICY AND COUNTERPROLIFERATION

MS. BRONSON. Thank you.

Mr. Chairman and Commissioners, I am honored to be with you today. You have my longer written prepared statement. I will simply cover a few highlights so I can spend more time focusing on your questions this morning.

The President has said that we seek a candid, constructive, and cooperative relationship with China. China is a partner on some issues and a competitor on others. American interests could be served by a China that is developing economically and politically. Still, we do not ignore the fact that China has embarked on an ambitious program of military modernization, including nuclear modernization. This modernization, combined with China's poor record on proliferation, leaves us with many questions about the future direction of China's foreign and security policies.

One of the challenges China presents is its current and growing inventory of nuclear, biological and chemical weapons and their associated delivery systems. A review of DOD's recent publication, "Proliferation: Threat and Response," is instructive.

China currently has over 100 nuclear warheads and is increasing the size, accuracy and survivability of its nuclear missile force. Given some 20 CSS-4 ICBMs of over a 13,000-kilometer range, China is already one of the few countries that can threaten the continental United States. We expect China will continue to modernize its strategic missile force over the next generation, improving the survivability, reliability and accuracy of this force.

China continues to maintain elements of an offensive biological warfare program. Beijing is believed to have an advanced chemical warfare program, including research and development, production, and weaponization capabilities.

A vital aspect of China's overall military modernization includes pursuit of a viable indigenous space force. China is paying particular attention to the development of small boosters able to launch satellites at a moment's notice in a contingency.

Recognized experts observe that China's modernization program appears to be focusing on "pockets of excellence" where advances

in select technologies can be leveraged for disproportionate benefit in a potential conflict. Several such pockets include: preemptive long-range precision strike capabilities; information dominance; command and control; and integrated air defense.

In support of these efforts, Beijing has identified the development of an indigenous microelectronics industry as one of its highest priorities.

China continues to be one of the world's key sources for missile and WMD-related technology, including for some terrorist-sponsoring states. Chinese firms have provided some important missile-related items and assistance to countries like Iran, Libya, and North Korea. Additionally, Chinese entities have provided extensive support in the past to Pakistan's nuclear and ballistic missile programs and have supported some nuclear and chemical programs in rogue states.

The United States has a variety of tools to protect sensitive technologies from inappropriate Chinese exploitation, as well as multilateral means to encourage similar approaches among allies. My colleagues from the Departments of Commerce and State will address our dual-use and munitions regulatory systems in detail.

The Department of Defense is a full partner in the interagency export license process, reviewing all sensitive munitions and dual-use license applications referred by the Departments of State and Commerce. Moreover, we are actively engaged in fashioning the conditions and provisos that address any national security concerns posed by export licensing applications.

DOD's export licensing functions are executed by nearly 200 military and career civilian personnel of the Defense Technology Security Administration. This cadre includes a tremendous depth of expertise in the hard sciences, engineering, and manufacturing techniques.

In addition, we have a dedicated space launch monitoring division that is tasked specifically with reviewing licenses and then developing and implementing the technology safeguard programs for space launches of U.S.-made equipment on foreign launch vehicles. The space launch division also implements technology safeguards for U.S. launches of U.S.-built satellites of certain foreign ownership.

Members of our space launch division combine both scientific and licensing expertise to provide cradle-to-grave supervision of space launch technology safeguard programs. There have been no waivers of Tiananmen sanctions to permit any launch of U.S. equipment from China since 1998. However, DTSA's space launch division is ready to resume monitoring immediately if a policy decision to issue such a waiver is made.

Whether in the space launch division, dual-use, or munitions licensing, DTSA personnel review each license application individually, with input as necessary from the military services, the Joint Staff, and as necessary, other DOD components.

It is a process that is time-consuming, with some 24,000 licenses processed in calendar year 2001. The DOD dual-use license review process also includes reviews of the end-user to minimize the risk of diversion. Over a year ago, DTSA realigned its end-user reviews

to create an assessment unit that provides more comprehensive checks on end-users identified in all dual-use license applications.

Despite the overall volume of licenses, I am pleased to report that there has been consistent improvement in DOD processing times for munitions, down from an average of 38 days in 1999 to approximately 20 days today. On the dual-use side, our processing timelines have decreased from an average of 12 to 11 days in the past two years.

I believe that we have struck an appropriate balance between taking the time to protect national security without unnecessarily delaying action on industry license applications.

Where do we go from here? China is both a problematic proliferator and the largest potential future market for the U.S. It must be dealt with as part of the larger national security and foreign policy agenda set by the President, who has said that "America's next priority to prevent mass terror is to protect against the proliferation of weapons of mass destruction and the means to deliver them." This poses a significant policy challenge with respect to China.

The challenge of China is striking the balance between the desire to successfully compete in a vast untapped commercial market and the need to protect national security. Our policies and practices must strive to minimize transfers of technology that could contribute to potentially threatening modernization efforts. Our focus is on areas that Beijing has already identified as "pockets of excellence," but we need to continually be vigilant in the licensing process for new areas where our highest technology might be exploited to our detriment.

Our policies and practices must ensure that the United States companies can compete for legitimate commercial sales on equal footing with their foreign competitors.

In August 2001, the Deputy Secretary of Defense reestablished the Defense Technology Security Administration as an organization under the Under Secretary of Defense for Policy. This move reunited the technology security, counterproliferation and non-proliferation functions under a single Under Secretary of Defense. The Under Secretary of Policy has directed a more integrated approach than has been taken in the past. In this regard, my responsibilities include not merely export licensing and technology security policy, but counterproliferation policy as well.

Counterproliferation refers to the range of military preparations and activities to reduce the threat posed by weapons of mass destruction and their delivery systems. It is distinguished from non-proliferation, which includes the range of political, economic, and diplomatic tools to prevent, constrain, or reverse the proliferation of weapons of mass destruction and their delivery systems.

Thus, my office is now responsible for preventing potential adversaries from leveraging controllable, sensitive technologies, as well as policies for dealing with adversaries who may have already obtained such technologies.

By putting both our technology security and counterproliferation offices under one organic management structure, we plan to give the Department of Defense a more comprehensive approach to the interagency export control process and to the development of a U.S.

strategy for managing technology security and countering proliferation.

The realignment of technology security functions at DOD will pay dividends across the board. But we are paying special attention to China and its modernization and proliferation challenges in several areas.

My office oversees the DOD contribution to the ongoing review and revision of the United States Munitions List. This review is informed by our knowledge of China's key modernization priorities. In particular, our review of microelectronics dual-use licenses is colored by our evolving understanding of what China wants.

DOD license officers work closely with Commerce to fashion license conditions designed to deny critical dual-use manufacturing technology to Beijing but at the same time allow U.S. industry to compete where end items are widely available from foreign suppliers.

September 11 was a grim reminder that Government needs to better integrate all elements of national power—military, law enforcement, regulations, and intelligence—into a successful national security strategy. Technology security is one of those elements. It has implications for our troops deployed abroad as well as for homeland defense within our borders.

The pursuit of a necessary balance between free markets and national security is affected by many factors. Striking the right balance with respect to China is especially difficult, and questions of Chinese intentions, capabilities, and conduct weigh heavily. In confronting the challenges posed by China, I expect that the work of this Commission will offer us very important insights.

Mr. Chairman, I appreciate the opportunity to appear before the Commission and look forward to our discussion.

Co-Chairman REINSCH. Thank you.

[The statement follows:]

PREPARED STATEMENT OF LISA BRONSON

Mr. Chairman and Commissioners, I am honored to join you today with colleagues from the Departments of Commerce and State to discuss United States export controls and China.

The President has said that we seek a candid, constructive, and cooperative relationship with China. China is a partner on some issues and a competitor on others. American interests could be served by a China that is developing economically and politically. Still, we do not ignore the fact that China has embarked on an ambitious program of military modernization, including nuclear modernization. This modernization, combined with China's poor record on proliferation leaves us with many questions about the future direction of China's foreign and security policies.

One of the challenges China presents is its current and growing inventory of nuclear, biological and chemical weapons and associated delivery systems. A review of DOD's recent publication "Proliferation: Threat and Response" (January 2001) is instructive. China currently has over 100 nuclear warheads and is increasing the size, accuracy and survivability of its nuclear missile force. Given some 20 CSS-4 ICBMs of over a 13,000 km range, China is already one of the few countries that can threaten the continental United States. We expect China will continue to modernize its strategic missile force over the next generation, improving the survivability, reliability and accuracy of this force.

China continues to maintain elements of an offensive biological warfare program. Technology for production and weaponization of biological agents developed prior to Beijing's accession to the Biological Weapons Convention (BWC) in 1984 is believed to provide the basis for current capabilities. In addition, China is believed to have made incomplete and inaccurate declarations under BWC protocols.

Beijing is believed to have an advanced chemical warfare program, including research and development, production and weaponization capabilities. Chinese industry produces the necessary precursors for traditional agents, and its forces have a variety of delivery options. In the past, Beijing has not acknowledged the full extent of its chemical weapons program despite its ratification of the Chemical Weapons Convention.

A vital aspect of China's overall military modernization includes pursuit of a viable indigenous space force. China is paying particular attention to the development of small boosters able to launch satellites at a moment's notice in a contingency.

Recognized experts observe that China's modernization program appears to be focusing on "pockets of excellence," where advances in select technologies can be leveraged for disproportionate benefit in a potential conflict. Several such "pockets" include: preemptive long-range precision strike capabilities; information dominance; command and control; and integrated air defense. In support of these efforts, Beijing has identified the development of an indigenous microelectronics industry as one of its highest priorities. A cutting-edge domestic microelectronics sector will support both military and commercial modernization in China. China's increasing emphasis on development of very large-scale integrated circuits will have direct application in future military systems, for example, advanced phased-array radars.

China continues to be one of world's key sources for missile and WMD-related technology, including to some terrorist sponsoring states. Chinese firms have provided some important missile related items and assistance to countries like Iran, Libya, and North Korea. Additionally, Chinese entities have provided extensive support in the past to Pakistan's nuclear and ballistic missile programs and have supported some nuclear and chemical programs in rogue states.

How Does Our Export Control System Deal With China?

The United States has a variety of tools to protect sensitive technologies from inappropriate Chinese exploitation, as well as multilateral means to encourage similar approaches among allies.

My colleagues from the Departments of Commerce and State address our dual-use and munitions regulatory systems in detail in their prepared statements. I want to reiterate that the number of Munitions List exports to China has been extremely small over the past several years. In the dual-use area, the export licensing system provides the U.S. government with a useful set of procedures for controlling dual-use commodities that could be used for military purposes.

The dual-use control system under the Export Administration Regulations addresses commodities falling within four areas of special military sensitivity: national security, nuclear nonproliferation, missile technology and chemical and biological weapons. The regulatory scheme assumes a policy of license denial for these commodities if they make a "direct and significant," or "material" contribution, depending on the area, to Chinese capabilities. Examples under the "national security" area of sensitivity include electronic and anti-submarine warfare, intelligence gathering, power projection and air superiority.

Another means of regulating the flow of technology to China is the Commerce Department "Entity List." This list identifies foreign entities that are believed to pose proliferation risks; there are currently 19 Chinese entities on the list. Other tools include the various multilateral nonproliferation regimes: the Missile Technology Control Regime, the Australia Group, and the Nuclear Suppliers Group. A particularly important element of these regimes is a "no undercut" policy, which remains to be adopted in a fourth multilateral regime, the Wassenaar Arrangement.

DOD's Role in the Licensing Process

The Department of Defense is a full partner in the interagency export license process, reviewing all sensitive munitions and dual-use license applications referred by the Departments of State and Commerce. Moreover, we are actively engaged in fashioning the conditions and provisos that address any national security concerns posed by export licensing applications. DOD's export licensing functions are executed by the nearly 200 military and career civilian personnel of the Defense Technology Security Administration. This cadre includes a tremendous depth of expertise in the "hard" sciences, engineering and manufacturing techniques. These technology specialists support licensing officers who review individual licenses referred to DOD under provisions of the Export Administration Regulations (EAR) and the International Traffic in Arms Regulations (ITAR), administered by the Departments of Commerce and State, respectively. We have a dedicated space launch monitoring division that is tasked specifically with reviewing licenses and then developing and implementing the technology safeguard programs for space launches of U.S.-made equipment on foreign launch vehicles. In addition, the space launch division imple-

ments technology safeguards for U.S. launches of U.S.-built satellites of certain foreign ownership. Members of our space launch division combine both scientific and licensing expertise to provide “cradle to grave” supervision of space launch technology safeguard programs. There have been no waivers of “Tiananmen sanctions” to permit any launch of U.S. equipment from China since 1998. However, DTSA’s space launch division is ready to resume monitoring immediately, if a policy decision to issue such a waiver is made.

Whether in the space launch division, dual-use or munitions licensing, DTSA personnel review each license application individually with input as necessary from the military services, the Joint Staff, and, as necessary, any other DOD component. It is a process that is time-consuming, with some 24,000 licenses processed in calendar year 2001 (about 14,000 munitions licenses and 10,000 dual-use licenses). The DOD dual-use license review process also includes reviews of the end-user to minimize the risk of diversion. DTSA realigned its end-user reviews to create an assessment unit that provides more comprehensive checks on end-users identified in all dual-use license applications. This unit also assists reviews of munitions licenses. This unit is augmented by a cadre of reserve intelligence specialists who provide regular support for the end-user checks.

Despite the overall volume of licenses, I am pleased that there has been consistent improvement in processing times for munitions—down from an average of 38 days in 1999 to approximately 20 days today. On the dual-use side of our operation, processing timelines have declined from an average of 12 to 11 days over the past two years, though the complexity of dual-use licenses has increased significantly. I believe we have struck an appropriate balance between taking the time to protect national security without unnecessarily delaying action on industry’s license applications.

Where Do We Go From Here?

China is both a problematic proliferator and the largest potential future market for the U.S. It must be dealt with as part of the larger national security and foreign policy agenda set by the President, who has said that “America’s next priority to prevent mass terror is to protect against the proliferation of weapons of mass destruction and the means to deliver them.” This poses a significant policy challenge with respect to China.

The challenge of China is striking the balance between the desire to successfully compete in a vast untapped commercial market and the need to protect national security, including through effective nonproliferation. Our policies and practices must strive to minimize transfers of technologies that could contribute to potentially threatening modernization efforts. Our focus is already on the areas Beijing has identified as its “pockets of excellence,” but we need to continually be vigilant in the licensing process for new areas where our high technology might be exploited to our detriment. Our policies and practices must ensure that U.S. companies can compete for legitimate commercial sales on equal footing with their foreign competitors. We are ready and willing to hear an exporter’s case that a commodity is already widely available in the international market. For if a commodity is widely available, and not amenable to multilateral controls, then export controls may not be the best tool for addressing a national security or proliferation concern.

Specific Steps

In August 2001, the Deputy Secretary of Defense reestablished the Defense Technology Security Administration as an organization under the Under Secretary for Policy. This move reunited the technology security, counterproliferation and nonproliferation functions under a single under secretary. The Under Secretary for Policy has directed a more integrated approach than has been taken in the past. In this regard, my responsibilities include not merely export licensing and technology security policy, but counterproliferation policy as well. Counterproliferation refers to the range of military preparations and activities to reduce the threat posed by weapons of mass destruction and their delivery systems. It is distinguished from nonproliferation, which includes the range of political, economic and diplomatic tools to prevent, constrain or reverse the proliferation of weapons of mass destruction and their delivery systems. Thus, my office is now responsible for preventing potential adversaries from leveraging controllable, sensitive technologies, as well as policies for dealing with adversaries who may have already obtained such technologies.

By putting both our technology security and counterproliferation offices under one organic management structure, we hope to give DOD a more comprehensive approach to the interagency export control process, and to the development of a U.S. strategy for managing technology security and countering proliferation.

The realignment of technology security functions at DOD will pay dividends across the board. But we are paying special attention to China and its modernization and proliferation challenges in several areas:

- We oversee the DOD contribution to the ongoing review and revision of the United States Munitions List. This review is informed by our knowledge of China's key modernization priorities.
- In particular, our review of microelectronics dual-use licenses is colored by our evolving understanding of what China wants.
- DOD licensing officers work with Commerce to fashion license conditions designed to deny critical dual-use manufacturing technology to Beijing but at the same time allow U.S. industry to compete where end items are widely available from foreign suppliers.
- If and when a decision is made to resume space launch licensing for China, DTSA's license review, technology security planning and monitoring infrastructure is prepared to protect U.S. technology.
- We are exploring ways to strengthen multilateral regimes such as the Wassenaar Arrangement.

Conclusion

September 11 was a grim reminder that government needs to better integrate all elements of national power—military, law enforcement, regulations, and intelligence—into a successful national security strategy. Technology security is one of those elements. It has implications for our troops deployed abroad as well as for “homeland defense” within our borders.

The pursuit of a necessary balance between free markets and national security is affected by many factors. Striking the right balance with respect to China is especially difficult, and questions of Chinese intentions, capabilities, and conduct weigh very heavily. In confronting the challenges posed by China, I expect that the work of this Commission will offer us very important insights.

Mr. Chairman, I appreciate the opportunity to appear before the Commission and look forward to our discussions.

Co-Chairman REINSCH. Mr. Jochum?

STATEMENT OF JAMES J. JOCHUM, ASSISTANT SECRETARY OF COMMERCE FOR EXPORT ADMINISTRATION

Mr. JOCHUM. Thank you, Mr. Chairman, distinguished commissioners.

I am also honored to be here today. The Administration appreciates the opportunity to contribute to the work of this Commission.

Before turning to the specific issues of China, I would like to briefly discuss the Bureau of Export's approach to dual-use export controls. BXA's mission is to implement an export control system that prevents the diversion of sensitive technologies that could jeopardize national security, while at the same time protecting U.S. economic security by allowing U.S. companies to compete for legitimate commercial sales on an equal footing with their foreign competitors.

As you know, free and open trade is a fundamental component of the Bush Administration's economic and foreign policy. The President strongly supports trade promotion authority and, as it relates to this Commission's work, normalizing trade relations with China, including support for China's entry into the World Trade Organization.

While some may view export controls as an impediment to trade, we believe that the work of BXA supports the Administration's free trade agenda. Effective export controls reduce the likelihood of terrorist acts and the proliferation of weapons of mass destruction that disrupt the conditions necessary for a safe and secure global economy—conditions necessary for free trade.

China itself can be viewed as a microcosm of the challenges we face as export control officials. On one hand, China is the fastest-growing market in the world for foreign trade and investment, particularly in the technology sector. China's membership in the World Trade Organization should create even greater opportunities for U.S. exporters.

If U.S. producers are not allowed to compete alongside their foreign competitors in the China market, the implications could include the loss of high-paying American jobs and a stifling of technological innovation in certain sectors.

On the other hand, China remains a proliferation risk, as Lisa described and Vann will discuss here as well. We must recognize both of these facts as we continue to develop and update U.S. export control policy.

With this background in mind, I'd like to spend a few minutes outlining the licensing policy for U.S. exports of controlled goods to China.

The United States maintains export controls on dual-use items to every country in the world. The level of control differs, however, based on a number of factors, including the country's membership in nonproliferation regimes, the nonproliferation credentials of the particular country, the technical sophistication of the item to be exported, and the proposed end use and end user.

One way we distinguish among countries is through the use of license exceptions. For example, few licenses are required to export to a NATO ally who is a member of a nonproliferation regime—say the United Kingdom, France, or Germany—while a virtual embargo is maintained on trade and controlled goods with countries such as Iraq, Iran, or Libya.

China is afforded very few such license exceptions. This means that BXA requires a license for a greater number of items exported to China than for most other destinations. In fact, over the past few years, China has accounted for BXA's highest volume of export license applications.

There are several specific licensing policies which apply to China that bear mentioning.

Nuclear nonproliferation—the export of any item that would make a direct and significant contribution to nuclear weapons and their delivery systems in China is prohibited. The U.S. Government reviews applications to export nuclear proliferation-controlled items for commercial end use on a case-by-case basis, with a high level of scrutiny.

Missile technology—applications to export items to China that are controlled for missile technology reasons are reviewed with a high level of scrutiny on a case-by-case basis to determine whether the export will make a material contribution to the proliferation of missiles. If a material contribution is found, the license will be denied. If no material contribution is found, and the application is approved through the interagency process, the President must still certify to Congress prior to the license being granted that 1) the export is not detrimental to the U.S. space launch industry; and 2) the equipment, including any indirect technical benefit that could be derived from the export, will not measurably improve China's missile or space launch capabilities.

As a result of both the careful scrutiny we give to these items and the Presidential certification requirement, applications for the export of missile technology-controlled items to China are approved very infrequently. In fact, since 1999, only two such exports have been approved.

High-performance computers—for high-performance computers, countries are grouped into three general categories. China is currently a Tier 3 country, meaning that exports of computers up to 85,000 MTOPS can be shipped without a license. Exports of computers performing above that level are reviewed on a case-by-case basis.

On January 2, President Bush announced that the current Tier 3 licensing threshold will be raised to 190,000 MTOPS. As the White House stated at that time, these changes reflect the President's ongoing effort to update the U.S. export control system so that it protects U.S. national security while at the same time allowing America's high-tech companies to innovate and compete in today's marketplace.

Chemical and biological controls—the export of items that would make a material contribution to the development or use of chemical or biological weapons is prohibited. In addition, China is one of only 34 countries to which we require a license to export chemical and biological-related equipment.

Crime control items—pursuant to the Tiananmen Square sanctions, the export of crime control items to China is prohibited. This includes items such as fingerprint identification systems and shotguns.

Other than these specific license policies, applications to export controlled goods to China are reviewed on a case-by-case basis to determine whether the item would make a direct and significant contribution to China's military capabilities.

In addition to these commodity-based licensing requirements, another way that BXA ensures that strategic goods are not diverted to unauthorized end use in China and elsewhere is through implementation of the Enhanced Proliferation Control Initiative, known as EPCI. EPCI provides authority for the U.S. Government to block any export in cases where there is an unacceptable risk of diversion to proliferation activities.

Although the Commerce Department is the primary licensing authority for dual-use items, virtually all licensing decisions are subject to the interagency process outlined in Executive Order 12981. For China, this means that the Departments of State and Defense review and make recommendations on essentially all licenses and in addition, the Energy Department reviews all nuclear-related license applications. Input from the intelligence community is a necessary and critical component of this review. Finally, when it is warranted, the interagency review is supplemented by a pre-license check conducted in country by an export enforcement attaché.

Because of the relatively high level of controls on exports to China and the strict level of scrutiny given to these transactions, China typically accounts for BXA's highest volume of export license applications and longest licensing times. In 2001, the average processing time for a license application to China was 73 days, com-

pared with 44 days for other licenses subject to the interagency review.

Last year, BXA processed approximately 11,000 export license applications. About 1,300 of these applications, or 12 percent, were for exports to China. Of these 936 were approved, or about 72 percent, 30 were denied, and 325 were returned to the exporter without further action.

In any given year, the value of approved exports to China ranges from about \$175 million to \$500 million, which represents less than one percent of total U.S. exports to China.

I want to make three brief points about these licensing statistics. First, while the majority of license applications to China do end up being approved, every license issued contains a number of strict conditions to which companies must adhere when exporting under that license.

For example, a typical license restricts the ability of the exporter or the end user to use the item for any purpose other than its authorized use, from transferring the item to another end user or re-exporting the item to another country. And as Lisa said, we work out these conditions on an interagency basis.

One such condition, when warranted, is a post-shipment verification. A post-shipment verification not only allows BXA to verify the use and location of the item that was exported, but it also provides us with information for future licensing decisions with respect to that particular entity or item.

The second point I would make about the licensing statistics is that U.S. nonproliferation objectives can often be advanced by authorizing the U.S. export of a particular item. There are many companies in Europe and Asia willing to sell to the highly competitive China market. In many sectors, unfortunately, the U.S. industry no longer holds a significant technological edge over our foreign competitors. Therefore, the choice for us as export control officials is often whether to allow a U.S. company to export the item, which in turn allows the U.S. Government to strictly condition or limit its end use and monitor compliance with such conditions, or to allow a foreign competitor to sell the same item and relinquish the ability to further control or monitor its use.

Finally, one should not underestimate the deterrent effect of the export licensing system itself. Exporters generally do not apply to export an item that is subject to a licensing policy of denial. The statistics relating to license denials include very few cases, if any, related to crime control times, for instance, or items that could support China's nuclear program. On the contrary, those license applications are never submitted and the exports not made because of the policy prohibiting such exports.

I hope that today I was able to give the Commission a better understanding of current U.S. export control policy toward China. As I said at the beginning of the testimony, and I think you will hear from all of us, China will continue to present a significant challenge for U.S. policymakers.

In closing, I would like to highlight three ways to improve U.S. export controls on China and more generally.

The first is for Congress to approve a new Export Administration Act. Relying on emergency authorities as we do today is not the

most effective means of implementing export controls on China or anyone else.

Second, we must strengthen the existing multilateral export control regimes. As you know, many of our regime partners do not view China the same way that we do. We should attempt to harmonize licensing policies to the extent possible in order to close some of the gaps in the international export control system.

Third, we must improve the interagency licensing process itself by enhancing cooperation and information exchange among the agencies and with the intelligence community. The agencies represented here today are full partners in the export licensing process, and the unique perspective that each of us brings to the table is essential to ensuring that the decisions we make are in the best interests of the American people.

Thank you again for the opportunity to testify today. I look forward to working with the Commission and with Congress to continue to strengthen our export control system.

Co-Chairman REINSCH. Thank you.

[The statement follows:]

PREPARED STATEMENT OF JAMES J. JOCHUM

Mr. Chairman and Distinguished Commissioners: I am pleased to testify today before the U.S.-China Commission on the issue of export controls. In my brief comments, I hope to give the Commission an understanding of U.S. dual-use export control policy toward China, the licensing process, the volume and make-up of controlled trade with China, and finally, ways to improve the effectiveness of the export control system generally.

Before turning to the specific issue of China, however, I would like to briefly discuss the Bureau's approach to dual-use export controls generally. The Bureau of Export Administration (BXA) administers and enforces controls on the export of sensitive dual-use items and technologies for national security and foreign policy reasons. BXA's mission is to implement an export control system that prevents the diversion of sensitive technologies that could jeopardize national security, while at the same time protecting U.S. economic security by allowing U.S. companies to compete for legitimate commercial sales on an equal footing with their foreign competitors.

As you know, free and open trade is a fundamental component of the Bush Administration's economic and foreign policy. The President strongly supports trade promotion authority and, as it relates to this Commission's work, normalizing trade relations with China, which includes support for China's entry into the World Trade Organization.

While some may view export controls as an impediment to trade, we believe that the work of BXA supports the Administration's free trade agenda. Effective export controls reduce the likelihood of terrorist acts and the proliferation of weapons of mass destruction that disrupt the conditions necessary for a safe and secure global economy-conditions necessary for free trade.

Similarly, effective export controls are an integral component in maintaining the political support for a free trade agenda, and economic globalization generally. Obviously, the American public would not support a trading system that results in the United States arming terrorists or other potential adversaries. Export controls, then, are a necessary element in sustaining both the political support for free trade and the commercial environment in which free and open trade can exist.

China, itself, can be viewed as a microcosm of the challenges we face as export control officials. On one hand, China is the fastest growing market in the world for foreign trade and investment, particularly in the technology sector. China's membership in the World Trade Organization should create even greater opportunities for U.S. exporters. If U.S. producers are not allowed to compete along side their foreign competitors in the China market, the implications could include the loss of American jobs and a stifling of technological innovation in certain sectors. On the other hand, China remains a proliferation risk, as others here today will discuss in greater detail. We must recognize both of these facts as we continue to develop and update U.S. export control policy.

Licensing Policy for Exports to China

With this background in mind, I'd like to spend a few minutes outlining the licensing policy for U.S. exports of controlled goods to China.

The United States maintains export controls on dual-use items to every country in the world. The level of control differs, however, based on a number of factors, including the country's membership in nonproliferation regimes, the nonproliferation credentials of that country, the technical sophistication of the item to be exported, and the proposed end use and end user. One way we distinguish among countries is through the use of license exceptions. For example, few licenses are required to export to a NATO ally who is a member of a nonproliferation regime—say the U.K., France or Germany—while a virtual embargo is maintained on trade in controlled goods with countries such as Iraq, Iran or Libya.

China is afforded very few such license exceptions. This means that BXA requires a license for a greater number of items exported to China than for most other destinations. In fact, over the past few years, China has accounted for BXA's highest volume of export license applications.

There are other specific licensing policies which apply to China that bear mentioning:

Nuclear Nonproliferation

The export of any item that would make a direct and significant contribution to nuclear weapons and their delivery systems in China is prohibited. The U.S. Government will review applications to export nuclear proliferation-controlled items to a non-nuclear end use or for a commercial end use on a case-by-case basis, with a high level of scrutiny.

Missile Technology

Applications to export items to China that are controlled for missile technology reasons are reviewed with a high level of scrutiny, on a case-by-case basis, to determine whether the export would make a material contribution to the proliferation of missiles. If a material contribution is found, the license will be denied. If no material contribution is found, and the application is approved through the interagency process, the President must, prior to the license being granted, certify to Congress that: (1) the export is not detrimental to the U.S. space launch industry; and (2) the equipment, including any indirect technical benefit that could be derived from the export, will not measurably improve China's missile or space launch capabilities.

As a result of both the careful scrutiny we give to these items and the presidential certification requirement, applications for the export of missile technology-controlled items to China are approved infrequently. In fact, since 1999, only two such exports have been approved, although several applications are currently pending.

High Performance Computers

For high performance computers, countries are grouped into three general categories. China is a Tier 3 country, meaning exports of computers up to 85,000 MTOPs can be shipped without a license. Exports of computers performing above that level are reviewed on a case-by-case basis. On January 2, 2002, President Bush announced that the current Tier 3 licensing threshold of 85,000 MTOPs will be raised to 190,000 MTOPs. As the White House stated, these changes reflect the President's ongoing effort to update the U.S. export control system so that it protects U.S. national security, while at the same time, allows America's high tech companies to innovate and compete in today's marketplace.

Chemical and Biological Controls

The export of items that would make a material contribution to the design, development, production, stockpiling, or use of chemical or biological weapons is prohibited. Applications for the export of other items will be reviewed on a case-by-case basis. In addition, China is one of only 34 countries to which we require a license to export chemical and biological-related equipment.

Crime Control

Pursuant to the Tiananmen Square sanctions, the export of crime control items to China is prohibited. This includes items such as fingerprint identification systems and shotguns.

National Security Controls

Other applications to export to China are reviewed on a case-by-case basis to determine whether the item would make a direct and significant contribution to China's military capabilities.

EPCI and the Entity List

In addition to commodity-based licensing requirements, another way BXA ensures that strategic goods are not diverted to unauthorized end use in China and elsewhere is through implementation of the Enhanced Proliferation Control Initiative (EPCI). EPCI provides authority for the government to block any export in cases where there is an unacceptable risk of diversion to proliferation activities.

One way EPCI is implemented is through the publication of the Entity List. The Entity List identifies specific end users that pose a proliferation risk. The Entity List is developed through an interagency process and is based on specific information on a particular entity. Currently, there are 19 Chinese entities on the list. A license is required to export to these entities items on the Commerce Control List and, in some cases, low-level items that are not controlled for other purposes. The Entity List is one of the important ways the U.S. Government informs exporters about proliferation concerns under the EPCI provisions.

Licensing Process and Statistics

Although the Commerce Department is the primary licensing authority for dual-use items, virtually all licensing decisions are subject to the interagency process outlined in Executive Order 12981. For China, this means that the Departments of State and Defense review and make recommendation on essentially all licenses and, in addition, the Energy Department reviews all nuclear related license applications. Input from the intelligence community is also a necessary and critical component of this review. Finally, when it is warranted, the interagency review is supplemented by a pre-license check, conducted in-country, by an export enforcement attaché assigned to the U.S. Embassy.

Because of the relatively high level of controls on exports to China and the strict level of scrutiny given to these transactions, China typically accounts for BXA's highest volume of export license applications and longest licensing times. In 2001, the average processing time for a license application to China was 73 days, compared with an average processing time of 44 days for all licenses subject to interagency review.

In 2001, BXA processed approximately 11,000 export license applications. About 1,300 license applications (or 12 percent) were for exports to China. However, 46 percent of these applications, were for domestic transfers of technology, known as "deemed exports," to Chinese foreign nationals working for U.S. companies. Of all license applications for China, 936 were approved (72 percent), 30 were denied, and 325 were returned to the exporter without further action. Applications are returned to exporters for a number of reasons, including instances where no license is required, when the exporter provides insufficient information to process the license, or when the item falls under State Department licensing jurisdiction. In any given year, the value of approved exports to China ranges from about \$175 million to \$500 million, which represents only a fraction (less than one percent) of total U.S. exports to China.

I want to make three brief points about these licensing statistics. First, while the majority of license applications to China are approved, every license issued contains a number of strict conditions to which companies must adhere when exporting under the authority of that license. For example, a typical license restricts the ability of the exporter or end user from using the item for any purpose other than its authorized use, from transferring the item to another end user, or reexporting the item to another country. One such condition, when warranted, is a post-shipment verification (PSV). A PSV not only allows BXA to verify the use and location of the exported item, but also provides us with information for future licensing decisions with respect to that particular entity or item.

Second, U.S. nonproliferation objectives can often be advanced by authorizing the U.S. sale of a particular item. There are many companies in Europe and Asia willing to sell to the highly competitive China market. In many sectors, U.S. industry no longer holds a significant technological edge over its foreign competitors. Therefore, the choice for export control officials is often whether to allow a U.S. company to export an item, which in turn allows the U.S. government to strictly condition or limit its end use and monitor compliance with such conditions, or to allow a foreign competitor to sell the same item and relinquish the ability to further control or monitor its use.

Finally, one should also not underestimate the deterrent effect of the export licensing system itself. Exporters generally do not apply to export an item that is subject to a licensing policy of denial. The statistics relating to license denials include very few cases—if any—related to crime control items, for instance, or items that could support China's nuclear program. On the contrary, those license applications

are never submitted—and the exports not made—because of the policy prohibiting such exports.

Looking Ahead

I hope this gives the Commission a better understanding of current U.S. export control policy toward China. As I said at the beginning of my testimony, China will continue to present a significant challenge for U.S. policy makers. In closing, I would like to highlight three ways to improve U.S. export controls on China, and more generally.

The first is for Congress to approve a new Export Administration Act. Relying on emergency authorities, as we do today, is not the most effective means of implementing export controls on China or anyone else.

Second, we must strengthen the existing multilateral export control regimes. As you know, many of our regime partners do not view China the same way we do. We should attempt to harmonize licensing policies to a greater extent in order to close some of the gaps in the international export control system.

Third, we must improve the interagency licensing process by enhancing cooperation and information exchange among the agencies, and with the intelligence community. The agencies represented here today are partners in the export licensing process and the unique perspective that each of us brings to the table is essential to ensuring that the decisions we make are in the best interests of the American people.

Thank you for the opportunity to testify today. I look forward to working with the Commission and with Congress to continue to strengthen our export control system.

Co-Chairman REINSCH. Mr. Van Diepen?

STATEMENT OF VANN H. VAN DIEPEN, ACTING DEPUTY ASSISTANT SECRETARY OF STATE FOR NONPROLIFERATION

Mr. VAN DIEPEN. Thank you, Mr. Chairman, and members of the Commission. Thank you for the opportunity to provide the views of the Department of State on export controls and China. I will briefly summarize my written testimony.

Our relationship with China continues to be one of the most complex foreign policy issues facing this Administration. We have been encouraged by the level of cooperation that we have received from China on fighting terrorism since September 11. However, this does not mean that we have diminished in any way our commitment to pursue U.S. objectives in areas where key differences exist between us and China, such as nonproliferation and human rights. To this end, existing export controls play a crucial role in safeguarding U.S. national security and foreign policy interests while also upholding important U.S. political and economic interests in responsible trade with China.

China is a focus of our export control policy because it is a growing regional military power and because Chinese entities have been involved in proliferation-related activities.

The U.S. applies strong export controls on both dual-use items and munitions, with the goal of not contributing to weapons of mass destruction, missile, and other military programs of concern in China or elsewhere.

At the same time, U.S. industry has rightly identified China as the largest potential market of the coming century. Now is a critical time when our companies are jockeying for position in the market with competitors from Europe and Asia. First entry is often the difference between success and failure.

When the business relationship involves controlled dual-use items, these realities require export control policy and individual licensing decisions that strike an appropriate balance between traditional security concerns and U.S. economic security. This can be

particularly problematic with China, where it is often difficult to distinguish between the public and private sectors and between military and civilian end users.

Ultimately, however, when there is a conflict between economic and traditional security concerns export controls must uphold U.S. national security and foreign policy.

As to the export controls themselves, exports to China of items on the U.S. Munitions List, which currently includes satellites and many satellite components, are prohibited by the Tiananmen Square sanctions. Several Presidential national interest waivers have been granted over the years, mostly to launch satellites from China and for encryption equipment; but the overall number of Munitions List exports to China since 1989 has been extremely small.

Exports of satellites and components for launch from China have sometimes been prohibited because of Chinese missile proliferation activities, and there have been periods when we would not consider such Tiananmen square waivers or satellite licenses because of proliferation concerns.

As noted in my written testimony, we currently are in such a period until such time as China takes steps to resolve our concerns regarding implementation of its November 2000 missile non-proliferation commitments.

On the dual-use side, the U.S. continues to maintain a system of dual-use controls that focuses on evaluating the appropriateness of the proposed export to the civil needs of the end user and the risk of diversion, a system that is sensitive to the economic consequences of licensing decisions while still upholding U.S. national security.

Jim and our written testimony describe the dual-use controls themselves in some detail.

The bulk of these U.S. export controls are maintained in harmony with over 30 other countries that are members of one or more of the multilateral nonproliferation regimes. The Australia Group chemical-biological regime, the Missile Technology Control Regime, the Nuclear Suppliers Group, and the Wassenaar Arrangement on conventional arms and associated dual-use items. This helps keep our export controls from being undermined by other countries.

These regimes, in addition to our discussions with and demarches to the major potential supplier nations of sensitive exports, have helped preserve the integrity of U.S. export controls, including vis-a-vis China.

I would like to comment now on the adequacy of our export controls as they concern China. Some, citing China's modernizing military, are concerned that our controls are inadequate. Others, including some in industry, just as loudly question the utility of limiting access to a lucrative market.

While it may ultimately be unsatisfying to all sides, the reality is somewhere in between, which is par for the course in export control, which must balance national security concerns and foreign policy concerns with economic concerns.

U.S. export control policy on China allows us to implement stringent sanctions on end-users of concern and prohibit specific mili-

tary or proliferation-related exports, relying on thorough reviews of applications and the extensive license conditions imposed to take national security concerns into account.

Our policy also allows us to treat flexibly areas where the technology is widely available as commodity items or physically impractical to control.

The U.S. continually reviews its export control policies in an effort to take into account the realities of the market and the technology.

Finally, it is important that we continue to maintain an active dialogue on and with China. The State Department welcomes the opportunity to discuss these crucial issues with Members of Congress and the Commission.

I look forward to your questions.

Thank you.

[The statement follows:]

PREPARED STATEMENT OF VANN H. VAN DIEPEN

Members of the Commission: Thank you for the opportunity to provide the views of the Department of State on export controls and China.

Our relationship with China continues to be one of the most complex foreign policy issues facing this Administration. We have been encouraged by the level of cooperation that we have received from China on fighting terrorism since September 11. However, this does not mean that we have diminished in any way our commitment to pursue our objectives in areas where key differences exist between us, such as nonproliferation and human rights. To this end, I believe that existing export controls play a crucial role in safeguarding U.S. national security and foreign policy interests while also upholding important U.S. political and economic interests in responsible trade with China.

China is a focus of our export control policy because it is a growing regional military power and because Chinese entities have been involved in proliferation-related activities. The Administration applies strong export controls on both dual-use items and munitions with the goal of not contributing to nuclear, missile, CBW and other military programs of concern in China or elsewhere.

Before I elaborate on the controls in the Export Administration Regulations (EAR) and the International Traffic in Arms Regulations (ITAR), it is important to comment on China as a market. U.S. industry has rightly identified China as the largest potential market of the coming century. Now is a critical time when our companies are jockeying for position in the market with competitors from Europe and Asia. First entry is often the difference between success and failure. When the business relationship involves controlled dual-use items, these realities require export control policy and individual licensing decisions that strike an appropriate balance between traditional security concerns and U.S. economic security. This can be particularly problematic in our relationship with China, where it is often difficult to identify the line between the public and private sectors and between military and civil end-users.

Ultimately, however, when there is a conflict between economic and traditional security concerns, export controls must uphold U.S. national security and foreign policy. This is particularly clear in the case of munitions exports.

Munitions exports

Exports to China of items on the U.S. Munitions List (USML), which currently includes satellites and many satellite components, are prohibited by the sanctions imposed following the 1989 Tiananmen Square massacre. The sanctions allow for a Presidential waiver if an export is deemed to be in the U.S. national interest. Several waivers have been granted over the years to allow the launch of satellites from China (including those under Commerce control pursuant to a separate provision of the Tiananmen sanctions), as well as for encryption equipment when it was on the USML. But the overall number of munitions-list exports to China since 1989 has been extremely small.

Exports of satellites and components for launch from China have sometimes been prohibited because of Chinese missile proliferation activities, and there have been

periods where we would not consider such waivers or satellite licenses because of proliferation concerns.

For example, as a matter of policy the U.S. decided in February 2000 not to approve satellite licenses or waivers for China until it had addressed our missile proliferation concerns. In November 2000, the Chinese made certain missile nonproliferation commitments to us that made it possible for us to resume normal processing of licenses for the launch of U.S. satellites on Chinese boosters. We reviewed cases that had been submitted and were considering whether to recommend waivers of Tiananmen sanctions to the President. However, because of subsequent exports to Pakistan by Chinese entities that were inconsistent with the November 2000 U.S.-China missile nonproliferation arrangement, the U.S. in September 2001 sanctioned a Chinese entity, and, by extension, certain activities of the Chinese government. These missile sanctions preclude for two years approval of new export licenses for the export to China of any items on the Missile Technology Control Regime (MTCR) Annex (which, in USML terms, would include satellites containing Annex items) and present another barrier, in addition to the Tiananmen sanctions, to the export of U.S. satellites, or foreign satellites containing USML components, to China.

We have discussed this issue with China, including at senior levels, and remain open to further dialogue. The key to moving forward on this issue is in China's hands. China must take steps to resolve our concerns regarding implementation of its November 2000 missile nonproliferation commitments—including putting in place comprehensive missile-related export controls—before we can consider waiving the September 2001 missile sanctions and recommending to the President that he waive Tiananmen sanctions for satellite projects.

Dual-use Goods

By definition, dual-use items pose fewer national security risks than items under munitions controls. Decisions on dual-use exports, therefore, must be more sensitive to the economic consequences while still upholding U.S. national security. Therefore, the Administration continues to maintain a system of dual-use controls, including on China, that focuses on evaluating the appropriateness of the proposed export to the civil needs of the end-user and the risk of diversion.

The Commerce Department under the EAR maintains dual-use controls that include China in the following areas of proliferation and military concern; National Security (NS), Nuclear Nonproliferation (NP), Missile Technology (MT), and Chemical and Biological Weapons (CB). The NS-control specifically outlines a policy of extended review or denial for China if the item makes a “direct and significant” contribution to electronic and anti-submarine warfare, intelligence gathering, power projection or air superiority. The NP-control includes a policy of extended review or denial for items to China that make a “direct and significant” contribution to nuclear weapons and their delivery systems. The MT-control includes a policy of denial for items deemed to make a “material contribution” to missile proliferation; various restraint and denial criteria also are required by U.S. commitments under the Missile Technology Control Regime (MTCR). Furthermore, the National Defense Authorization Act for Fiscal Year 1999 requires that any export of MTCR-controlled items to China be preceded by a Presidential certification that the export is not detrimental to the U.S. space launch industry and will not “measurably improve” Chinese missile or space-launch capabilities. The CH-control includes a policy of denial for those items deemed to make a “material contribution” to CHW programs. The Administration also continues to enforce those aspects of the Tiananmen sanctions that prohibit export of items controlled for crime control from the U.S. to China without a license.

Another key component of our export controls generally is the ability to control items based on the end-use and end-user. EAR “catch-all” controls require a license to export or reexport any item subject to the EAR that the exporter or reexporter knows will be used for WMD- or missile-related activities in certain countries, including China. The catch-all controls also prohibit certain activities of U.S. persons in support of certain nuclear, missile, chemical or biological end-uses regardless of whether that support involves the export or reexport of items subject to the EAR. In addition, agencies involved in dual-use export control have placed a number of end-users of concern (including Chinese end-users) on the Commerce Department Entity List because of an unacceptable risk that items going to these entities would be used in, or diverted to, proliferation activities. By further focusing China controls on not only the item to be exported but also the ultimate end-use and on certain end-users, we have created a system that is both efficient and effective.

It is also of great importance that our export controls are not undermined by other countries. The U.S. therefore works closely within the multilateral regimes

and individually with regime partner countries to ensure that U.S. security is not undercut by foreign sales. The MTCR, Nuclear Suppliers Group (NSG) and Australia Group all have “no undercut” policies in place. Certain categories of items controlled by the Wassenaar Arrangement are subject to post-facto undercut reporting, albeit not a true “no undercut” policy. We believe that these regimes, in addition to our discussions with and demarches to the major potential supplier nations of sensitive exports, have helped preserve the integrity of our export controls including vis-a-vis China.

Conclusion

Are these U.S. export controls enough? That question has been posed by some concerned about what they see as a growing Chinese military threat. Are the controls too extensive? Just as loudly, some in industry question the utility of limiting access to a lucrative market. While it may be ultimately unsatisfying to all sides, the reality is somewhere in between—which is par for the course in export control. Our policy on export controls to China, as in the case of export controls more generally, must continue to balance national security concerns and other foreign policy concerns with economic concerns.

U.S. export control policy on China allows us to implement stringent sanctions on end-users of concern and prohibit specific military- or proliferation-related exports, relying on the U.S. government’s thorough reviews of applications and the extensive license conditions imposed to take national security concerns into account. Our policy also allows us to treat flexibly areas where the technology is widely available as commodity items or physically impractical to control, such as low-level computers or encryption, thus helping U.S. companies to compete in China on a level playing field. The Administration continually reviews export control policies for China and other countries in an effort to take into account the realities of the market and technology.

In conclusion, it is important that we continue to maintain an active dialogue on and with China. The State Department welcomes the opportunity to discuss these crucial issues with members of Congress and the Commission.

PANEL I DISCUSSION AND QUESTIONS AND ANSWERS

Co-Chairman REINSCH. Thank you very much, Mr. Van Diepen, and thank you for being brief.

I’m going to exercise the chair’s prerogative and ask a couple questions and then yield to my colleague Mr. Bryen, and then to anybody else who has questions. I think we have plenty of time for 5 minutes each.

Ms. Bronson, your testimony indicated that the Department of Defense has focused on the Chinese objective of making the micro-electronic sector a “pocket of excellence” or a key priority. What is the Department of Defense’s objective with regard to the Chinese microelectronics sector? What do you want to do with that sector, and how would export controls play a role there?

Ms. BRONSON. I think there are several parts of our objective. First, we want to understand how their pursuit of this particular technology might be used for their military modernization. So we want to keep abreast of developments, we want to continue to carefully study ways in which this technology, which has both commercial and military applications, could be exploited for military purposes. We would like to be in a position where we can make balanced decisions about when it is appropriate to go ahead and license that technology, when it is appropriate to put certain conditions on that technology.

Co-Chairman REINSCH. Is it all ad hoc, or do you have a general view about where you want to position them with respect to the exports we send them?

Ms. BRONSON. I think the answer is actually somewhere in the middle. A case-by-case review of licenses is not an ad hoc policy;

it is a thoughtful way of going through the facts of each case based upon the intelligence information we know and based upon the technical parameters of a particular license request, the context, and where it is going and making decisions about whether or not there is a risk of diversion.

Co-Chairman REINSCH. As I recall, it seems to me a policy in the past—and whether or not it was articulated is one question—was that we try to make sure that, particularly in this sector, they stay two generations behind. Is that your policy?

Ms. BRONSON. That is not the policy of the Department of Defense or the United States Government.

Co-Chairman REINSCH. It is not. What is your policy, then?

Ms. BRONSON. The policy is laid out in the Export Administration regulations, which my colleagues from Commerce and State can go through for you, and that is the policy that we follow in the Department of Defense.

Co-Chairman REINSCH. That is very helpful.

Also still on microelectronics, with respect to high-performance computers, does the Department of Defense believe that we need to continue to maintain controls on high-performance computers, and if so, at what level?

Ms. BRONSON. The Department of Defense agrees with other experts that MTOPS has ceased to be a useful metric for controlling high-performance computers. We are currently engaged with our interagency colleagues in an in-depth study of what the specific national security implications are of various other options for going ahead and continuing to control high-performance computers.

There are a number of applications for computers which for the most part are only sought after by DOD entities or by research laboratories or by DOE laboratories that have certain specific applications that we have concerns about.

Co-Chairman REINSCH. I assume you have seen the study that was done by your Department in the previous Administration that studied exactly that question and concluded there were not any other metrics that were adequate. Do you reject that?

Ms. BRONSON. I have looked at that study. I neither accept nor reject it. I note that it is not a comprehensive study of every, single possible other option for controlling technology. I understand that as far as the report goes, in terms of the specific alternate metrics that it looked at, it has made some useful commentary about why those metrics are not as useful.

However, there are other metrics that the report did not investigate, and in the interest of national security, it is my belief that we have an obligation to go ahead and look at those other metrics and to look carefully and thoughtfully at the balance between the national security concerns that could be involved in the highest-end computers against the commercial interests.

Co-Chairman REINSCH. Would you care to tell us what those other metrics are?

Ms. BRONSON. Those metrics are currently under study. We have not yet completed our internal deliberations, and we have not yet completed our interagency deliberations.

I might also add that we have asked the intelligence community and they have just about finished a study of what certain countries

like China are after in their pursuit of various high-performance computers, and that will be a part of our analysis and the inter-agency deliberations.

Co-Chairman REINSCH. Good. I have one more question, and then I'll stop for this round.

Mr. Van Diepen—and I don't mean to ignore you, Mr. Jochum; I'll get back to you—Mr. Jochum's written testimony referred to the entities list, and I believe Mr. Van Diepen mentioned it as well—Mr. Van Diepen, what is the State Department's view about how that list should be constructed and what the process should be for placing names on it or removing names from it?

Mr. VAN DIEPEN. Well, first of all, the Entities List is just one of two components of the so-called catchall control or Enhanced Proliferation Control Initiative that Jim talked about in his testimony. The overarching part is the standing regulatory requirement that if a U.S. person knows that his good or service or activity is intended for a WMD or missile program, including in China, he has to come in for a license.

In addition, we have the regulatory authority to inform a U.S. person that his good or service or activity requires a license because of an unacceptable risk of use in or diversion to a WMD or missile program. And one way of doing that involves the Entities List, although it's not the only way.

Co-Chairman REINSCH. I understand. How many names are on the list right now, roughly—40; 300; 8,000?

Mr. VAN DIEPEN. For China specifically?

Co-Chairman REINSCH. No—

Mr. VAN DIEPEN. Overall? I would guess less than 100; for China, it is 19.

Co-Chairman REINSCH. Nineteen. Why so few? I would think there are more than 19 entities in China that are problematic.

Mr. VAN DIEPEN. Well, I think implicit in your question is the question of what is the utility of the Entities List, and—

Co-Chairman REINSCH. No. My question is what is the process for putting names on them, and why aren't there more names on them.

Mr. VAN DIEPEN. The process is that an agency has to decide that there is such an unacceptable risk of use in or diversion to WMD that would be presented by otherwise uncontrolled U.S. export to an entity that it believes it would be warranted to put that entity on the entities list, and that decision is then run through the same sort of decision-making process as would be the case for Commerce Department license. So if an agency has made a nomination, and if in effect there is a majority of agencies, which support putting that entity on the list, it will go on the list.

So if in your view there are too few, then agencies are not nominating enough, or there is not a majority vote to put enough on the list.

Co-Chairman REINSCH. There is a vote at the end. All right. Thank you. That's worth exploring, but my time is up.

Commissioner Bryen?

Co-Chairman BRYEN. Thank you.

First, I want to thank the witnesses for their testimony. I think it was quite interesting.

I want to start with a broad question for all the witnesses. In Mr. Jochum's testimony, he indicated that most of the licensing activity in the Commerce Department, which means the other agencies as well, involves China. I don't know what the proportion is; do you have a percentage—75 percent, 85 percent?

Mr. JOCHUM. I'm sorry. The percentage of total license applications?

Co-Chairman BRYEN. Yes.

Mr. JOCHUM. It's only about 10 to 12 percent in any given year, actually.

Co-Chairman BRYEN. That is China?

Mr. JOCHUM. Right. Last year, we had 11,000 applications, and 1,300 were for China. That is pretty typical.

Co-Chairman BRYEN. You say that China has accounted for BXA's highest volume of export license applications.

Mr. JOCHUM. That's right. They are the highest licensed destination, but they account for only about 10 to 12 percent of total licenses.

Co-Chairman BRYEN. Okay. What I want to know from everyone is how do you train your people to deal with the China case, and do you train them, and how many experts do you have who understand the dynamics of that problem.

Jim, you start off.

Mr. JOCHUM. I have about 50 licensing officers who process the 11,000 applications. We do have analysts and licensing officers who have expertise in China. We recruit specifically for expertise in certain areas, as we have for the Middle East and other areas. We have ongoing training programs from a technical standpoint and also, I guess, more of an economic standpoint. We interact very often with the intelligence community. Up until last month, unfortunately, we had a detailee from the agency in BXA who provided briefings on a very regular basis.

Co-Chairman BRYEN. Is there any formal way that the staff as a whole is briefed and educated by the intelligence community, by the—

Mr. JOCHUM. Absolutely, absolutely. We probably had briefings every other week, and it was open to all people, and I certainly encourage my people to take part in those. They would range from the economic situation in China, the political situation, the proliferation concerns with China, and even on specific commodity items like high-performance computers and other things.

Mr. VAN DIEPEN. I think that in our case, we tend to look at these licenses more from a functional standpoint than a country or regional standpoint, at least on the dual-use side. And we chair interagency groups that look, for example, at all missile technology licenses, a chemical-biological group, a nuclear group. And at the table will be people from the intelligence community, the law enforcement community, Commerce, DOD, all of whom bring their respective expertise to the table.

Our comparative advantages tend to be looking at things in terms of U.S. international commitments under the various non-proliferation regimes and enforcing various U.S. unilateral non-proliferation policies.

Co-Chairman BRYEN. Secretary Bronson?

Ms. BRONSON. In our Policy Division, we have certain experts who focus specifically on China. If what you are asking is do we have a formal way in which we sensitize all of our licensing officers about China in particular, the answer is we don't have a formal program. But your question has caused me just as I am sitting here to think that that might be something for us to go ahead and take a look at the way in which we ensure that all of our people are sensitized to various intelligence updates.

Our engineers go ahead and do their own personal professional reading to stay abreast of various developments. But I will take this home as something that is worth looking at more closely.

Co-Chairman BRYEN. It is something that concerns me, and I think it is an area that if you can improve that, you can do a better job in this field.

I have some specific questions on the topic areas of space launch, supercomputers, and microelectronics. First, in the area of space launch, which is a very complicated area, I was involved in—my own personal view is that we shouldn't be launching satellites from China because I am very worried about improving the Chinese ICBM capability. Isn't it a fact that these space launches are on the same rocket that is used by China for its ICBMs—the Long March III?

I guess Secretary Bronson should probably answer that one.

Ms. BRONSON. I don't know the answer to that question, but I'll find out for you.

Co-Chairman BRYEN. I believe you'll find out the answer is that it is.

Has there been any effort—we have been doing space launch with China intermittently since—I think it is all post-Tiananmen—but by Presidential exception, and some of that has worked without incident, and then there have been some very nasty incidents, the newspapers tell us and we are well aware.

The question I have is have we done an audit of any kind on the security procedures and the success of those security procedures in respect to all the launches—not just the famous Loral situation, which actually didn't involve as much the launch as it involved the aftermath—but have we done an audit to see if the security measures that are supposed to protect U.S. national security in the field work? Do we have any idea if they work?

Ms. BRONSON. We have gone ahead and in the last couple of years, in response to a number of specific events and a number of specific investigations, taken a number of steps to go ahead and enhance the security of launches. One of those steps has been the creation in my organization—I might add, before my time—of an amazing synergistic unit where we have in one place the review of the licenses, in fact, even before the licenses, the initial discussions that take place with industry so there can be an understanding of the kind of technology that they might contemplate transferring in a space launch so that we are able to have cradle-to-grave treatment of the process.

In my space launch branch, the same engineers and scientists review the licenses, they develop the technology control plans, and then they go out and actually supervise and monitor the launches.

This has been done specifically in response over the last couple of years to problems that have been identified.

There has been the development of a physical security system specifically designed to detect, deter, and record unauthorized access to satellites. We have developed a closed circuit television perimeter with a 360-degree view around the satellite. It has an independent intrusion detection system that includes motion sensors, magnetic contacts for the doors and other access points, and personal duress alarms for security and technical personnel monitoring who have access to the spacecraft. This is controlled by DOD, it is independently operated, and it provides an objective positive control method to record evidence of unauthorized access to the satellite.

So a number of steps have been taken both in organizational structure, in review structure, and in technology developments over the last couple of years to go ahead and respond to the very real concerns of commissions like the Cox Commission.

Co-Chairman BRYEN. I understand I'm out of time, so I will come back later with my other questions.

Co-Chairman REINSCH. The next person on my list is Commissioner Mulloy.

Commissioner MULLOY. Thank you, Commissioner Reinsch.

Ms. Bronson, on page 2 of the prepared testimony that you submitted to the Commission, you discuss the four different regimes that are trying to control exports on a multilateral basis. We have the missile technology control regime, which I think is missile parts or things that can make missiles; the Australia Group, which I think is chemicals; and the nuclear suppliers group, which is nuclear weapons; and that those three regimes have a "no undercut" policy.

Can you tell us what the "no undercut" policy is?

Ms. BRONSON. The "no undercut" policy essentially is that when we notify our partners in these regimes that we have made a decision not to transfer a particular item that is on the lists that are covered by these groups, that they have an obligation not to undercut us by going ahead and making the very transfer of that item that we have said that we are not going to make.

Commissioner MULLOY. In other words, the multilateral regime comes up with an agreed control list—

Ms. BRONSON. That is correct.

Commissioner MULLOY [continuing]. That you all work to put together. And then, if we won't sell it, nobody else will sell it—is that correct—among the people in that regime?

Ms. BRONSON. That is the concept of the "no undercut" policy, yes.

Commissioner MULLOY. Now, in Wassenaar, which I think governs both the Commodity Control List administered by the Commerce Department—does it also cover the Munitions List covered by the State Department?

Ms. BRONSON. Yes.

Commissioner MULLOY. Wassenaar covers both control lists?

Ms. BRONSON. Wassenaar has items on it that are covered by both the CCL and the USML, yes.

Commissioner MULLOY. The problem that you allude to in there is that we have no undercut agreement in Wassenaar. In other words, if we deny it, France, even though it is on the agreed control list, can sell it.

Ms. BRONSON. That is correct.

Commissioner MULLOY. Now, Wassenaar is aimed at what group of countries?

Ms. BRONSON. That's a good question, and therein lies one of several inadequacies of the Wassenaar arrangement. Unlike the other three regimes that we have talked about where there is a clearer coming together of the collective minds concerning who are the countries of concern, the Wassenaar arrangement as I understand it is not specifically directed toward specific countries of concern.

In addition, the Wassenaar arrangement does not have a "no undercut" policy, and that, as my colleagues have mentioned, is an item that is very high on our agenda of something that we would seek to fix because it is an inadequacy in the arrangement.

Commissioner MULLOY. But as I look on these other regimes, they probably don't really control the guts of what commercial transfers are going on around the world. Wassenaar gets into dual-use technologies, which are really the guts of the commercial transfers around the world. Is that an assumption that has merit?

Ms. BRONSON. That is not completely accurate. For example, the Australia Group, the vast majority of items for chemical and biological warfare are dual-use items. So it is not accurate to say that the other three regimes only cover things that are not dual-use.

But you are correct that there are a number of items on the Wassenaar list that are dual-use items that are sought after and that have legitimate commercial applications.

Commissioner MULLOY. Okay. On microelectronics, which you allude to as one of the areas that the Chinese want to develop a capability in for probably both commercial and perhaps other reasons—are they on the Wassenaar list? Is that an area that is covered by the Wassenaar list?

Ms. BRONSON. I believe there are aspects of microelectronics that are discussed under the Wassenaar arrangement. I will go back and get you a precise listing for the record.

Commissioner MULLOY. Okay. Then, finally, with regard to this issue, some of us went to China as part of this Commission, and to tell you the truth, I was quite surprised at the sophistication of the technology development centers that are going on in China and the foreign investment that is going into these, both U.S. and other countries. So they are building a tremendous technical capability of their own, indigenously, with the help of people who invest.

How do we control—people want to invest in microelectronic production in China because it makes commercial sense to do so—how do we get at that issue? Is there any way, or do we not get at that issue?

Ms. BRONSON. I'm not sure what you are getting at when you say "invest"—

Commissioner MULLOY. Build a plant that produces the stuff in China.

Ms. BRONSON. When a company wants to build a plant that involves equipment for the manufacture of microelectronics, they

have to come to us for a license. So we have an opportunity to go ahead and review the license requests for that manufacturing equipment. So we control it through the application licensing process and the items that are listed on either the Munitions List or on the Commodity Control List. That's how we get at an ability to observe and control those kinds of transactions.

So part of what I think you are getting at—we have a responsibility to carefully review the U.S. Munitions List and the Commodity Control List to ensure that the manufacturing parts, components, and other pieces of equipment that might give us reason for concern are covered by those lists, and we are actively involved in that process as we speak.

Commissioner MULLOY. So with regard to investment, the individual items that are being shipped to help build the indigenous capacity may be controlled, and you would look at that; but the overall transfer of know-how, technology, and ability to build on what you are learning for the next round, we don't consider that in what goes into China in terms of investment.

Ms. BRONSON. Some of those items may be applicable and may be part of the package of manufacturing equipment and processes. That is going to be done on a case-by-case basis depending upon the part, depending upon the particular equipment that is involved.

Commissioner MULLOY. Thank you.

Do I have any time left?

Co-Chairman REINSCH. No. We'll get to you again on the next round.

Commissioner MULLOY. Okay. Thank you.

Co-Chairman REINSCH. Mr. Wessel?

Commissioner WESSEL. Thank you, Mr. Chairman, and I thank the witnesses for appearing here today.

Secretary Bronson, let me ask you a question since you said with regard to the "no undercut" policy that the concept is that if we wouldn't sell, others wouldn't undercut us.

I assume there is ongoing monitoring, however, of whether our allies and others are in fact undercutting us and that you could provide to the Commission any history in that area?

Ms. BRONSON. On this one, given that I have been on the job for 120 days, my State Department colleagues who oversee the U.S. participation in that are in the best position to do that.

Commissioner WESSEL. If you could supply that to the Commission so we have some understanding of what holes there are in the "no undercut" policy and what is leaking through the system and how we may seek to gain greater adherence by our friends and competitors, we would appreciate that.

Mr. VAN DIEPEN. Mr. Commissioner, if I could interject for a second since "no undercut" has come up twice. There is an important nuance of the issue that has been missed.

The "no undercut" policies in these regimes are in fact not a ban or a veto policy. If a country notifies that it is denied an item pursuant to the rules of the regime, another country is required not to make an essentially identical sale without first consulting the country that originally made the denial. So there is no—"if we deny it, they can't sell it" is not in fact the "no undercut" rule that is in the three regimes that have "no undercut." There is a require-

ment to consult, at which time, after consultation, either the original denying country can convince the other country not to make the export, or the other country is free to go ahead and make another export.

But this consultation has some political significance, and in fact in the 10 years that I have been doing this job, I am not aware of an undercut in the two regimes that I have had the most to do with, the MTCR and the Australia Group.

So the system works well, but it doesn't work because there is a requirement not to make a corresponding sale; it works well because there is a general like-mindedness in this regime and an assumption that if another member has denied and notified something, they must have had a good reason for it, and that tends to be the sort of lubricant that makes the machine work.

We will certainly check and see if we have any information on undercuts, but my expectation is that we probably won't find any actual undercuts per se in terms of—

Commissioner WESSEL. I appreciate that. You indicated, though, as part of your description just a moment ago that if another competitor were to question our refusal to sell that we would review that again, and in fact we might sell. So if you could give us a full historical exposition of what the denial has been, whether there has been a "no undercut" discussion, whether in fact that was triggered upon the information from another country that they would like to do so that we have in fact reversed our decision or made some alternative decision and in fact have gone back and sold that.

Let me also understand in relation to the Entities List, as I was informed, that is published in the Federal Register. Is that correct?

Mr. JOCHUM. That's correct.

Commissioner WESSEL. Is that an Entities List that our competitors adhere to as well? It's in the Federal Register, so they know it; do you do any monitoring of what activities our competitors might have with regard to those entities?

Mr. JOCHUM. There is certainly no formal adoption of our Entities List in any of the multilateral control regimes, so from that standpoint, they don't comply in any formal sense. And I'm not sure what we do on an intelligence basis in terms of monitoring potential exports from our trading partners to those specific entities.

Commissioner WESSEL. Are those entities primarily—I'm understanding that there are some shadows and mirrors and smoke as it relates to PLA activities—are those entities primarily PLA-connected entities, or are they broader than that in China?

Mr. JOCHUM. Since, in my terms of office, we haven't put any entities on the list yet, I'm going to speculate. I think it is broader than that. I think that clearly when we put something on the Entities List that there is hard evidence of proliferation concerns. I don't know if that necessarily means that there is military ownership of the entities or any such relationship, but there very well may be.

Commissioner WESSEL. Do you have a list of the PLA enterprises in China so that you are reviewing their activities with a more careful eye?

Mr. JOCHUM. What we do, Commissioner, is every license that comes in for China is vetted through the intelligence community

database. At the Commerce Department, we really rely on the intelligence community to give us a readout of the bonafides of the particular end-user. We all have, I guess, individual intelligence capabilities as well that are brought to bear on a particular decision.

Commissioner WESSEL. Thank you.

I see my time is up. I'd like to get on the next round if we have that opportunity.

Co-Chairman REINSCH. This is a popular topic. All right.

Ms. Dreyer?

Commissioner DREYER. I was interested in Ms. Bronson's statement on page 5 that we are exploring ways to strengthen multilateral regimes such as the Wassenaar arrangement. One of the ways that I suppose we might be thinking of is to strengthen that "no undercut" policy, but I am wondering if you could give me some details about exactly what mechanism we are exploring and with which regimes.

Ms. BRONSON. The Administration has just begun its consideration of ways in which we might make the Wassenaar arrangement more effective. Having them in the last plenary round go ahead and agree that terrorism and the terrorism factor is something that is important to consider is an example of increasing the awareness and increasing the consensus in that arrangement of the things that we care about.

We are investigating the possibility of adoption of a "catch-all" provision so that even though something might not be specifically listed, if an item is going out that could cause problems or raise concerns about stability, that countries would be more sensitive to that.

And then there is the—

Commissioner DREYER. I'm not sure I understand what a "catch-all" provision is. Do you mean you don't have to have a specific objection to a specific aspect of this? Is that what "catch-all" means?

Ms. BRONSON. "Catch-all" means—and I'm going to let my State and Commerce colleagues chime in here—

Mr. JOCHUM. I'd be glad to. "Catch-all" is really similar to our EPCI provision, the Enhanced Proliferation Control Initiative, that I mentioned in my testimony, which means it is not necessarily an item-based control; it is a control based on the end-user and the likelihood that there would be diversion if an item went to that end-user.

So for instance, our EPCI control is often referred to as a "catch-all." We could control virtually any export—it wouldn't have to be a controlled export—if we felt that it would be diverted by that end-user to proliferation activities. It really expands the scope of our control authority.

Commissioner DREYER. Okay. So that would be one example. Are there any others?

Ms. BRONSON. We are still reviewing the lists, and we are reviewing various ways to strengthen it.

Commissioner DREYER. That makes it sound as if you are in the very early stages of considering this.

Ms. BRONSON. I think that's accurate.

Commissioner DREYER. And what agreement besides Wassenaar are you looking at in order to strengthen the multilateral regime?

Ms. BRONSON. Wassenaar is the primary focus right now.

Commissioner DREYER. Okay. For Mr. Jochum, you mentioned that we have to improve the interagency licensing process by enhancing cooperation and information exchange among the agencies. By what mechanism or mechanisms do you think that could best be done?

I have participated myself in interagency working groups, and I am not entirely happy with my own experience, and that's the reason I ask.

Mr. JOCHUM. Oh, we are very happy here on this panel. I used to be on the other side of this table but behind where you are sitting, when I was a staff member up here for six years and did work on overseeing the activities of BXA and the export control system when Commissioner Reinsch was down there. One impression I received from being up here was that there was a lot of acrimony in the interagency relationship—I hope that's fair to say, Bill; you can correct me—and that there were a couple of specific issues where the system had really almost ground to a halt with jurisdictional disputes on a few particular items. And one of my top goals coming into office was to try to change or help improve the culture of all the agencies so that we had a more cooperative way of approaching export controls.

We do have an interagency system set up under an Executive Order that tells us all of our various roles in this process and gives us strict deadlines to adhere to, and it is very specific. But I found that that had often been ignored and still is sometimes ignored.

But I think that although we have different points of view, I don't view that as a weakness; I view it as a tremendous strength. I have reached out to the other agencies, and I think we have made a tremendous amount of difference on this issue, and we now try to look at licenses from a common point of view, protecting national security, but as we have all said, not to unduly burden industry when there is no national security benefit. I think I can report after 9 months in office that we have made a lot of progress on this front.

Commissioner DREYER. But I'm a little confused by what you say when you say that, well, we all have our different points of view, but that's a strength.

Mr. JOCHUM. Yes, absolutely.

Commissioner DREYER. Are you able to reconcile these different points of view?

Mr. JOCHUM. I think we are. Lisa talked about the military capabilities of some of these items; that is certainly not my expertise, and Vann certainly has more diplomatic experience than I do. So we all bring a nuanced look at each transaction, but our goal should certainly be to reconcile them at the end of the day. I think that benefits exporters that we actually make a decision and don't just delay, and it certainly benefits national security.

Commissioner DREYER. Finally, how satisfied are all of you that people who sign end-user agreements abide by those end-user agreements, and if they don't, what do we do?

Mr. VAN DIEPEN. I'll let Jim opine on the last question. On the first question, we certainly don't regard end-user undertakings as dispositive or as a replacement for hardheaded examination of the

license itself. It is a factor; as your next panel will probably tell you, it's a hook that they can use in subsequent enforcement action. But just because, oh, guess what, this company gave us an end-user statement, if it's a flaky export, that's not going to make us more inclined to approve it.

So the end-user statement has a limited role in the licensing process and I think a more significant role in the enforcement process, but it is not a big player in whether we decide to approve or deny a license.

Commissioner DREYER. And if they do sign it and disobey it, then what?

Mr. JOCHUM. I think your next panel will tell you what happens in that situation, our enforcement people.

Co-Chairman REINSCH. Thank you.

Commissioner Robinson?

Commissioner ROBINSON. Thank you, Mr. Chairman.

I'd like to follow up on the questions of Commissioners Mulloy, Wessel, and Dreyer. Given this absence of a "no undercut" policy in the Wassenaar regime, albeit just a consultative process as I understand it, what recourse does the U.S. have in the event that we believe a dual-use item should be proscribed from sale to China or another potential adversary, but the French or the Germans or one of our other allies proceed to go forward with the sale of essentially the same militarily-relevant item? And related to that, have we ever employed such recourse-oriented options?

Mr. VAN DIEPEN. I think generally, when you were talking about friendly countries, the primary recourse is to go and talk to them and see if we can try to get them to see matters our way; and sometimes that works, and sometimes it doesn't.

Underlying that is the fact that just as different agencies don't always agree on whether a particular export is risky or not risky, countries don't always agree on that, either, and fundamentally, all these regimes work on the basis of national discretion. At bottom, it is the sovereign decision of each country as to whether or not it makes a particular export.

In my limited experience in Wassenaar but greater experience with the others, it is very, very rare that if someone makes an export that we would not make, it is an export that all of us would agree makes some sort of clear contribution to Country X's military capability; it is usually much more gray than that, and it is more of a question of the potential, the risk, not being satisfactory and so on and so forth.

Now, in theory, there are certain exports that a country could make that could actually require the imposition of sanctions under U.S. law, but I'm certainly not aware of that threshold having been crossed by our partners in Wassenaar.

Commissioner ROBINSON. So it's basically a political intervention.

Mr. VAN DIEPEN. It's basically a political intervention.

Commissioner ROBINSON. This is not directly in your purview, but I was wondering if you had a reaction to this scenario. If you believe that a Chinese or another company that has been accurately described as a known proliferator of components of weapons of mass destruction and/or ballistic missile delivery systems, i.e., a known proliferator, should continue to be given access, for example,

to the U.S. stock and bond markets to raise funds from U.S. investors—now, that may be more in the Treasury Department's venue, but obviously, money is an element of this equation—have you ever reflected on that dimension, or do you have any view on it even off-the-cuff? That question is to any of the three panelists.

Ms. BRONSON. Sure. I can tell you that personally, I have gone ahead and have thought through, when you are trying to leverage the conduct of a country, what is the range of levers that you have, and one cannot help but think about your trade relationship and your military assistance relationship in that context.

But I would add to that that there is an integrated approach that has to be taken in balancing how you use those various levers that are at your disposal, and one of the things that this Administration will do—the President has directed that we develop a proliferation strategy, and it is certainly fair game to go ahead and consider the extent to which the range of levers that are out there could be considered. But I hasten to add that one has to look at these in a contextual fashion, and one has to weigh a number of different considerations when one looks at it. But it is certainly a fair thing to consider.

Mr. JOCHUM. Not to wade into this, but I would note that the Administration, I believe, has rejected this idea in other contexts—I think with Sudan when there was an amendment on the House floor earlier this year.

I think we have tools on the nonproliferation side to provide an economic incentive not to continue proliferation activities, and I think the tools we have are adequate at this point.

Commissioner ROBINSON. So a known proliferator, then, would be allowed to raise funds in the U.S. capital markets as things stand today, and you would concur that that's an acceptable practice.

Mr. JOCHUM. No—I'm just reflecting on—trying to build an analogy of an Administration response on a similar case. But I won't speak for the Treasury Department.

Commissioner ROBINSON. And similar to that, do you believe that a company's involvement or confirmed connection to proliferation would be material information that an investor who is going to perhaps go forward in the purchase of a stock or bond of that company should properly know, just from a disclosure point of view, because obviously, you have had a lot of experience in looking at proliferating entities. I would assume that you have viewed this offense as important, if not grave. Do you think that that is a material piece of information?

Mr. JOCHUM. Commissioner, I know so little about securities law, I won't even venture. I would say that proliferation activities are very serious, and we have a range of tools that we can bring to bear from our point of view, and that's what we do.

Commissioner ROBINSON. Thank you.

Co-Chairman REINSCH. Thank you.

I want to commend Mr. Jochum on his profound answer to that series of questions.

Next is Commissioner Lewis.

Commissioner LEWIS. Thank you for your informative and provoking presentations. I'd like to ask you a question. Despite the fact that we are encouraged by the level of cooperation since 9–11,

to quote Mr. Van Diepen, and we all acknowledge that there is a growing regional military power occurring in China, and proliferation-related activities are involved there, I would like to ask each of you, do you think that China is a potential military threat to us?

Ms. BRONSON. A country that has nuclear weapons, that has missiles that can range our continent—the only answer I can give you is of course, they are a potential military threat.

Commissioner LEWIS. Okay, good. That's what I asked.

Yes?

Mr. JOCHUM. Yes. I think the President is clear on this. Certainly we have a policy of engagement from an economic standpoint—

Commissioner LEWIS. I just want you to answer that question—do you think they are a potential military threat?

Mr. JOCHUM. I would concur with Lisa's assessment.

Mr. VAN DIEPEN. By definition.

Commissioner LEWIS. Okay. Thank you.

There seems to be a conflict between protecting national security and protecting economic interests. That seems to be the conflict here. We are allowing things to be exported to a country that you admit is a potential military threat to us because other countries do it.

Are we now licensing things to China that we wouldn't license if we were the only available source?

Mr. VAN DIEPEN. Let me start to try to answer that. I think potentially, only in certain cases on the margins. For example, on the Munitions List, we sell virtually nothing to China, and those are the items of most direct military utility.

Commissioner LEWIS. In any field, are we—

Mr. VAN DIEPEN. On the dual-use side, I don't think any of us believes that we license an item that presents an unacceptable risk of posing a threat to the United States.

Commissioner LEWIS. No. My question is are we selling things that we would not sell if they were not available elsewhere from other countries.

Mr. VAN DIEPEN. I don't have an empirical answer to that, but my instinct is perhaps only on the margins.

Mr. JOCHUM. The fact that a foreign supplier exists for a particular item is a factor we consider in the licensing analysis. It is not the dispositive factor, however.

Commissioner LEWIS. Ms. Bronson, would you say that we are selling things that we would not were we the sole supplier?

Ms. BRONSON. I don't have the empirical data to answer that, but I do want to comment on something else that you said. The notion that there is a binary function here, that there is a conflict between national security and economic security—I reject that premise. It is just not that simple. We have to make decisions that weigh a number of very, very complex factors.

For example, if we deny our U.S. industries the ability to continue to be competitive, that ultimately could hurt the Department of Defense if the U.S. microelectronics industry doesn't have an incentive to continue to be the very best that they are.

So I would just caution the Commission to avoid getting into a black or white characterization here. These are very complex

issues, and they deserve a kind of considered reflection that takes into account that there are multiple dimensions here, not simply one or two.

Commissioner LEWIS. I'd like to ask a question about high-performance computers, and I would like to read a paragraph that Gary Milhollin wrote—he is going to be making a presentation to us later today—on high-performance computers. He says: “The main argument for the recent relaxation is that higher computer speeds can be achieved by wiring together a number of slower computers.” And that is one of the reasons why the decision was made to go to 190,000 from the 85,000 set by Clinton on his last day in office. He says that “The argument that higher computer speeds can be achieved by wiring together a number of slower computers proved too much, because if a number of computers, each operating at 190 billion operations per second, are grouped together, the resulting speed will be much higher than the speed achieved by combining a similar number of computers operating at 85 billion.”

His point is that the relaxation of controls ignored a December 2000 warning by the General Accounting Office to the Clinton Administration, cautioning that the decision had failed to assess the national security impact on the United States of Russia, China, or other countries obtaining high-performance computing.

Would you react to what Gary Milhollin wrote, please, Mr. Jochum?

Mr. JOCHUM. A couple of things. First, I think he misses the point. The computers we are allowing to be exported today are by no means supercomputers by definition. They are computers in the 100,000 MTOP levels. We have computers in this country that operate in the millions of MTOP levels. I just read about a computer being developed in one of our labs that would operate at the 30 million MTOP level. So we're talking about commodity items, commercial times.

I think the President's statement stands on its own on the reasons why we did this, and I would put that up against the reasons cited by Mr. Milhollin.

But when we look at high-performance computers, I think we have to look at the relevancy of this MTOP metric to enhancing any military capability, and I don't think it is very relevant. I think we are dealing with mass marketed, commodity-based items that enhance military capabilities only on the margins, and we feel very comfortable that this decision will allow us to focus our export control resources on the critical items that could really enhance weapons of mass destruction programs or military capabilities.

We don't feel that the mass marketed computer falls into that category anymore.

Co-Chairman REINSCH. Thank you.

Commissioner Becker?

Commissioner BECKER. Thank you, Mr. Chairman.

I have just a couple of questions, because I think everything that I was really concerned with has been covered very adequately up to this point.

I would like to focus just a little bit on the leakage. One of my colleagues made reference to things that were leaking through the system. I wonder if that is a concern on your part, or whether you

believe that the system that we have in place now adequately secures us from the points that we have been raising about dual-use technology. Do you feel that nothing is leaking through, that we are policing this very well?

I'd like any comments on that.

Mr. JOCHUM. Maybe I'll start. I think you'll hear from the next panel that the reason we have enforcement agencies is because although we have what I consider a sound, comprehensive export control system, people still violate it on occasion. Do we catch all of those people? That's something you might want to pursue with the next panel. But certainly I believe that we have an export control system that allows those of us at this table to make good decisions; it gives us the discretion to respond to national security concerns in China. And I don't believe we have leakage within the system. Does that mean that we shouldn't do more outreach to companies to let them know their obligations under the system? I think we should do more in that regard, and that is one way to address the issue of companies that may not know that they are dealing with controlled exports.

Commissioner BECKER. How about the other two panelists?

Mr. VAN DIEPEN. Well, in a way, it's difficult to answer that question because we don't know what we don't know. I mean, certainly, for espionage and crime and smuggling and so on and so forth, by definition there are things going out of the United States that shouldn't be going out of the United States.

Commissioner BECKER. Let me focus it a little bit more. We have heard testimony that there are literally thousands of Chinese front companies in the United States. Do you know who those companies are? Do you get a list of those in order to be able to focus on those—front companies purchasing material in the United States and, in one way or another, getting the technology back to China. Are you aware of that, or do you believe that?

Mr. VAN DIEPEN. Well, certainly, as Mr. Jochum noted, license applications get vetted against a database, and those would be among the bad end-users, I'm sure, that are in the database, and if somebody comes up as a bad end-user, we are highly unlikely to approve a license application for them.

Commissioner BECKER. In 1998, Congress mandated that a list of these companies be compiled and published. Has that been done?

Mr. VAN DIEPEN. I don't know, sir.

Commissioner BECKER. You are not aware of this?

Mr. JOCHUM. Commissioner Becker, let me address the front company issue. Front companies are companies operating within the United States, and we don't license or control transfers within the United States. I think it is an appropriate question for the FBI or other enforcement agencies whether they track the activities of these companies within the United States. If they were to re-export something that they obtained here, obviously, if it is a front company, they are probably not coming to us for a license. So again, I think it is an enforcement issue.

Commissioner BECKER. So this could be a means of leakage that would bypass the export controls?

Mr. JOCHUM. You know, as any other system, I assume we have people who work around the system, whether it is the tax code or any other U.S. regulatory-based system.

Commissioner BECKER. Finally, are there any solid recommendations that you would offer this Commission that we should address to tighten up and prevent leakage? If not now, could you give us a list of your suggestions on that? Surely, from your experience and looking at this—and I imagine you have a list of things that you are trying to prevent that has happened before that you focus on and discuss in your sessions on how to tighten things up. Could you provide those to us?

Mr. VAN DIEPEN. I think the one thing that comes to my mind immediately is more resources for intelligence and enforcement. Again, in our view, the problem is less that we are making bad deliberate export decisions than that there is lack of knowledge that might influence those decisions in ways that by definition we are not aware of, or there is smuggling and illegal activity going on that by definition doesn't come into the system, and the way you get at that is through intelligence and enforcement.

Commissioner BECKER. Thank you.

Co-Chairman REINSCH. Thank you, Commissioner Becker.

Commissioner Ledeen?

Vice Chairman LEDEEN. Thank you.

I just have two really quick questions. End-user checks—Commerce and State are supposed to do end-user checks. Are you satisfied with the cooperation you are getting from the Government of the People's Republic of China in carrying out those checks?

Mr. JOCHUM. Commissioner, if you don't mind, I'm going to defer to my colleague who will be coming up next, who runs our enforcement agency that is in charge of the end-user check program in China. I think he can give you some more detail on that.

Mr. VAN DIEPEN. And on the United States side, the so-called Blue Lantern Program is certainly active, but there have been so few munitions exports to China, I'm not aware to what extent that—

Vice Chairman LEDEEN. This would be dual-use, presumably; right?

Mr. VAN DIEPEN. Certainly the vast majority of what has been going there is.

Vice Chairman LEDEEN. The last question is on punishments. It seems to me that if we find a violation, the punishment takes place in that same box, so that if somebody violates the missile control regime, they don't get to buy missile parts for a while, as is the current case; if they violate chemical and biological things, they wouldn't be able to buy in that area, and so on.

Is that right? At the moment, China can't buy missile technology from us because first, there was Tiananmen, and then there was Pakistan; and if we get serious about what they are selling to Iran, there might be Iran as well. But the punishment would be that they are barred from pursuing interests in that area; is that right?

Mr. VAN DIEPEN. Basically, the U.S. legislation in different areas has different penalties. In the missile tech area, for example, if it is a transfer of a so-called Category 2 MTCR item, the export penalty is no new U.S. licenses for MTCR items. If, however, the ex-

port is of a Category 1 item, the penalty is no new individual licenses for anything, whether it is on the MTCR annex or not. In the chemical area, the penalty is a ban on imports into the United States and a ban on U.S. Government procurement from the entity involved. So basically, for reasons that are probably better known to people on the Hill than to us, the different legislation prescribes different penalties. So it sometimes departs from that pattern that you are suggesting.

Vice Chairman LEDEEN. Thank you.

Co-Chairman REINSCH. Mr. Bryen and I have agreed to have a lightning round just to finish off here, since there was some interest from the other Commissioners. So if Commissioners have one additional question, if you don't mind, we'll ask the next panel to forebear, and we'll go through that as quickly as we can, and I'll just go down in the same order as before, beginning with Mr. Bryen.

Co-Chairman BRYEN. Thank you.

I want to address the high-performance computer question, and specifically, the question I have is have we done a study of any kind on the tactical and strategic military implications of the transfer of supercomputers to China. And I note high-performance computers; we can use any definition you like. I don't accept that these are nontrivial. If they were nontrivial, nobody would buy them. So the question is have we done such a study, are we planning to do such a study, and shouldn't we do such a study if we haven't, given the fact that supercomputers or high-performance computers can be used for everything from constructing biological and chemical weapons to nuclear weapons to delivery systems for nuclear weapons to breaking encryption codes—and I can go on with the list—but all those have significant gravitas in terms of the military implications. So I'd like to have an answer to my question.

Ms. BRONSON. As part of our ongoing review over the last few months, we have asked the intelligence community to help us think through this issue. I don't believe we asked them specifically to focus on China, but China would be wrapped up in the kind of information they would provide us.

I think it is important that we are careful when we use terms like "supercomputers" and "high-performance computers." One of the things that we have been going through in the Department of Defense is carefully gradating the types of computing capabilities that we need for certain kinds of techniques, and one of the reasons why the MTOPS metric is not particularly useful is that it does not measure accurately pure computing power in the way in which we at Department of Defense care about it.

There are other ways to look at it, and we are actively going through and looking at things like three-dimensional simulations. Those are much more important to us than two-dimensional simulations, and we want to be able to maintain a way to keep our edge in that area. The modeling of billions of particles as opposed to millions of particles as we try to think about the development of hardened bunkers—there are areas where an ability to use computers for, as I said, three-dimensional modeling as opposed to two-dimensional modeling is an example of how we are working to do this.

Co-Chairman BRYEN. You are right. I just want to stop you for a second, which I have only one question which I have had to ask three times now. You mentioned the intelligence community, but is anyone asking the military services to do this study? The intelligence community is going to look at it from a little bit different point of view, what is the impact on China's capabilities, for example; whereas the military is going to look at what is the impact on our capabilities. And I suspect that we haven't done that piece, and that's why I ask the question.

Ms. BRONSON. I can tell you personally that an expert from the Naval Research Laboratory, for example, has been a regular visitor in my office in the last three to four months as I have been working through, and I have engaged with him in a number of conversations about what countries might be interested in these kinds of capabilities and what that impact would be on us. So we have started that process.

Co-Chairman REINSCH. Thank you.

Mr. Mulloy, do you have one more question?

Commissioner MULLOY. Yes, very briefly.

Coming back to an issue that Commissioner Bryen got into earlier—these satellite exports. When the Challenger blew up, we didn't have any domestic launch capacity, so we started permitting our guys to export these satellites to be launched in China; is that correct? That is my understanding. This helped the Chinese with their missile development program.

The satellites used to be on the Dual-use List controlled by Commerce. My understanding is that they are now on the Munitions List after the Cox Report. Is that correct?

Mr. VAN DIEPEN. After the legislative requirements that switched the jurisdiction, yes.

Commissioner MULLOY. And they are now licensed by the State Department.

What is our current policy? Are we permitting the licensing of satellites for launching in China?

Mr. VAN DIEPEN. Currently, because there are missile sanctions in place as of September 1 last year that are in place for two years, we are not able to grant new licenses for the export to Chinese Government space-related activities of MTCR, Missile Technology Control Regime, annex items. The way the State Department licenses, such items are almost always contained in satellites, and therefore, that ban would affect a license to launch a satellite on a Chinese booster. So that is hurdle one. Hurdle two, then, even if you could get over that one, there would be a requirement for a Presidential National Interest Waiver under the Tiananmen Square sanctions, and given the current state of where we are in the missile proliferation issue with China, I think it's pretty unlikely that the President would see himself in a position to issue such a waiver.

Commissioner MULLOY. Okay; so they are not being licensed. Now, finally, where do our people—how do they launch them now? Where do they go?

Mr. VAN DIEPEN. They will launch them on Ariane, the European system; they will launch them on U.S. boosters; they will launch them on Russian boosters. I think those are the predominant ones.

Commissioner MULLOY. Thank you.

Co-Chairman REINSCH. Mr. Wessel?

Commissioner WESSEL. With the desire to move on, as I know the Chairman has, I have a number of questions, so if appropriate, I hope that our witnesses will respond to written requests, because I am sure there are from a number of us.

Co-Chairman REINSCH. Thank you.

Mr. Robinson?

Commissioner ROBINSON. In a similar venue, I have more of an information request that could be provided pursuant to these hearings, but just to give you a sense that a consortium called the China Electronic Technology Corporation has reportedly been organized that includes some 46 research institutes and 26 companies—obviously a large consortium. The question that I'll ask that the information be provided a little later is: Are any of those research institutes involved in military activities or implicated in proliferation-related activities?

Thank you.

Co-Chairman REINSCH. Thank you.

Mr. Lewis, do you have one more question?

Commissioner LEWIS. Just getting back to what we are selling that we might not otherwise sell if the other countries weren't in the market for selling them, on dual-use technology, would you acknowledge that we are selling things that we wouldn't if we were a sole-source supplier?

Mr. JOCHUM. No. We just don't look at it that way. We look at each transaction on its merits and try to determine what the national security implications would be of making that transaction.

Commissioner LEWIS. Then, are you saying that the fact that other countries would sell it if we don't is irrelevant?

Mr. JOCHUM. No. It is a factor we consider.

Commissioner LEWIS. It is a factor.

Mr. JOCHUM. Yes.

Commissioner LEWIS. Where do you draw the line?

Mr. JOCHUM. It's on a case-by-case basis.

Commissioner LEWIS. Ms. Bronson?

Ms. BRONSON. I agree; it's a case-by-case basis. In addition to the foreign availability, we would look at the risk of diversion, we would look at whether we are able to use things like post-shipment verification and other tools to go ahead and feel more comfortable about the risk of diversion. But as Jim has said, we would look at it on a case-by-case basis. No single factor is going to be the only reason that we make a decision on a license. That's just not the way we make decisions.

Commissioner LEWIS. But the fact that it is available elsewhere is a factor.

Ms. BRONSON. It is clearly a factor, yes.

Mr. JOCHUM. Commissioner, my testimony outlines certain things that we don't sell—crime control instruments; we don't do satellite launches. Other countries are more than willing to do that in our stead.

Commissioner LEWIS. Thank you very much.

Co-Chairman REINSCH. Mr. Becker, do you have one more question?

Commissioner BECKER. Please.

You have referred, I think, Mr. Van Diepen, to the business community and the desire to move ahead in China and sometimes the conflicts that arise between the ability to sell something and what you would view as national security. And we have all heard a lot of cases about that. Others suggest that perhaps we should make a change, that instead of having the export control licenses spread out like they are and a coordination between the different departments, that all of this rest with the Department of Defense. I would like your comments on how you feel about that.

Mr. VAN DIEPEN. Well, I guess by definition I'd have to say that we wouldn't like to see the State Department stuff go to Defense. I think that irrespective of who is holding the pen on the licensing, there still has to be an interagency process to review those licenses. No one agency has all the expertise and all the equities on the kinds of complex decisions that have to be made on licenses. And if you have multi-agency involvement, there is going to be disagreement, and there needs to be some way of relatively expeditiously and transparently resolving those disagreements, if for no other reason than otherwise, business isn't going to know how to do business.

So for me personally, it is less an issue of who is holding the pen on the license than making sure that you have the best process that you can get for getting this interagency advice and getting disputes resolved.

Commissioner BECKER. Not to extend on the question, but clearly, the main goal of the Department of Commerce is to encourage commerce, to encourage trade, by the very definition of the Department of Commerce. So I am just wondering if you see any conflict or any undue pressure that you face in the discharge of that duty.

Mr. JOCHUM. I don't think Vann wants to answer that, so I will. I would note that if you look at our mission statement for the Bureau of Export Administration, we are charged with all the national security functions within the Department of Commerce, and we take our national security mission very seriously. There are other parts of Commerce that are engaged in promoting trade, and that is their mission. Ours is to take into consideration the national security concerns of these transactions.

We have a lot of employees who used to work at the Defense Department, actually.

Co-Chairman REINSCH. Thank you, Mr. Becker.

A last question, then. Mr. Jochum, since I ignored you previously, I have one for you at this point. With respect to commercial communication satellites, what has been the impact on the industry of first the action by Congress of moving jurisdiction back to the State Department, and second, of the current policy not to approve these launches in China?

Mr. JOCHUM. Commissioner Reinsch, my sense is that the market in China for commercial space launch isn't what it once was a few years ago, but industry tells me the impact to them on the transfer of jurisdiction has been significant.

Co-Chairman REINSCH. Can you put a number on that?

Mr. JOCHUM. I don't have a number at my fingertips; I'd be glad to provide it for you.

Co-Chairman REINSCH. If you could submit it, that would be very helpful.

Mr. JOCHUM. Absolutely.

Co-Chairman REINSCH. Does anybody else want to say anything on that one?

Mr. VAN DIEPEN. Yes. I wouldn't necessarily agree with that. My understanding, for example, is that 2001 has been a banner year for the U.S. satellite industry, and they captured something like 80 percent of the market this past year. In 2000, they had a harder time, but we believe that that was due to market impacts that really didn't have very much to do with the jurisdiction change.

Co-Chairman REINSCH. That is very different from my data, which makes it all the more important for you to come to a consensus and submit something. I think that might be very useful.

If there is nothing else, let me thank the panel very much, both for their articulate expositions of their points of view and their very thoughtful testimony, and for your patience in putting up with us for so long.

We'll now turn to the next panel, and I'll turn the gavel over to Mr. Bryen.

We'll take a couple minutes.

[Short break.]

PANEL II: USG PANEL—U.S. EXPORT ENFORCEMENT POLICY

Co-Chairman BRYEN. We are ready to begin our second panel, which will focus on export enforcement policy.

We welcome as our witnesses today Mr. Michael Garcia, who is an Assistant Secretary at the Department Commerce Office of Export Enforcement, and Mr. Richard Mercier, Executive Director for Investigative Programs at the U.S. Customs Service.

I just want to be clear at the outset that we invited the FBI's National Security Division to be here today, and unfortunately, at the last minute, they were unable to attend. We will try to schedule a briefing by the FBI as soon as we can agree on the time. The reason is that they play an awfully important role in tracking, for national security reasons, Chinese activity and S and T collection against targets in the United States, which I believe is a fairly extensive undertaking by China which is aimed at extracting both military and civilian technologies that can enhance their military and intelligence capabilities.

So that is a very important piece of testimony that we will not have today, but I hope that our other witnesses can enlighten us as to what we are doing in the area of export enforcement and particularly in respect to China.

I will first call on Mr. Michael Garcia from the Department of Commerce, Office of Export Enforcement.

STATEMENT OF MICHAEL J. GARCIA, ASSISTANT SECRETARY, OFFICE OF EXPORT ENFORCEMENT, DEPARTMENT OF COMMERCE

Mr. GARCIA. Thank you, Commissioner Bryen, and thank you for the opportunity to testify here today before the Commission.

I would like to offer a few prepared remarks on the Department of Commerce's activities with respect to enforcement of restrictions on dual-use items to China.

Before doing that, however, let me introduce myself. I am the Assistant Secretary of Commerce for Export Enforcement, and I was confirmed in that post in August 2001. Prior to joining the Commerce Department's enforcement team, I was an Assistant United States Attorney in the Southern District of New York where I focused on prosecuting national security-related cases. As an AUSA, I prosecuted a number of terrorist cases, including the four defendants who were charged with conspiring along with Osama bin Laden and 17 others to kill Americans overseas by bombing our two Embassies in East Africa. Those four defendants were convicted in May 2001. While an AUSA, I also participated in the successful prosecution of four defendants in the first World Trade Center bombing trial and the successful prosecution of Ramzi Ahmed Yousef and two others who had plotted to cause 48 hours of "terror in the sky" by planting bombs aboard American jetliners flying from Southeast Asia to the United States.

These cases involved very real threats to our national security. I bring this experience, this background, to my work as Assistant Secretary of Export Enforcement.

The primary mission of the Commerce Department's Bureau of Export Administration where I now serve is to advance U.S. national security, foreign policy, and economic interests. The Export Enforcement arm of BXA protects U.S. national security interests by identifying and halting illegal export transactions and prosecuting violators. It is a responsibility that we take very seriously, especially with respect to exports to areas such as China, where U.S. trade is increasing rapidly, and which also pose complex national security issues.

Export Enforcement performs its mission through several program offices. Altogether, Export Enforcement employs approximately 100 special agents located in Washington, D.C. and in field offices in eight major American cities. They are responsible for investigating violations of the Export Administration regulations, apprehending violators, and working with the U.S. Attorneys to prosecute cases. Our investigators are empowered to make arrests, carry firearms, execute search warrants, and seize goods about to be illegally exported.

Two of our agents are stationed overseas as export control attaches in Beijing and Moscow.

Export Enforcement employs 26 analysts who assist EE's field offices and BXA's export licensing offices by receiving and disseminating information on end-users and end-uses of concern. Export Enforcement also makes licensing recommendations to BXA licensing officers based on intelligence information and input received from our special agents in the field.

Export Enforcement uses its resources—our attaché in Beijing, our analysts, and our agents—in its effort to ensure compliance with BXA's regulations governing exports of dual-use items to China. I will briefly discuss, first, the activities of our export control attaché in Beijing, second, our preventive enforcement efforts with respect to China, and third, some of our completed investigations involving China.

As a preliminary matter, however, I would note that a substantial portion of our enforcement resources are devoted to enforcement of export controls to China.

First, the export control attaché. China was deemed sufficiently important to BXA's mission that in 1996, we placed our first post-Cold War export control attaché there. The attaché, who is also a criminal investigator, serves as a bridge between our preventive enforcement programs and our investigative programs. He conducts all end-use checks in China—those that EE selects, those required by the NDAA, as well as those requested by other U.S. Government agencies.

The attaché works with the Embassy community, educating Embassy personnel on export control issues. He is the point of contact for the Chinese business community and U.S. businesses operating in China who have questions about U.S. export control issues.

The attaché also provides valuable information to BXA officials and licensing officers back in the United States to ensure that U.S. strategic products are safeguarded. The presence of the attaché also signals to the U.S. and Chinese business community that the Department of Commerce places emphasis on stopping any illegal exports to China.

EE's analysts review BXA licenses and shipping documents to determine which transactions should be the subject of end-use checks, both pre-license and post-shipment, and to recommend the denial or conditioning of licenses in light of specific facts and circumstances. In China, we have an end-use visit arrangement, negotiated between the U.S. and Chinese governments in July 1998, regarding end-use checks. In the past 12 months, BXA has conducted 42 such checks. These checks help to ensure that our national security is not compromised by the exports of controlled goods and technology.

For China, as for 50 other countries, post-shipment checks on all high-performance computers above a specified level of performance are mandated by law. This level has been raised as technology advances, reducing the number of PSVs required for future exports. However, as we interpret the law, Export Enforcement is not relieved of the requirement to conduct post-shipment verifications on previously exported computers that met the prior—lower—control level.

This presents Export Enforcement with a problem. We are being required to conduct checks on computers that are no longer considered advanced enough to be controlled, yet were controlled when exported. The sheer volume of these backlog checks combined with our limited enforcement resources diminishes our ability to choose and conduct those targeted checks, which we believe are most critical to our national security interests. We are actively exploring different avenues for relief from this burdensome requirement.

In addition to analyzing specific transactions involving Chinese entities or individuals, Export Enforcement also reviews applications for visas filed by Chinese nationals to prevent such individuals from illegally acquiring controlled U.S. technology while in the United States. Export Enforcement recommends denial of visas to the United States Department of State when it believes that the

applicant poses a particular risk of illegally seeking or gaining access to controlled technology or technical data.

Export Enforcement vigorously enforces U.S. export control regulations concerning China. Working within its resource limitations and consistent with its broader global enforcement responsibilities, BXA's enforcement arm concluded a number of major investigations involving China that resulted in the imposition of significant criminal and administrative penalties in 2001.

Commerce's dedication to the enforcement of export controls applicable to China is illustrated by a pair of cases that arose from the 1994 sale of controlled machine tools by the McDonnell Douglas Corporation to the China National Aero-Technology Import and Export Corporation, known as CATIC, a PRC government-owned corporation.

On May 11, 2001, following a six-year investigation by Commerce, the U.S. Customs Service, and the Department of Justice, TAL Industries, Inc., a wholly-owned subsidiary of CATIC, entered a nolo contendere plea to a felony violation of the Export Administration Act for making false and misleading statements in connection with an export license application submitted by McDonnell Douglas and CATIC. TAL was sentenced to pay a criminal fine of \$1 million and, in what we believe to be an unprecedented step for a Chinese sovereign entity, TAL waived its sovereign immunity.

In addition, TAL, CATIC, CATIC USA, and CATIC Supply settled administrative charges by Commerce that they conspired to violate Export Administration Regulations, made false statements or misrepresentations of material facts to the U.S. Government, and violated the terms and conditions of ten export licenses that were issued to McDonnell Douglas concerning machine tools. TAL agreed to pay an administrative penalty of \$1.32 million and have its export privileges denied for 10 years. CATIC, CATIC USA, and CATIC Supply each agreed to a five-year export denial, with the denial suspended provided they comply with the Export Administration Regulations and cooperate in any administrative enforcement proceedings against other parties.

On November 14, 2001—

Co-Chairman BRYEN. Excuse me. Does that mean the five years is waived? Is that what you are saying?

Mr. GARCIA. Suspended, yes, assuming there are no further violations.

On November 14, 2001, Commerce imposed a \$2.12 million administrative penalty against McDonnell Douglas Corporation, which by that time had become a wholly owned subsidiary of the Boeing Company. This was the maximum monetary penalty available under the applicable law. In addition, the Boeing Company agreed to assume responsibility and liability for all future exports by McDonnell Douglas that are subject to the EAR.

The Commerce Department as well as other U.S. Government entities devoted substantial resources to these two cases over the course of many years. We did so not only because these cases raised potentially serious violations of the EAR, but also to send a clear message that the Commerce Department takes very seriously and will enforce exporter obligations where the items at issue are

sensitive controlled items going to destinations that raise complex national security issues such as China.

I would like to make one final point that, while relevant to China, has a far broader applicability. As many of you know, U.S. export controls were authorized under the Export Administration Act, legislation that expired in August of last year. This is the sixth time in the past 23 years that this Act, enacted in 1979, has expired. To maintain a system of export controls in effect, the President was forced again to declare a national emergency and invoke safety net emergency powers. The absence of a coherent, modern statutory basis for our export control laws not only creates uncertainty for the business community and hurts United States credibility in dealing with foreign governments, it also harms our efforts—my efforts—to enforce export control laws.

Accordingly, as an enforcer of the export control laws, I believe it is critical that we get new export control legislation enacted in the near future.

To sum up, in short, Export Enforcement is actively involved, within the limits of our resources, in monitoring our strategic exports to China. No system is perfect. An export control system must be fluid in the sense that it must be responsive to advances in technology and to evolving threats to national security. Yet it must also be consistent in providing the law-abiding business community with guidance on legitimate transactions and deterring those who would compromise our national security through illegal exports.

I will use my time as Commerce's enforcement Assistant Secretary to enhance our efforts on both fronts, aided, I hope, by new authorizing legislation.

I would be pleased to answer any questions you may have.

Thank you.

Co-Chairman BRYEN. Thank you.

[The statement follows:]

PREPARED STATEMENT OF MICHAEL J. GARCIA

Introduction

Thank you for the opportunity to testify today. I would like to offer a few prepared remarks on the Department of Commerce's activities with respect to enforcement of restrictions on dual-use items to China.

Before doing that, however, let me introduce myself. I am the Assistant Secretary of Commerce for Export Enforcement, and I was confirmed to that post in August 2001. Prior to joining the Commerce Department's enforcement team, I was an Assistant United States Attorney ("AUSA") in the Southern District of New York where I focused on prosecuting national security-related cases. As an AUSA, I prosecuted a number of terrorist cases, including the four defendants who were charged with conspiring, along with Usama Bin Laden and 17 others, to kill Americans overseas by bombing our two embassies in East Africa. Those four defendants were convicted in May 2001. While an AUSA, I also participated in the successful prosecution of four defendants in the first World Trade Center bombing trial and the successful prosecution of Ramzi Ahmed Yousef and two others who had plotted to cause 48 hours of "terror in the sky" by planting bombs aboard American jetliners flying from South East Asia to the United States.

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Export Enforcement's Mission

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tional security interests by identifying and halting illegal export transactions and prosecuting violators. It is a responsibility that we take very seriously, especially with respect to exports to areas, such as China, where U.S. trade is increasing rapidly, and which also pose complex national security issues.

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Export Enforcement's China Programs

Export Enforcement uses its resources—our attaché in Beijing, analysts, and agents—in its effort to ensure compliance with BXA's regulations governing exports of dual-use items to China. I will briefly discuss (1) the activities of our export control attaché in Beijing, (2) our preventive enforcement efforts with respect to China; and (3) some of our completed investigations involving to China. As a preliminary matter, however, I would note that a substantial portion of our enforcement resources is devoted to enforcement of export controls to China.

Export Control Attaché

China was deemed sufficiently important to BXA's mission that in 1996 we placed our first post-Cold War export control attaché there. The attaché, who is also a criminal investigator, serves as a bridge between our preventive enforcement programs and our investigative programs. He conducts all end-use checks in China—those that EE selects, those required by the NDAA, as well as those requested by other USG agencies. The attaché works with the Embassy community, educating Embassy personnel on export control issues. He is the point of contact for the Chinese business community and U.S. businesses operating in China who have questions about U.S. export control issues. The attaché also provides valuable information to BXA officials and licensing officers back in the United States to ensure that U.S. strategic products are safeguarded. The presence of the attaché also signals to the U.S. and Chinese business community that the Department of Commerce places emphasis on stopping any illegal exports to China.

Preventive Enforcement

EE's analysts review BXA licenses and shipping documents to determine which transactions should be the subject of end-use checks (both pre-license and post shipment) and to recommend the denial or conditioning of licenses in light of specific facts and circumstances. In China, we have an end-use visit arrangement (negotiated between the U.S. and Chinese Governments in July 1998) regarding end-use checks. In the past 12 months, BXA conducted 42 checks. These checks help ensure that our national security is not compromised by the exports of controlled goods and technology.

For China (and 50 other countries), post-shipment checks on all high performance computers above a specified level of performance are mandated by law. This level has been raised as technology advances, reducing the number of PSVs required for future exports. However, as we interpret the law, EE is not relieved of the requirement to conduct PSVs on previously exported computers that met the prior—lower—control level. This presents EE with a problem. We are being required to conduct checks on computers that are no longer considered advanced enough to be controlled, yet were controlled when exported. The sheer volume of these backlog checks, combined with our limited enforcement resources, diminishes our ability to choose and conduct those targeted checks which we believe are most critical to our national security interests. We are actively exploring different avenues for relief from this burdensome requirement.

In addition to analyzing specific transactions involving Chinese entities or individuals, EE also reviews applications for visas filed by Chinese nationals to prevent such individuals from illegally acquiring controlled U.S. technology while in the United States. EE recommends denial of visas to the U.S. Department of State

when it believes that the applicant poses a particular risk of illegally seeking or gaining access to controlled technology or technical data.

Investigations

Export Enforcement vigorously enforces U.S. export control regulations concerning China. Working within its resource limitations and consistent with its broader global enforcement responsibilities, BXA's enforcement arm concluded a number of major investigations involving China that resulted in the imposition of significant criminal and administrative penalties in 2001.

Commerce's dedication to the enforcement of export controls applicable to China is illustrated by a pair of cases that arose from the 1994 sale of controlled machine tools by the McDonnell Douglas Corporation to the China National Aero-Technology Import and Export Corporation (CATIC), a PRC government-owned corporation. On May 11, 2001, following a six year investigation by Commerce, the U.S. Customs Service, and the Department of Justice, TAL Industries, Inc., a wholly owned subsidiary of CATIC, pled nolo contendere to a felony violation of the Export Administration Act for making false and misleading statements in connection with an export license application submitted by McDonnell Douglas and CATIC. TAL was sentenced to pay a criminal fine of \$1 million, and, in what we believe to be an unprecedented step for a Chinese sovereign entity, TAC waived its sovereign immunity.

In addition, TAL, CATIC, CATIC USA, and CATIC Supply settled administrative charges by Commerce that they conspired to violate the Export Administration Regulations, made false statements or misrepresentations of material facts to the U.S. Government, and violated the terms and conditions of ten export licenses that were issued to McDonnell Douglas concerning the machine tools. TAL agreed to pay an administrative penalty of \$1.32 million and have its export privileges denied for 10 years. CATIC, CATIC USA and CATIC Supply each agreed to a 5 year export denial, with the denial suspended provided they comply with the Export Administration Regulations and cooperate in any administrative enforcement proceedings against other parties.

On November 14, 2001, Commerce imposed a \$2.12 million administrative penalty against McDonnell Douglas Corporation, which by that time had become a wholly owned subsidiary of the Boeing Company. This was the maximum monetary penalty available under the applicable law. In addition, the Boeing Company agreed to assume responsibility and liability for all future exports by McDonnell Douglas that are subject to the Export Administration Regulations.

The Commerce Department, as well as other U.S. Government entities, devoted substantial resources to these two cases over the course of many years. We did so, not only because these cases raised potentially serious violations of Export Administration Regulations, but also to send a clear message that the Commerce Department takes very seriously, and will enforce, exporter obligations where the items at issue are sensitive controlled items going to destinations that raise complex national security issues such as China.

I'd like to make one final point that, while relevant to China, has a far broader applicability. As many of you know, U.S. export controls were authorized under the Export Administration Act, legislation that expired in August of last year. This is the sixth time in the past 23 years that this act—enacted in 1979—has expired. To maintain a system of export controls in effect, the President was forced again to declare a national emergency and invoke safety net emergency powers. The absence of a coherent, modern statutory basis for our export control laws not only creates uncertainty for the business community and hurts the United States credibility in dealing with foreign governments, it also harms our efforts—my efforts—to enforce export control laws.

Accordingly, as an enforcer of the export control laws, I believe it is critical that we get new export control legislation enacted in the near future.

Conclusion

In short, Export Enforcement is actively involved, within the limits of our resources, in monitoring our strategic exports to China. No system is perfect. An export control system must be fluid in the sense that it must be responsive to advances in technology and to evolving threats to national security. Yet it must also be consistent in providing the law-abiding business community with guidance on legitimate transactions and deterring those who would compromise our national security through illegal exports. I will use my time as Commerce's enforcement Assistant Secretary to enhance our efforts on both fronts aided, I hope, by new authorizing legislation. I would be pleased to answer any questions you may have.

Co-Chairman BRYEN. Mr. Mercier?

STATEMENT OF RICHARD MERCIER, EXECUTIVE DIRECTOR, INVESTIGATIVE PROGRAMS, U.S. CUSTOMS SERVICE

Mr. MERCIER. Commissioner Bryen and other members of the Commission, it is a privilege to appear before the Commission today to discuss Customs' unique role in enforcing U.S. export control laws and our views on the export of U.S.-origin high-technology and Munitions List material to the People's Republic of China.

Customs has a long and proud tradition of enforcing our Nation's import and export laws. This tradition has evolved with Customs' earliest responsibilities for the collection of revenues on imported merchandise, to our role today as the first line of defense at our Nation's borders in preventing the illegal international trafficking in goods which threaten the public safety and national security.

Customs is a leader in enforcing U.S. export controls. We are at the forefront of the Administration's efforts to prevent the proliferation of weapons of mass destruction and conventional arms, combat international terrorism, and implement U.S. economic sanctions and embargoes.

Customs is principally responsible for enforcement of the Arms Export Control Act, which regulates the export of arms, munitions, and military equipment. We also enforce the Export Administration Regulations, which regulate the export of dual-use technologies and commodities, including those with application in the development of weapons of mass destruction; the International Emergency Economic Powers Act, otherwise known as IEEPA, which regulates financial and other transactions with specified countries, individuals, and other entities. We also enforce the Trading with the Enemy Act, which imposes economic sanctions and embargoes on trade with Cuba and North Korea.

U.S. Customs' program on exports is titled Operation EXODUS. We enforce these laws and regulations through our unique border search and law enforcement authorities in processing international passengers, conveyances, and cargo crossing our Nation's borders to ensure compliance with export regulations, as well as collect trade data and detect violations.

The focus of our export enforcement efforts has shifted to meet the changes in international threats that have confronted the United States, especially since September 11. In the early 1980s, the nature of the export control threat was mainly by efforts of the former Soviet Union and its allies to acquire sophisticated Western technology for use in building their military establishments. In response to this threat, U.S. Customs initiated an intensified enforcement program called Operation EXODUS to enforce provisions of the EAA and other export control statutes, and we deal with any kind of licensable commodity that leaves the United States.

Under EXODUS, Customs significantly increased examinations of merchandise exported from the United States to ensure compliance with export controls and interdict illicit shipments, and pursue investigations of criminal wrongdoing.

With the dissolution of the Soviet Union, we have seen a shift in the threat once again. Today we continue to see efforts by the People's Republic of China to obtain sophisticated Western technologies to enhance their military capabilities.

We also see rogue states attempting to develop nuclear, chemical, and biological weapons and delivery systems.

We are also faced with the potential for international terrorists to acquire weapons of mass destruction, arms, and other support for terrorist attacks against United States citizens in the U.S. and abroad.

We also see a rise in illicit trafficking in arms and military equipment, supplying international criminals and political insurgents as well as contributing to regional instabilities.

Our goals under Operation EXODUS are to prevent proliferant countries, the PRC being one, and rogue states, international terrorists, and transnational criminal organizations from obtaining sensitive and controlled technologies and commodities, including materials and technologies for weapons of mass destruction, conventional munitions, and firearms, and also from engaging in economic transactions which violate U.S. and international sanctions and embargoes.

Our objective is to disrupt these international trafficking operations in sensitive and controlled commodities through the interdiction of these shipments and to dismantle criminal trafficking organizations supplying and supporting proliferant countries, rogue states, terrorists, and other transnational criminal groups.

As I have noted, our role in export enforcement is unique in terms of our legal authorities and inspectional presence to enforce U.S. export laws and regulations at our border; our experience in the processing of international passengers, conveyances, and cargo; our expertise in examining and analyzing export documentation; and our familiarity in licit and illicit international shipping modes and routes; our automated commercial and enforcement systems and analytical tools; and our proactive, cooperative enforcement efforts with both U.S. and foreign law enforcement agencies. This is how we do what we do every day in our export control enforcement.

Our legal authority at the border is unique. Our border search authority by statute means that United States Customs can search without warrant passengers, conveyances and cargo entering and leaving the United States to ensure full compliance with U.S. laws. We are the only Federal agency with this broad power. As a result, with this authority, we are able to interdict merchandise being imported and exported from the U.S.

Every other Federal agency with export enforcement requirements, restrictions, or prohibitions must rely on United States Customs to enforce these provisions at our borders.

We maintain 301 ports of entry and exit throughout the United States. These include international airports, seaports, and vehicle and rail crossings along our land border with Mexico and Canada. We have over 7,200 inspectors operating in these ports to process these passengers, conveyances and cargo. As noted, Customs is the only Federal law enforcement agency with border search authority for merchandise.

We are at the border to examine the cargo, and that is obviously a big job, and we need cooperation from all types of partnerships, including the law enforcement community, international partners, as well as the trade.

Customs has had a longstanding, intensified outbound examination program, and we are interested in making sure that EXODUS is employed and our inspectors are employed in export examinations at all times. We do not deter from that mission.

To date, since 1981, we have seized over \$1.2 billion in merchandise being exported in violation of U.S. export control laws, and since 1998, we have initiated 558 criminal investigations relative to unlawful exports of technology to the People's Republic of China. Of that number, 64 cases resulted in enforcement action, including arrest, indictment, or seizure.

Seizures range from the commodity being intercepted before export actually occurs or afterward. During the aforementioned time period, we affected 32 arrests, 24 indictments, and 21 convictions of individuals and companies, charging them with unlawfully exporting or attempting to unlawfully export controlled commodities to the People's Republic of China. The value of all the seizures is over \$3 million.

Our experience in conducting proactive investigations of international trade violations directly contributes to our export enforcement efforts. Our experience and successes in conducting proactive investigations of criminal export violations continues. Customs investigations have resulted in the arrest, prosecution and conviction of hundreds of criminal export violators dealing in equipment ranging from sophisticated computer and precision machining technologies used for nuclear weapons development to helicopters equipped for chemical agent dispersal to nuclear reactor components.

In 1998, Customs special agents in Boston arrested two Chinese nationals involved in the attempted export of sophisticated aircraft and missile gyroscope systems to China and obtained the conviction of a third individual. We also found attempted exports of similar sophisticated aircraft guidance components to that country.

In May 2001, special agents in our Baltimore office initiated an investigation based on a referral by the Defense Security Service, which alleged that an individual from Missouri was attempting to acquire sophisticated encryption technology and related data for illegal export to the People's Republic of China. The technology is controlled for export under the U.S. Munitions List of the ITAR and by the National Security Agency.

Based on that referral, an undercover investigation was initiated and contact was made with the target of the investigation through the cooperation of the manufacturer of the technology. In August of 2001, a co-conspirator in Los Angeles as well as the target of the investigation was arrested for attempting to unlawfully export the encryption devices to the People's Republic of China via Singapore. An arrest warrant is also outstanding for another co-conspirator in the case.

In the area of international cooperation, a key element of our enforcement efforts is coordination and cooperation with our foreign customs and law enforcement counterparts around the world. In fact, most of our successful interdictions were effected by foreign customs and law enforcement agencies based on our providing them with the information they needed to stop these shipments be-

fore the goods were delivered to their intended ultimate destinations.

United States Customs maintains 28 customs attaché offices around the world to coordinate our international enforcement efforts, including in the People's Republic of China, where we have three criminal investigators assigned. Also, United States Customs has another unique tool, and that is we have Customs Mutual Assistance Agreements with our counterpart customs services around the world—I think we have almost 50 of those currently—which mandates, basically, that per the agreement, we can task a counterpart customs service to assist us in acquiring information in furtherance of our criminal investigations.

As I previously mentioned, one of our export enforcement objectives is the dismantlement of criminal trafficking organizations, not just in the United States but in every country and venue in which they operate, if they involve U.S.-originated material that is controlled under the export control regimes. Our foreign partnerships are essential to meet this objective.

An example of an outreach program that United States Customs has and I believe one of your staff may have provided to you a booklet called "Shield America," which was initiated by Commissioner Robert Bonner in December. We are seeking to gather and provide information under Project Shield America as an industry outreach program with the intent of obtaining the assistance and cooperation of those companies involved in the manufacture, sale, and export of U.S.-origin high-technology munitions used in WMD and delivery systems that originate from the United States.

The Commissioner of United States Customs has invited the Office of Export Enforcement of the Department of Commerce and the FBI to participate in this endeavor, and they have responded very enthusiastically to our initiative. Customs and Commerce OEE have worked and will continue to work jointly in the investigation of unlawful exports of dual-use technology.

Customs has also implemented what we term the Customs Trade Partnership Against Terrorism, or C-TPAT, program. The objective of this program is a partnership between Customs and the importing community, requiring importers to review their entire logistics chain and incorporate sound security measures to reduce exposure to product and conveyance tampering. Customs believes that this is an effective program for importers to implement in their efforts against terrorism. Yes, we are talking about importers here, but if companies that are involved in the importation process, whether they be customs brokers, freight forwarders, manufacturers, importers, they parallel also export; therefore, if they improve their security systems and understanding who their customers are and how their shipments could in fact be compromised by having other goods placed in there before they are imported or exported, that is basically a compromise of the import and export systems. So we are really working hard, not only on the import side but also on the export side, to reach out with our trade communities as well as the entire community of movement of not only the goods but also how the goods move toward the ultimate destination.

Our relationship with the FBI has led to Customs placing special agents in 30 Joint Terrorism Task Forces around the country.

Their mission is to investigate not only terrorist organizations but also to follow up on information from the FBI regarding not only the People's Republic of China's efforts to obtain U.S.-origin high technology, but any other country that would be in violation of U.S. export laws.

This concludes my statement, and I'll answer any questions that you have.

Co-Chairman BRYEN. Thank you very much.

[The statement follows:]

PREPARED STATEMENT OF RICHARD MERCIER

Good morning, Commissioner Becker, Chairman D'Amato, and members of the Commission. It is a privilege to appear before the Commission today to discuss Customs unique role in enforcing U.S. export control laws and our views on the export of U.S.-origin high technology to the People's Republic of China.

Customs has a long and proud tradition of enforcing our Nation's import and export laws. This tradition has evolved from Customs earliest responsibilities for the collection of revenues on imported merchandise, to our role today as the first line of defense at our Nation's borders in preventing the illegal international trafficking in goods which threaten the public safety and national security.

Customs is a leader in enforcing U.S. export controls. Customs is at the forefront of the Administration's efforts to prevent the proliferation of Weapons of Mass Destruction and conventional arms, combat international terrorism, and implement U.S. economic sanctions and embargoes.

Export Controls Enforced by Customs

Customs is principally responsible for enforcement of:

- The Arms Export Control Act (22 U.S.C. 2778), which regulates the export of arms, munitions, and military equipment;
- The Export Administration Regulations (15 C.F.R.), which regulate the export of dual-use technologies and commodities, including those with application in the development of Weapons of Mass Destruction;
- The International Emergency Economic Powers Act, or IEEPA (50 U.S.C. 1701 et seq), which regulates financial and other transactions with specified countries, individuals and other entities; and
- The Trading With the Enemy Act (50 U.S.C. App. 1), which imposes economic sanctions and embargoes on trade with Cuba and North Korea.

Operation EXODUS

To enforce these laws and regulations, Customs employs its unique border search and law enforcement authorities in processing international passengers, conveyances and cargo crossing our Nation's borders to insure compliance with export requirements, collect trade data, and detect export violations.

The focus of our export enforcement efforts has shifted to meet changes in international threats that have confronted the United States, especially since September 11.

In the early 1980s, the nature of the export control threat was mainly by efforts of the former Soviet Union and its allies to acquire sophisticated Western technology for use in building their military establishments. In response to this threat Customs initiated an intensified enforcement program, Operation EXODUS, to enforce provisions of the Export Administration Act and other export control statutes to prevent illegal exports of munitions, strategic technologies, and shipments destined for sanctioned/embargoed countries from the United States. Under Operation EXODUS, Customs significantly increased examinations of merchandise exported from the United States to insure compliance with export controls and interdict illicit shipments, and aggressively pursued investigations of criminal export violations.

With the dissolution of the Soviet Union, we have seen a shift in the threat once again. Today, we continue to see efforts by the People's Republic of China to obtain sophisticated Western technologies to enhance their military capabilities. Second, we see rogue states attempting to develop nuclear, chemical and biological weapons and delivery systems. Third, we are faced with the potential for international terrorists to acquire weapons of mass destruction, arms, and other support for terrorist attacks innocent citizens in both the U.S. and abroad. Fourth, we again see a rise in illicit trafficking in arms and military equipment, supplying international criminals and political insurgents as well as contributing to regional instabilities.

Customs goals under Operation EXODUS today are to prevent proliferant countries, the PRC being one, and rogue states, international terrorists, and trans-national criminal organizations from obtaining sensitive and controlled technologies and commodities, including materials and technologies for Weapons of Mass Destruction, conventional munitions, and firearms; and from engaging in economic transactions which violate U.S. and international sanctions and embargoes.

Our objectives are to disrupt international trafficking in sensitive and controlled commodities through the interdiction of illicit shipments, and to dismantle criminal trafficking organizations supplying and supporting proliferant countries, rogue states, international terrorists and trans-national criminal groups.

Customs Unique Role in Export Enforcement

As I have noted, our role in export enforcement is unique in terms of our legal authorities and inspectional presence to enforce export laws and regulations at our Nation's borders; our experience in the processing of international passengers, conveyances and cargo; our expertise in examining and analyzing export documentation, and our familiarity in licit and illicit international shipping modes and routes; our automated commercial and enforcement systems and analytical tools; and our proactive, cooperative enforcement efforts with both U.S. and foreign law enforcement agencies.

Border Search Authority

Let me first briefly address Customs unique legal authorities. Chief among them is our border search authority. By statute, Customs may search, without warrant, passengers, conveyances and cargo entering and leaving the United States to insure full compliance with all U.S. import/export requirements and to uncover violations. Customs is the only Federal law enforcement agency with this broad power. As a result, we are the only Federal agency with the ability to interdict merchandise being illegally exported from the United States. Every other Federal agency with export requirements, restrictions or prohibitions relies on Customs to enforce those provisions as passengers; conveyances and cargo cross our international borders.

Outbound Examinations

Customs maintains 301 ports of entry and exit throughout the United States. These include international airports, seaports, and vehicle and rail crossings along our land borders with Canada and Mexico. Customs has over 7,200 Inspectors operating in these ports to process passengers, conveyances and cargo to insure compliance with all U.S. import and export requirements, detect violations, and seize merchandise imported or exported contrary to law. As noted above, Customs is the only Federal law enforcement agency with border search authority for merchandise. Customs Inspectors are the only Federal presence at our Nation's borders with the ability to examine outbound passengers, conveyances and cargo to interdict and seize strategic and controlled commodities being exported in violation of U.S. export controls.

As I previously noted, Customs has had a long standing, intensified outbound examination program designed to enforce U.S. export controls, known as Operation EXODUS. Operation EXODUS has had a significant impact on preventing the illegal export of strategic and controlled commodities: since its inception in 1981, Operation EXODUS has to date resulted in the seizure of over \$1.2 billion in merchandise being exported in violation of U.S. export controls. Since fiscal year 1998, Customs has initiated 558 criminal investigations relative to unlawful exports of technology to the PRC. Of that number, sixty-four (64) cases resulted in an enforcement action, that is, an arrest, indictment, or seizure. The seizures range from the commodity being intercepted before export up to real property owned by the defendants. During the aforementioned time period, Customs effected 32 arrests, 24 indictments, and 21 convictions of individuals and companies, charging them with unlawfully exporting or attempting to unlawfully export controlled commodities to the PRC. The value of all the seizures is approximately \$3,805,432.

Export Investigations

Our experience in conducting proactive investigations of international trade violations directly contributes to our export enforcement efforts. Our experience and successes in conducting proactive investigations of criminal export violations continue Customs tradition of leadership in export enforcement. Customs investigations have resulted in the arrest, prosecution and conviction of hundreds of criminal export violators dealing in equipment ranging from sophisticated computer and precision machining technologies used for nuclear weapons development, to helicopters equipped for chemical agent dispersal, to nuclear reactor components.

By way of illustration, in 1998, Customs Special Agents in Boston arrested two Chinese nationals involved in the attempted export of sophisticated aircraft and missile gyroscope systems to China, and obtained the conviction of a third individual for earlier, attempted exports of similar sophisticated aircraft guidance components to that country. (Lion Photonics)

In May 2001, Special Agents in Baltimore initiated an investigation based on a referral made by the Defense Security Service which alleged that EUGENE HSU, of Blue Springs, Missouri, was attempting to acquire sophisticated encryption technology and related data for illegal export to the People's Republic of China (PRC). The technology is controlled for export under the U.S. Munitions List of the International Trafficking in Arms Regulations and by the National Security Agency. Based on the referral, an undercover investigation was initiated and contact with HSU was made with the cooperation of the manufacturer of the technology. On August 28, 2001, HSU and DAVID YANG, a co-conspirator in Los Angeles, California, were arrested for attempting to unlawfully export the encryption devices to the PRC via Singapore. An arrest warrant was also issued for another co-conspirator, CHARLSTON HO, currently residing in Singapore, and is a fugitive. Their trial is pending. (Eugene HSU)

International Cooperation

A key element of our enforcement efforts is coordination and cooperation with our foreign customs and law enforcement counterparts. In fact, many of our most successful interdictions were effected by foreign customs and law enforcement agencies, based on our providing them with the information they needed to stop these shipments before the goods were delivered to their intended, ultimate destinations. Customs maintains 28 Customs Attaché offices in countries around the world to coordinate our international enforcement efforts, including the PRC. As I previously mentioned, one of our export enforcement objectives is the dismantlement of criminal trafficking organizations—not just in the United States, but in every country and venue in which they operate. Our foreign partnerships are essential to meeting this objective.

Project Shield America

In seeking to both gather and provide information, Project Shield America was initiated by Commissioner Bonner on December 4, 2001. Project Shield America is an industry outreach program, which is intent on obtaining the assistance and cooperation of those companies involved in the manufacture, sale, and export of U.S. origin high technology and munitions used in weapons of mass destruction and delivery systems, that could be unlawfully exported to the enemies of the United States.

The Commissioner has invited the Office of Export Enforcement, U.S. Department of Commerce, and the Federal Bureau of Investigation to participate in this endeavor and they have responded enthusiastically. Customs and OEE have worked and will continue to work jointly in the investigation of unlawful exports of dual use technology.

Customs has also implemented the Customs-Trade Partnership Against Terrorism (C-TPAT) program. C-TPAT is a partnership between Customs and the importing community requiring importers to review their entire logistics chain and incorporate sound security measures to reduce exposure to product and conveyance tampering. Customs believes that this is an effective program for importers to implement in their efforts against terrorism.

Our relationship with the Federal Bureau of Investigation has led to Customs placing Special Agents in 30 Joint Terrorism Task Forces around the country. Their mission is to investigate not only terrorist organizations but also to follow up on information from the FBI regarding the PRC's efforts to obtain U.S. origin high technology.

Conclusion

This concludes my statement for the record. I appreciate the opportunity to appear before you today. I would now be pleased to answer any questions you may have about Customs enforcement of U.S. export controls relative to the PRC.

PANEL II DISCUSSION AND QUESTIONS AND ANSWERS

Commissioner Reinsch?

Co-Chairman REINSCH. Thank you, Mr. Bryen.

Mr. Garcia, were the 42 noncomputer checks that you referred to in your testimony pre-license or post-shipment?

Mr. GARCIA. Commissioner Reinsch, they were 42 checks primarily NDAA checks; they were primarily high-performance computer checks. And of that number, the vast majority were post-shipment checks. I don't have the precise number.

Co-Chairman REINSCH. Okay. Then, of all of the checks, let's say, both NDAA, computer, and other, did you find any problems in China—any that didn't check out?

Mr. GARCIA. Commissioner, the problem that we are finding in China is more with getting the checks done than with problem end-use visits. I do not recall any unsuccessful check that was actually completed.

Co-Chairman REINSCH. So that when you are able to do them, they generally check out, if you will?

Mr. GARCIA. Yes.

Co-Chairman REINSCH. What are the obstacles that you encountered doing them? Are they logistical problems, resource problems, problems with the Chinese Government, cooperation problems?

Mr. GARCIA. All the above, I would say. Certainly there are logistical problems given the size of the country and the number of checks that we are required to do. There are also problems with the resources dedicated to these checks on the Chinese Government side.

I also believe that we have problems targeting the checks that we believe would have the most strategic value because of the sheer number of checks that we have on our backlog list.

Co-Chairman REINSCH. I can't help but notice—I observe in the audience the individual who has actually been doing this for the last five years is here, Mark Bayuk and I want to commend him for his public service. He undertook an extraordinarily difficult job under adverse circumstances, and in my judgment—and I was his boss—performed admirably. To the extent this program has been helpful to our national security, I think it is largely due to Mr. Bayuk's work. He is now back here, but I just want to publicly commend him because I haven't had a chance to do that, since he returned after I left office. And I won't point him out because of the risk that some of you might want to ask him questions. We all owe him a debt of gratitude for his work.

Mr. Garcia, you also mentioned the deemed export reviews that you do of individuals. Have you ever recommended denial of one of those?

Mr. GARCIA. I am not aware that we have recommended denial of any deemed export licenses, but we have recommended denial of visa applications.

Co-Chairman REINSCH. Okay.

Mr. Mercier, as I recall, in your testimony, there was—and maybe still is, which is my question—a Memorandum of Understanding between the Customs Service and the Office of Export Enforcement about regularizing things. You didn't mention that in your testimony. Does that still exist?

Mr. MERCIER. Yes, sir, it does.

Co-Chairman REINSCH. And it is working well?

Mr. MERCIER. We believe it is, yes.

Co-Chairman REINSCH. And Mr. Garcia, you think it is working well, too?

Mr. GARCIA. Yes, sir.

Co-Chairman REINSCH. This is wonderful news. I am delighted to hear that.

In regard to Project Shield America, which you were kind enough to give us a brochure about, and I appreciate having that, can you explain precisely what is new here? What are you doing as a result of this that you were not doing six months earlier?

Mr. MERCIER. Okay. U.S. Customs had in the Cold War period an operation called Gemini, which was essentially our outreach program to the community. It started in the late seventies, early eighties. With the changes since September 11, our focus in United States Customs overall has switched to terrorism as being our key focus, as well as all of the other activities that we are charged with the responsibility for, including narcotics interdiction.

What we have done is we have taken a step back and created a list of commodities, working with all the partners in the licensing community as well as the intelligence community, to review and make sure that we know what the shopping list of terrorist organizations is. We have refined that, and we have gone back and tried to identify U.S. companies that may in fact be suppliers of this type of technology to support terrorism.

Some of the products involved in terrorism, as you are aware, are controlled, and a lot of them are not. We want to reach out to those domestic companies and make sure that they are aware that their products could in fact, either unwittingly or wittingly, be used for terrorist activities.

That is the focus of Shield America.

Co-Chairman REINSCH. Are you also focusing on things that are not controlled?

Mr. MERCIER. That's correct. The idea is that if they are destined for a terrorist or rogue nation, there are certain laws under the Office of Foreign Assets Control and other export control regimes that we can employ to try to discourage that activity. We are also trying to focus on the money trails involved in terrorist procurements.

Co-Chairman REINSCH. So you are focusing by destination, then?

Mr. MERCIER. Yes—destination and terrorist organizations that would be—they are not necessarily—al Qaeda, for example, is located in Afghanistan but also in a lot of other places around the world.

Co-Chairman REINSCH. And your statutory authority for doing that is what?

Mr. MERCIER. The Trading with the Enemy Act, the Office of Foreign Assets Control sanctions that are set up under specially-designated nationals.

Co-Chairman REINSCH. Thank you.

Co-Chairman BRYEN. Just a quick observation on that. There is always the risk that terrorists can buy things domestically and essentially build the bomb here.

Commissioner Lewis?

Commissioner LEWIS. I have a question for each of you, but I'll start with Mr. Garcia. You obviously have a very impressive record in dealing with terrorists, but I'd like to ask you about the CATIC cases.

Another person will be testifying later today, Gary Milhollin, and he has a reference to the CATIC cases. I would like to ask you why it took six years to investigate this; why such a long time? It occurred in 1994, yet it was in 2001 that it was finally resolved.

Mr. GARCIA. Commissioner, without getting into many of the details as to the steps of the investigation, I would say generally that, one, any investigation that involves such a complex case involving the intelligence community, the Justice Department, various law enforcement agencies, various companies, foreign companies, shipments overseas, is going to take an extensive amount of time.

Commissioner LEWIS. Does that mean that during that six-year period, they were barred from buying things, or were they still buying things during that six-year period?

Mr. GARCIA. I believe there were some limits placed on what they could buy during that six-year period, yes.

Co-Chairman BRYEN. But they weren't banned during that period—particularly CATIC.

Mr. GARCIA. From buying certain things—

Co-Chairman BRYEN. They were still conducting trade.

Commissioner ROBINSON. That's not right. I think they were subject to normal export controls, not extra ones.

Commissioner LEWIS. Excuse me. Can I—

Co-Chairman BRYEN. I'm just trying to clarify the point.

Commissioner LEWIS. Mr. Garcia, Gary Milhollin makes the point that even though they were barred, within two months of the indictment, a sister company called Bostomatic was selling to CATIC's sister companies the same kinds of things, and it was approved by the Commerce Department. He says that "Commerce advocated the approval of this export to promote trade, and adverse publicity caused this to be prevented."

Do you have any comments about that?

Mr. GARCIA. I have no knowledge of it, I'm sorry, Commissioner. I don't know anything about that transaction.

Commissioner LEWIS. Thank you very much.

I would like to ask you a question about Customs with imports and exports. Are there any Customs agents not only watching the discharge of cargo but watching the loading of cargo, or certifying this cargo and then sealing it? Does that occur?

Mr. MERCIER. You have a couple questions there. The answer is yes—we have inspectors out there, looking at cargo, at containers coming off of ships and examining that cargo, the containers. We do it on a targeted basis, though. We process, as an example—

Commissioner LEWIS. You're talking about the removal of the containers; I'm talking about the loading of the containers.

Mr. MERCIER. We also have resources dedicated in our outbound enforcement program that we are actually looking at containers going outbound. But you have to understand that there are tens of thousands of containers daily—

Commissioner LEWIS. Millions.

Mr. MERCIER [continuing]. That move in and out of the United States, so we have to focus our limited resources on basically intelligence-driven examination.

Commissioner LEWIS. Of course, of course.

Mr. MERCIER. Otherwise you have a container ship coming in and discharging a thousand, and in 18 hours, they are moving back out with thousands. It's a very difficult job.

Commissioner LEWIS. Of course. But this is part of your work.

Mr. MERCIER. Yes, it is part of the mission of the United States Customs Service. But you have to understand, a majority of our resources in United States Customs are dedicated on the import side. We have about 500 inspectors out there nationwide looking at exports, and exports could include not only passengers, concerning export of currency; we also have exports concerning stolen vehicles, containers, and obviously, the myriad of buses, rail, whatever else. Whatever goes out, you have two or three inspectors sometimes at a land border or at a seaport that may be looking at things.

Commissioner LEWIS. Do you feel you have enough people overseas doing the job that needs to be done?

Mr. MERCIER. In the overseas environment, we are currently expanding to, I think, six additional attaché officers overseas—

Commissioner LEWIS. Is that enough?

Mr. MERCIER. I think that what we are trying to do is to do this incrementally, to find out where the weaknesses are in the shipping routes and where we feel we can place people. I think we need to examine the current resource deployment plan that we have, and if it turns out that we need additional, we will move forward in that area as a recommendation.

Commissioner LEWIS. You can't say now that you need more people?

Mr. MERCIER. I am not empowered to say that, sir.

Vice Chairman LEDEEN. What do you mean you are not empowered to say that?

Mr. MERCIER. What I'm saying, sir, is that any recommendations regarding resource requests have to go through a process through my Commissioner to the Department of Treasury—

Vice Chairman LEDEEN. Commissioner Lewis is just asking you for your own best judgment. He's not asking you for a formal recommendation.

Mr. MERCIER. I think the importance of resources deployed foreign is where we would put them and how many—if we had 100 resources, the key issue is where we would put them and how we would utilize them. I don't think we should just haphazardly get a number of people and then say, hey, where do we think we want to put them. I think that has to be based upon good, sound judgment and intelligence. And I think we have quite a few resources—I think we have 24 additional positions that we have gotten in this fiscal year that we plan to put overseas, and I think we'll have to take it a step at a time with that.

Commissioner LEWIS. Thank you very much, both of you.

Co-Chairman BRYEN. Commissioner Wessel?

Commissioner WESSEL. Thank you, and I thank both of our witnesses for the substantial Government service they have already given to our country; we certainly appreciate it.

To follow up somewhat on what Commissioner Lewis was talking about—and clearly, you showed substantial prosecutorial prowess dealing with the bombings in Africa—it seems to me that you had the resources necessary to investigate and prosecute that case,

since you did so in less than three years with similar constraints, if you will, in terms of intelligence, overseas activities, needing to coordinate with Justice, et cetera, but we find that as it relates to China, maybe the correct amount of resources and cooperation among all the various agencies may not be there, since the activity took six years.

As I heard you say, you have one person in China, and we have dozens of trade promotion commissioners, attaches, et cetera, throughout the country, so that clearly our priority is more selling goods and not worrying about end-use uses. And as we heard from the previous panel, who all indicated that the areas that you are supposed to prosecute and enforce matter significantly to our national security, perhaps we need to do a little more there.

Earlier, if I remember, you talked about 42 investigations that you were allowed to do. I don't think it is surprising that in most of the investigations that you were allowed to do, you came up finding that things weren't so bad. How many cases, open investigations, are there that you are not getting cooperation on by the Chinese?

Mr. GARCIA. A few things, Commissioner. I agree with you that it is a large territory to cover. We had one attaché, Mr. Bayuk, who was until very recently, as Commissioner Reinsch said, doing an excellent job out there. He is one person. We are seeking to increase our resources in China.

We also send verification teams to add to our resources. So that although we don't have a presence in country, we periodically send a team of one or two other agents to assist in doing end-use checks there—

Commissioner WESSEL. But if I can interrupt—and I in no way am trying to denigrate what you and the fine people in the agency are doing—it is more a question of what cooperation are you getting from the Chinese. You talked about the end-use check agreement, if I remember, that was signed in 1998.

Mr. GARCIA. Yes, sir.

Commissioner WESSEL. And Mr. Mercier talked about the Mutual Assistance Agreement with 50 countries—I don't know whether China is one of those.

But what kind of cooperation are you getting?

Mr. GARCIA. Commissioner, I'll tell you what I see as my biggest problem with cooperation on end-use checks in China during my brief time in this position. I think that we have such a list of checks outstanding in China, into the 700s, which are primarily mandated checks on high-performance computers that were mandated at a time when the level was beneath 10,000 MTOPS. If you go to a country that may not be inclined to give you free access, and you say we want to do checks of this kind, I would think that the problem is that we are being given checks on a 6,000-MTOP computer that is at a travel agency, and a check is done.

My biggest problem is to get the strategic checks, the checks that our organization would see as the most important to our national security and the ones we should be doing given, as you said, our limited resources, pushed to the front of the line. And in my view, that is not happening, and I think that that is the biggest improve-

ment we could make in our end-use arrangement and in our end-use cooperation with China.

Commissioner WESSEL. So in part it is a question of the burden you have for the outstanding checks for the low number of MTOP computers. But if you had the strategic ability to choose which products as it applies to Chinese cooperation, do they give you cooperation on the 6,000-MTOP computer but not on the item that you really care about?

Mr. GARCIA. Well, here is the example that I would give on that. There is a number, and it is relatively few items, that we have asked for post-shipment verification that do not relate to high-performance computers. We have seen extensive delays in getting those post-shipment verifications done. I think that answers your question.

Commissioner WESSEL. Mr. Mercier, if I could quickly, you talked about the Mutual Assistance Agreements. Is China a signatory? Do we have an agreement with them? You talked about 50 of them.

Mr. MERCIER. I don't have the answer to that. I know that we have quite a few. I know that we have one with Hong Kong. I'll have to verify on China. I know that if we don't have one, we have been striving to get one. But I know that we do receive cooperation from Chinese customs in some of our investigations.

Commissioner WESSEL. Okay. If you could get back to us on that, I'd appreciate it.

Mr. MERCIER. Yes, sir.

Commissioner WESSEL. Thank you.

Co-Chairman BRYEN. Commissioner Mulloy?

Commissioner MULLOY. Thank you, Mr. Bryen.

This is for Mr. Garcia. When Mr. Jochum was here before—he is with the Commerce Department; I guess you are in part of the same bureau—

Mr. GARCIA. Yes, sir.

Commissioner MULLOY [continuing]. he said that last year, there were about 1,300 licenses for exports to China. And he went on to say that 46 percent of these dealt with domestic transfers of technology. In other words, I think the issue is something called "deemed exports."

Mr. GARCIA. Yes.

Commissioner MULLOY. And that would be a Chinese foreign national coming here to work for a U.S. company, and before they can get into certain critical technologies, I guess they have to get permission from the Commerce Department.

Mr. GARCIA. In essence, a license to get access to that technology, as if it were exported.

Commissioner MULLOY. Now, in your testimony on page 3, you say that you assist in administering, I think, the deemed export program by reviewing applications for visas filed by these Chinese nationals.

Mr. GARCIA. Yes, sir.

Commissioner MULLOY. Do you look at NIVs, or do you look at IVs, or do you look at both—that is, non-immigrant visas, immigrant visas, or both.

Mr. GARCIA. These would be visas for people who are coming here seeking to work and seeking access to—I don't know what the

classification of that visa would be. But we look at all visas—let me back up a little bit.

At Commerce Department, at Export Enforcement, which I think is a very forward-looking program, we see all visas—not the actual application itself, but the backup information that goes into the cable—and we review all visas to the extent possible with our resources, and we are seeking to increase resources in that field, as we seek to increase let's call them "flags" as to who is coming into the United States to gain access to sensitive technology such as flight training. As things develop, and we identify different risks, we are seeking to expand that program. But we see all visas for Chinese nationals—46,000 worldwide with approximately 8,000 Chinese applicants.

Part of those are the deemed export visas where we have a very specific task—what is the technology, what are they seeking access to, what is their background, who is sponsoring them. With the rest of the visas, where we see a role for ourselves in making a recommendation, possibly a recommendation for denial, we'll do that. So it is kind of a broader program, our visa review program, than just the deemed exports, and we are actually seeking to expand it somewhat both in terms of resources and in terms of what we look at.

Commissioner MULLOY. When did you institute that program to get the broadness and look at this whole issue?

Mr. GARCIA. Mainly in the aftermath of September 11.

Commissioner MULLOY. Post-September 11.

Mr. GARCIA. Although, to be clear, prior to that time, we did have this access, and we did do a broader review than solely deemed exports. We are seeking to adapt that review or fine-tune that review in the aftermath of those attacks.

Commissioner MULLOY. Just a follow-up on one issue that you have with Commissioner Wessel. Can you not set your own priorities as to what you want your people to do to go out and look at these post-shipment investigations?

Mr. GARCIA. I can, but—

Commissioner MULLOY. I mean, you mentioned that you were frustrated because there are too many, obviously. The law requires you to do more than you really should do, and you asked that we look at the law or maybe look at that as a recommendation. But can you not tell your own people, "I don't want you guys looking at stuff we have already decontrolled, I want you looking at the key things"—can you get your people to do that?

Mr. GARCIA. There are some problems with that, sir.

Commissioner MULLOY. Why?

Mr. GARCIA. The first is that the NDAA checks are mandated by law, so I cannot tell my agents, "Don't do these checks."

Commissioner MULLOY. Yes, but you can tell them what the priorities are.

Mr. GARCIA. I can tell them what our priorities are. We are going over to China where we have a specific arrangement with the Chinese Government; we work through a specific agency in China; we arrange a schedule on those checks. I have a team of agents in China; now we are going out to this province and looking at these certain checks, which are checks that we are required to do. We are

not in a position at any point to say, "We don't want to do those checks; we are only going to do these checks," but at the end of the day, does it turn out that we're doing primarily lower-level MTOPS on NDAA checks? Yes. We can prioritize, and we can do other things—

Commissioner MULLOY. I don't understand, though. You are running this place, and you have your guys out there, and they are responsible to you. Why can't you say to them, "These are our priorities, and this is what I want you to look at"—or are the Chinese telling you what you should look at, based on the agreement?

Mr. GARCIA. The Chinese are basically setting the schedule for what checks we are doing on a certain trip. I can tell you that we can take certain steps when checks are not done, and let me give you an example.

I mentioned earlier in the discussion with Commissioner Lewis that there are certain checks on non-high-performance computer items, relatively few post-shipment checks that we would like to see done. Those languish on the checklist, let's call it. After a period of 60 days, we will withdraw the request. They are not mandated checks; they are checks that we want done. In the future, if a shipment is going to that entity, and they are seeking a license, we will put in as a condition that a pre-license check be done before the new commodity is shipped, and in addition, a satisfactory post-shipment verification is done on the prior shipment before Export Enforcement will sign off on the new license application.

So there are certain things that we can do, certain leverage that we have, in terms of checks not being done. I think that operating in China and trying to set our own agenda going through a Chinese entity on which checks our visiting agents are going to do is not realistic.

Commissioner MULLOY. Thank you, Commissioner Bryen.

Co-Chairman BRYEN. Thank you.

Commissioner Dreyer, please.

Commissioner DREYER. Mr. Garcia, you mentioned that Export Enforcement is involved within the limits of our resources. What would be your wish list—and we realize, as you say very clearly in your next clause, that there is nothing you can do to make the system perfect; you can only make it better. So how do you envision making it better? What is your wish list?

Mr. GARCIA. A wish list in terms of resources, Commissioner, would be additional overseas attaches. I worked extensively in the legal attaché program with the FBI when I prosecuted terrorism cases, and I really think there is no substitute for an overseas presence when you are conducting a very complicated investigation where you need consistent and sustained communication on the ground overseas.

I think that would be at the top of my list. I think we also would look to expand domestically. I have eight field offices that are in major port areas, and they cover a lot of territory; they travel a lot. I have a little over 100 agents. Some of those are intelligence agents at headquarters. I would like additional resources in the field, domestically.

I think we can expand our visa review program and perhaps hire specialists to come in and help us with that.

Another thing that I would like to do as an initiative is bring on more of a technical expertise to the enforcement side to help us strategically target commodities and goods. So that we are aiming from an enforcement point of view at the high-level—more so—at the real threat to our national security.

So I would like someone detailed or a permanent presence in Export Enforcement of an engineer or someone who could—we do have input from very good engineers in other Government agencies, but perhaps having our own in-house engineer, not only to do prospective strategic planning, but also to assist our agents as they develop cases, because oftentimes very technical questions will come up about commodities, about classifications, that an engineer could answer, whereas now we go to an outside agency.

I think that is an avenue where we could improve in terms of resources.

In terms of non-dollar improvements, what I would like to see—and this falls on me—is for myself and my deputy assistant secretary to get out and do a better job of educating other law enforcement agencies as to our role in the national security effort. I would like the FBI and their Joint Terrorist Task Force Program—and they do this to a large extent, but even more so—to think of us when they come across an item like night vision, and instead of thinking of it as the terrorists having the night vision camera—it's how did they get it, who is responsible for it going over there. And I think we can do that with the intelligence community as well, and I think that that is on us to get our message out to those agencies with the message that we have limited resources, and perhaps we can't put a permanent presence on a Joint Terrorist Task Force in Milwaukee, but we can have an agent available in our Chicago office who can feed you into the Export Enforcement system.

I think that is one of the things that I would like to accomplish.

Commissioner DREYER. And Mr. Mercier, I note that you said that your agency has three Customs inspectors in the People's Republic of China—

Mr. MERCIER. Three special agents; I'm sorry.

Commissioner DREYER. Three special agents. As you say that, I am imagining the size of China and the number of things they must have to do. Can you tell me how one of these people spends his time, or all three of them?

Mr. MERCIER. Okay. The thing we must remember—and having been an attaché for six years myself, I am familiar with the process of working in a foreign environment—although the State Department obviously may want you there, the Ambassador may want you there as part of the country team to assist in his program development in country, obviously, the host government is a key here, and they are the ones who say how many people can come in and under what agency, and also what you can do.

Essentially, our people are in the Embassy and can only travel to other parts of China based on counterpart agreement with that. So they don't have a free agent status from the standpoint that they can travel. If they want to visit a company, it has to be pre-arranged. These are limitations that obviously are a fact of reality in—

Commissioner DREYER. And this is reciprocal with the United States—if they want to inspect one of our factories, it also has to be prearranged?

Mr. MERCIER. I can't address that issue, ma'am, because I'm not familiar with it. I can only tell you about—you asked me what my people in China can and can't do. Our office domestically tasks our Embassy office in Beijing. They turn around and send the request over to the appropriate counterpart on the Chinese side, and sometimes we get timely responses, and sometimes we don't. That is the process of what we do and how we do it.

Our representatives in China were not sent there specifically to be working export control; it is part of the full cadre of responsibilities of what our investigators do in a foreign environment. But they also do money laundering, they do training, they do narcotics, child pornography—any of the other types of investigations that we come up with.

My attaché there in China—I spoke with him, and he feels—and these are his direct words—that “Our PRC counterparts have evolved to the point that we have received responses in most of our recent requests. We don't want to overstate the case; however, we are optimistic about the future cooperative relationship with our law enforcement counterparts.”

Commissioner DREYER. Are three agents enough?

Mr. MERCIER. I think we have to examine that, because the major ports are not in Beijing. Just like we have quite a staff in Hong Kong, I think that in the future, the Port of Shanghai and some of the other significant ports are aware that in those consulates, a U.S. Customs representative may be appropriate. Again, I think that once the relationship matures, that would be something that we would want to take a look at in the future.

Commissioner DREYER. You both mentioned that your actions are to some extent controlled by agreements that have been signed with the Chinese. Pardon my ignorance, but who negotiates these, and if it were up to you, are there changes that you would make in those agreements?

Mr. MERCIER. Thank you. Obviously, the process of an attaché working in a foreign environment—some countries are very receptive to our presence, or the presence of any law enforcement—I speak now as a law enforcement agent for 30 years—and some other countries are not. Their criminal enforcement system and liaison with foreign law enforcement counterparts is evolving.

Co-Chairman BRYEN. Commissioner Dreyer, we are out of time, so could we move on, please?

Commissioner Becker, please.

Commissioner BECKER. Thank you.

I listened with a great degree of interest when you were speculating on the literally thousands of containers in cross-border trafficking, trains, airlines, and the relatively small number of inspectors for all of that—and it is a horrendous job.

I was at the border during some of the NAFTA debates, myself personally, and I saw literally thousands upon thousands of trucks crossing the border, with none of them being pulled over. And this raises a great degree of concern.

Would you speculate as to what percentage of the containers or the trucks are actually inspected by Customs?

Mr. MERCIER. Less than 3 percent.

Commissioner BECKER. Less than 3 percent. Is there a way that you see out of this morass?

Mr. MERCIER. The choices are tens of thousands of new inspectors or working toward trying to get smarter about how we examine cargo by using intelligence, by getting information, working in partnership with the trade to try to do sorting. You have to decide if you've got 100 containers on the dock, and you only have the resources to search three of them, which three? That's the dilemma that we have, not only on imports, but you take the converse on the export side. And again, it has to be driven by intelligence. Intelligence comes from all sources. We don't care where the intelligence comes from. It could come from a competitive company that wants to turn in someone else. It could be an informant, a paid informant. It could be somebody to whom we have shown the light that maybe they shouldn't be involved in criminal activity and want to cooperate with us. It could be our partners overseas in counterpart Customs Services and other agencies and licensing agencies.

We need their assistance in order to deal with the 50,889 trucks and containers that we examine every day and the 1.3 million passengers every day. That is the problem that we have, and—

Commissioner BECKER. Let me focus in just a little bit tighter, then. During the last panel, I raised the question on the China front companies operating in the United States. Do you have a list of these companies, and are these companies targeted for every kind of shipment they make in or out of the country?

Mr. MERCIER. No, sir, and let me explain to you why. We don't have the resources to examine companies or do investigations of domestic companies. That is not our responsibility. We have to rely upon other partners such as the Department of Defense and their responsibilities, and other agencies that may be involved in controlling or examining the licensing side of when they want to export. We don't have that capability. We are looking at that thin blue line at the border of where our people are, and all those trucks coming at us and all those containers, and we have no way of knowing what is in those containers unless we have information and are then able to try to stop them through interdiction.

The partnership that we have with our counterparts is the most important part here. If it gets away from us, and we know that there are in Singapore, Canada, or Europe, we can call upon counterpart customs services to try to do an interdiction, or an examination and an inspection, and even sometimes ask for redelivery of the container back to the United States. There are all types of aspects, and that includes Mutual Assistance Agreements with counterparts.

There is no piece of paper that's going to say that this is a WMD product, and it is going to China. It is going to say that it is going to another country that is involved in transshipping to China. That's our problem.

Commissioner BECKER. In that regard, your thoughts about cooperation and relying on other agencies—can I assume that there

is a high degree of coordination and cooperation with Commerce and Customs, that when Commerce gives license or has reasons to be concerned—I mean, do the two agencies work together very closely?

Mr. MERCIER. We have a process in our agreement where they can request checks to be made of the U.S. Customs indices to find out about a particular company, and whether or not they are on record for us pertaining to an investigation, or maybe their importing record, or if we have information on their exports. And we do pass that information on. I have what is known as an EXODUS Command Center, where I have one of my assistant directors in one of my divisions, my Strategic Division, who has a staff of not only a couple of intelligence analysts, but also an inspector and a couple of special agents, and that interacts daily with the Department of State on the licensing side and also with the Department of Commerce. If we detain a shipment at the border, and we do not know whether or not it needs a license, that is the key thing. That's why we have this set up to act as a conduit to verify it and not detain shipments we don't need to and obviously detain those that we have to.

Commissioner BECKER. And Mr. Garcia, I'd like you to comment along this line also, because what I am reading into this is that when Commerce has any reason to grant a license or to become involved in any kind of a shipment in or out of China, that this is passed on to Customs so that they would be alerted and could give additional attention to this.

Mr. GARCIA. I would echo what Rick has said. There are ways to do that, and there is a lot of communication there. Obviously, the point has been made—you can't check every shipment—and Commerce has limited resources—but without going into detail, those checks would be targeted to items of specific concern where we think those checks or Customs thinks those checks would make a difference.

Co-Chairman BRYEN. Thanks, Commissioner Becker.

Commissioner WESSEL. I apologize. Could I just get a quick clarification on Mr. Mercier's response, because George had asked you two parts to the question—do you have the list, and do you have the resources to inspect everything? FBI has indicated—and I regret they are not here—that there are essentially more than 3,000 of these front companies. Do you have that list, or do they share that with you?

Mr. MERCIER. I can honestly tell you that I don't know that we have the list. I don't know the answer on that. I know that I would want it if I don't have it. I'm going to find out from my intelligence people.

Commissioner WESSEL. Can you find out whether you have it and let us know, please?

Mr. MERCIER. Yes, sir.

Commissioner WESSEL. Thank you.

Co-Chairman BRYEN. Commissioner Ledeen?

Vice Chairman LEDEEN. First, let me say that it has been a terrific session, and in fact, both sessions have been terrific, and we are all grateful for that.

I'd like to ask both of you whether you have in the course of your work run across any kind of trade connections between the People's Republic of China and either terrorist-sponsoring states or organizations. We are interested in it.

Mr. MERCIER. From a Customs perspective, we are absolutely interested in it. We have had some investigations, and we may have some that—I am not specifically aware, but I know of one, anyway—we are tracking commodities that are going to terrorist organizations. Now, whether or not they are ending up in China or somewhere else, we do not know. I can't specifically say China. I can say that there are some. They are headed to the Asian theater, okay? I think that would be the better way to focus on it.

Vice Chairman LEDEEN. If you would feel more comfortable giving us a classified response, we can live with that.

Co-Chairman BRYEN. But the question, I guess, is whether al Qaeda, for example, in Asia is—

Vice Chairman LEDEEN. Well, no, actually, what I had in mind—

Co-Chairman BRYEN. I'd like to know the answer to that, because it seems like there is a big al Qaeda operation in Asia, as much as there is in—

Vice Chairman LEDEEN. And also, I would expect that you would have looked at China-Iraq, China-Iran, China-Syria, that sort of thing.

Mr. GARCIA. If I could offer some answer to this, I think that connection is perhaps what has thrown us off a little bit. Certainly there is a risk in that area and in China specifically of commodities going into China and then being reexported or transshipped to countries of concern, state sponsors, Iran—yes.

In terms of al Qaeda, from my own personal experience prior to coming to this job, my understanding at the time we were looking into those cases was that China has its own issues with insurgency groups and extremist groups, and I never saw any—

Co-Chairman BRYEN. But on the other hand, there were Chinese weapons and equipment found in the al Qaeda caves in Afghanistan. So we can't be completely relaxed about that, I think.

Mr. GARCIA. Certainly not.

Mr. MERCIER. But I would follow up, sir—that doesn't necessarily mean that China was involved. The product could have been bought or sold a generation ago to an intermediate country or countries and sold three or four times. That is part of the problem that we have in any of these transshipment matters is that we don't know exactly where the transaction begins and where it ends. We know where the commodity is and what the interest is, but—

Co-Chairman BRYEN. Understood; not how it gets there.

Are there any other questions from the panel?

[No response.]

Co-Chairman BRYEN. I want to thank both witnesses today. This has been very useful. I think you have a huge job to do and a very important job to do, and we hope we can stay in touch with you as we work on our report, and if we have additional questions, we'll submit them to you.

Mr. GARCIA. Thank you, Commissioner Bryen.

Mr. MERCIER. Thank you.

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Vice Chairman LEDEEN. We must now clear this room until one o'clock, at which point we'll reconvene.

(AFTERNOON SESSION, 1:20 P.M., THURSDAY, JANUARY 17, 2002)

PANEL III: EXPORT CONTROLS—PROBLEMS, IMPACTS, AND SOLUTIONS

Co-Chairman REINSCH. Let's get started. We have a quorum. My co-chair, Mr. Bryen, will be here in a few minutes. The way we have divided this up, I'm going to chair this panel, and Mr. Bryen will chair the final panel for the day.

Welcome to all of you. I'm sorry for the late arrival. We are just creeping a little bit behind schedule as we go along. We appreciate your forbearance. I'm not going to make any statement in an effort to move things along.

What we'll do is ask you to limit yourselves to 10 minutes—we have little timers up here that flash—and then we'll give the Commissioners five minutes each to ask you questions. We'll hold questions until all of you have finished testifying. And if you can keep your remarks to 10 minutes or less, that would be good, since there are five of you.

Just for simplicity sake, we'll start with Dr. Hicks and work our way down the table, unless someone has a pressing need to go first.

No. Then, we'll give Don the honor.

Dr. Hicks, it is an honor and a personal pleasure for me to have you here, and I appreciate your coming. Thank you.

STATEMENT OF DONALD HICKS, CHAIRMAN, HICKS AND ASSOCIATES

Mr. HICKS. Bill, I'm pleased to do it.

Most of my remarks are based on the Defense Science Board Task Force that I chaired; actually, December 1999 was when we put out the report. I think you all have copies of that, or should have—we sent them over—and I think you have copies of my remarks, which are basically in outline form.

There are a lot of situations where I learned a lot myself from chairing that Defense Science Board study. We did have a large number of really competent people. It was sort of unusual for a Defense Science Board study, but I brought in people inside the building and also from Commerce and State, and Bill himself spent a fair amount of time with us during the periods when we would have meetings and investigations and comments from various people.

The results that come out in a study like this, of course, are not like physics. One of the protests that we had on our final version of this was that, "We don't think you have enough data to justify what you are saying." And of course, the real issue here is that there isn't enough data, and what you have to rely on in many cases is the experience of a lot of people that we had on that task force, years of experience in the various areas. As a matter of fact, the final report was reviewed by all levels of the defense establish-

ment at that point and was signed off by everyone including the Secretary of Defense. I believe it is a very good study.

China becomes probably one of the most important issues that we looked at, but certainly the results of our study were much broader. In terms of China, we considered the problems with China. Are they a potential military threat? Are they a potential partner in trade, or will they even exist—if you think about running China today, if you are the “Mao” of China. How do you keep it operating and together? It’s a horrendous problem, with the people of China having different cultures and different languages.

So China as a nation is tough to manage, and what we have to hope is that as time goes by, democracy can seep into China and that the things we do in our trade policies among others will help them become a democracy and improve the issue of human rights.

I think the main question for this Commission is what about our present U.S. export policy—is it helpful or detrimental to our future relations? And would a more open policy in this area lead to better communications between the U.S. and China? Would this help lead to reduced tensions between the two countries? And, finally, will restricting military and dual-use exports delay or prevent the Chinese military from becoming a threat, since that’s an issue of real concern.

I’m sure this Commission understands better than most that honest people differ highly on this issue. But I think that a better understanding of what we can and can’t control, and what is happening in the world today will allow us to get some agreement on how to proceed.

From that standpoint, I think that our effort, which took a year and a half, lots of meetings, and lots of testimony from lots of people, lots of thought process among the people on the Task Force, could be of help.

So with that in mind, let me turn to those findings. I think the most important finding was that accelerated global integration is irresistible. We can pretend that it’s not happening and hide our heads in the sand, but our policymakers are going to have to adapt to a situation that is real. That in fact globalization is there and, from the standpoint of our own military, is fundamentally altering the composition of our supporting industrial base. Many defense that we buy result from products from the commercial area. Frankly, I think that our Defense Department doesn’t do enough of that, but it still has a major impact.

So we are now being supported by a more commercially intensive industrial base, and whenever you see a commercial base, you automatically realize that it is international in character. Our commercial companies are forced by competition to market their products internationally.

When I first went into defense in the technical areas of the 1950s, defense was really the driving edge of the important technologies for our weapons systems. We had the best technology. We were ahead of everybody, and we spent more money than anybody. Much of that is no longer true.

What is true now is that most of the technology money is being spent in the commercial area, and that means the globalized area,

and those globalized commercial technologies are really driving the development of much of the advanced technology.

So, we can say without much chance of people disagreeing—they may disagree, but they are wrong—that over time, all friendly and adversarial states will share access to the majority of the technology underpinning of the modern military.

Another important issue—and here, I’m going to make a pro statement for the Defense Department, (which is better-off this year than it was in terms of money) that the reason why we have an advantage today and continue to have an advantage and must continue to have an advantage derives less from advanced component and subsystem technology than from the U.S. defense sector’s ability to architect manufacturing systems.

Very early on, I was involved in Stealth, including on the B-2. The mathematics or the physics of Stealth is as much in the open as anything. For example, some of the best mathematicians in the world in those days were in the Soviet Union, in Russia. But the USSR did not have the capability to proceed to an actual air vehicle. Systems are very complicated, you would make mistakes, change things, do it again, and get to the point where you carryout many field tests. You build in that way a whole region of capability. That is what we have had in this country—a defense industry which is competitive, pushing the state of the art on the systems aspects of things, coming up with ideas that the military frankly didn’t think about very often that would help our future military capabilities, and then, having the architectural and manufacturing capability, the infrastructure, to build those things. That is the real strength of our country.

So I believe that increasing U.S. dependence on export controls to maintain this capability gap so-called between our military forces and those of our competitors will actually increase, not decrease, the likelihood that the gap will narrow.

Commissioner LEWIS. Excuse me. Could you repeat that—it will likely increase the—

Mr. HICKS. It will likely increase, not decrease, the likelihood that the gap will narrow. That is, I believe that restrictive export controls, because there is a reciprocal issue here, will actually hurt us more than help us in terms of our technical understanding, and it will have zero impact, except for that, on the real ability that we have, which is to build those things because of our infrastructure and the talent we have in architectural engineers.

So as far as I am concerned, DOD should protect for the purpose of maintaining our military advantage only those capabilities and technologies of which the U.S. is the sole possessor. And there are things that require additional protection for example, Stealth in the early days. We protect Stealth and that we should have protected it. There are other similar capabilities, but in general, so much of these technologies are on the open market from a commercial standpoint (in terms of acquiring the necessary building blocks it hurts us more than helps us.

To continue, our external threats are actually getting worse, not better. There are military “cookbooks”—we all hear more and more about that—that give everybody the ability to construct military

systems, and we face a number of threats and we see these growing.

Russia and China certainly have the capability of developing superior weapons systems. I think Russia's capability is down because of funds again, but they are the outfit in the Soviet Union that developed the double-hulled titanium submarine, ahead of us.

Even poor nations can develop what we call "good enough" weapons systems. North Korea's ballistic missile system is an example of that.

The other thing we should recognize is how quickly these threats, based on the ability of commercial technology, can evolve into a problem for us. I would take you back to when I was small, back to 1932, when we weren't worried about Germany, and yet in seven years, they were a threat to the world. So it doesn't take long for a country with money and capability, if they are willing to focus on things, to get there from here. The Soviet Union focused on the military at the expense of nice things for their citizens, but they still had enough money to become very serious to us.

So, with this unknown future, what actions should we take? I have a list here that I'll read off. One is that U.S. export control policy really plays a minimal role in our national security. The first responsibility of our Government is the survival of our Nation. The Federal Government alone, by the way—a very interesting thing that people don't think about—has responsibility for national defense. Most other things in Government—States, cities, whatever—have money and effort to do, but not defense. And by the way, ultimately, particularly through the last decade, the defense sector's capability as a system integrator has been slowly eroding.

I'll give you an example, and these numbers, by the way, came before September 11, so things are improving in terms of both R and D and procurement, so the numbers I'm going to give you are pre-September 11.

The real problem with these new numbers is that if you really look at them in depth, you'll find out that not very much is going into what I call new systems, and so much of it is going to old systems because the pressures of the defense industry and Congress. All of these pet "sandboxes" keep the votes coming and are still being funded. Some of the things that the Administration said they were going to kill when they came in a year or two years ago are doing very well, thank you, in the new budget.

When I was in the building as Undersecretary, 6 percent of the gross domestic product was spend on defense. The portion of budget where I was involved at that point was about \$120 billion in those year dollars. Before September 11, it was down to 2.9 percent. It has gone up, but if you really want to look carefully at where it has gone up, you'll find that a lot of it has gone up in ways to try to counter what happened on September 11.

Finally, democracies through history have very often been unwilling to pay the price during peace to get themselves in a position to deter threats, and they have always ended up paying a horrible price for that. So the Nation must give defense a high priority—and I say that even though it was a great success in Afghanistan. If Afghanistan had had any kind of major air defense capability, the whole thing would have changed, because we are not sup-

porting the kind of long-range threat projections that we should be, and that the Defense Department still is ignoring.

Thank you.

[The statement follows:]

PREPARED STATEMENT OF DR. DONALD A. HICKS

What is China's Future?

Potential military threat to the U.S.?

Potential partner in trade with the U.S.—with internal stability?

Potential collapse of the Chinese State?

Can U.S. Trade Policy Shape China's Future?

Is the present U.S. export policy detrimental to our future relations with China?

Would a more open policy lead to better communications between the U.S. and China?

Would this lead to reduced tension between China and the U.S.?

Will restricting military and dual use exports delay or prevent the Chinese military from becoming a threat?

Answers to These Questions Are Conflicted

Honest adherents of different economic and political persuasions support different solutions.

A better understanding of what we can and can't do could lead to some agreement on how to proceed.

In this regard, a recent Defense Science Board study might be helpful.

Report of the DSB Task Force on Globalization & Security

The Task Force was composed of a number of knowledgeable individuals who studied various issues for more than a year and issued a final report in December 1999.

Some of the findings and recommendations of this Task Force may be of interest to this Committee.

The Findings Support Changes to Our Present Export Control

The phenomenon of accelerated global integration is largely irresistible and is a fact to which policymakers must adapt.

Globalization is altering fundamentally the composition of DOD's supporting industrial base.

DOD now is supported by a more commercial intensive industrial base that is becoming increasingly international in character.

The Impact of Globalization on National Security

Globalization and the commercial sector are driving development of much of the advanced technology.

Over time, all friendly and adversarial States will share access to the majority of the technology underpinning the modern military.

U.S. military-technological advantage will derive less from advanced component and subsystem technology than from our defense sector's superior system integrators.

Effect of Our Export Control Policy

Increasing the U.S. dependence on export controls to maintain the capability gap between U.S. military forces and those of our competitors will ultimately increase, not decrease, the likelihood that the gap will narrow.

DOD should attempt to protect for the purpose of maintaining military advantage only those capabilities and technologies of which the U.S. is the sole possessor.

External Threats Are Increasing

With military "cook books" globally available to construct weapon systems, the U.S. will face a number of threats.

Russia and China have the capability of developing superior weapon systems.

—e.g., Russia's doubled hulled titanium submarines

Even poor nations can develop "good enough" weapon systems.

—e.g., North Korea's ballistic missiles

Threats can evolve quickly.

—Consider how Germany transformed its military might between 1932 and 1939.

With an Unknown Future—What Actions Should the U.S. Take?

U.S. Export Control policy may play a minimal role in National Security. The first responsibility of our Government is the Survival of our Nation. The Federal Government alone has responsibility for National Defense. Unfortunately, the Defense Sector's capability as a system integrator is slowly eroding.

Defense of Our Nation Must Be Given the Highest Priority

Between 1985 and 1999, Defense procurement, in real terms, fell 50 percent—from approximately \$100 billion to \$50 billion per year.

—Fiscal year 2001 Defense funds are expected to consume 2.9 percent of the GDP, the lowest level since WWII.

—At the height of the Reagan build-up, we spent 6 percent of the GDP on Defense.

Democracies often have been unwilling to divert sufficient funds to meet future threats and then have had to pay a horrible price.

The U.S. Needs To Be Better Prepared for Future Threats

While this Administration recognizes the need to restructure our military force to meet future threats, the super sandboxes of Congress, the Defense Industry, and the Military make it impossible to do with the present budget.

In addition to export controls and Globalization, over which we have limited control, we need to focus on policies and resources under our direct and full control.

This Nation must give Defense a higher priority.

Co-Chairman REINSCH. Thank you, Don. I appreciate the presentation, and I suspect there will be some questions for you.

I think I will also as an aside ask the staff if they can get copies of the Defense Science Board study that your testimony is based on for everybody. I think the Commissioners would find it very enlightening. It is an elusive item these days, but we'll do our best to dig up 12 of them. We have one copy. Good. We'll work on 11 more.

Thank you.

Dr. Lewis?

STATEMENT OF JAMES LEWIS, DIRECTOR, TECHNOLOGY POLICY, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Mr. LEWIS. Thank you, Mr. Chairman.

Let me begin by noting for the Commission that I base my testimony on my experience in the Bureau of Political and Military Affairs at the Department of State as a negotiator for the Undersecretary of State for International Security and Arms Control, and as the negotiator for the President's Special Envoy for Cryptography over the last nine years, starting in the Bush Administration, and my experience in five different efforts by the United States to achieve some kind of multilateral cooperation—unsuccessful efforts for the most part, I must say—has shaped my views.

So it is on the basis of being a practitioner of this art, or perhaps a veteran or even a survivor.

I have looked particularly at the topic of technology transfers and export controls to China and the question touched upon by Dr. Hicks about the contribution of export controls to national security and in restricting China's military modernization.

My conclusion is that U.S. export controls are in the main irrelevant to Chinese military modernization and that efforts to restrict high-tech trade are more likely to damage than improve U.S. national security.

Contrary to claims that China buys U.S. industrial equipment and seeks to use it for military purposes, the Chinese follow the

more sensible course of acquiring modern military technology and weapons from non-U.S. sources.

U.S. commercial technology is important to China's economy, but these technologies are available from sources outside the United States, and other Western industrial nations do not share our concerns and would not support an embargo on technology. Other countries with advanced military technologies are willing to sell to China.

None of the items that have figured in the debates of the last few years about technology transfer to China—computers, satellites, telecommunications, elderly machine tools, semiconductor manufacturing equipment—are regarded by the three major nonproliferation regimes as contributing to proliferation. This is an important point to bear in mind. Efforts to restrict access to these industrial goods make little sense in the light of growing global economic integration. This of course builds on the work of Dr. Hicks and others.

While there was consensus in the 1980s to control technology transfers between the U.S. and its allies, this consensus did not extend outside the Warsaw Pact, and it does not continue today.

Some of the differences are that the U.S. has global responsibilities, and we see an international environment filled with threats and challenges. Many of our allies, however, do not see these threats and are more attuned to commercial opportunity. In particular with the return of Hong Kong and Macau to Chinese sovereignty or Chinese control, there is no European military presence in Asia, and there is no direct confrontation or threat posed by China to Europe; and the Europeans are very cognizant of this.

The clearest sign of some of the differences we face is in COCOM. COCOM occupies a sacred place in the annals of export controls, but our allies ended COCOM in 1994. The regime was moribund by that point with the end of the Cold War, and they chose to end it and with it any cooperation on export controls with China.

The result is that U.S. export controls are now unilateral and thus ineffective. The successor regime to COCOM, the Wassenaar Arrangement, has rejected China as a target repeatedly. The U.S. has not been able to explain to its allies how China is a threat to them or advance a coherent strategic rationale for continued controls on many dual-use goods. And many nations, I must say—and this came up in the most recent meeting in Wassenaar last December—suspect that our export controls are a cunning feint to gain commercial advantage; they do not see it as a security matter.

Let me go over the trends and the concerns over U.S. exports to China in light of this. I can provide and I believe my written testimony provides numerous examples of where U.S. commercial exports are unimportant to Chinese military modernization. I would note the U.S. does not export any military goods to China; we have not done so for more than a decade.

Let's go over a few examples just for the Commission's entertainment. Some critics believe that high-performance computers are a sensitive enabling technology. The problem with this is that it does not take into account the dramatic changes in computing power that have occurred in the last few years. Today's retail-level computers provide all the computing power needed for military mod-

ernization. Let me give you two examples of that—and I apologize to the Commission that back on my desk—I meant to bring it—I have a picture of a pink “Hello, Kitty” computer that has pink plastic fuzz. This computer is more powerful than most of the computers we used to design our nuclear arsenal. It is sold to teenage girls in Japan. I love that one.

A second point might be that when you think about the chips that are available now—and I believe the Commission had testimony on this earlier—the chips that are readily available provide more than enough computing power. One sign of this is that a few years ago when we changed our control levels, Russia, China, India, and Israel would come in and complain. They would come to the State Department and ask, “Why are you doing this to us? It’s unfair.” In the last few years, no one comes in and complaints. Our controls are irrelevant. They can get all the computing power they need.

Microprocessors are a supporting example of this, and in particular semiconductor manufacturing equipment, I would focus on.

Our policy is to try to hold China to two or three generations behind the U.S. A recent GAO study noted that we are not sure what two or three generations is, which handicaps our policy. A more important problem is that none of the other leading suppliers, Japan or Europe, are willing to join us in this policy, and in fact Taiwan is the leading supplier of China’s semiconductor industry. So we pursue a policy of restriction; the rest of the world pursues a policy of commercial advantage.

This brief review I think paints a very different picture of the effect of the transfers of U.S. commercial technology.

Let me also touch briefly on conditions in China. China has extensive defense industries, but they are very old and not capable of absorbing modern Western technology. I do not underestimate China’s desire to become a modern defense industry or to develop one, but they face severe difficulties in doing this.

The Chinese have instead chosen to explore military strategies that emphasize strength in areas where the U.S. is weak—asymmetric warfare—and they have absorbed the lesson of the Soviet Union, which was driven into bankruptcy while trying to match us weapon for weapon.

One of the flaws with the technology transfer critique is that it does not take into account the fact that a nation using an asymmetric strategy will have a different acquisition approach than a mirror-image opponent.

More importantly, while China tries to build its defense industry, facing immense difficulties in doing so, they have chosen to import modern weaponry to improve their military. If you think of the names of the weapons that China has imported and which do affect the military balance in Asia—Sukhoi fighters; Sovremenny destroyers; Crotale and Aspide missile technology; Lavi aircraft components; Spey jet engines—these have a decidedly un-American ring, and these are the transfers that we need to pay attention to.

China purchases modern military technology from foreign sources, and again, there is no consensus to restrict this. You could advocate economic warfare against China, saying we should try to block their modernization, since when they modernize, they will be

a more capable opponent, but this is not something that we would have consensus in doing, this is not something that our allies would support, and it could actually damage our own interests either by harming the American economy or affecting stability in Europe.

One troubling aspect of the technology transfer debate as it relates to China—and this is again following on Dr. Hicks' remarks—is that in emphasizing the risks of technology transfer, we have obscured the costs of restriction to the U.S. These costs fall not only in our own technology and in our own military capabilities but in our access to Chinese programs and understanding what China is doing. We have damaged ourselves in these places in ways that in the long term will be very hurtful. The U.S. must exercise greater care in determining what areas still exist where technology denial makes sense and where we can deny technology without damaging our industrial base, our ability to cooperate with allies, and our ability to ensure continued technological innovation.

I would also note for the Commission that it is worth considering that as China absorbs Western technologies, it must make changes in its economy, its society, and its political structure to reap their full benefit. This poses severe challenges for the Chinese leadership and in some ways, the opening of China in the last decade or so and the economic integration with the West has done more to reshape and erode the control of the Chinese Communist Party than anything that has occurred since 1926.

U.S. policy debates for much of the last century about China have been more about symbols than reality. If you think about themes and fables like the Open Door, the Arrow Shirt myth, or the Yellow Peril, or any of the things that have occupied or intrigued us for most of the 20th century, it has been more about symbols in some ways than about reality.

There are powerful forces in China that fear and distrust the United States. China does seek to modernize its military. America needs to develop new responses to this, and we need strong tools to respond to it—but export controls are not among those tools.

Thank you.

Co-Chairman REINSCH. Thank you, Dr. Lewis.

[The statement follows:]

PREPARED STATEMENT OF JAMES A. LEWIS

Chairmen, Commissioners, I would like to thank you for this opportunity to testify on technology transfer, export controls and China. This is an important topic and I applaud the Commission for looking at it. It is an important topic, but one that has been much clouded by rhetoric and imprecision, and the Commission has an opportunity to dispel some of this.

That transfers of U.S. technology to China can damage national security has become a staple of the larger debate over China policy. Critics charge that China improves its military capabilities with U.S. commercial technology. While these charges are widely accepted, they are wrong. Despite the noisy China cases that attracted public attention in the past few years, a close examination suggests that U.S. technology is irrelevant to China's military modernization and that efforts to restrict high tech trade are more likely to damage than to improve U.S. national security.

Contrary to claims that China acquires U.S. commercial technology and turns it to military purposes, the Chinese follow the more sensible course of acquiring modern military technology from non-U.S. sources. U.S. commercial technology is important to China's continued economic growth, but these commercial technologies are all available from other Western industrial nations that do not share U.S. concerns

with China and which do not support an embargo on advanced technology exports. Other countries with advanced military and industrial technologies are willing to sell to China (although the ability of the PLA and China's defense industry to absorb these technologies remain mixed, despite China's general economic progress). There is not the slightest interest among America's major trade partners or allies in Europe or Japan support a cold-war style embargo (or indeed any embargo on technology) for China. Finally, the U.S. technology sold to China has been overwhelmingly civil and not military, and of little use in weapons production.

Given the limitations of its domestic arms industry, China can only improve its military through purchases of foreign military equipment. China cannot manufacture major weapons systems equal in quality to the best Russian, U.S. or European equipment. While foreign purchases are crucial to any effort to modernize China's military, the U.S. does not sell military or proliferation-related items to China. None of the items that have starred in the U.S. debates over China—computers, satellites, telecommunications, elderly machine tools, semiconductor-manufacturing equipment—are regarded by the three major nonproliferation regimes (the Missile Technology Control Regime, the Nuclear Suppliers Group and the Australia Group for Chemical and Biological Weapons) as contributing to proliferation. This point is usually lost in the larger dispute about China, where charges that U.S. exports help China develop weapons of mass destruction are frequent.

An ironic aspect of the China tech transfer debate is that it focuses on general purpose industrial goods, not weapons or military technology. The debate has blurred differences between military and civil technologies in a way that is unhelpful for analysis. Additionally, efforts to restrict access to these industrial goods make little sense in light of growing global economic integration. Multilateral cooperation in controlling these technologies is at a low ebb. While there was a consensus in the 1980s to control technology transfers among the U.S. and its allies vis-à-vis the Soviet Union, this consensus did not extend much beyond the Warsaw pact. The U.S. itself relaxed technology transfer controls for China in the late 1980s, when China became a useful card to play against the Soviets.

Differences between the U.S. and other Western industrial nations over how to treat China became apparent when the U.S. proposed in 1992 and 1993 to recast Cold War technology controls into broad restrictions to unstable regions like the Middle East or North Asia. The U.S., with global responsibilities, saw an international environment filled with new risks. Many allies, however, saw commercial opportunity. European allies in particular no longer faced a military threat to their survival. The result was a swift decline in defense budgets and a new view of China. With then return of Hong Kong and Macao to China, there is no European military presence in Asia for the first time in 500 years, eliminating any potential for friction. The PLA is far away and unlikely to ever threaten Europe (or, in the view of many Europeans, the U.S), making it very hard to win support among our allies for trade restrictions for industrial goods.

The clearest sign of different views on either side of the Atlantic was the demise of COCOM (the Coordinating Committee for Multilateral Export Controls). COCOM occupies a hallowed place in the hagiography of export controls. Under COCOM's rules, the U.S. and the major western industrial nations restricted their technology transfers to China, the Soviet Union and its allies. America and its major trade partners had a coordinated, multilateral approach to high tech trade with China. By 1992, the regime was moribund and other nations had stopped submitting their high tech exports to China for COCOM review, effectively ending multilateral cooperation and U.S. oversight of exports to China. The COCOM bureaucracy, like all bureaucracies, continued to work and seek new tasks for itself, but COCOM depended on the financial contributions of the member states, and with the end of the Soviet Union, budget cutters in many nations were eager to pull the plug.

Many U.S. allies have dismantled restrictions on a range of industrial technologies once denied to the Soviet Bloc. Commercial concerns are paramount, and a few countries even see China as a lucrative military market. The result is that many U.S. restrictions are now unilateral and thus ineffective as restraints on China's ability to acquire advanced technology. While the U.S. developed a successor regime to COCOM (called the Wassenaar Arrangement), it is ineffective. Creating an organization is not a substitute for a shared strategic vision. Wassenaar members have rejected China as a target for restriction.

This divergence between the U.S. and its allies on technology transfer means that the European Union is increasingly important in setting tech transfer policies for its members and for nations who would like to be members. In 1994, as part of the larger reorientation of export controls, the European Court decided that dual-use industrial exports were an issue of trade rather than security, and so fell under the purview of Brussels (member states retain control of their arms transfer policies).

The EU developed its own technology transfer regulations for industrial goods to which all members must adhere and which any new entrant to the EU must adopt. EU nations have also adopted a common "Code of Conduct" for arms transfers. While the Code of Conduct was in some measure the result of U.S. prompting, it and a related conventional weapons "catch-all" created by the EU were carefully designed to avoid applying to China.

These EU regulations and policies differ extensively from U.S. practice and have become a de facto international standard. The growing stature of the European Union in setting international technology transfer standards, the emergence of common European identity and security policies, combined with differing views between the U.S. and Europe on the risks of high tech trade, is one of the most significant changes in the last decade for technology transfer to China.

The U.S. China debate has played a role in differentiating U.S. and EU policy and in enhancing the EU's role. The U.S. has not been able to explain to its allies how China is a threat to Europe and it has not advanced coherent strategic rationale for continued controls on many dual-use items. A large portion of U.S. and multilateral controls were designed to constrain Soviet weapons programs in the 1980s and make little sense in a different strategic context. U.S. allies now ask how transfers of telecommunications equipment or mass-market microprocessors contribute to weapons proliferation, and many nations suspect that our obsession with export controls is a cunning feint to gain commercial advantage. The partisan nature of the China export debate in the 1990s also did not persuade allies that China was a new threat justifying a COCOM style regime.

How do concerns over U.S. exports to China stack up in light of these trends? China allegedly imports U.S. computers, machine tools, aircraft engines, semiconductors, telecommunications and space technology to improve its military, but U.S. commercial exports are unimportant for China's military modernization. There is considerable evidence to support this conclusion:

- Critics charge that exports from the U.S. of a thirty-year-old jet engine designed for small business jets would contribute to Chinese cruise missile production. The Chinese instead bought cruise missile engine technology from the French and advanced cruise missiles from the Russians.
- U.S. and Chinese companies, in clear contravention of their export licenses, diverted used machine tools to a Chinese aircraft plant. The dramatic charge is that these machine tools were used to build the B-1 Bomber. In fact, the tools were twenty years old, worn, inaccurate and mostly sold as scrap. The Chinese uncrated one of the diverted machine tools, a stretch press, before the U.S. discovered the violation and required China to return the machine tools to a U.S.-owned plant in Shanghai. At the plant, the new American owners inspected the tools and found them inaccurate, unrepairable and unusable. Ironically, the U.S. action led to an improvement in China's industrial capabilities, as the Chinese replaced the worn-out stretch press they were obliged to return with a more modern and sophisticated stretch press bought in Europe. China routinely acquires the most advanced five axis machine tools from European sources even when the end-user is a military installation.
- The Department of State denied the export of a U.S.-built communications satellite to China, fearful that it would be used to collect signals intelligence. This was implausible. While both sigint and communications satellites pick up communications from the ground, communications satellites lack the capability for covert interception and processing. A commercial telecommunications satellite cannot intercept communications unless it has been substantially modified. Since this satellite was being built in the U.S., no such modification by China was possible.
- In 1998, concerns over alleged leaks of space technology to China led to legislation that transferred export licensing for communications satellites from the Department of Commerce to the Department of State. When Congress weighed new satellite restrictions in 1998, it underestimated their cost. It did so because the 1998 debate overstated the "uniqueness" (and thus the risk to national security) of U.S. satellite and launch technology. The immediate result was a significant decline in the U.S. share of the communications satellite market and new pressures on America's satellite manufacturing base.

Space launch vehicles and ICBM's share technologies, but launching satellites on liquid-fueled Space Launch Vehicles involve different technologies than does launching warheads on solid-fueled ICBMs. One important difference is that warheads are designed to re-enter the atmosphere and satellites are not. Reentry entails very high temperatures, high g-forces and speeds exceeding Mach 6. Only a very strong vehicle can withstand this, and the robust warhead does not need the same sort of

launch as does a more delicate communications satellite: the warhead can withstand vibration and environmental effects that would destroy a satellite.

A second difference is that long-range missiles are, ideally, capable of rapid launch on very short notice. Solid-fuel rocket engines are better for this than are liquid fueled rockets used for satellite launches. Satellite launches can take several days to weeks to prepare, allowing for the use of liquid-fuel engines (which are very vulnerable from the military perspective, as they must sit immobile on the pad for hours while being fueled, making them easy targets). Other important factors, such as thrust termination, also differ from liquid-fueled to solid-fueled rocket engines. China has had liquid-fueled ICBMs for several decades. It wants to move to solid-fueled, road-mobile ICBMs (the DF-31). The technology used for commercial space launches by liquid-fueled, immobile rockets will not help them make this move.

—Charges that China gains military advantage from U.S. computer exports ignore the increases in computing power brought about by microprocessor performance software developments, and clustered computers. Today's retail-level computers provide all the computing power needed for military and proliferation-related applications.

Military applications do not require much computing power. Increases in computing power in the past 10 years has transformed computers from highly specialized research tools into commodities and break any connection between high performance computing and weapons proliferation. The United States itself used elderly 650 MTOPI VAX computers until recently in the J-STARS battlefield surveillance aircraft (MTOPI are a measure of computer speed). EP-3E aircraft, the type involved in the recent incident in China, used 240 MTOPI workstations. To put this in perspective, desktop or laptop computers on the market today using a single Pentium III chip operate between 700 and 1,000 MTOPI. For these battlefield applications and for design and manufacture, computing power is less critical than the ability to integrate computers, sensors, and platforms into an effective system.

Critics believe that high performance computers are a particularly sensitive "enabling" technology for nuclear weapons, missiles, submarines, and other military applications. These charges grossly overestimate the amount of computing power needed for military use and weapons design. Access to computing power does not automatically translate into modern weaponry. The United States designed and built its nuclear arsenal with computers of 500 to 1,000 MTOPI. At the time, these were large, sophisticated supercomputers. Consumer systems can now provide the computing power once supplied only by these "supercomputers." The U.S. designed its most advanced fighter, the F-22, with a 958 MTOPI Cray supercomputer, now roughly one-quarter of the power found in mass-produced Pentium chips.

Computational power is of little benefit for weapons design unless the computer is running sophisticated codes based on extensive experience and test data. Desktop computers and workstations can meet military requirements if—and this is the crucial element—they are running the necessary software and databases. For nuclear weapons design, a central concern in the computer export debate, access to data derived from nuclear weapons explosions is more important than computing power. A country without extensive experience in weapons design is at a significant disadvantage, and the lack of reliable data and proven codes will substantially constrain the usefulness of computer technology for military or proliferation purposes.

—Opponents of high-tech trade with China decry sales of semiconductor manufacturing equipment. This equipment is among the most advanced industrial technology in use today. Japan, Germany, the Netherlands and the U.S. are the major producers. U.S. firms complain of significant hurdles in exporting this equipment to China, even when the intended recipient is a plant owned by a U.S. company. Restrictions on semiconductor manufacturing have survived almost intact from Cold War export controls aimed at the Soviet bloc, despite radical changes in the international security and economic environment.

This restriction runs headlong into China's desire to build an advanced national electronics industry and the desire of other supplier nations to take advantage of China's cheap labor and domestic market. Many companies build plants in China to ensure access to China's expanding consumer market and to lower their labor costs. While U.S. export policy tries to hold transfers of semiconductor manufacturing equipment by U.S. firms to two or three generations behind state-of-the-art, Taiwanese firms have been transferring advanced equipment to China. Taiwan is the leading foreign developer of China's microelectronics industry. All other major suppliers—the Netherlands, Germany and Japan, have told the U.S. that they will not block equipment sales to China. They have repeatedly questioned the contribution of semiconductor manufacturing equipment to military capabilities and proliferation and ask whether there is still any strategic rationale for controlling these items.

- Project 909 is the name given by China to its plan to develop a microelectronics industry. Project 909 involves joint ventures between Chinese and foreign firms. The foreign firms supply financing and technology and the Chinese supply labor and market access. In 1996, the U.S. had just begun to consider whether to permit exports of semiconductor manufacturing technology to Project 909 when Japan announced that it had approved the participation of its firms and the transfer, under a “global license,” of advanced semiconductor manufacturing technology. The transfer was covered by a short agreement between the two governments where China promised not to use the semiconductor manufacturing equipment for military or proliferation purposes. The U.S. sought to discourage the transfer, but the Japanese responded that they did not see the strategic concern over manufacturing semiconductors for cell phones and pagers.
- A German company planned to sell advanced semiconductor manufacturing equipment to a Chinese firm. A U.S. company was competing for the sale, but the U.S. denied permission for its export out of concern that the recipient was somehow involved in missile proliferation (the Chinese company made electronic components for use in a range of goods, including missiles). The U.S. demarched the German government several times, asking that it deny its company permission to export. The Germans declined, noting weaknesses in the U.S. proliferation charge and pointing out that the equipment in question was not controlled by the Missile Technology Control Regime. After almost a year of discussion, when it was clear that the Germans would not back down, the U.S. finally relented and approved the sale.
- While unable to persuade Taiwan, the Netherlands, Germany or Japan that there is a military rationale for denying semiconductor manufacturing technology to China, the U.S. had more success in applying restraints to itself. The endless debate over Motorola’s requests to build a chip fab in China for more than two years shows this. The equipment would go to a Motorola-owned and operated plant to make components for pagers and other civil products. The Chinese government would not have access to the fab and could not design or build chips for military purposes in it. This situation offered the U.S. the maximum degree of control over semiconductor manufacturing equipment, yet it took almost a year to approve and then with conditions that limited the equipment Motorola could use to two generations behind state-of-the-art.
- Critics say that sales of advanced telecommunications equipment by U.S. firms increase China’s capability for command and control and even contribute to proliferation. None of the nonproliferation regimes control telecommunications equipment and they do not regard it as a proliferation-related technology. Until 1994, the U.S. and its allies controlled telecommunications equipment exports in order to preserve the ability to monitor Soviet forces. In 1992, COCOM nations led by Germany and France, rebelled and threw off Cold War controls on telecommunications equipment. U.S. allies questioned whether there was still a strategic rationale for controlling civil telecommunications. Over the last few years, they have forced the U.S. to decontrol most of this equipment. Even before the decontrol, major western producers had begun to transfer equipment to Russia and China despite U.S. objections.

The most famous case involving telecommunications equipment involves a Chinese company named Hua Mei. Some of Hua Mei’s owners were in the PLA. Hua Mei bought an advanced videoconferencing system from the U.S. (similar systems were also available from European suppliers) to use in hotels. Critics argued that the equipment would provide the PLA improved command and control. However, even the GAO noted that the equipment was for video-conferencing among hotels, suggesting that this military use scenario is implausible. The issue with China and telecoms is market access, not national security or nonproliferation.

This brief review paints a very different picture of transfers of U.S. commercial technology to China. These transfers were benign. Conditions in China are also important in understanding the limited risk posed by such transfers and the limited utility of technology restrictions. China’s defense industries, although extensive, remain a product of central economic planning and cannot produce modern weapons. Much of the defense industrial base is comprised of the least productive elements of China’s economy—the State Owned Enterprises (SOE) that are an immense drain on China’s finances. Given the role the SOE’s play in providing a social infrastructure the Chinese will find it politically difficult to undertake the necessary contraction in its defense industrial base (shutting inefficient or older plants to reduce overcapacity) that will be necessary to modernize arms production.

This weakness reflects choices China made in the 1950s. Experience counts in making advance weapons, where extensive databases and long practice at testing and integration skills are the most important factors for successful weapons produc-

tion. If China had built the modern conventional forces advocated by Peng Teh-huai and others, it would have forty years of experience in developing an advanced military industrial base. Mao's emphasis on low-tech warfare denied this to China and in general, their arms industry lags far behind other nation. We should not underestimate China's desire to develop a modern defense industry, but we should also not underestimate the difficulties they face in doing this.

Given this, the Chinese are exploring military strategies that emphasize strength in areas where the U.S. is weak rather than in trying to match American military forces. The lesson of the Soviet Union being driven into bankruptcy while pursuing a mirror-image military posture has not been lost on Beijing (which could not afford such a strategy even if it wanted to). One of the flaws with the technology transfer critique s that it often fails to take into account how the acquisition plans of a nation pursuing a strategy of asymmetric warfare differ from those of a mirror-image opponent.

More importantly, while China pursues its long-term goal of becoming a modern industrial state with a strong defense industry, it imports modern weaponry. The names of the weapons that China has imported and which help set the military balance in Asia—Sukhoi fighter-bombers, Sovremenny destroyers, Crotale and Aspide missile technology, Lavi aircraft components, Spey jet engines—have a decidedly un-American ring. These are the transfers that affect the military balance. China's principal sources of modern military technology are Russia and Israel. European countries are at best only secondary suppliers—The EU's Tiananmen sanctions apply only to 'lethal' equipment (i.e. arms, not sensors, avionics, engines). Of the \$5 billion in arms China has imported in the last decade, only one percent has come from the U.S. China has also purchased modern military-industrial technology from foreign sources, but continues to have difficulties in using this technology to build modern weapons, even when supplied with turn-key facilities.

This will change as China becomes more technologically advanced and better able to absorb foreign technologies and build its own advanced equipment. This is an unavoidable corollary to China's broader modernization, albeit something that lies years in the future. While some advocate that the U.S. wage "economic warfare" against China to prevent its economic modernization, there is no international support for this and "economic warfare" is unlikely to be in the U.S. national interest. Keeping China poor would be more likely to increase instability in Asia and the Bush Administration has wisely rejected this option.

One troubling aspect of the China technology transfer debate is its emphasis on the risks of technology transfer has obscured the costs of restriction to the U.S. Technology denial can still be effective in those areas (such as in advanced sensors or satellite remote sensing) where the U.S. has unique capabilities or multilateral support, but the U.S. must exercise greater care in determining those areas where technology denial will damage its ability to maintain a robust industrial base, to cooperate with allies and to ensure continued technological innovation. The debate also fails to consider whether the process of absorbing western technologies and of making the necessary changes to reap their full economic benefit will do more to reshape and erode the control of the China's Communist Party than anything since 1926.

U.S. policy debates for much of the last century have been shaped as much by the symbolism of China as by the reality of bilateral relations. Themes and fables like the Open Door, the Arrow Shirt myth, the Good Earth, the Red Menace and Who-Lost-China appear to recycle at least once a generation. However, a reliance on symbols is not beneficial as the bilateral relationship enters a new and difficult phase. Powerful forces in China fear and distrust the U.S. China is modernizing its military forces in response to this, and also to secure the central role it believes it should play in Asia. America will need clear thinking and effective tools to manage this challenge, not irrelevant measures that can weaken U.S. technological strength and harm relations with allies without denying countries like China access to advanced technology.

Co-Chairman REINSCH. Let me say with respect to our next witness that Mr. Hatano is here on behalf of George Scalise, President of the Semiconductor Industry Association, and he is accompanied by David Rose of Intel, who is in the first row, who will also respond to questions. And I think what I'd like you to do, David, when the panel is done is come to the table and take the extra seat.

Mr. Hatano, please.

**STATEMENT OF DARYL HATANO, VICE PRESIDENT, SEMI-CONDUCTOR
INDUSTRY ASSOCIATION**

Mr. HATANO. Thank you.

This afternoon, I'd like to do two things. First, I would like to provide an overview of the global semiconductor industry, particularly developments in China; and second, I would like to give three specific policy recommendations with regard to U.S. export control. These recommendations will follow a common theme, namely, that the United States should generally replace its policy of controls on exports of commercial IT products to China and elsewhere with a policy of staying ahead technologically.

First, an overview of the global semiconductor industry and developments in China. Semiconductors are the enabling technology for the Information Age. It is literally true that the World Wide Web is spun with silicon, not just in terms of the information traveling on fiber cables between computers, but also on the silicon chips themselves within the computers.

To better understand the dynamics of this unique industry, let me highlight three key points. First is the pace of change in the industry, second is the ubiquity of chip applications, and third is the commercial and global nature of this industry.

The pace of change in semiconductors is best characterized by Moore's law. Since the 1960s, this industry has quadrupled the number of transistors on a chip every three years, and Moore's law has actually accelerated in the latter half of the 1990s with regard to microprocessors, with a two-year rather than three-year cycle being achieved.

By continually increasing the density of circuits on each chip, these chips become better, faster, and cheaper. The declining cost for the performance we get from semiconductor chips leads us to the next point, which is the ubiquity of semiconductors. Chips are everywhere. They are in your computer, and they are in the antilock brakes in your car. They are in the satellites flying above us and the metro system below us. They may be in your daughter's doll and in your father's hearing aid.

To underscore the ubiquity of chips and in particular how microprocessors are changing our world, let me make this statement. In the time that this coin is in the air..[two second pause]..we just shipped another 30 advanced microprocessors and micro controllers to customers around the world.

Not only are we making millions of microprocessor chips every year, but the software exists to cluster this computing power into networks of standard personal computers that can reach supercomputer performance levels.

The third industry dynamic that I would like to highlight is that the industry is global and commercial, not national and military. Seventy-five percent of the semiconductor market is outside the United States, and seven of the world's top ten semiconductor companies are headquartered outside this country. Current military and aerospace applications represent less than one percent of worldwide semiconductor demand.

While the advancement of information technology makes an important contribution to national defense, there is nothing inherently military about IT. This is a key point that must be empha-

sized in any discussion of export control. There is nothing inherently military about information technology.

Given the accelerated pace of change in the industry, the ubiquity of semiconductor chips, and the global and commercial nature of this industry, applying the current Cold War era export control regimes to commercial IT must be reconsidered.

Let me now move to a description of the opportunities and challenges that we see with regard to China.

The semiconductor industry strongly supported normal trade relations with China because we wanted to ensure equal access for U.S. producers to this important market. China has become the world's largest cell phone market; it is the third-largest personal computer market, and it is the third-largest semiconductor market, destined to be the second-largest semiconductor market by 2010.

Production in China is also expected to increase. The Chinese Government's tenth Five-Year Plan is aiming to increase Chinese semiconductor output from about \$2 billion in the year 2000 to \$24 billion in the year 2010.

Success of information technology companies, including chipmakers, will be tied to success in the China market. Recall my earlier statements about the pace of change in this industry, and you will understand why this industry has to invest about one-third of its revenues into new plant and equipment or R&D. To remain competitive, chipmakers must be able to spread these large investments over a bigger volume. If U.S. export controls prevent U.S. companies from competing in one of the world's largest markets, U.S. chipmakers become less competitive over time. This is not in our country's economic interests, and I would submit also not in our national security interests.

Moving to our proposals with regard to reform of U.S. export controls, again, we would go with the theme that the U.S. should generally replace their controls on exports of commercial IT to China and elsewhere with a policy of staying ahead technologically. We would urge you to consider three proposals that adopt this theme, and they are: to eliminate performance-based controls on widely available commercial items; to remove outdated export controls on chip technologies and semiconductor equipment and materials; and to focus on company behavior rather than on individual employees.

Let me review each of these in turn. First is eliminating performance-based controls on widely available commercial items. Performance-based controls are controls that are based on the performance of a product such as microprocessors with speeds exceeding 6,500 MTOPS. The problem is that today's microprocessors used in business computers will have increased in performance over 22 times over the last five years, making it ever more unpredictable and ultimately a futile exercise to continually update component MTOP levels to try to keep pace with this technological advancement.

This year, the current MTOPS level of 6,500 will be exceeded by the performance of PCs, work stations, and server processors, and despite an expected anticipated increase of 12,000 MTOPS sometime this year, the Government will have to continue to adjust this threshold in the future, or else they will have a collision between the high volumes of uncontrollable components and the existing export licensing system.

Furthermore, as the Center for Strategic and International Studies concluded, the ability to cluster PCs to achieve supercomputer performance also makes the MTOPS level controls obsolete.

Recognizing the futility of MTOPS controls, nearly every member of the 33-nation Wassenaar Arrangement supported the elimination of these controls last year. The United States was the sole opponent to this reform.

The U.S. should join with the rest of the Wassenaar Arrangement in agreeing to eliminate the MTOPS parameter.

Our second proposal is to remove outdated export controls on chip technologies and semiconductor equipment and materials. Today's export controls on these technologies, equipment, and materials present a significant competitive disadvantage for U.S. companies. The strategic importance of the China market will drive ever-increasing investments and technology transfers, and foreign companies are rapidly engaging in these activities. Japan and European countries have made it clear that they do not consider chips or semiconductor equipment and material exports to China to represent a security threat.

Since China can obtain all major types of semiconductor production equipment from non-U.S. sources in Japan and Europe, there is no justification for restraining U.S. exports to the extent that these items are going to be freely available from other sources.

The third proposal is to focus on company behavior rather than on individual employees. SIA member companies experience significant problems in the area of deemed exports, which is the transfer of controlled technology to foreign nationals working or visiting in the United States who are from controlled countries such as China.

Unlike other controls in the U.S., the deemed export rule goes beyond the exporting entity—the company that owns and develops the technology—and singles out select employees for restrictive treatment on the basis of their non-U.S. nationality. The deemed export licensing process is often unduly complex and time-consuming, with no discernible benefit to U.S. security. The rule has served to impede technology transfers within a U.S. company operating in the United States and made it increasingly difficult to attract the most talented scientists and engineers, thus stunting the pace of technical advancement in the United States.

The deemed export rule should be eliminated. The U.S. export control system should not unilaterally and arbitrarily place restrictions on individuals working for U.S. companies and residing in the U.S. based on their nationality. Rather, the onus should be put on companies to ensure that technological know-how and information is kept within the confines of their operations.

In sum, the SIA is concerned that the export control system has become disconnected from IT realities, including the acceleration of Moore's law, the ubiquity of semiconductor chips, and the commercial and global nature of information technology. Export controls represent a major, unnecessary impediment on U.S. participation and success in the Chinese semiconductor market, and the U.S. should generally replace its export control policy with a policy of staying ahead technologically.

Thank you.

Co-Chairman REINSCH. Thank you very much, Mr. Hatano.

[The statement follows:]

PREPARED STATEMENT OF GEORGE SCALISE, PRESIDENT, SEMICONDUCTOR INDUSTRY ASSOCIATION

On behalf of the Semiconductor Industry Association (“SIA”), I would like to thank you for the opportunity to testify before the U.S.-China Security Review Commission. I would like to address some of the elements of U.S.-China relations as they pertain to national security and do so from the perspective of the information technology (“IT”) industry. In particular, and as requested, I will focus on export controls.

SIA is the leading trade association representing the U.S. semiconductor industry. Its member companies comprise 90 percent of U.S.-based semiconductor production. SIA member companies manufacture a wide variety of semiconductor products, including chips used in computers and related equipment, cellular phones, telecommunications systems, automobiles, appliances, and many other items.

SECURITY DIMENSIONS: INFORMATION TECHNOLOGY AND U.S.-CHINA RELATIONS

Information technology contributes significantly to all aspects of U.S. security related to China—political, economic and military. Information technology has had a particularly important role in moving China to a more open, market-based society that is becoming more broadly integrated with the rest of the world community.

SIA began many years ago to seek to bring China into the world trading system through multilateral trade agreements. SIA has also worked hard to support and shape the basis for China’s accession to the World Trade Organization as it relates to information technology.

SIA welcomes China’s accession to the WTO. As a part of its WTO commitments, China has agreed to join the Information Technology Agreement and eliminate tariffs on semiconductors, computers, telecommunications equipment and many other IT products. China has also made numerous commitments to reduce and eliminate trade barriers and to adhere to the same rules as other WTO members. China’s accession will contribute to further opening of its market and to the development of IT in China. WTO membership will serve to make China’s economic potential an economic benefit to the community of nations and strengthen the rules-based international trading system.

The United States should not take these developments for granted. While SIA supports China’s WTO accession, it needs to be accomplished pursuant to the rule of law and China’s obligations must be fully and carefully enforced if China’s impact on the world economy is going to be constructive rather than generating major disruptions and distortions. SIA recognizes that the challenges of WTO enforcement are substantial. For example, to circumvent high tariffs and taxes, today up to 80 percent of semiconductors imported into China are traded through indirect channels that are conducive to extensive smuggling. Further, intellectual property protection, which is vital to our industry, is at best very fragile in China.

The advancement of information technology also contributes to meeting the United States’ defense needs. Agility in utilization of information technology is helpful to all sectors of activity: from consumers to students to soldiers. But it should be emphasized that there is nothing inherently military about IT. On the contrary, information technology is a product of, and has come to be dominated by, the civilian sector. U.S. industry’s ability to keep pace with innovation, and therefore remain a reliable source of critical technology to the U.S. military, is directly correlated to its ability to produce and market its products on a global scale.

United States national security interests are dependent on how effective the United States develops advanced technologies, not how the United States purports to restrict technologies. To maintain its leadership in advanced technologies—leadership which is crucial to all dimensions of security—the United States must be able to:

- Provide an environment that attracts, and is conducive to, technology development. The United States should welcome research and development within our shores and value and foster greater technology advancement within the United States.
- Maintain a strong education base including a vibrant university system that attracts students from around the world. The United States Commission on National Security in the 21st Century, co-chaired by former Senators Gary Hart and Warren Rudman, concluded in its January 2001 Report, “Road Map for National Security: Imperative for Change,” that “the inadequacies of our systems of research and education pose a greater threat to U.S. national security over

the next quarter century than any potential conventional war that we might imagine.”

—Maintain a regulatory system that does not drive technology development elsewhere. The United States needs to make sure that the regulation of IT is managed in a manner that allows technology development to flourish in the United States.

EXPORT CONTROLS: A CRITICAL CHALLENGE FOR RELATIONS WITH CHINA

The United States should do what it can to better relations between China and Taiwan so that the likelihood of aggravated political tensions or conflict is reduced. Like elsewhere in the world, economic development in China and economic integration with Taiwan can provide a stabilizing effect in that region.

One of the central features of the United States’ security relations with China is the unsettled policy area of export controls. The United States currently places restrictions on a wide variety of commercial information technology exported to China, including semiconductors and related equipment and technology. While these Cold War-era controls are imposed in the name of national security, they are increasingly becoming counterproductive to U.S. policy goals, most notably the democratization of China and its integration into the world economy. Commercial information technology will be a driving force in China’s future modernization and economic and political stability. Delaying the adoption of this technology, which has already proven to be an important agent for change within China, will work against U.S. interests and will be increasingly detrimental to the global leadership position of many U.S. technology industries.

In addressing export controls and their impact on U.S.-China relations, I would like to address the following topics:

- The nature of semiconductor products and other widely distributed IT.
- The unique opportunities and challenges presented by the Chinese market for semiconductors and related products.
- Problems presented by the current export licensing system.
- Recommendations for changes in U.S. export control policy

I. THE NATURE OF SEMICONDUCTORS AND RELATED INFORMATION TECHNOLOGY

Over the past few decades, the IT industry has undergone a dramatic transformation. The manner in which IT products, including semiconductors, are manufactured, marketed, distributed and serviced is radically different than it was even ten years ago.

The growth and impact of IT driven by Moore’s Law has created change at an exponential rate. For decades, computing power has doubled roughly every 18 months, while the cost of computing has been cut in half during the same periods. As a result, we have moved far away from the world in which IT systems were large, few in number, hard to build, and geographically constrained. We have entered a fundamentally different domain where IT products are small, easy to assemble, globally produced and distributed in huge volumes, and connected to intelligent networks and the Internet.

The process by which IT products are produced and distributed has flipped from a vertical “control” model to a horizontal “dispersal” model. In the computer industry of the 70s, each company largely controlled the development, production, sales/marketing and maintenance of its products. A company generated its own designs, components, subassemblies, platforms, operating systems, applications software, sales channels and product service. In the 1980s and 1990s, this vertical model changed to a globalized horizontal model in which computers are built (increasingly locally) by assembling mass-produced chips and other standardized IT building blocks from vendors around the world. This change occurred because companies saw that a horizontal approach would increase innovation, drive cost reduction, and foster ease of assembly through uniform global standards. This horizontal model is now being expanded to the Internet itself.

Within the last thirty years, information networks have changed from conventional telephone systems and a few localized computer networks into a vast information infrastructure. This transition has resulted in media-rich exchange of information over long distances—from text to graphics to voice to streaming video. It has also enabled computing to be conducted on a remote-access basis since network capabilities remove the need for a physical presence in a given location. Furthermore, networks are migrating beyond standard wired “PC-to-server” connections to include cell phones, hand-held information appliances connected on both a wired and wireless basis. Remote information exchange and computing are thus becoming “the fabric of our daily lives”—developments that allow individuals and organizations al-

ways to be on the network and communicate with anyone or anything anywhere. This is fundamentally changing the way in which businesses and governments operate, as well as the way people conduct their lives.

The ability to cluster computing power has allowed supercomputer performance from networks of standard personal computers. The systems software that allows cluster technology is readily available on the Internet. The emergence of cluster technology has led the Office of the Undersecretary of Defense (Science and Technology) to conclude in February 2001 that MTOPS controls for high performance computers were ineffective and should be scrapped in favor of better security of military applications software. A similar analysis led the Center for Strategic and International Studies to recommend scrapping MTOPS controls on microprocessors.

Special links between the IT industry and military systems have ended. Thirty years ago, the major U.S. semiconductor companies were, in large part, defense contractors. They worked closely with the Defense Department and followed its lead in developing advanced IT systems specifically for military applications.

Today, commercial applications completely dominate the markets served by all major semiconductor producers. IT technology development is led by advances in the commercial arena, and the vast bulk of IT products is inherently commercial. Military systems rely principally on the same off-the-shelf, commercial IT products used by civilian customers.

Given these drastic changes, applying the current Cold War-era export control regimes to the commercial IT industry merits careful reassessment.

II. OPPORTUNITIES AND CHALLENGES IN CHINA

China has been gradually but irreversibly embracing the global IT revolution, and development is now moving at an incredible pace. The country's deliberate and concerted efforts to promote the broad adoption of most types of information technology raise fundamental strategic issues for the U.S. IT industry, and the semiconductor sector in particular.

Although China remains in the early stages of IT modernization, expansion of China's IT infrastructure over the past decade has already resulted in China becoming the world's second largest PC market and third largest semiconductor market. The rate of growth has been among the highest in the world. By 2005—in just 36 months—China expects to have 70 million computer owners—up from about 19 million today. China is predicted to be the world's second largest market for semiconductors, behind only the United States, by 2010. With regard to production, the Chinese Government's 10th Five-Year Plan aims to increase Chinese semiconductor output from \$2 billion in 2000 to \$24 billion in 2010, at which time Chinese producers would satisfy 50 percent of their domestic demand compared to 20 percent today.

In short, the success of U.S. IT companies, including chipmakers, will be inextricably tied to success in the Chinese market. To remain world leaders, U.S. companies will have to be leaders in the Chinese market.

United States IT companies will not be able to secure and maintain leading positions in China without manufacturing there. In general, IT companies need significant production in critical markets to succeed in these venues. This is part of being close to the customer—a cardinal rule in any business.

Moreover, it is clear that China will be a center of semiconductor manufacturing. The Chinese semiconductor market has been supplied predominantly by foreign chip manufacturers through exports of finished products. China still satisfies only 20 percent of its demand for semiconductors through domestic production.

Increasingly, however, joint ventures have been formed to mass-produce semiconductors in China. In 2000, for instance, plans were announced for several multi-billion dollar Chinese semiconductor fabrication plants with advanced production technology. One Sino-Japanese producer in Shanghai recently announced that it will be using leading-edge, .18 micron process technology by early 2002. Over the past decade, semiconductor capital spending in China has risen from a mere \$20 million in 1990 to \$3 billion in 2001. And analysts predict that semiconductor capital spending in China will be \$7 billion in 2003, more than 300 percent higher than 2000 levels.

In the past two years, there has been a surge of submicron fab activity in China, with at least twelve fabs either under construction or in their planning stages. Most of these facilities will utilize .25–.18 micron process technology and will be capable of adjusting to even smaller feature sizes. These plants are concentrated in industrial parks near Shanghai and Beijing.

Over the next several years, significant growth in Chinese semiconductor production capacity is expected to be fueled in large part by Taiwan-based semiconductor

producers, who are transferring some manufacturing functions to the mainland while retaining “high end” functions in Taiwan. Semiconductor firms from Europe and elsewhere in Asia are also making strategic commitments to chip manufacturing in China.

Beyond the cost-related reasons for expanding chip production into China, growth in domestic productive capacity has become a priority for the Chinese government, which desires a level of self-sufficiency in semiconductors.

Accordingly, it is important for U.S. semiconductor companies likewise to participate in Chinese semiconductor manufacturing. As a related matter, it is important that U.S. makers of semiconductor production equipment and materials or “SEM” be able to sell into the Chinese market. United States chip producers rely heavily on U.S. SEM companies to supply their fabrication facilities. And, like U.S. chip makers, U.S. SEM companies must be leaders in China to be worldwide leaders.

Finally, with the continued growth in China, much of the focus for future research in China will be in the area of IT. The opening of markets within China also means that intellectual talent will grow, thus presenting an additional opportunity for U.S. companies, particularly in an industry driven by intellectual talent and creativity. United States semiconductor companies already utilize highly skilled workers from the PRC, and this trend is expected to continue. It is therefore imperative that the U.S. export control system not unilaterally and arbitrarily place restrictions on individuals working for U.S. companies and residing in the United States based on their non-U.S. nationality.

III. PROBLEMS WITH THE U.S. EXPORT CONTROL SYSTEM

United States export controls have long been a complicated issue for U.S. companies competing in the Chinese semiconductor market. Despite periodic liberalization of controls on semiconductors, and the overwhelmingly commercial nature of the semiconductor industry, existing constraints continue to affect a wide range of devices, technology and equipment and threaten to capture mass market, general-purpose items.

SIA is concerned that the export control system has become disconnected from IT realities, including the growth and impact of Moore’s Law, the ubiquity of commercial IT, the ability to cluster computing and foreign capability. In many cases, export regulations represent much industry effort and restraint without resulting in purposeful or effective control. Even if a license is granted, export license application reviews cause damaging and undue delay and uncertainty. The problem is essentially the result of a collision between centralized controls and the decentralized nature of IT.

Policy-makers are unable to identify a connection between mainstream, commercial IT products and national security that warrants maintenance of export controls in this area. Most IT products are purely civilian items, which cannot, for these purposes, be distinguished from civilian applications such as automobiles or automobile production equipment. Consequently, restricting shipments of these products is akin to an economic embargo, not strategic export controls.

There are three specific areas of the export control system that SIA believes need immediate attention: Performance-based controls on IT hardware components, including microprocessors, digital signal processors and other microcircuits; controls on chip manufacturing capability and SEM; and controls that focus on the individual employee rather than company behavior.

Performance-Based Controls On Components.—Propelled by Moore’s Law, commodity-level technology is perpetually on a collision course with performance-based export controls. In 2000, 500 million 32 bit and above microprocessors and microcontrollers were produced. Meanwhile, microprocessors used in business computers have increased in performance over 22 times over the last five years.

The government has tried to keep pace with this accelerating technological advance by raising MTOPS levels for processors and other microcircuits on an ever more frequent basis. Since 1998, the government MTOPS level moved from 500 to 1,200 to 1,900 to 3,500 to 4,500 to 6,500. Earlier this month, the United States announced plans for yet another increase—this time to 12,000 MTOPS.

The problem is that it has become an ever more challenging and unpredictable exercise to update component MTOPS levels to keep pace with technological advances. This timing “collision” can subject high volume products to export restrictions that cause shipping delays, administrative burdens and potential export denials. For example, in 1998 and 1999, low MTOPS limits subjected scores of China-bound shipments of Intel’s Pentium processors to export licensing delays that lasted for many months. Only when the MTOPS levels were raised could Intel ship these items. If the levels had not increased, the licensing caseload would have

jumped to hundreds of applications, since the microprocessors in question were only beginning to be released into the market place when the MTOPS increases occurred.

This year, the current level of 6,500 MTOPS will be exceeded by the performance of PC, workstation and server processors. Even with an increase to 12,000 MTOPS, the government will have to continue adjusting the threshold in the future in order to avoid a collision between high volumes of uncontrollable components and the export licensing system. Future adjustments will require greater increases in the threshold at even more frequent intervals. This process will only increase the likelihood of a regulatory breakdown, without enhancing national security in any measurable way.

Recognizing the futility of MTOPS controls, nearly every member of the 33-nation Wassenaar Arrangement supported the elimination of these controls during the organization's 2001 negotiation round. The United States was and remains the principal opponent to this reform. As an alternative to MTOPS elimination, the United States supports the perpetuation of the MTOPS adjustment process, and has considered new controls that would impose a new, more complex tiered approach to MTOPS controls.

Controls On Chip Manufacturing Capability and SEM.—Manufacturing or otherwise investing inside a major market, particularly in the early stages of market development, is a fundamental business tenet since it can bolster a company's status as a key supplier. In SIA's view, the strategic importance of the market in China, coupled with major tax incentives and highly skilled labor, will drive ever-increasing investments and technology transfers which will quickly enable that nation to close its technology gap with other countries.

Today's export controls on chip manufacturing capability present a significant competitive disadvantage in this regard. First, the controls seek to keep China behind in the acquisition of semiconductor manufacturing know-how, despite readily available foreign sources of supply. Second, SEM are tightly controlled by outdated regulations, even though U.S. competitors have less stringent control regimes. As a result, even if a license is ultimately issued, licensing delays can represent a decisive factor leading Chinese buyers to source SEM, for example, from non-U.S. sellers since Japanese and European SEM producers do not face the same licensing constraints.

Controls on SEM are a particular challenge for U.S. competitiveness in China. The adverse impact of these controls has grown as the demand for semiconductor manufacturing equipment in China has continued to expand. SEM items have been subject to very little export control liberalization since the end of the Cold War. Most modern tools for chip fabrication facilities require a license when exported to China.

As already noted, foreign companies are engaging in China-related technology transfers, capital investments, building of wafer fabs, and joint ventures. Other IT-producing countries have not committed—through the Wassenaar Arrangement or otherwise—to administer any particular export licensing policy regarding products such as semiconductors and SEM. Japan and European countries have made it clear that they do not consider chips or SEM exports to China to represent a security threat. Consequently, their licensing policies are far more liberal than are U.S. licensing policies.

While the United States still has a large semiconductor production equipment base, China can obtain all major types of semiconductor production equipment from non-U.S. sources in Japan and Europe. For example, Hua Hong/NEC—China's most advanced 8", .25 micron semiconductor fabrication facility—incorporates primarily non-U.S. production equipment. As a result of the ready availability of SEM globally, the U.S. policy objective of using export controls to keep China's indigenous semiconductor production two generations behind the state-of-the-art is not being met, yet the controls remain, hampering U.S. SEM suppliers and their ability to remain global leaders.

There is no justification for restraining U.S. exports to the extent that the items to be exported are freely available from other sources. Doing so gratuitously aids non-U.S. semiconductor and SEM development and production at the expense of U.S. production and development.

Controls That Focus On Individual Employees Rather Than Company Behavior.—SIA member companies experience significant problems in the area of deemed exports, i.e., transfers of controlled technology to foreign nationals working or visiting in the United States that are from controlled countries. Many of these foreign national hires are from China.

The deemed export licensing process is often unduly complex and time consuming. It can take three to six months to process and may impose burdensome restrictions on technology flows. The effect of these restrictions is to complicate intra-company

endeavors, significantly retard the development of new products and thereby impede the advancement of technology in the United States.

Unlike other controls in the United States, the deemed export rule crosses beyond the company level and seeks to unilaterally single out select individuals on the basis of their non-U.S. nationality. As companies within the United States—particularly in the IT industry—become increasingly reliant on talent from abroad, administration of the deemed export rule becomes more difficult and the detrimental impact it has on company operations and technological development is greater.

IV. RECOMMENDED IMPROVEMENTS

The United States should generally replace its policy of controls on exports of commercial IT products to China and elsewhere with a policy of staying ahead technologically. This policy shift should embrace the positive correlation between technological leadership and the broad dissemination and absorption of IT in China and around the world. This will, in turn, lead to major political, economic and, ultimately, security benefits for the United States.

In sum, the balance has shifted so that the benefits to the United States of diffusing IT in China and worldwide far outweigh potential risks. The national interest is advanced by promoting commercial IT exports rather than restricting them.

Eliminate Performance Based Controls on Widely Available Commercial Items.—Geographic containment of components and computing power generally has become unworkable in an era of IT globalization marked by wide availability of IT products, worldwide IT manufacturing capability, and pervasive computing driven by networks and clustering technology. For example, mass market microprocessors and other microcircuits with rapidly changing performance are, by definition, so voluminous and widely distributed that they are no longer susceptible of MTOPS controls. It is therefore self-defeating to impose MTOPS export restrictions on widely available commercial chips and computers. Such unnecessary controls only serve to create a competitive disadvantage for U.S. companies, thereby thwarting their ability to advance technologically.

Rather than perpetuate the flawed MTOPS control process, the United States should seize an important opportunity and join with the rest of the Wassenaar Arrangement in agreeing to eliminate the MTOPS parameter as a basis for controlling general purpose commercial chips.

Remove Outdated Export Controls on Chip Technologies and Semiconductor Equipment and Materials.—Inevitably, China will be a center of semiconductor manufacturing. Chip technologies and SEM are widely available to China through non-U.S. sources and semiconductor firms from Europe, Japan and South Korea are currently positioning themselves through strategic commitments to chip manufacturing in China in order to achieve a strong foothold in this crucial market. Rather than imposing outmoded Cold War-era export controls on these items, U.S. export control policy should focus on determining with greater precision the specific types of technologies that are truly sensitive.

Focus on Company Behavior Rather Than Individual Employees.—United States export control policy historically has not sought to look behind a company's internal operations. The principal exception, promulgated in 1994, is the deemed export rule. This rule has served to impede technology transfers within a U.S. company operating in the United States, made it increasingly difficult to attract the most talented scientists and engineers, and stunted the pace of technological advancement in the United States. All of this has occurred with no discernible benefit to U.S. security.

The deemed export rule should be eliminated. Consistent with other U.S. controls and regulations, the onus should be put on companies to ensure that technological know-how and information is kept within the confines of their operations.

During the spring of 2002, the Congress is expected to continue its consideration of a renewed Export Administration Act, the authorizing legislation for U.S. dual-use controls. As a general matter, new export control authorizing legislation should reflect changing U.S. security interests and the dynamic growth of technology. It should address the current shortcomings of the export control systems as well as establish a basis for an effective and enduring regulatory regime. To this end, an improved export control system should have the following generic features in addition to the specific recommendations enumerated above.

Flexible.—The pace and proliferation of modern technology development means that an export regulatory system must have a variety of ways to adjust controls. Authorizing legislation should mandate a focus on unique differentiators of military performance and dismiss items that do not merit control or are not controllable. United States export controls should account for rapidly changing product performance levels, mass market products, foreign availability global markets and manufac-

turing, and electronic transfers of information. One hallmark of a flexible system would be reliance on measures other than license requirements, such as mandatory notification for sensitive exports.

Timely.—New authorizing legislation should establish a control regime that operates with the speed of modern information technology. Decision-making delays measured in weeks and months are unnecessary and intolerable.

Balanced.—For dual-use items, perceived national security and foreign policy interests should be weighed against economic and technological realities. Restricting civilian exports has an economic cost to the nation and a competitive cost to the affected industry. These are costs that can undermine the technological leadership on which the U.S. military depends. The overriding national security goal should be continued and expanded U.S. technological leadership, which depends largely on global competitiveness.

Simplified.—Any modern export control system must be based on voluntary compliance and therefore must be clear and understandable to businesses large and small. Imposition of complex requirements works against this principle and will ultimately decrease the effectiveness of export controls.

Multilateral.—Where controls on information technology or other products are warranted, they should be implemented on a multilateral basis. A multilateral approach is the only way that controls can work in an era of global production and distribution. Unilateral controls should be avoided at all costs. They are self-defeating because they provide advantage to foreign competitors while failing to realize the objective of control.

These improvements would help maintain the U.S. leadership in cutting-edge technology, rather than isolating U.S. industry from commercial and investment opportunities in China and elsewhere. In the long run, current export policies that isolate U.S. industry serve to diminish U.S. interests—not strengthen them. Industry's ability to keep pace with innovation in information technology—and therefore remain a reliable supplier to the U.S. military—is directly correlated to its ability to produce and market its products on a global scale. Removing costly and unnecessary export controls on information technology is crucial to achieving this end.

For the same reason, SIA also encourages this Commission to include in its final report specific recommendations related to education and university-based research. We believe that in the next 10 to 15 years, the fundamental semiconductor process on which the industry has depended for the last 30 years will approach its physical limits, and that university research in fields such as materials sciences and physics must be increased so that the understanding of nanoscale materials will exist to develop electronic devices to replace our current semiconductor circuits.

If semiconductors reach their physical limits and we have not adequately invested in the science necessary to develop a replacement technology, our nation will quickly lose its technological lead over China as well as other nations in the critical field of microelectronics. We would thus ask that this Commission include in its recommendations that Congress appropriate the funds necessary to implement the math and science education initiatives that were included in the "Leave No Child Behind" Act recently signed by the President, and that Congress and the Administration commit to substantially boost funding for information technology related research at our nation's universities over the next five years.

In sum, export controls represent a major, unnecessary impediment on U.S. participation and success in the Chinese semiconductor market. Outdated and unjustifiable restrictions on the export to China of U.S. finished products, as well as on manufacturing equipment and related technology, currently produce significant competitive costs to U.S. companies, particularly as foreign competitors vie for market leadership. Without changes in current U.S. export control policy towards China, U.S. companies will increasingly fall behind in this crucial market, and, by extension, the global market.

Co-Chairman REINSCH. Mr. Storie?

**STATEMENT OF CHIP STORIE, VICE PRESIDENT FOR MARKETING,
CINCINNATI MACHINE ON BEHALF OF THE ASSOCIATION FOR
MANUFACTURING TECHNOLOGY**

Mr. STORIE. Thank you.

I am here speaking on behalf of AMT, the Association for Manufacturing Technology. They represent over 350 machine tools and machine tool-related companies in the United States of various sizes.

I work for Cincinnati Machine, a division of UNOVA, which is the largest machine tool company in the United States. Cincinnati Machine is the largest supplier of five-axis machine tool equipment to the United States aerospace industry, used for production of aircraft. There are very few U.S. companies left with this capability.

Five-axis technology is Cincinnati Machine's most critical core competency. Unfortunately, we no longer have a dominant position technologically in this area. We compete with the Europeans and the Japanese and even the Chinese in this realm. The Chinese are now producing their own fixed-axis equipment.

Aerospace is certainly the largest market for Cincinnati Machine. The largest foreign growth market for U.S. aerospace companies such as Boeing is China. China represents 10 percent of Boeing's commercial sales today, where just in 1995, it was only 2 percent. China ranks number two in the world in machine tool imports and number three in the world in machine tool consumption.

U.S. aerospace companies purchase commercial structural aircraft parts and subassemblies from China through offset programs. This is driving the need for current five-axis machine tool technology, which is controlled today because aircraft are used in both civil and defense applications.

U.S. companies such as Boeing assign expatriates to live onsite at these facilities where the parts are being manufactured, and they monitor both quality and schedule 24 hours a day.

We certainly see some current problems that we are experiencing with the U.S. export control system. One of the biggest problems that we have is that the average approval cycle time for a U.S. export license or the disposition thereof is between three and 12 months, and quite often, it is much closer to 12 than to three.

Foreign competitors usually take days or weeks. Based on evidence gathered informally at a Wassenaar meeting by the AMT technical advisor to the U.S. delegation, the following machine tool license processing times can be expected if an export license for the shipment of products or technology destined to China were to be applied for in these major industrialized countries.

In Germany, they tell us it takes a maximum of 30 days. In Italy, the normal processing is 30 days, and with extraordinary cases involving pre-license checks, it can take up to as much as 60 days. In Japan, normal processing is two to three weeks, with up to a month in cases involving a pre-license check. In Switzerland, normal processing can be two days, with the possibility that a license could take as long as seven to ten days if it were a difficult case.

Chinese companies cannot afford the inherent delays in our system.

One of the drivers that takes the length of time for the United States to approve the license is that we have many potential requirements that we are expected to provide to the U.S. Government for analysis. We certainly need an end-user certificate. We have to have proof of capacity requirements—why do they need these machine tools, what are they going to be making with them.

They want to see if it is a U.S. or a European subcontractor that the work is coming from—is it coming from Boeing, is it coming

from Airbus? We have to try to get those contracts to show the chain of command and the chain of the contract.

They want to know whether there is an onsite U.S. resident at these manufacturing facilities. They want to have quarterly inspections of the equipment and quarterly written reports of the inspections. We find that European and Japanese approval only requires the end-user certificate for the most part.

The consequences of the current export control system to U.S. machine tool manufacturers is great. It reduces our access to the biggest long-term growth market for commercial aircraft. It reduces our competitiveness with the Europeans and the Japanese. Over the last three years, U.S. machine tool companies have less than 5 percent market share of five-axis machine sales in China. Japan and Europe share the rest.

We have a reduced ability to fund future manufacturing technology. Dr. Hicks mentioned the composites, the Stealth technology, and Cincinnati Machine is the world's leading supplier of composites manufacturing equipment that supplies the material for the Stealth technology. Without a robust market that we can share in, we don't have the money to allow us to invest in the technology that our Defense Department needs.

The combination of a tight export control policy and the weak yen and euro certainly puts U.S. machine tool builders at a distinct disadvantage, even to the point where it is often difficult to get Chinese companies even to allow us to bid on projects.

There are also consequences of the current export control system to the United States Government. There is a long-term deterioration in manufacturing technology capability of the U.S. defense supply base; it goes back to the U.S. machine tool market being able to invest in future technologies.

There is diminished control and influence over development of manufacturing capability and capacity in China. Boeing personnel are training Chinese to manufacture aircraft parts on Japanese and European machine tools. There is certainly reduced trade with China. There are fewer jobs available in the United States. And one of the most important ones is that there is less intelligence information being passed on to the United States Government. When a U.S. machine tool company ships a five-axis machine to China, in general as part of the license restrictions, we are obligated to supply post-shipment review checks to the U.S. Government. European and Japanese machine tool companies do not provide these written reports. U.S. companies provide insight as to what is actually happening at the Chinese aircraft manufacturing companies.

I have provided you with a list of about 50 machine tools that have been sold to China over the last three years, five-axis machine tools; and again, about 95 percent of those were Japanese or European.

The conclusions that we have drawn are that five-axis technology is no longer high-tech. Dr. Lewis deemed it "elderly," I believe. The technology is 30 to 40 years old. Five-axis technology is widely available from European and Asian machine tool companies, including within China. There is no question about foreign availability.

The U.S. export control process is lengthy and rigorous, forcing Chinese companies to purchase from non-U.S. sources. The Chinese are growing tired of the delays, the uncertainty, and the conditions of those licenses that are approved. If a license is denied for a U.S. export, the Chinese will purchase the equivalent technology from our allies.

China is being driven by Boeing, Airbus, and their own desire to manufacture a Chinese-built regional jet to increase machine tool capability quickly over the next five years.

Boeing indirectly promotes Chinese companies to purchase U.S.-built products, because this is what Boeing has in its own factories; but they will not promote the purchase of U.S.-built products at the expense of schedule delays. They have very strict time lines that they have to meet, and if they think that the Chinese cannot get an export license for a U.S. piece of equipment, they will encourage them to buy Japanese or European.

Finally, Chinese aircraft companies will continue to purchase non-U.S. five-axis machine tools to satisfy their needs, and the U.S. Government will not get the intelligence it desires as long as this trend continues.

Thank you.

Co-Chairman REINSCH. Thank you very much. That was very helpful.

Ms. Walsh?

STATEMENT OF KATHLEEN A. WALSH, SENIOR ASSOCIATE, HENRY L. STIMSON CENTER

Ms. WALSH. Thank you, Commissioner, and members of the Commission. It is my pleasure to speak before you today regarding U.S. export controls on technology transfers to China.

In the brief time that I have, I would like to respond to the Chairman's questions regarding export controls. My comments are based largely on research and analysis conducted as part of the Study Group on Enhancing Multilateral Export Controls for U.S. National Security, a bipartisan, congressionally-mandated study that completed its work last year, and I believe each of the Commissioners has a copy of that report, as well as some work that I did for the Office of the Secretary of Defense on ways to reform the U.S. export control system to better respond to globalization and the security threats of today.

In addition, I have been asked to talk very briefly about work that I did on U.S. commercial technology transfers to China and one of the interesting findings from that study that remains relevant to U.S.-China relations today.

Before I continue, let me first state that what I say here today are my views only and do not represent U.S. Government policy or positions or that of the Henry L. Stimson Center. With that, let me turn to export controls.

As you have heard today and as many of you well know, a clear consensus has emerged over the last few years that our current system of export controls must be overhauled in order to better protect U.S. national security interests, broadly defined. Numerous studies, including in particular Dr. Hicks' report on globalization that the Study Group also read very carefully, have outlined the

deficiencies in the current system and the challenges—the real-world, on-the-ground challenges—that the globalized world economy presents today. Some of these you have already heard, such as newly-emerging forms of technology transfer, which I'll speak to in a moment, the internationalization of research and development around the world; growing numbers of global suppliers of high-tech and defense-related items, technologies and know how, including the most advanced as well as less capable technologies that are still lethal but are not necessarily the latest-generation technologies though we would like to know where they are going; dissemination of and increased dependence on dual-use technologies, especially by the U.S. military; more rapid technological innovations, as has been explained here; and faster-paced international business cycles, for instance, just-in-time delivery, to remaining competitive. This is what U.S. companies and others around the world have to deal with.

So although a consensus exists that reform is needed, there has been a lack in political will to effect real and fundamental change in the U.S. export control system. Even the much-needed update of the Export Administration Act has yet to pass the House of Representatives. In large part, I believe this impasse is due to conflicting philosophies, as I think you have heard a bit about today, on how to best secure U.S. national interests, whether that is by control and denial, or as Dr. Hicks and others have explained, by staying ahead of our competition. I think there is also a problem of having limited options or false choices between control or decontrol. I believe that there is an interim step that would enhance U.S. national security that others have alluded to, enhance U.S. security. Having more information about where technologies, U.S. technologies and others, are going around the world.

One issue, however, that has almost universal support is that if U.S. export controls are ever to be effective in this environment, they must be applied multilaterally. Even prior to September 11, concerns over the effectiveness of multilateral export controls, particularly about the Wassenaar Arrangement, led Congress to mandate this bipartisan Study Group, which was comprised of Government officials as well as nongovernmental experts and industry representatives, to examine ways in which the United States and our allies and friends can cooperate on improving international controls over weapons and dual-use technologies.

In the wake of September 11, it has become clearer how vital more effective multilateral export controls are to U.S. national security.

Let me briefly describe the Study Group, its objectives and its findings. The main objective was to develop a new, negotiable international framework for multilateral export controls, as well as a strategy for realistically implementing the steps needed to achieve this goal.

The Study Group reported its findings, recommendations, and an action agenda for reform in April of last year, and as I said, I believe each of you has a copy of that, so I won't go into it in great depth. In short, the Study Group concluded that a three-pronged approach to reform is needed.

The first recommendation addresses improvements to existing multilateral export control regimes, particularly the Wassenaar Arrangement. The second recommendation introduces a new concept for security and cooperation among what was termed a "Coalition of Willing Partners." And the third recommendation calls for strengthening partnerships for change here in the United States.

The first step as agreed by the Study Group is to improve the inner workings of the Wassenaar Arrangement as well as other nonproliferation regimes. In particular, the Study Group suggested that short-term improvements to Wassenaar should include measures such as instituting more robust information exchanges; procedural reforms, including possibly the development of an executive council that would improve coordination among the nonproliferation export control regimes; a catch-all provision; an agreement for a stronger "no undercut" rule, which the United States has been pursuing for a while; and an enhanced role also for Wassenaar Secretariat. Another of the findings of the Study Group's recommendations, based on research in some of the papers we commissioned was that the Wassenaar Arrangement has a robust or relatively robust Secretariat that could be utilized in a much greater way for coordinating among the different regimes, which the members thought was important. Though it is important to keep the regimes separate, because they each focus on different types of weapons and technologies, a coordinating executive council would be useful.

The Study Group also recommended that over the long term, consideration be given to merging the Wassenaar Arrangement and other nonproliferation regimes into a single body, but only if this is deemed on balance, to improve the overall functioning of the multilateral export controls regimes. So that was left in the air, but it was something that should be considered.

I should say that I believe all these measures would help in the ongoing efforts to keep weapons of mass destruction and key technologies out of the hands of international terrorists today, so I encourage you to consider this framework in today's security environment as well.

Another recommendation that the Study Group put forward, which is new and I think really the heart of the recommendations that the Study Group put forth, is a supplemental framework for coordinating multilateral export controls. This would be an organization, really a framework or agreement among parties, that would complement or supplement existing regimes—Wassenaar, the Australia Group, and others. Again, this new framework would be built around a "Coalition of the Willing," that is, close partners of the United States who would agree to implement common export control policies and procedures in return—this is important—for a more cooperative defense trade relationship.

This new framework, which would be the first, I would suggest, to address both the challenges of the post-Cold War security environment and the effects of globalization, would do so by providing incentives—primarily closer defense cooperation, for allied states willing to devise a common export control approach toward nations and end-users outside the framework.

Let me reiterate that unlike the COCOM regime, the proposed framework is not targeted at any one country or bloc; rather, it would treat all parties outside the framework in the same manner.

In addition, it is important to note that while a clear and more or less unifying threat has emerged today in the form of al Qaeda and other international terrorist organizations, the framework that is proposed is not dependent on a common enemy but on shared interests and commitments among the partners. Therefore, it should be sufficiently flexible to address changing international security threats.

The strategy for instituting the proposed supplemental framework calls for members to implement both domestic and multilateral export control reforms to both arms and dual-use export controls. This is a tall order, but by building upon common values and shared interests in enhanced defense cooperation, which is particularly relevant today in the face of international terrorist threats against the West, the United States and its prospective partners could forge a consensus on technology transfers that allows freer access to technologies within the framework and more effective controls over transfers of the most critical technologies to parties outside the framework.

In other words, the goal of the new arrangement would be higher walls around fewer items. But this could only be possible if partners agree on and effectively enforce identical controls over critical technologies to third parties.

Finally, in addition to the multilateral supplemental framework, the Study Group recommended that reforms be made simultaneously to the U.S. export control process in order to enhance U.S. security and provide the necessary confidence in both domestic and international partners in the U.S. commitment to fully implement export control reform.

To achieve these goals, the Study Group concluded that a coordinated effort led by the President would be essential and could only be achieved through partnerships forged between the various government agencies that have export control jurisdiction, the White House, Congress, and industry.

Since the harrowing events of September 11, I believe the prospects of reaching such an arrangement have, in fact, improved. The United States and our NATO allies have a renewed common cause and have already enacted changes to export control regulations to enhance and facilitate defense trade.

Also, the sharing of intelligence, which the Study Group considered a key element to effective multilateral export controls, has improved significantly, I believe—from reading the press reports, anyway—since the terrorist attacks on the United States.

Other states, moreover, whose participation in the framework was deemed unlikely (i.e., Russia) could conceivably become constructive partners in such a framework, which was not the case when we originally considered the prospective or likely partners.

The shared and heightened interest also in preventing weapons of mass destruction and armaments from falling into the hands of terrorists and rogue states may also provide a good starting point for enhancing the nonproliferation regimes and Wassenaar.

This was a very brief overview of the key recommendations of the Study Group. I would be happy to go into greater detail with you at the end of our comments.

Let me now turn to another issue I was asked to discuss—

Co-Chairman REINSCH. We are about out of time. Do you have just a couple more paragraphs?

Ms. WALSH. Sure. Very briefly, I was asked also to discuss a study conducted on behalf of the Bureau of Export Administration a couple of years ago that remains relevant today. It looked at U.S. commercial tech transfers to China and the reasons why and motivations for this.

In doing the research, we found an interesting new dynamic, which was foreign companies, including U.S. high-tech companies, conducting research and development in high-tech industries in China. This was something that surprised me and has since surprised many others, because China is not necessarily a place where you think of doing high-tech research.

Since the initial report, which was back in 1997–1998, one can look at any of the business trade journals and see that more and more of this type of activity is occurring in China. The problem is that we don't know very much about what is going on at these R & D centers. It can be anything from training Chinese employees to more basic or applied R & D.

So this is an area that we know a little bit about and that I will be working further on. It is important in terms of both U.S. national security interests; and competitiveness, and where China is going down the road. So I will leave it at that.

Co-Chairman REINSCH. Thank you. I ran out of money on that, so I am delighted that you have found another way to continue that study; that's great.

[The statement follows:]

PREPARED STATEMENT OF KATHLEEN A. WALSH

Thank you, Commissioner Reinsch and Commissioner Bryen, members of the Commission. It is my pleasure to speak before you today regarding U.S. export controls and technology transfers to China. First, I would like to respond to the Chairman's questions regarding export controls. My comments are based largely on research and analysis conducted in conjunction with the bipartisan Study Group on Enhancing Multilateral Export Controls for U.S. National Security, a congressionally mandated effort that completed its work last year, as well as prior studies conducted on behalf of the Office of the Secretary of Defense (OSD) on ways to reform the U.S. export control system. In addition, I have been asked to discuss the findings from an earlier study on U.S. commercial technology transfers to China conducted on behalf of the Bureau of Export Administration a few years ago but which remains relevant to U.S.-China relations today.

Before I continue, I would like to make clear that the views presented here are my own and in no way represent U.S. Government policy or a position by the Henry L. Stimson Center. That said, let me turn first to the issue of export controls.

EXPORT CONTROLS

As you know, I was originally scheduled to present this testimony on the morning of September 12th. The horrible events that occurred the day before have changed much of the American political landscape and, in particular, how we view national security. However, the impasse over domestic export control reform remains largely unchanged by these events, and it is unclear whether our allies and friends abroad have substantially altered their views on enhancing multilateral export controls as a result of September 11. While this is understandable given other more pressing security concerns, the problems raised by outdated export controls prior to 9–11 remain unresolved and the issue awaits serious attention. Therefore, the testimony

that follows first outlines the challenges to, and proposed solutions for, export control reform that existed prior to the September attacks and then touches on the challenges as well as opportunities for reform that the post 9–11 security environment presents.

The World Before September 11

U.S. and International Views on Export Controls

In the post-Cold War era (which, I would argue, ended the morning of September 11), U.S. attitudes and foreign perspectives on export controls evolved, but not necessarily in the same direction. Although export controls remain vital to U.S. national security, the many challenges posed by the uncertain post-Cold War security environment presented three key dilemmas that policymakers have yet to fully address:

- The lack of a principal, unifying threat
- The increased difficulty in implementing and enforcing traditional export controls in a global economy
- A breakdown in the consensus over how to balance security and economic interests in the post-Cold War world.

Let me briefly address each of these problem areas and how they affect U.S. export controls, international views, and overall U.S. national security interests.

Lack of a Principal, Unifying Threat.—The reality before September 11 was that the United States and even our closest allies did not agree on which states pose a threat. It is for this reason that the successor regime to COCOM (the Cold-War era Coordinating Committee on export controls) relies on national discretion to implement multilateral export controls on conventional arms and dual-use technologies. Although there was more or less agreement on the threat posed by what the United States termed rogue states (North Korea, Iraq, and Libya), there were and are numerous “gray area” states on which no consensus exists (e.g., Iran, Israel, India, Russia, and China). If anything, the latter list has grown since 9–11.

To man, China represents the most difficult case in this regard. Although many Europeans and Asians are wary of China’s growing power and at times questionable trade relations with Pakistan, Iraq, and other states, there is far less concern among European allies over China as a potential threat than exists in the United States. This debate, as this Commission is fully aware, also complicates many facets of U.S. domestic policy toward China. The result is a lack of consensus on how to deal with China by means of U.S. or multilateral export controls.

Effects of Globalization.—An increasingly global economy also presents many new challenges for managing export controls. These include:

- Newly emerging forms of technology transfer (e.g., increased levels of global research and development)¹
- Growing numbers of global suppliers of high-tech and defense-related items, technologies, and know-how (including the most advanced as well as less-capable, but often still lethal, technologies)
- Dissemination of, and increased dependence on, dual-use technologies
- More rapid technological innovations (e.g., microchip capacity)
- Faster-paced international business cycles (e.g., just-in-time delivery).

As a result of these global trends, the United States’ ability to deny foreign technology acquisition is diminishing, unilaterally or in concert with allies.

At the same time, the U.S. military is becoming increasingly dependent on dual-use, commercial off-the-shelf technologies (COTS). Moreover, defense planning documents such as Joint Vision 2010/2020 rely on increasing levels of interoperability between U.S. and allied military forces. These policies are designed to leverage the very same effects of globalization that challenge export controls, presenting policymakers with a difficult dilemma.

Balancing Security and Economic Interests.—The most critical challenge to export controls, I would argue, is the breakdown in the consensus over how to balance national security and economic interests. Export controls have always required an economic tradeoff for the sake of increased security. This calculation, however, has

¹Recent studies on globalization have found a significant rise in global research and development (R&D) by multinational corporations. In addition to increased R&D by foreign companies in the United States, a recent Department of Commerce report finds that U.S. company expenditures abroad on R&D are also increasing, particularly in newly industrializing economies such as Singapore, Brazil, and Mexico. See Donald H. Dalton, Manuel G. Serapio, Jr., and Phyllis Genter Yoshida, *Globalizing Industrial Research and Development*, 2nd ed. (Washington, DC: U.S. Department of Commerce, September 1999); and *International Science and Technology: Policies, Programs and Investments* (Washington, DC: U.S. Department of Commerce, December 2000).

changed with the end of the Cold War and with the emergence of an increasingly globalized economy. Now the costs of export controls can result not only in greater economic sacrifice than ever before but also in significant defense-related costs. As a result, there is no longer agreement on where the proper cost-benefit balance lies, nor on how it can be achieved through export controls.

Two general schools of thought exist in the U.S.: the traditional notion that national security is enhanced by denying foreign access to advanced technologies and the newer strategy that emerged in the mid- to late-1990s of maintaining a technological lead as the primary means of protecting U.S. national security in the post-Cold War world.² The old model endures, but is increasingly challenged by the post-Cold War security environment, weakened by the effects of globalization, and criticized by U.S. allies and others as hopelessly outdated.³ However, proponents of the new model have failed to convince influential skeptics of the need for a wholly new approach to regulating export controls that their model for enhanced security would require.

This conceptual divide has repeatedly obstructed U.S. export control reform efforts and has created a high level of distrust between and among U.S. Government regulators and industry executives. Long-stalled U.S. reforms, particularly on munitions, also have led to increased frustration and concern on the part of U.S. allies in Europe and elsewhere.

Implications for U.S. National Security and Economic Competitiveness Due to different U.S. and allied views, approaches, and policies on China and other “gray area” states, the diminishing effectiveness of the traditional export control-by-denial policies in an era of globalization, and the need still to find a new balance between security and economic interests, U.S. and multilateral export controls have become stagnant and, therefore, less effective than they ought to be. As a result, U.S. national security interests are not being well-served and may be undermined over the long-term if these issues remain unresolved.

Divergent approaches to export controls put a serious strain on U.S.-allied relations (prior to the September attack), which could have serious long-term repercussions. Because U.S. policies and those of even our closest allies differ with regard to China and other states, U.S. export control policies in many ways treat allies the same way as problem states. This is due to U.S. concerns about the possible transshipment of advanced technologies to states (which the U.S. may singularly view with concern) via allies and others who do not share the same threat perceptions. This approach obviously rankles allied leaders who resent the charge that their export control policies and processes, though in some cases different, are not as effective. In addition to aggravating U.S.-allied relations, this approach is counterproductive to U.S. efforts to persuade allies and others to “control up” in an effort to harmonize allied export control policies.

The 17 reforms that make up the Defense Trade Security Initiative (DTSI) agreed to in 2000 by the Departments of Defense and State, plus reforms to dual-use export controls achieved over the last several years, have been designed to better differentiate between exports to allied and less-friendly nations. But, in many ways, there remains little distinction. The longer this situation continues, the more likely there will be unintended but harmful consequences for U.S.-allied relations and overall U.S. national security interests.

In fact, Europeans have grown skeptical of U.S. reform initiatives. Some do not believe that the United States is prepared to deal with Europeans and the EU as partners, while others view the DTSI at least in part as a “buy America” program or an effort to slow European integration and defense restructuring. This, in addition to differences of opinion over how well the current U.S. and multilateral export control regimes work, had diminished the level of trust between the United States and its allies in Europe prior to September 11.

As a result, many transatlantic conversations have raised the possibility of a “Fortress Europe”—the idea of a united European defense establishment large enough

²This strategy is outlined in a seminal report by the Defense Science Board. See U.S. Department of Defense, Office of the Undersecretary of Defense for Acquisition and Technology, Final Report of the Defense Science Board Task Force on Globalization and Security (Washington, DC: U.S. Government Printing Office, December 1999).

³As a former director of DARPA points out, “It is probably not possible to implement more effective export controls by tightening controls of all advanced technology. The unclassified, open nature of most of the research and the wide participation in development precludes this option. In addition, since most of the technologies are not exclusive to the United States, this strategy would seriously disadvantage our industry in the international marketplace. Larry Lynn, Forecasting Critical Military and Commercial Technologies: Potential Long-term Challenges for Export Controls, Study Group on Enhancing Multilateral Export Controls for U.S. National Security, Working Paper No. 5, March 2001, p. 21.

to compete with the U.S. defense industry. This remains a very real concern for long-term U.S. security interests. The need for European companies to be able to compete with what they view as a "Fortress America" is discussed in response to what is perceived abroad as outdated and overly restrictive U.S. export control policies that limit transatlantic trade, particularly European investments in the U.S. defense sector. These frustrations, particularly with U.S. arms export control policies, have led some foreign defense firms to "design-out" or to seek alternatives to utilizing U.S. components in their defense items.⁴ Obviously, this situation is troubling and, left to fester, would undermine long-term U.S. national security and economic interests.

Thus, the real danger lies in doing nothing. There is an urgent need for a new consensus that deals with the challenges posed by globalization and now also the post-9-11 security environment. In order to be effective, however, export control reforms must be coordinated with U.S. allies and be applicable on a global scale.

The World After Sept. 11

Although crafted almost a year ago, a new framework proposed by the Study Group on Enhancing Multilateral Export Controls for U.S. National Security would address the challenges outlined above and also, I believe, the challenges posed by the present security environment. Increased international good will and cooperation in the U.S.-led effort to stem Al Qaeda's terrorist activities may provide additional opportunities for significant reform as well as some new and unforeseen challenges.

What Can Be Done?

In the short-term, some of the efforts underway to reform U.S. export controls prior to September 11 should be enacted. These include an updated Export Administration Act and the implementation of key provisions in the Defense Trade Security Initiative (such as the review of items and technologies on the Militarily Critical Technologies List), though with a new eye toward terrorist capabilities. These reforms will help address some present-day obstacles to achieving more effective export controls, but they will not be sufficient over the long-term to deal with more fundamental issues. Still, as two comprehensive studies on exports controls completed last year concluded, real reform will require a coordinated effort by the executive and legislative branches of government and a more cooperative relationship between government and industry to be successful.⁵

In order to enact more substantial, long-term reforms, however, the United States must also lead the effort to improve multilateral export controls. The Study Group on Enhancing Multilateral Export Controls, a congressionally mandated, bipartisan effort authorized in the fiscal year 2000 defense bill and charged with achieving a consensus on enhancing multilateral controls, reported its conclusions, recommendations, and a strategy for reform last April. As no less than three members of this Commission participated in the Study Group's efforts, I will dispense with a long description of the Study Group's makeup and findings. Rather, let me focus on the Study Group's recommendations for export control reform, which I believe are relevant to the threats we face today as well.

In short, the Study Group concluded that a three-pronged approach to reform is needed. The first recommendation addresses improvements to existing multilateral export control regimes, the second introduces a new concept for security to be implemented by what was termed a "coalition of the willing," and the third recommendation calls for a partnership for change.

The first step in enhancing U.S. national security through multilateral export controls, as agreed by the Study Group, is to improve the inner workings of the Wassenaar Arrangement and other nonproliferation regimes. In particular, the Study Group suggested that short-term improvements to Wassenaar should include

⁴In October 1999, the president and CEO of DaimlerChrysler Aerospace (DASA, which is now part of EADS) reportedly wrote to then-Under Secretary of Defense Jacques Gansler about DASA's intent to reduce the company's overall reliance on U.S. components in order to provide greater reliability in supply. See FDCH Political Transcripts, "House Committee on International Relations Holds Hearing on Munitions Export Licensing," March 28, 2000; Joseph C. Anselmo, "Hamre: Export Delays Hurting U.S. Alliances," *Aviation Week and Space Technology*, November 8, 1999, p. 34; and U.S. Department of Defense, "Fletcher Conference on Strategic Responsiveness: Remarks as Delivered by Deputy Secretary of Defense John J. Hamre," press release, November 3, 1999.

⁵The Study Group on Multilateral Export Controls reached the same conclusion as the CSIS Military Export Control Project working group. See, respectively, The Henry L. Stimson Center and CSIS, Study Group on Enhancing Multilateral Export Controls for U.S. National Security: Final Report, April 2001 and Center for Strategic and International Studies, Technology and Security in the Twenty-First Century: U.S. Military Export Control Reform, CSIS Panel Report, May 2001.

measures such as: instituting more robust information exchanges; procedural reforms (including the establishment of an executive council to improve coordination among the control regimes, a catch-all provision, and agreement on a stronger no-undercut rule); and an enhanced role for Wassenaar's Secretariat.

The Study Group also recommended that, over the long term, consideration be given to merging Wassenaar and the other nonproliferation regimes into a single body, but only if this is deemed, on balance, to improve the overall functioning of multilateral export controls.

All of these measures also would aid in the renewed effort to keep weapons of mass destruction out of the hands of terrorists.

A New Framework for Improved Multilateral Export Controls.—An entirely new proposal put forward by the Study Group was a recommendation that a new, supplemental framework for coordinating multilateral export controls be formed among a “coalition of the willing”—that is, close partners with the United States who would agree to implement common export control policies and procedures in return for a more cooperative defense trade relationship. This new framework would address the challenges and dilemmas described above by providing incentives (primarily closer defense cooperation) for allied states willing to devise a common export control approach toward nations and/or end-users outside the framework.

The strategy for instituting the proposed supplemental framework would require both domestic and multilateral reforms to arms and dual-use export controls. But by building upon common values and a shared interest in enhanced defense cooperation—particularly now, in the face of international terrorist threats against the West—the United States and its prospective partners could forge a consensus on technology transfers that allows freer access to technology within the framework and more effective controls over transfers of the most critical technologies to parties outside the framework. In other words, the goal of this new arrangement would be the oft-cited “higher walls around fewer items.” This would only be possible, however, if the partners agree on, and effectively enforce, identical controls over critical technologies to third parties.

What made the Study Group think that an arrangement such as this is possible is the fact that the European defense establishment has undergone a transition similar to the period of consolidation that transformed the U.S. defense industry.⁶ Just as the effects of globalization and the consolidation of the U.S. defense industry led to calls for export control reforms in the United States, a similar round of consolidations in Europe has resulted in efforts there to update export controls. In fact, having followed on the heels of the U.S., and due to the transnational character of European political, legal, and economic institutions, the European defense industry transformation has resulted in arguably more far-reaching and significant export control reforms than have thus far been possible in the U.S.

Three events over the last few years are significant in terms of European export control reform. In June 1998, all 15 European Union states agreed to a Code of Conduct on conventional arms exports. Although a politically (rather than legally) binding agreement, this document nevertheless provides a common EU standard and set of criteria for selling arms exports within and outside the European Union.

This was followed not long after by the signing of a Letter of Intent (LOI) agreement in July 1998 by the six European defense ministers representing the United Kingdom, France, Germany, Italy, Spain, and Sweden to cooperate on restructuring their defense industries under a common framework. The LOI agreement, in turn, led to the formation of a six-party Framework Agreement, a legally binding document signed in August 2000 by these same six leading arms-producing states.⁷ In so doing, the six nations agreed to implement significant changes to their respective export control policies, processes, and procedures by simplifying and harmonizing export controls for militarily useful goods in order to facilitate greater defense cooperation. The agreement also includes measures to streamline procedures for sharing classified information and other information exchanges to allow joint defense-related research and development. The goal: to harmonize military requirements, defense production, and export controls among the six major defense industrial states so as to develop a European defense market and to promote the internationalization of European defense industries. From visits to several European capitals

⁶For an overview of this process and its effects on transatlantic relations, see François Heisbourg, *From European Defense Industrial Restructuring to Transatlantic Deal?*, Working Paper no. 4, Study Group on Enhancing Multilateral Export Controls for U.S. National Security (Washington, DC: The Henry L. Stimson Center/CSIS, February 2001).

⁷The Agreement Concerning Measures to Facilitate the Restructuring and Operation of the European Defence Industry or “Framework Agreement” was signed at the Farnborough Air Show on 27 July 2000.

in conjunction with the Study Group and conversations since that time, I can assure you that this effort is real, and that it is well underway.

In fact, it became clear that many of the export control issues that the United States has only begun to grapple with are already real-world realities in Europe due to the close cooperation and increasing economic and political integration of European institutions. This has forced European leaders to come up with practical solutions to many of the same dilemmas that U.S. policymakers now face (for instance, how to deal with large numbers of diverse foreign nationals working on a single large defense program). U.S. national security could benefit from similarly innovative approaches and by building upon the reform efforts already underway in Europe in conjunction with the Framework Agreement. This premise underlies the strategy outlined by the Study Group for instituting a new framework for multilateral export control reforms, which will be successful only if built upon these foundations.

Finally, in addition to this new multilateral framework, the Study Group recommended that simultaneous reforms be made to the U.S. export control process in order to enhance U.S. security and provide the necessary confidence—in both domestic and international partners—in the U.S. commitment to fully implement the proposed new framework. To achieve these goals, the Study Group concluded that a coordinated effort and partnerships between the various U.S. Government agencies with export control jurisdiction, the White House, Congress, and industry would be essential to success.

Prospects for Success Post-9-11.—Since the harrowing events of September 11th, the prospects for reaching agreement with a coalition of willing states on a new multilateral export control framework have only improved. The United States and our NATO allies have a renewed common cause and already have enacted changes to export control regulations to facilitate defense trade. Also, the sharing of intelligence—which the Study Group considered a key element for more effective multilateral controls—has improved significantly since the terrorist attacks on the U.S. Moreover, other states, whose participation in the framework was deemed unlikely (e.g., Russia), could now conceivably become constructive partners in this new framework. The shared, and heightened interest in preventing weapons of mass destruction and armaments from falling into the hands of terrorists and rogue states may also provide a good starting off point for enhancing the nonproliferation regimes and Wassenaar Arrangement.

Also, it is important to note that while a clear, and more or less unifying, threat has emerged in the form of Al Qaeda and other international terrorist organizations, the framework is not dependent on a common enemy but on shared interests and commitments. Therefore, it should be sufficiently flexible to address changing international security threats.

This is a very brief overview of the Study Group's recommendations and how they apply to today's environment. I would be happy to go into greater detail during the Q&A period. Let me now turn to the other side of the coin, technology transfers. Specifically, U.S. and foreign commercial technology transfers to the People's Republic of China.

TECHNOLOGY TRANSFERS TO CHINA

Globalization is clearly a boon for countries wishing to quickly acquire and possibly advance in commercial as well as defense-related technologies. The ever-wider dissemination of dual-use technologies around the globe provides an increasing supply of militarily useful and enabling technologies that are becoming more and more difficult to regulate under the present system. Moreover, not all forms of technology transfer of potential significance are captured by export controls. Once again, China is a prime example of these trends.

According to research published by the Department of Commerce's Bureau of Export Administration (BXA), U.S. and foreign high-tech firms operating in China were (and likely still are) being pressured to transfer commercial technology in return for market access in China.⁸ In addition, this research identified an offset and form of technology transfer new to the China market: the establishment by foreign high-tech firms of research and development (R&D) centers in China. Both have potentially serious implications for U.S. economic competitiveness and national security.

⁸See Kathleen Walsh, U.S. Commercial Technology Transfers to the People's Republic of China (Washington, DC: Office of Strategic Industries and Economic Security, U.S. Department of Commerce, January 1999). Much of the information contained in the following section is based on this study.

Findings on U.S. Commercial Technology Transfers to China

It is clear that the transfer of U.S. technology was—and, I believe, likely still is—included as a type of offset in U.S.-China joint venture agreements. This transfer of U.S. technology is not “forced” on U.S. or foreign investors, as is sometimes suggested, for the simple reason that no foreign company is required to invest in China and can refuse technology transfer-related offset demands by walking away from the investment opportunity. That said, transfers of U.S. technology sometimes are “coerced” to varying degrees by making them an informal condition of trade or investment in China. In other words, the reality of doing business in China has frequently required U.S. high-tech businesses to accede, to a greater or lesser extent, to Chinese demands to transfer technology, advanced equipment, and/or know-how that these companies might not otherwise be willing to bring to the China market.

This was clearly the case across the three industry sectors studied as part of the BXA report: automotive, aerospace, and electronics. For example, according to an internal report of one of the big three U.S. automotive companies, that company’s offer to establish a “technology development center” as part of their investment in a large joint venture in China was the key to beating out other foreign competitors in gaining Chinese government approval of the joint venture. Other companies and industry analysts interviewed for the study, and according to numerous press reports, lost similar bids to foreign competitors who were willing to transfer some or comparatively more technology to close a deal. It is these types of transactions that the study was intended to document. Although much of the evidence remains anecdotal, the indications of these types of demands on foreign investors are persuasive.

Moreover, these findings mirror conclusions reached in the last six annual National Trade Estimate reports published by the Office of the U.S. Trade Representative (1995–2001). These reports state explicitly that “. . . the Chinese Government routinely seeks to obtain offsets from foreign bidders in the form of local content requirements, technology transfers, investment requirements, counter-trade or other concessions, not required of Chinese firms.”⁹ The 2001 report goes on to describe the problem:

For example, regulatory officials have on occasion advised foreign equipment suppliers that they need to transfer technology, establish a joint venture with a local partner, and/or establish manufacturing facilities if they wish to supply equipment to China for certain new telecommunication services. Sometimes, regulatory officials have gone so far as to demand the commercial terms of such technology transfer agreements, which is totally outside the purview of their stated responsibilities. These informal requirements serve as administrative barriers to trade.

A Key Finding: Joint Research and Development in China

In addition, high-tech firms wishing to invest in China have been asked, prodded, suggested to, or otherwise informed of the need to establish an R&D center in China. Numerous companies have complied. According to Chinese sources, there are nearly 100 foreign-sponsored, high-tech research and development centers in China, and there may well be more than that.¹⁰ Many of these centers or programs have been established over the last several years and are sponsored by leading high-tech multinationals such as General Motors, Microsoft, Intel, Motorola, Nokia, and others. These programs or centers typically are set up in partnership with a Chinese enterprise and/or university.¹¹ This is a potentially significant development and constitutes a relatively new trend in U.S. and foreign investment in China.

Foreign investors in growing numbers seem willing to conduct research and/or develop new products or processes with their Chinese partners. How significant is the emergence of foreign-sponsored R&D in China? It is unclear. Much, although certainly not all, of this joint R&D is being conducted by students, scholars, or engineers at some of China’s leading, well-known universities (including Peking and Tsinghua Universities, Fudan University in Shanghai, Zhongshan University in Guangzhou, and elsewhere). Other joint R&D projects are part of, or directly related

⁹ See National Trade Estimate Report on Foreign Trade Barriers: People’s Republic of China, 1995–2001.

¹⁰ This figure, from September 2000, was reported by China’s Ministry of Foreign Trade and Economic Cooperation (MOFTEC).

¹¹ Richard P. Suttmeier and Cong Cao, “China Faces the New Industrial Revolution: Achievement and Uncertainty in the Search for Research and Innovation Strategies,” *Asian Perspective*, vol. 23, No. 3 (1999); See also Marco Di Capua, “Technology Innovation in China,” paper presented at the Sixth ISODARCO Beijing Seminar on Arms Control, October 29–1 November 1998. For a brief list of foreign high-tech R&D programs in China, see Donald H. Dalton, Manuel G. Serapio, Jr., and Phyllis Genter Yoshida, *Globalizing Industrial Research and Development*, 2nd ed. (Washington, DC: U.S. Department of Commerce, September 1999), Appendix C, p. 86.

to, the work of the joint venture with which they are affiliated.¹² Little information is available on what, if anything, these ventures have produced.

Moreover, the nature of what constitutes joint R&D differs in each case and depends on the foreign and Chinese partners involved. Most of what is termed joint R&D appears to be applied research, often constituting the “localization” of foreign products to suit the domestic market.¹³ Some “R&D” labs or centers are established primarily for the purpose of training Chinese employees to master foreign technology, equipment, and management techniques.¹⁴ Obviously, much more research in this area is needed in order to understand exactly how these centers operate, how these relationships will affect U.S. economic and security interests, as well as how they will impact China’s own economic and technological development.

In the meantime, U.S. companies currently engaged in collaborative research in China run the risk of potentially losing the monetary and technological gains from their investments due to limited intellectual property rights and discriminatory provisions regarding the rights and obligations of foreign partners in China that favor the domestic partner. So, why are U.S. and other foreign high-tech firms still in China and acceding to demands to transfer technology? The answer stated most often was that a company simply could not be in China, lest a competitor had the chance to gain a foothold first.

What Motivates Technology Transfers to China?

As you know, doing business in China has never been easy. Numerous tariff and non-tariff trade barriers exist that make selling most foreign-made products to Chinese consumers a difficult, and in some cases commercially unviable, prospect. China’s efforts to develop indigenous high-tech industries include foreign investment policies that are selective and restrictive in the type of foreign investment that is allowed and officially encouraged. Over the years, there has been an increased emphasis on industry-specific investment and high-technology imports.

Nonetheless, China remains a buyer’s market. The potential of this single market is perceived still to be unparalleled, and the prospect of selling most anything to over one billion people, in one place, is irresistible to many companies. The leverage afforded by this enormous potential market allows Chinese officials frequently to play foreign competitors against each other in their bids for joint venture contracts and large-scale, government-funded infrastructure projects in China. Unfortunately, many companies discover only later the reality that the size of China’s market is in truth not that remarkable when one discounts the majority of the population that is extremely poor and the 100 million-plus floating population. This same type of miscalculation regarding the potential Chinese market has plagued foreign investors in China for centuries.¹⁵

Yet, while there have been numerous complaints registered by U.S. companies regarding unfair trade practices in China, many companies are hesitant, if not unwilling, to complain publicly or even privately about the numerous difficulties inherent in doing business in China, including demands for technology transfers. This is in part due to the high cost—both financially and politically—of exiting the market. It is not surprising then that, despite the fact that the majority of industry representatives interviewed for the study clearly stated that technology transfers were the price of doing business in China, most representatives also were optimistic about their future business prospects in China and did not think the entry “price” had yet become too high. Apparently this optimism remains unbowed despite continued unprofitable China ventures and a slowing Chinese economy.¹⁶

Why? Initially, U.S. and other foreign investors were more interested in trying to “gain a foothold” or to “establish a beachhead” in China than in realizing near-term profits or even gaining more than limited access to China’s market. Therefore, if Chinese policies demanded a manufacturing joint venture and technology transfers in exchange for investment approval and market access in China, many companies stood ready to make the deal. This is not to say that these firms were or are uncon-

¹²Di Capua, “Technology Innovation in China”; and A.T. Kearney, *Global Investment in China: A White Paper on the Quest for Profitability* (1999), p. 14.

¹³This was the finding of an ATIP study. See Asian Technology Information Program (ATIP), *Foreign R&D Centers in China* (ATIP97.058), July 9, 1997.

¹⁴Di Capua, “Technology Innovation in China.”

¹⁵For an amusing account of this perpetual problem, see James Surowiecki, “Little Profit in Big China,” *The New Yorker*, July 16, 2001, p. 31.

¹⁶See A.T. Kearney, *Global Investment in China: A White Paper on the Quest for Profitability* (1999). According to this report, “Just two out of five participants report that their consolidated China operations are profitable.” More than half, 52 percent of international respondents, have yet to realize a profit in China (see p. 2). This is in line with findings from an earlier white paper published in 1997.

cerned about giving away proprietary information or about China's infringements of intellectual property rights, or even China's capacity to become a competitor in their own industry sector. Rather, most companies seemed to think either that the potential short and long-term gains were worth the risks, that many of the problems would be resolved once China gained WTO membership, or that the problems were more or less easily prevented by taking proper precautions.

In terms of joint R&D, most companies also did not view these programs and other "required" technology transfers as threatening to their competitive edge or that of their industry. While each circumstance differs and this may all be true, it is the cumulative effect of these independent decisions that is of interest and, potentially, of concern down the road.

Implications for U.S. National Security Interests and U.S.-China Relations

Though troublesome, the trends and dynamics described above are observed in other developing countries, and foreign investors from other nations are experiencing similar pressures in the China market.¹⁷ The extent to which U.S. firms agree to transfer technology to China in exchange for market access is a judgment call each must make. No company, as I have been told many times during interviews, willingly transfers its most advanced or latest-generation technological capabilities. These same companies, however, may be willing to transfer less than the latest generation technology that is nonetheless more advanced than would generally be appropriate for the less-developed China market. Some do; others resist. It has clearly been the objective of Chinese authorities and joint venture partners to acquire foreign advanced technologies in this way, and the cumulative effect could contribute to the creation of an economic competitor at more rapid pace than might otherwise appear. One well-known success story that continues to impress (or give one pause) is the Chinese computer company, Legend.

Legend Holdings, Ltd., has become not only the number-one seller of personal computers in the PRC, but now ranks just below Japan in sales to the Asia-Pacific region and is poised to expand its international reach.¹⁸ The question is whether this success is in spite of, or because of, foreign competitors in the China market such as Hewlett Packard, IBM, Dell, and others. Obviously, as a leading state-owned enterprise, support from the Chinese government as well as smart growth strategies have helped leapfrog this company ahead of more advanced, foreign computer makers in the China market. But the strategy that Legend has followed of collaborating with many different Western high-tech competitors at once also has been essential to the company's success and is being duplicated in other Chinese industry sectors.

Does this matter? It does if Legend's path to success can be replicated across other critical high-tech sectors, particularly if over a similarly short period of time. As this case makes clear, the question we must ask is not whether or when Chinese enterprises may reach technological par with the United States and others (which is probably a long way off); the critical question is when will China acquire technological capabilities good enough to compete? As a recent study on China's commercial technological development concludes, "Simply because China's technological capabilities will lag those of the United States does not mean—that China could not present a serious military challenge to the United States."¹⁹

A primary motivation for requiring foreign-sponsored joint R&D ventures, centers, or labs in China has been the integration, compatibility, and absorption of foreign technology. In some cases, foreign investors have been asked to make foreign technology and equipment compatible with Chinese technical specifications or standards.²⁰ This also raises a serious question whether (or not, in the case of Legend's

¹⁷David Bennett, et al., *China and European Economic Security: Study on Medium to Long-term Impact of Technology Transfer to China*, Prepared for the European Commission Directorate General I (July 1999), p. ix.

¹⁸Tyler Marshall, "Little-Known PC Maker Is Legend in the Making," *Los Angeles Times*, Business Section, page 1 (September 2, 2001).

¹⁹Roger Cliff, *The Military Potential of China's Commercial Technology* (Washington, DC: RAND, 2001), p. 62. This study examines China's present capabilities in eight major industries: microelectronics, computers, telecommunications, aviation, space, nuclear power, biotechnology, and chemical technology and concludes that "China has significant production capabilities in all but one (biotechnology)—[but] also has significant limitations to its capabilities in all eight" (p. 30).

²⁰In software and other industry sectors, foreign investors must in some cases alter their technology to conform to Chinese standards. See, for example, Hong Kong Trade Development Council, "Business Alert—China," Issue no. 3, March 15, 2001, accessible online at <http://www.tdctrade.com/alert/ch0103c.htm>.

foreign competitors) the technological advantage that foreign standard-bearers bring to the China market will translate into a dominant market position.

Nonetheless, although China could stand to gain significant technological know-how and advances in critical high-tech industry sectors as a result of foreign technology transfers and joint R&D programs, this is by no means assured, and should not be assumed. To date, China's overall record of indigenous technological development and innovation has been spotty and sporadic at best. This is despite the huge inflow of foreign direct investment (more than any other developing country and second only to the United States) and the technology transfers that often accompany this.

Several central government programs have been established to take advantage of foreign investment and technologies and to promote domestic technology development and innovation. As part of these programs, experiments with state-sponsored high-tech development zones, national engineering research centers (NERCs), high-tech incubators, and other programs have been instituted in an effort to link China's research community with both Chinese entrepreneurs and foreign investors. Yet, although Chinese acquisitions from Soviet technology transfers made clear that transfers do not necessarily translate into indigenous technological capabilities, many bureaucratic, political, and economic barriers to innovation remain.²¹ Even in cases where Chinese ventures have been successful in manufacturing technologically advanced products (e.g., airplane, automotive, or electronic parts), they typically lack the cradle-to-grave capabilities and processes necessary for a modern successful enterprise or industry. As a result, roughly half of China's exports still are produced by foreign-invested enterprises (either joint ventures or wholly foreign owned enterprises).²²

Thus, the progress of foreign-sponsored or joint R&D centers in China could provide critical indications of China's modernization and ability (or inability) to assimilate new ideas, methodologies, and technologies. In fact, a lack of progress despite possibly significant levels of technology transfer would also be revealing.²³

Technology transfers to China and the success or failure of foreign R&D centers will likely have important economic, political, and security implications for U.S.-China relations. Most immediately, China's commitment to the WTO will be tested through its approach to foreign R&D centers, the establishment of which China has since explicitly agreed not to use as a quid pro quo or condition for further opening of its markets to foreign investors.²⁴ Intellectual property rights and the rule of law in China also will be tested by these centers, as will U.S. and multilateral export controls. More generally, the U.S.-China balance of trade could be affected over the long-run if China is able, in part through these collaborations, to more rapidly develop its high-tech industry sectors and thereby become surprisingly competitive in these industries both within China and internationally. Finally, the success or failure of these centers could also indicate the degree to which China's economic and industrial reforms will aid efforts to modernize Chinese defense industrial enterprises.

Although both export controls and technology transfers will continue to pose challenges for U.S.-China relations, there is some reason for optimism.

Last year, the U.S. Government sanctioned a Chinese entity for violating a November 2000 bilateral agreement on export controls governing missiles and weapons of mass destruction. Although the apparent violation is troublesome, sanctions levied against the entity in question allow U.S.-China relations to continue on a more or less even keel while dealing with this particular problem. Given the roller-coaster nature of Sino-U.S. relations over the years, this represents progress and, I think, a maturing of the relationship.

²¹Di Capua, "Technology Innovation in China."

²²Hong Kong Trade Development Council, Market Profile on Chinese Mainland, citing data from China's National Bureau of Statistics, the Ministry of Foreign Trade and Economic Cooperation (MOFTEC), and General Administration of Customs. Available online at <http://www.tdctrade.com/main/china.htm>.

²³As Richard Suttmeier observes with regard to the emergence of foreign R&D centers in China, "Chinese R&D can benefit substantially from this type of foreign presence, but there clearly are risks, as well, that the most productive and innovative parts of the system will be captured by foreign interests." See Richard P. Suttmeier and Cong Cao, "China Faces the New Industrial Revolution: Achievement and Uncertainty in the Search for Research and Innovation Strategies," *Asian Perspective*, vol. 23, No. 3 (1999); and Eric W.K. Tsang, "A Preliminary Typology of Learning in International Strategic Alliances," *Journal of World Business*, no. 3, vol. 34, September 22, 1999, p. 211.

²⁴See Protocol Language in the "U.S.-China WTO Market Access Agreement," March 14, 2000, pp. 3 and 227.

Also, a bilateral agreement reached in November 1999 that led to China's recent accession to the World Trade Organization is promising. The agreement includes a specific commitment by China not to condition approval of foreign investments on the willingness of U.S. and other companies to transfer technology, set up an R&D center, and so forth. This, too, is progress.

Neither agreement, however, will be the last word, and there is no doubt that disagreements will continue to challenge U.S.-China relations for years to come. In particular, China's joining the WTO will not solve all the foreign investment problems faced by American and other companies overnight (although it is often presented this way). Continued wariness and caution in terms of technology transfers will be necessary. Yet, China's willingness to participate in multilateral arrangements that regulate trade is encouraging. Encouraging this is in the U.S. national interest in terms of both economic and security concerns.

CONCLUSION

U.S. export controls and technology transfers play a vital role in protecting U.S. national security. Yet, neither can be too restrictive nor too liberal if they are to be effective. While dual-use, commercial technology transfers to China can enhance investment opportunities, they are also a potential concern for U.S. national security, as several high-profile cases have shown. Export controls as presently constituted, however, are not well-designed for the on-the-ground reality in China and elsewhere. Perhaps more importantly, nor can they provide the type of information necessary to fully understand the implications of these transactions.

There are ways, I would argue, to reform U.S. and multilateral export controls such that more information about these transactions could be available and provide a much clearer, more comprehensive picture of the cumulative effect of China's (and other states') technology transfers and acquisition programs, patterns, and priorities in a way that would not unduly impede international trade. Anything of this sort, however, would require wholesale reform of the current system and, more importantly, a collective political that thus far has been lacking. Perhaps, in the aftermath of the September tragedy, significant reforms will be possible. But it will require U.S. commitment and leadership. Although the Bush administration has sounded its support for export control reform, a new and vigorous effort is needed to move past the current impasse and to establish new forms of international cooperation to better protect the transfer of critical technologies and to enhance U.S. national security. Otherwise, we will continue to operate in the dark and wonder what it is we can't see.

I would like to thank the Committee for providing me this opportunity to describe some of the work that I have been involved in over the last few years. I hope that it has been helpful. These complex issues have been horribly oversimplified for the sake of brevity, but I would be happy to answer any questions you may have on either export controls or technology transfers to China. Thank you for your time and your attention.

PANEL III DISCUSSION AND QUESTIONS AND ANSWERS

Co-Chairman REINSCH. Mr. Rose, please come to the table and join us now, and we'll turn to questions. We'll begin with the co-chairman, Mr. Bryen.

Co-Chairman BRYEN. Thank you.

I have a couple of questions. First, for Mr. Storie, I am frankly confused by what you said, so I hope you can try to clarify for me. You said in the beginning of your testimony that five-axis machine tool technology is Cincinnati Machine's most critical core competency. Then you said a little later on that this is 30-or 40-year-old stuff that doesn't deserve to be export controlled, and in fact, all kinds of firms around the world, even in China, have the technology. So I just wonder which is it—or maybe I just don't understand your testimony.

Mr. STORIE. Both statements are true. Cincinnati Machine's core competency is fix-axis technology. We are the world's leader in supply five-axis equipment. There is quite a large market for it in the world. But the fact is that five-axis technology has been around for

30 or 40 years. So both statements are true. There have certainly been improvements, efficiencies; what was produced 30 or 40 years ago is certainly—

Co-Chairman BRYEN. So it's not only the number of axes; it is also the level of accuracy—right—that counts in these kinds of machine tools?

Mr. STORIE. The level of accuracy has certainly improved in 40 years.

Co-Chairman BRYEN. I spent a long time studying this when I worked in the Defense Department—and visiting your factory.

Mr. STORIE. It is productivity improvements that are most effective and why we still manufacture this—

Co-Chairman BRYEN. And you are convinced that the licensing process is what has inhibited your sales in a significant way.

Mr. STORIE. There is no question that the licensing process is an inhibitor of sales.

Co-Chairman BRYEN. So you would recommend dropping the licensing of these kinds of machine tools?

Mr. STORIE. I think that there are certain sizes of machine tools that are over 2 meters in length that do not have the accuracy that you are probably referring to that probably do not need license. I do think that you could have special consideration for machines such as the large five-axis machines, where you can ship under a general license, but would also require the end-user checks.

Co-Chairman BRYEN. So you think there is still a national security reason to have license controls on most, if not all, of the machines?

Mr. STORIE. I think there is absolutely no national security—

Co-Chairman BRYEN. Then there is no reason to have any license.

Mr. STORIE [continuing]. And the reason is because they are going to buy the equipment—they are buying the equipment. The only thing that we are doing is providing you information.

Co-Chairman BRYEN. So, then, the right answer to the question I asked is, "No, I don't think there should be any export controls on five-axis machines."

Mr. STORIE. My friends at DOD tell me they want to get together, and they want as much information on the Chinese aircraft factories as possible.

Co-Chairman BRYEN. Well, that's a different matter. I think the point here is that if there is no national security interest served by an export control, then we shouldn't have it.

Mr. STORIE. Well, foreign availability is not a question here. They can—

Co-Chairman BRYEN. Foreign availability is probably not a question on almost everything nowadays, I think.

Dr. Hicks, pardon me for being delayed and missing the beginning of your testimony, because you have been contributing to this field for many, many years, and I have a question that I would like to put to you.

I believe it was in the 1970s, although I may be wrong, that we started a project in the Defense Department called the Military Critical Technologies List, and lo and behold, everybody found out that they had militarily critical technologies, because otherwise

they didn't have anything. Nonetheless, the idea was to try to identify those technologies that were most relevant to national security.

I don't believe that that exercise has continued in earnest in the last 10 or 15 years. Do you think it would make sense in taking a big picture view of export controls to ask the Defense Department to go back and revisit this concept and to develop a militarily critical list? That doesn't mean that you can control those technologies, mind you, but it means that those technologies are what are vital to your defensive capability.

You spoke eloquently about the need for more money for new defense programs, and I couldn't agree with you more, but we also have the problem of potential competition—if an air defense system were in Afghanistan, we would have a major problem. There are certainly going to be air defense systems in China and so on.

So could you respond to that question, please?

Mr. HICKS. Yes. That is actually a favorite subject of mine. This started out, as we both know, in the seventies to be of some importance. It looked like a good thing to do. It was tied to COCOM, for example, and so on.

It turned out to be a typical pet rock for everybody. Every single technology that people wanted to have people look at and be proud of went onto that list. So the list is an enormous thing now, totally unmanageable, and I think totally unimportant. It reminds me a little bit of the issue of security, which we brought out in our Globalization and Security Task Force, too. Everybody is for security. Everybody is for people who have important knowledge to be the right kind of people, and they have to be the kind of people who are willing to undergo personal background checks.

The problem is that, as you remember, we have 850,000 cleared people, most of whom don't do anything that is important in terms of real importance. So we have a security system that spends entirely too much money on too many people who don't matter. Yet the really important guys, since they do have critical positions, seem to escape the system—Ames at the CIA for example. There needs to be careful surveillance of those individuals who have important secrets.

The real problem with the list is the same. I think it has become irrelevant, frankly. But the point is that it is a situation where it delays everything, because everything had to be looked at in terms of that list.

We have tried to get rid of that list, or at least drop it down in numbers. That was one of the things that our task force talked about, and I frankly haven't followed it well enough to know what has actually happened. I think that there are relatively few technologies that are important to really control. It goes back to the issue of how we use this technology, which is really the important thing—that is, to have the capability, the infrastructure, the architectural people, the engineers, the manufacturing people with talent, who can take those things and make them into a important defense system.

To say that the “good enough” of the world—look at Somalia; they had “good enough” stuff to really knock the hell out of our force in that situation—so I say that the way that whole thing turned out because of the bureaucracies, I'd just as soon see the list

disappear and have a different approach for making sure that the really critical stuff does not get out.

Co-Chairman REINSCH. Ms. Dreyer?

Commissioner DREYER. For Dr. Lewis, with regard to your statement about Taiwan being a major supplier of technology to the mainland, this Commission recently visited Taiwan, and we had a long talk with Morris Cheng [phonetic] of semiconductor fame, and he was quite explicit that what he wants to transfer to the mainland his production facilities that are idled because they are considered antiquated by Moore's law standards—the 8-inch wafers rather than the 12-inch wafers. And he feels that he is not letting any technology out, although that may just be for our consumption.

But we got the same story from Tsai Ing-Wen, the woman who chairs the Mainland Affairs Council, that we think we can keep ahead of them technologically.

Would you have any comment on that?

Mr. LEWIS. Sure, and I'm very glad he said that, because it showed that he had read his talking points for you.

It is undoubtedly true that Taiwan hopes to keep technologically ahead of the mainland, just as we hope to keep technologically ahead of our economic competitors. I think the problem for the Taiwanese—and this is really an aside—is that they are now at the point where we were perhaps 10 years ago or even longer, where you need to move out of some of the low-end production, like chips, and into higher service-oriented. It is going to be a difficult transition for them. It was difficult for us—we tend to forget that—from the eighties.

Regarding what goes into China, I have also met with Taiwanese officials who have uttered similar assurances over the years. Part of what I urge people to do and what I try to do is to look at what is actually in China—and you can find this in semiconductors, you can find it in machine tools, you can find it across a range of production technologies—the Chinese have no difficulty getting advanced technology. And I believe that you could find Taiwanese firms that have done that. Perhaps Mr. Cheng was unaware of that. Perhaps it was through some triangular arrangement.

They may not even need to do that, because Japan, France, Germany, the Netherlands, and other major suppliers across the board will sell to China. And on the machine tool point, I found it very interesting that we talked about five-axis machine tools, because while the U.S. debates whether to sell five-axis machine tools to commercial aircraft facilities in China, our European competitors are perfectly willing to sell advanced five-axis machine tools to Chinese military aircraft facilities.

So when I look at the target, I don't see them impeded in acquiring advanced technology.

Commissioner DREYER. Thank you.

Just a quick question for Mr. Storie, and that is how many axes are there? What is the maximum number of axes? I notice you have a six-axis here on your—

Mr. STORIE. It's a good question. I'll give you the average number of axes, which is three or four. Most parts are made on three- or four-axis machines. When you get into five-axis machines, you are able to make more complicated parts.

Commissioner DREYER. I understand that. I'm familiar with the whole—I used to work with the Navy, so I'm familiar with the cavitation business.

Mr. STORIE. Okay. We have machines that go up to 17 axes. So it can get very complicated.

Commissioner DREYER. Seventeen. So that makes five sound rather antique, doesn't it?

Mr. STORIE. Well, we certainly have learned that any part that can be made on a five-axis machine can also be made on a four-axis machine, just much less efficiently. And four-axis machines are shipped under a general license.

Commissioner DREYER. Thank you.

Co-Chairman REINSCH. Mr. Wessel?

Commissioner WESSEL. Thank you, although I have to say that after hearing most of this panel, I come away somewhat both confused, as I think Mr. Bryen said, as well as somewhat depressed in that it seems that our rush to the bank is putting us in the position of saying there is basically nothing that we won't sell, which concerns me in light of the role that the U.S. has as policeman to the world, that as those we protect have alliances with Israel, et cetera, seek to profit from sales, we have held our business back in some ways, and it seems that many of the people on this panel are arguing that we shouldn't do it anymore, that we should just "Katie, bar the door" and sell everything.

I would like a response both to that question as well as my concerns about what I have heard from several of the panelists that our real role is not to limit sales of technology but to remain ahead in the race. Yet we heard earlier today from Department of Defense that we no longer have a policy of trying to remain generations ahead of our competitors. We have seen, as many of the panelists here known, large-scale transplantations of chip manufacturing to China and elsewhere around the world. Bangalor, India is now the second-largest software-producing area in the world.

Is there anything that we have such a competitive advantage in that the gap between us and our competitors isn't going to close to the point where everyone's technology is basically on a par with ours?

Mr. HICKS. Who would you like to have answer that?

Commissioner WESSEL. I would like anyone who has an interest.

Mr. HICKS. Well, like everything else, nothing is perfect, so there is no real final answer. First of all, I think you misinterpreted the issue of letting everything go. I heard no one say that. The real point is that so much has happened—

Commissioner WESSEL. But I did hear that export controls are ineffective—I believe a point that both you and Mr. Lewis made—export controls are ineffective in maintaining our technological—

Mr. HICKS. Exactly, exactly. Export controls are they exist today are ineffective. That doesn't mean we should not prevent some things from being sold. And I don't think anybody in this group will say that that is not true.

The more important issue is to look at the total system issue. The reason we have been able to be prime and be the defender of the world is because we put money into it. If you look at the defense budget here—and Steve and I know—we have spent more

money than anybody for a long time, and we have to continue to do that, or we are going to be losing this superiority.

One of the things that I am upset about now is our lack of ability to really have what I call a conventional deterrence—that is, to have such massive military power conventionally with smart weapons and long-range force projection that we can—

Co-Chairman BRYEN. We ran out of them. We're out of them.

Mr. HICKS. Pardon?

Co-Chairman BRYEN. We ran out of them in Afghanistan.

Mr. HICKS. Of course. So there are many answers to this whole problem. All I'm saying—and I think everybody here is saying—is that we have a lot of restrictive things going on in these export controls that absolutely make no sense based on the world as it is, because from the commercial standpoint, globalization is here. If this were 20 years ago, I wouldn't have the same speech, frankly, because it made more sense then to do things. It makes no sense now.

When I was Undersecretary, I strived hard, as Steve may remember, to prevent detailed specs from being used on military systems, because they were counterproductive. I wanted to go to systems specifications. It wasn't until Bill Perry became Secretary of Defense that that actually happened. And by the way, in terms of utilization, it still is not happening in a lot of places.

So it is a long struggle to do the right things. The Defense Department has its own problems. They are created by industry, they are created by the Congress, and they are created by the bureaucracy of the Defense Department. But the issues is that we have been able because of the money we have spent to stay ahead of the game and be in a superior situation.

We did not do Afghanistan right. Any time we have to have an F-18 E and F have seven refuelings when it drops a bomb on Kabul, there is something screwed up. We pressed the Navy to death on that issue, and I'll say many pilots are marvelous, because those guys did a hell of a good job. If Afghanistan had had any kind of air defense system, you would not have found B-52s flying over doing precision deals or the B-1s. They would not have existed. So it's a big story. We still want to protect things that are very important, but most of the stuff we are trying to protect is ridiculous. That's all.

Mr. LEWIS. Can I just follow up on that a little bit? One example of a technology where we have leadership and other people aren't going to catch up, I think, would be at the high end of remote sensing. Our spy satellites are better. Other people can't match them. They want very much to get our technology—and this includes China and others. I don't think we should transfer it to them. We have a lead there, and we have been able to maintain it.

In many other areas, however, that is not the case. So it has been very much a narrowing of the places where we have indisputable leads and unique technologies.

The goal is the same, which is how do we keep the United States more powerful; how do we retain our military power. I think that what we are advocating is that we need to change our tactics for doing that.

Commissioner WESSEL. Mr. Hatano, if you could, quickly.

Mr. HATANO. Yes. The U.S. Commission on National Security in the 21st Century, the commission chaired by former Senators Hart and Rudman, had an entire chapter in their report specifically on the area of research and development and education with regard to technology. They had a statement in there that, when I read it, just caused my jaw to drop in terms of the forcefulness in which they were making the point.

They concluded that the U.S. Government has seriously underfunded basic research, scientific research, in recent years and said that "In this Commission's view, the inadequacies of our system of research and education pose a greater threat to U.S. national security over the next quarter-century than any potential conventional war that we might imagine."

I think one thing this Commission might look into in your recommendations to Congress is to recommend that Congress appropriate the funds necessary to implement the math and science education initiatives that were included in the Leave No Child Behind Act that was just passed recently and signed by the President, and that Congress and the Administration commit to substantially boosting funding for information technologies and other physical sciences at our Nation's universities.

One thing that the Commission recommended was a doubling of the Federal research and development budget by 2010. So I think that would be in line with what that Commission concluded.

Commissioner WESSEL. Thank you.

Co-Chairman REINSCH. Thank you.

Mr. Becker?

Commissioner BECKER. Just a couple of points. I share some of the feelings that the Commissioners up here have already expressed about the sort of dismay and that we are heading down the wrong road entirely. I have a question particularly to Mr. Hatano and Mr. Storie.

Can you list for me any feelings that you have or any circumstances in which the United States should impose unilateral sanctions on trade with China concerning machine tooling and computer chips? Can you visualize any at all?

Mr. STORIE. When we look at our composites manufacturing technology, which is a machine tool, I think that that is an area where the United States holds a competitive advantage and that it could be used distinctly for military purposes and that that would be one area where there would be no questions about the licensing and that we would not license that technology.

Commissioner BECKER. If it were for military, you would agree with those kinds of sanctions?

Mr. STORIE. I would say certainly that it is a machine tool that was designed for support of the military system. It has moved into the commercial area, but it is certainly of a high-tech nature.

Commissioner BECKER. You would feel that way about any country, right—trading with any country.

Mr. STORIE. With our allies; we are already shipping this product into our allied countries—England, Spain, Italy.

Commissioner BECKER. How about you, Mr. Hatano?

Mr. HATANO. Well, I think similarly that chips that were designed specifically under a Government program to be put into a

missile would be classified as a weapons system and would be controlled under our ITAR regulations. So that would—

Commissioner BECKER. Excuse me. I thought I understood you to say that from an intelligence standpoint, it makes no difference, that there is no difference in the chips, there is no difference in the technology.

Mr. HATANO. A chip that is specifically designed to go for a particular application, such as the weapons system, the architecture in that chip would be different. Certainly in terms of the manufacturing technology that would make that chip, it would be very similar to other chips, but that particular chip would be for that specific application.

Mr. HICKS. May I make a point, because I think that is an important issue. As I said earlier, that's a manufacturing issue, not a technology issue. That is, he is using the same technologies and capabilities to make a specific chip for a weapons system that he uses for a commercial product. It costs a lot of money, however, to essentially develop what I call a specific chip. But we do focus on dual-use technology.

Co-Chairman BRYEN. But mostly, they are using COTS chips now, right—commercial off-the-shelf systems. They have gotten away from custom stuff.

Mr. HICKS. A lot of it, but a lot that is not, too.

Co-Chairman BRYEN. Pardon?

Mr. HICKS. Some that are not COTS, but you are right, in general, where we can use COTS, we do; but we don't use—

Co-Chairman BRYEN. But the trend is to—not totally—but I mean there has been a big push for that.

Commissioner BECKER. Can you always define or tell how the equipment, the end use of the equipment, when they order it or they want it, as to whether it is going to be commercial or wind up in military usage, particularly with machine tools? In fact, I think that was the problem, was it not, with Lockheed and with the McDonnell Douglas problem?

Mr. STORIE. The problem there was that they were told they were going to be sent to one factory for commercial use, and they were potentially going to be diverted to another factory for military use.

Commissioner BECKER. But how do you know that when they place the order with you where that piece of equipment is going to wind up?

Mr. STORIE. We certainly go through a rigorous information-gathering exercise where we are in the factory, we see what is going on. Ninety-nine percent of the time, we are dealing with Boeing people inside those factories. We are the ones who install the equipment.

Mr. LEWIS. Could I increase your dismay a little on the McDonnell story, because of course, that's one of my favorites.

Commissioner BECKER. Let me pursue this one point here and then, gladly.

Mr. STORIE. Okay. We install the equipment, so we know exactly where—when it ships, we ship with it to be able to put it in. So if it is not going to be put in where we have been told and where the licensing documents, and where we have told the U.S. Govern-

ment that it is going to be installed, we would notify them immediately.

Commissioner BECKER. So it is not a question of whether it is capable of being used for military applications; it is what they tell you they are going to do with it.

Mr. STORIE. And certainly, once we walk away from it, there is a concern called "diversion-in-place," that when you walk away, they take off what they told you they were going to run on it and put something else on it.

Commissioner BECKER. The other point that you raised—I believe you raised it—was on the average time of getting the license.

Mr. STORIE. Yes, I did raise that.

Commissioner BECKER. That has nothing to do with whether you are competitive, nothing to do with whether the State Department will give the license; it's just the fact that they do not move quickly enough.

Mr. STORIE. In the Chinese companies' minds, it certainly has to do with it's a competitive issue. If they place an order with me, and nine months later, I go back to them and tell them the license has been denied, now they have to start the process all over again. As a commercial aircraft supplier, they cannot afford to do that. They need to know with certainty when they place the order with the machine tool manufacturer that "x" amount of months later, the equipment is going to arrive, so they can start producing commercial aircraft parts.

Commissioner BECKER. So if you could get rapid answers, rapid determination—

Mr. STORIE. That would be a huge step forward.

Commissioner BECKER. That would be a huge increase without having just to give them carte blanche any piece of equipment they want.

Mr. STORIE. I would consider that a huge step forward. We heard in this morning's testimony times that were thrown out on average, the average time—

Commissioner BECKER. Everybody agrees with you. I think we hear this pretty steadily about the length of time it takes to process a case in the United States.

Mr. STORIE. Okay.

Commissioner BECKER. Mr. Lewis, you had a point.

Mr. LEWIS. Just very quickly, and thank you—and your chairman today knows this story very well.

The machine tools for the Douglas plant were diverted to another factory in part, I think, because they weren't particularly good; they were used. The United States made the Chinese return these machine tools, and the end result of that was that China then went to a European supplier and bought a better machine. So, far from actually preventing the Chinese from getting, in this case, a stretch press, which is a kind of machine tool that was part of the package, we improved their capabilities because they bought a better one in Europe.

So again, looking at what happens in China—

Co-Chairman BRYEN. So you would prefer to sell right to the military factory and bypass the middleman?

Mr. LEWIS. I would prefer to take into account whether or not we are having any effect on China's military programs, and if we aren't having any effect, then we'll have to do something else.

Co-Chairman BRYEN. So your view is to have no export controls, basically, on this sort of thing.

Mr. LEWIS. My view is that where there are things we can no longer control, we only damage ourselves.

Co-Chairman REINSCH. And on that happy note, Mr. D'Amato is next. Welcome.

Chairman D'AMATO. Thank you, Mr. Chairman. It is good to be here. And I thank the panelists for coming. I have a couple of questions for Mr. Hicks and also for Ms. Walsh.

Mr. Hicks, in your testimony, you talk about time and globalization. It seems to me that you are also saying that globalization can work against you or for you if you have political will, if you select the right technologies to focus on. But you must select the right technologies and focus on them and have the political will to carry forward whatever regime of control you can impose for them, because obviously, time is the factor, which is so critical. As long as we are years ahead, we are years ahead and stay ahead, and chances are better that we will prevail.

The second part of that question is you mentioned those capabilities of which the United States is sole possessor, and you mentioned integrators. Would you say that integrators in a sense are one of those technologies that we have to have the kind of political will to control—and what are the key technologies, let's say the three key technologies that you think we need to focus on?

Mr. HICKS. Well, let me define "integrator" first, because that is a terribly important issue that we spent a lot of time discussing.

I use the analogy of the difference between the cook and the chef. There are lots of cookbooks around. Everybody who likes to fool around in the kitchen, including me, uses a cookbook; it's nice to cook things, and people will eat them. But if I really want to have a good meal, I go to a chef, who has spent years with his cookbooks. He knows what is right, he knows how to do it, he has made mistakes; he has a real talent.

The defense industry of the United States was that kind of a "chef," so many of the other places had "cooks." That is why our airplanes were better than their airplanes—they may even have had some of the same technology, but ours were better airplanes. They had engines—we just did things better, with more precision.

Today, it's the same thing. We have JDAM [phonetic], and we have the ability to take "dumb" bombs have terribly good. If you look into the details of that in terms of the technologies involved, it was the implementation of those technologies and putting them to work that was the real issue. Other nations knew that GPS was available, but to use GPS augmenting cheaper but still fairly accurate gyros. We have the impressive smart "dumb" bombs that were so important in Afghanistan. We developed that system, JDAM. No one else has it!

An example is the Kosovo conflict, or you can go back to the Gulf War—our technologies in terms of implementation were so far ahead of our allies that we could not even utilize some of our ally's capability. The British tried to use a system that we all knew in

our Defense Department was going to have a problem—fly right over an airfield and drop bombs. Well, you know, you get killed doing that. And that's what happened—they lost airplanes in the Gulf War.

The real thing that happens in military capability is to spend the money to have the kind of talent that knows how to take these technologies and make them into high-quality weapons systems, to have the money to train people in the military to use them—because they will actually find new ways to use them—and our wars are won.

So the crucial thing that we need to protect is our defense budget. And the real problem is that in the last ten years, we have done terrible things to our defense budget. Luckily, we had so much capability built up during the years before that with the kind of budget we had that we could take advantage of that in the Gulf War, and Kosovo, and even in Afghanistan.

But in terms of the long-range future in terms of terrorism, we're missing an opportunity. We are doing all kinds of good things to prevent terrorist acts, and I am for everything that we do, and I'm for more money in that area. But you know, it's going to happen—we're going to have some terrible things happen to us because of terrorism I believe just as I believed that before September 11. We are fighting a war against a large number of individuals who hate the U.S. The only way to stop this is to have an incredible conventional killing power. We can then handle any situation where, as the President said, if you support terrorism, you are our enemy. But what are doing about that? Well, if you are our enemy, and you are training terrorists, and you have training camps, and you are building weapons of mass destruction, and they don't stop, you destroy them. And if you have the ability to destroy them, hopefully, it will serve as a deterrent and its use won't be required.

Afghanistan was a marvelous thing to happen in some ways, because it did not stress our defense systems in terms of modern technology. We have great stuff going on. But I say that we have to keep spending money to do this transition we need to do, which we had promised to do two years ago and a year ago. It still hasn't happened, and I see nothing happening in the Defense Department that's real in terms of that transition.

Chairman D'AMATO. Thank you.

Ms. Walsh, you give us some hope here. There are a couple of areas I want to ask you about. I would like to have some more information about what you are talking about in regard to what's going on in Europe. It sounds to me that what you are saying is that the Europeans are ahead of us and are trying to figure out how to circle the wagons on some of these technologies, and that we may not be participating fully enough with them; is that right?

Ms. WALSH. In some ways, yes. The Study Group, initially looked at a number of alternatives for developing a multilateral framework that would work in today's environment. Having done that, and with some semblance of what it was that we thought would work, members of the Study Group and particularly Capitol Hill staff went over to Europe to talk about these issues with our European allies. And it was there that we were actually surprised to find how advanced the Europeans had become in this area, not be-

cause they are smarter than we are, but they have been forced by their own political landscape to deal with a lot of these reform issues that are for them real-world, near-term issues such as deemed exports and dealing with foreign nationals within one defense program. They deal with that every single day. When you visit a company in Europe, they have Germans and French and Brits and others working together side-by-side already; that, combined with the European Union integration, a common foreign security policy, and in particular, their own transformation in terms of their defense industry, which followed a similar cycle in the United States.

So in essence, the U.S. started the ball rolling on trying to find new ways for U.S. export controls to facilitate trade among the U.S. companies and our allies; the Europeans then followed our example and took us a step further.

When we came back from these visits with the allies in Europe, we reported on what we found, and not only on the political arrangements that had been agreed to by the six leading defense industry countries in Europe, but also the way that they are working within the companies to facilitate trade within Europe. They are obviously very frustrated with the U.S. system and not being able to invest in the U.S. market as they would like, so they have looked to themselves in many cases to try to strengthen their joint defense industrial capabilities.

So there were lessons to be learned from the Europeans. Again, they were one step ahead because of their own landscape. We were talking to them about what might work on a multilateral basis, and they were very encouraged by what we had to suggest. This Letter of Intent and Framework Agreement that was signed in August 2000 was something that all sides thought we could build on, because again, the Europeans have done much of the preparatory work themselves; it no longer would require the United States going to each country bilaterally to set up different arrangement. They have already done much of the work for us, so it made sense to build on that good will and good work and have the United States in a sense become part of that system. It is already there for the U.S. to take advantage of.

So that was impressive, how far along the road they had gone with their defense industry consolidation, and we brought that back to the Study Group, again to take advantage of the progress we witnessed.

Chairman D'AMATO. Thank you.

Which country, if you were to cite one actor that would be the most informative and creative for us in this area in Europe?

Ms. WALSH. Without offending anyone, the Germans actually were quite impressive. We met with the Government but also with the corporations—and they are not just German anymore. EADS, for instance, we met with their French contingent, we met with the German contingent in Germany, and they are doing a lot on their own, because they are no longer just a German entity; they no longer, frankly, just listen to the German Government in terms of export controls. They have to take into account *The New York Times*. They don't want to be on the front page of *The New York Times*. So they have their own database that has the Wisconsin

Project information and other information in it. They essentially cull through their own export control license application before they ever submit it. I think that that is where things will go in the future, that companies will take responsibility more and more upon themselves to decide what they will have a good chance of exporting.

They were very impressive in that sense, and they work with these issues day in and day out. So compared to the United States, they are a little bit further down the road, and there are things that we can learn.

Chairman D'AMATO. I have just one quick follow-up, Mr. Chairman, for Ms. Walsh.

You also talk about these "forced" transfers of R and D centers as a result of Chinese Government activity with U.S. firms trying to get into that market. As I understand it, then, you think that one of the things that we should look into would be the question of R and D centers and their place in the WTO framework and that they may be in violation, and that would be something that we should pursue?

Ms. WALSH. Well, two things. One, I would be careful with the word "forced." No company is forced to invest in China. But at the same time, it is more or less a quid pro quo; it's the price of entry in joint venture agreements. So in that sense, you can consider them pressured, at least.

On the other question, the United States and China came to an agreement before China became a member of the WTO, and China agreed to no longer pressure or force U.S. companies to transfer technologies, including R and D centers. So that is something that we want to watch as with everything else in the WTO agreement—will China abide by these commitments that it has made. That is a question in my mind and obviously something worth following.

Chairman D'AMATO. Thank you.

Thank you, Mr. Chairman.

Co-Chairman REINSCH. Thank you.

Commissioner Lewis?

Commissioner LEWIS. Thank you for your very provocative presentations.

I'd like to ask my question in a departure from Kathleen Walsh's paper, and I'd like to read a couple of things that you said. You said that "Export controls remain vital to U.S. national security."

"There is far less concern among European allies over China as a potential threat than exists in the United States."

"There is a breakdown in the consensus over how to balance national security and economic interests."

"U.S. export controls on new technology transfers play a vital role in protecting U.S. national security. It neither can be too restrictive nor too liberal if they are to be effective. While dual-use commercial technology transfers to China can enhance investment opportunities, they are also a potential concern for U.S. national security."

Given those statements, I would like to ask each of you—do you see China as a potential military threat to the United States?

Mr. HICKS. It depends on the time line. I don't see them as a military threat now, and I don't see them as a military threat for

some time, because I think that as long as we keep ourselves strong, no one is a military threat to the United States, frankly.

Commissioner LEWIS. Thank you.

Mr. Lewis?

Mr. LEWIS. Right now, I believe no country in its right mind would challenge the United States militarily, and our goal is to make sure that it remains that way.

Commissioner LEWIS. That means that you are going to see the Taiwan Strait issue becoming a potential threat to us?

Mr. LEWIS. A threat to the United States? I see it as a potential area of conflict, but I don't see it as a threat to the United States.

Commissioner LEWIS. Okay.

Mr. HATANO. I would say that I am not an expert on military affairs and wouldn't comment on China militarily per se, but I would add that on the geopolitical situation, we think that the more information technology is promoted around the world, the more the political systems in countries around the world are going to be more democratic and therefore more likely to be allies rather than adversaries.

Mr. STORIE. I am certainly not in a position to judge the Chinese military capability, but I would concur that the strength of the United States is what is most important here.

Ms. WALSH. I would say that China could be a threat if it wanted to be, but I believe that neither China nor the United States wants to have an adversarial relationship. And also, since you cited some of the things in my written testimony, some of the things that you have heard today are contradictory. How do you square this? I think that export controls as we have defined them in the Cold War are no longer effective in many cases. I think we need to have a new concept of what export controls can do, not just deny and not just control.

Again, I think that using information to enhance U.S. national security is something that I would respectfully say that you, the Commissioners, should consider—that having more information about what is being transferred to China, not necessarily controlling it, but knowing what is going to China, will make the United States feel much more secure, I believe, and also help improve relations with China—not go down an adversarial path with them.

Commissioner LEWIS. Okay. I'd like to ask another question of each of you. Do you think that we, the United States, are selling things to China that have military applications that we would not be selling if we were the only supplier of those goods in the world?

Mr. HICKS. Well, that's a hard question to answer because it has no reality to it. I suppose that if I—

Commissioner LEWIS. It certainly has reality. We are selling things, and you know what we are selling. Would we be selling it if we were the only supplier in the world?

Mr. HICKS. I'd probably say that if nobody else had the capability, I wouldn't sell anything militarily to anybody.

Commissioner LEWIS. Okay.

Mr. LEWIS. We are prevented by law from selling missile technology to China; the United States doesn't do that. We have Tiananmen sanctions, so we don't sell any military technology—

Commissioner LEWIS. I understand what we aren't selling, but are we selling things that we wouldn't be selling if we were the only supplier?

Mr. LEWIS. And for what's left, especially for commercial, civil, dual-use goods, I don't believe they make any military contribution.

Mr. HATANNO. I am not aware of anything.

Ms. STORIE. I think with the narrowness of the question, that you are looking at only one aspect of a big picture, it's impossible to make anything out of that. You can't look at that once slice, that one question, and draw anything from it.

Ms. WALSH. I'm having difficulty coming up with an example, but I'd say that perhaps we are. It is an advantage that U.S. technology in many cases—certainly not all, and less so today—is the best in the world. So that's a market advantage, and perhaps we are. It's something that needs to be looked at.

Commissioner LEWIS. Thank you very much.

Co-Chairman REINSCH. Thank you.

If Mr. Mulloy doesn't mind, Ms. Dreyer has one quick follow-up to that.

Commissioner MULLOY. Yes, sure.

Commissioner DREYER. Thank you.

Dr. Hicks, I'd like to consider your answer to Mr. Lewis in light of your own concept of the "good enough" weapons. You state that China is not a military threat to the United States, but if you think about it, what they are trying to do now and what their military writings concentrate very heavily on is the development of "good enough" weapons, the asymmetric warfare.

Mr. HICKS. The asymmetric weapons, no question.

Commissioner DREYER. Yes. And also, again, if you ask somebody—supposing the United States and China were to come into conflict globally—I think there is no question that what everybody has said here is correct. But if you talk about just the Taiwan Strait, and they are using "good enough" weapons, wouldn't that modify your answer?

Mr. HICKS. I don't think so, and actually, the question was are they a military threat to the United States—

Commissioner LEWIS. No. The question was are they a potential military threat to the United States.

Mr. HICKS. If we do what we should do, they are not a potential threat to the United States. If we don't—

Commissioner DREYER. But you mean only the territorial United States; do you see what I mean?

Mr. HICKS. But the Taiwan Straits is an interesting issue, because we are politically committed to defend the Taiwan issue. So from that standpoint, if China attacks Taiwan or starts to work in that direction, we are going to support the Taiwanese. Will that lead to a military action? Absolutely. Would we win? Absolutely.

Commissioner DREYER. Thank you.

Co-Chairman REINSCH. Thank you for that.

Mr. Mulloy?

Commissioner LEWIS. Excuse me. Let me just have one follow-up to that question.

We will win in Afghanistan. Were they a threat to us? Yes, they were.

Mr. HICKS. They were a threat to us, and that group is still a threat to us.

Commissioner LEWIS. Yes, they are, but we will win—but that doesn't mean they are not a threat.

Mr. HICKS. Absolutely.

Co-Chairman REINSCH. Mr. Mulloy?

Commissioner MULLOY. This is directed to Dr. Lewis and Dr. Hicks, and if there is time, if Ms. Walsh would please jump in.

Dr. Lewis, on page 2 of your testimony, you talk about an issue that another Commissioner and I were talking about last night—Wassenaar and the inability to get a successor agreement to COCOM. My understanding is that Europe and the Japanese were in COCOM as well and that there is no feeling that we should redirect Wassenaar—there is no consensus that China should ever be a target of multilateral export controls with regard to that regime. That is my understanding. And you worked to make Wassenaar more effective. Were you trying to deal with China in Wassenaar?

Mr. LEWIS. In our initial proposals, Mr. Commissioner, we did propose continuing COCOM-like restrictions on certain countries, including China. These proposals were rejected by all of our NATO allies, Japan and Australia.

Commissioner MULLOY. And Japan as well; okay. Now, what is it that we see and are worried about in China with regard to—is it because of Taiwan that we have this concern? Why do we have such a concern here in this country about China that—I'm not saying that it is prevalent, but it is widespread—as opposed to where Europe and even Japan are. Japan must have some concern.

What is your view? You have had significant public policy responsibilities, as has Dr. Hicks, so I would like your views on that, and Ms. Walsh can jump in.

Mr. LEWIS. Well, I think there are three things that contribute to this off the top of my head, and I hope I can defer to Dr. Hicks on some of this to get me out of hot water.

The first is that I have routinely see where the U.S. is a global power, we have global responsibilities, and other countries no longer have that so they don't have concerns outside of their regions. The British used to be a little different on that, and every year they are a little less global. They are beside us in Afghanistan, so they still have a global interest or reach. But for most of the other European countries, they think very much in regional terms. So we are the only ones who see global issues, and the integration of China into the global system poses issues for us that it doesn't pose for Europe.

Second, we have strong ideological concerns with China. China remains governed by the Communist Party. I think that it is not the Communist Party that it used to be, even though there might be Chinese who wish it were; but that still provokes a good degree of sentiment in the U.S. regarding how we should react to China, that again, many of our allies don't share, perhaps wrongly, but they don't share it.

Mr. HICKS. I think that's a good statement. I would only add to it that suppose we took a different tack. Suppose we decided that we would do what we did in the thirties, that is, become an isolationist nation—and it's not just a question of what we think we

should do in terms of helping people and, because of our strength, taking care of some of these bad situations, and saying let the world go its own way. But you see, the result of that, if you do that, unfortunately, we also have history to tell us it doesn't work, because eventually, those things that we didn't care about become so important, so big, so emotionally involved that we have a major world war like we did in World War II.

So I think that exactly what Dr. Lewis said is there. That is what I call the "morality" of the situation. But there is also the practical situation that if we don't show that leadership and maintain that strength—and by the way, I think some of our foreign policy is not supporting the President's position, and the issue of where there are terrorists and where people support terrorists, we're going to take them out in effect—I think that's a very dangerous part of our foreign policy right now. We have to be strong enough to defend that situation, or eventually, we're going to have that same problem, little by little.

Commissioner MULLOY. Ms. Walsh?

Ms. WALSH. I would agree with everything that has been said. I think Taiwan is the most critical factor but also U.S. presence in the region and the U.S.-Japan Alliance. These are matters that the Europeans do not need to consider, or do not consider to the extent that we do. Also, Chinese missile capabilities—again, we are very concerned about missile capabilities around the world, and China is one of those, and their proliferation, which is also a key U.S. concern around the world.

And frankly, for the Europeans, we talked about this at length with the Europeans, and their main concern is really Russia. Russia is much more of a concern to them, being much closer to Europe, part of the European land mass, than it is to the United States, where we see a more reformist political landscape there.

So China for them is too far away on issues and also geographically; for us, we have a global interest, and China is more of a concern.

Commissioner MULLOY. Thank you.

Co-Chairman REINSCH. That concludes the panel, and I want to thank all of you. Your testimony has been so thoughtful and thought provoking and the questions so good that anything that I would ask would just lower the tone and quality of the presentation, so I am going to stop and thank you very much.

We'll take a very short break while the next panel comes to the table.

[Short break.]

PANEL IV: CHINA'S ADVANCED TECHNOLOGY ACQUISITION SYSTEM

Co-Chairman BRYEN. This is our last panel for today, and we have with us Dr. Paul Godwin, formerly of the National War College, retired—isn't that nice? You'll explain to us how you got away with that after your testimony.

We also welcome Dr. Gary Milhollin, Director of the Wisconsin Project.

We are going to focus on the U.S. export control system from the perspective of China's weapons development programs. I think that this is appropriate, and in the last panel, it seemed that we were

being told that the transfers of technology from the United States have no impact whatsoever on China's weapons programs.

I think that's a somewhat interesting position, not one that I happen to share, but I think this is an opportunity for us to clarify that and other points, so we welcome both of you here.

Do you have a preference as to how you want to proceed, or shall I just call it? Okay. Let's start with Dr. Milhollin, because he doesn't have any charts—or do you have charts?

Mr. MILHOLLIN. No charts today.

Co-Chairman BRYEN. Dr. Godwin has the charts. Can we move those up, because I have no ability to see that at all, even with my high-powered glasses. Great.

Dr. Milhollin, please proceed.

STATEMENT OF GARY MILHOLLIN, DIRECTOR, WISCONSIN PROJECT ON NUCLEAR ARMS CONTROL

Mr. MILHOLLIN. Thank you very much.

I am pleased to appear today before the Commission. I have appeared before and always consider it an honor and a stimulating experience. I am glad to be able to comment on export controls concerning China.

First, I'd like to remind the Commission—perhaps other witnesses have done so already—that the CIA recently came out with a report on various capabilities in the world, and it observed that China has a long-running modernization program to develop mobile solid-propellant ICBMs that will be aimed at us, and the CIA predicts that by 2015, most of China's strategic missile force will be mobile and therefore, I assume, capable of a second strike.

The intelligence community predicts that the overall size of China's strategic ballistic missile forces will range from 75 to 100 warheads deployed primarily against the United States.

Co-Chairman BRYEN. Is it warheads or rockets? I think it's rockets.

Mr. MILHOLLIN. Is it rockets? I think it's warheads, but I'm not certain. I guess I always assume that my testimony never has an error in it, but I'll admit that it may be possible.

Chairman D'AMATO. I think what you mean—they are all single-warhead missiles anyway, so the number would be the same—although they do have the MIRV technology capability, they have not done that.

Mr. MILHOLLIN. Yes, that's right.

I suppose it is possible that you could say there are more warheads deployed against the United States. I am just talking about the ones on long-range global missiles.

I would like as a major part of my testimony to refer you to a report that our organization did on U.S. exports to China from 1988 to 1998. I believe you have that report; I hope you have had a chance to look at it. I won't go through it in detail but will just try to point out some of the major aspects of it.

The report found that the U.S. Commerce Department approved more than \$15 billion worth of strategically sensitive U.S. exports to the People's Republic of China. These are sensitive because these items were on the Commodity Control List, and items are not on that list unless they are sensitive.

The exports, according to our analysis, could be used to design nuclear weapons, machine nuclear weapon components, improve missile designs, and build missile components.

We know that some of this dual-use equipment went to China's leading nuclear, missile, and military sites. We have listed those sites and listed the exports that went to them. I will just point out a few of the major ones now.

First, the China National Nuclear Corporation received controlled exports from the United States, as well as the China Precision Machinery Import-Export Corporation; the Chinese Academy of Sciences; the National University of Defense Technology; the University of Electronic Science and Technology, and the Beijing University of Aeronautics and Astronautics. All of these entities are key participants in China's nuclear and missile program.

In preparation for this hearing, our staff prepared a short table that brings the report closer up-to-date. We have included data for fiscal years 1998 and 1999. The table is attached to my testimony.

I would also like to direct the Commission's attention to an export licensing case that has arisen since our report was prepared. That is the Bostomatic case, which I think shows us something important.

I'm sure that the Commission is familiar with the CATIC export case. I was here during the previous panel, and it was discussed then. CATIC was indicted in 1999 for diverting American machine tools to a Chinese cruise missile and military aircraft plant. The machines had produced parts for the B-1 strategic bomber and the MX nuclear missile.

The case that I would like to bring to your attention happened within two months of that indictment. The Commerce Department sought to allow one of CATIC's sister companies to buy the same kind of American machine tool that CATIC was accused of diverting. The Chinese company makes engines for China's military aircraft, including the nuclear-capable H06 strategic bomber.

Co-Chairman BRYEN. The same machine?

Mr. MILHOLLIN. The same machine, a five-axis milling machine.

Co-Chairman BRYEN. On the last panel, we were told that when the McDonnell Douglas transfer was halted, they were able to get the same machines from Europe, so they didn't need our machines. You are saying that in fact that wasn't the case, that they were getting the machines from the United States again under this Bostomatic? It's a really important point, because—

Mr. MILHOLLIN. I think what I heard the previous witness say was that the stretch press was purchased from Europe. I don't know whether the previous witnesses said that they also bought machine tools from Europe—that is, milling machines. Sorry. That, I don't know.

Co-Chairman BRYEN. We'll have to review the record, but I thought what was said was that—he mentioned stretch press, but he also mentioned the fact that the machine was kind of a low-level machine that was seized or ordered seized by the United States, and that that was replaced from European sources. So we should clarify that point, because if in fact they are still trying to get it out of the United States or have succeeded in getting it under a

license for the same purpose, it changes the whole way you would look at this problem and the implications.

Mr. MILHOLLIN. From what I know, I think the Chinese have continued to attempt to import controlled milling machines and other precision machine tools from us since the time of the CATIC experience.

In this particular case, because of publicity and the opposition of other agencies, this particular export was turned down and did not go out from the United States, at least as far as I know. But I think the point is that at least the Commerce Department was perfectly ready to have it go out. So what we see is a continuation of China's efforts to import these items, and I would say an imprudent willingness on the part of some of our Federal agencies to go along with those efforts.

The second thing that I would like to bring to the Commission's attention is supercomputers, high-performance computers. We have just experienced the announcement of another relaxation of controls. The new relaxation will take us up to 190,000 MTOPS, which is 190 billion operations per second. I think we are beginning to see that there are virtually no longer any meaningful controls on the export of high-performance computers.

I think that that is a big change in the world; that is, I think we, the United States, are giving up an advantage to other countries in a vital strategic technology, and no one has really looked at the consequences of having that event occur.

We know that he who computes fastest on the battlefield today tends to win, and the recent events in Afghanistan I think go further to show that the modern battlefield is electronic. So if America is giving up its advantages in computing speed, we are giving up a big strategic advantage that I think we ought to consider not giving up.

The General Accounting Office warned the Clinton Administration toward its waning days that the United States had not—and I'll quote—"assessed the national security impact on the United States of Russia, China, or other countries obtaining high-performance computing." So that what we are doing is engaging in a giant experiment on which we have no data; we haven't even tried to think through the consequences of it. We are decontrolling a vital technology, and we don't have any idea what it will mean for us strategically.

The Commission also asked me to describe the technologies that the United States can still control, and I would say that at a minimum, these technologies are ones that we and our allies already control under international export control regimes. We can and do control those technologies.

Why do I bring that up? Well, because I think many of these technologies would be decontrolled if Congress passes the pending bill to reauthorize the Export Administration Act.

I read the Act as decontrolling, or at least giving the Secretary of Commerce unilateral authority to decontrol a series of items that are used to make nuclear weapons and long-range missiles, and I have listed those in my testimony. I'll just go over them briefly.

One is what are called nuclear weapon triggers. These are the high-speed electronic switches that are used to detonate nuclear

weapons. I think that under the language of the bill, these would probably be decontrolled for the first time.

The second item I have chosen just for purposes of illustration is glass and carbon fibers. These go into long-range missiles and centrifuges used to make nuclear weapons material.

Third, I think that maraging steel would probably be decontrolled. It is used to make rocket motor cases and also centrifuge rotors.

And fourth, I think corrosion-resistant valves would be decontrolled. These are used to make nuclear weapons material.

These are only a few of the things that would probably be decontrolled.

I think that if the Act passes in the present form in which it is written, the result will be that China will be able to import a lot more sensitive American technology than has been in the case in the past.

I will conclude by making one last point, which I made the last time I was privileged to testify before you. You may recall that I recommended that the Commission supply to the State Department a list of 50 names of Chinese companies that ought to be added to the warning list. We know who these companies are. We know that they are key players in China's nuclear and missile program. We know that they probably should not—strike the “probably”—I would say that they should not be getting U.S. technology. Yet there seems to be a lack of will on the part of the Federal Government to list these companies. I can see no excuse for that; I think we ought to list them and do it right away. Especially in view of the virtual decontrol of high-performance computers, these companies should not be able to have U.S. computer vendors come in and wire them up to do high-performance computing. If they want to smuggle the computers in, figure out how to run them themselves, okay, but we shouldn't be allowing them to get these computers over the table.

If we do that, we are consciously allowing high-technology American products to go straight into China's nuclear missile program.

So I think the Commission ought to do that; you ought to take this list that I have suggested to you and submit it to the State Department and ask them why it is that these companies are not part of the warning list.

The result, if they were put on a warning list, would be only a first step, but it would help our companies avoid making sales that undermine our security.

Thank you.

Co-Chairman BRYEN. Thank you, Dr. Milhollin.

[The statement follows:]

PREPARED STATEMENT OF GARY MILHOLLIN

I am pleased to appear today before the U.S.-China Security Review Commission. The Commission has asked me to comment on China's efforts to obtain sensitive technology from the United States, and on the effectiveness of export controls to protect U.S. national security.

I would like to begin with a few remarks about China's current and projected strategic posture. In a report released earlier this month, the CIA observed that China has a long-running modernization program to develop mobile, solid-propellant ICBMs and that the intelligence community projects that by 2015, most of China's strategic missile force will be mobile. The CIA also pointed out that China has had

the ability to develop and deploy a multiple reentry vehicle system for many years, including a MIRV system. The CIA assessed that China could develop a multiple reentry vehicle system for its CSS-4 ICBM in a few years, although its pursuit of a multiple RV capability for its mobile ICBMs and SLBMs would encounter significant technical hurdles and would be very costly.

The intelligence community projects that the overall size of China's strategic ballistic missile forces, over the next 15 years, will range from about 75 to 100 warheads deployed primarily against the United States. U.S. intelligence predicts that China will have about two dozen shorter range DF-31 and CSS-3 ICBMs that could reach parts of the United States, and an SRBM force of several hundred missiles by 2005.

Imports of high technology from the United States, such as high-performance computers, will undoubtedly help China reach these strategic goals.

I would like to direct the Commission's attention to a report on sensitive—that is, strategically important—U.S. exports to China that my organization published in April 1999. The report covered the period from 1988 to 1998. The report found that the U.S. Commerce Department approved more than \$15 billion worth of strategically sensitive U.S. exports to the People's Republic of China. The exports included equipment that can be used to design nuclear weapons, machine nuclear weapon components, improve missile designs and build missile components.

Some of this "dual-use" equipment went directly to China's leading nuclear, missile and military sites—the main vertebrae in China's strategic backbone. And several of these Chinese buyers later supplied nuclear, missile and military equipment to Iran and Pakistan. It seems clear that China received American exports of great military and strategic value with the blessing of the U.S. government. Consider the following:

- The China National Nuclear Corporation was allowed to buy equipment useful for uranium prospecting. China National Nuclear then helped Iran prospect for uranium that U.S. intelligence believes will be used to make nuclear weapons.
- The China Precision Machinery Import-Export Corporation was allowed to buy equipment useful for building China's new C-801 and C-802 anti-ship cruise missiles. China Precision then exported the missiles to Iran where, according to the U.S. naval commander in the Persian Gulf, they threaten U.S. ships and personnel.
- The Chinese Academy of Sciences was allowed to receive equipment to process data from a nuclear fusion research reactor. The Academy then exported the reactor to Iran, where it is used for training scientists believed to be working on nuclear weapons.

American equipment was also approved for the National University of Defense Technology, which helps the People's Liberation Army design advanced weapons, for the University of Electronic Science and Technology, which helps develop stealth aircraft and advanced military radar, for the Beijing University of Aeronautics and Astronautics, which helps develop missiles and specializes in guidance, navigation, and flight dynamics. The licensing records do not reveal whether all the items approved were actually shipped, but it is safe to assume that virtually all of them were, otherwise it would not have been appropriate to apply for a license.

In preparation for this hearing, our staff has prepared a short table that brings the report up to date. The table contains data on U.S. exports approved for China for fiscal years 1998 and 1999. The exports during these two years followed essentially the same pattern that we observed during the previous decade. The table is attached to my testimony as Appendix A.

I would also like to direct the Commission's attention to an export licensing case that has arisen since our report was prepared. The case shows that the Commerce Department has continued to favor exports to China that are highly likely to undermine U.S. national security.

I am sure the members of the Commission remember the indictment of CATIC, the China National Aero-technology Import-Export Corporation. CATIC was indicted in 1999 for diverting American machine tools to a Chinese cruise missile and military aircraft plant. The powerful machines had produced parts for the B-1 strategic bomber and the MX nuclear missile, and CATIC was charged with lying to get the machines out of the United States in 1995 by promising to restrict them to civilian use.

Within two months or less of the indictment, however, the Commerce Department sought to allow one of CATIC's sister companies to buy the same kind of American machine tool that CATIC was accused of diverting. The export was a five-axis milling machine similar to the machines listed in CATIC's indictment. It was fully capable of making high-precision parts for China's next generation of fighters, bombers and missiles.

A company in Milford, Massachusetts called Bostomatic requested permission to sell the machine to China's Xian Aero-engine Company, which makes engines for China's military aircraft, including the nuclear-capable H-6 strategic bomber. Xian Aero-engine promised to use the milling machine only to make civilian aircraft, but that is what CATIC promised. Xian, like CATIC, is owned by Aviation Industries of China. Since both companies belong to the same organization, no one should have been fooled.

To make matters worse, Bostomatic was purchased in 1999 by the Agie Charmilles Group, a Swiss concern. According to U.N. inspectors, eleven of Agie's machine tools were found at five of Saddam Hussein's leading nuclear weapon and missiles sites in 1992. And in January 1999, General Alexander Zdanovich, a spokesman for Russia's foreign intelligence services, said that Agie had supplied Iran with equipment for making liquid fueled ballistic missiles.

The fact that the Commerce Department advocated the approval of this export shows that the Department was willing to promote trade no matter what the cost to U.S. national security. Fortunately, adverse publicity, together with opposition from other federal agencies, prevented the export from going forward.

Another subject I would like to discuss today is the export of supercomputers. Although he recently called for strengthening export controls, President George W. Bush announced on January 2 a further relaxation in controls on the export of American supercomputers. It will soon be possible for military entities in China to buy American computers performing 190 billion operations per second (190,000 MTOPS, or million theoretical operations per second), which is more than double the previous threshold of 85,000 MTOPS set by President Clinton on his last day in office.

The main argument for the recent relaxations is that higher computer speeds can be achieved by wiring together a number of slower computers. But this argument proves too much. It is obvious that if a number of computers, each operating at 190 billion operations per second, are grouped together, the resulting speed will be much higher than the speed achieved by combining a similar number of computers operating at 85 billion operations per second. We are rapidly reaching the point where no meaningful controls will be left on high-speed computers. The result is that America will have given up its advantage over other countries in a vital strategic technology.

Today, he who computes fastest wins wars. The United States has always used its most powerful computers for encryption and for designing nuclear warheads. In modern warfare, computers are used for surveillance, communications, targeting, and the precision-guiding of munitions. President Bush's relaxation of controls ignored a December 2000 warning by the U.S. General Accounting Office to the Clinton administration cautioning that the decision had failed to assess "the national security impact on the United States of Russia, China or other countries obtaining high-performing computing."

The Commission has also asked me to describe the technologies that the United States can still control. At a minimum, these are the technologies that we and our allies control under the various international export control regimes. Unfortunately, many of these technologies could be decontrolled if Congress passes S. 149, the pending bill to reauthorize the Export Administration Act.

One of the most alarming things about the bill is that it would decontrol a series of items that are used to make nuclear weapons and long-range missiles. It would do so by giving the items what the bill calls "mass market status." The items include such things as electronic devices used to trigger nuclear weapons and materials used to build missiles and produce nuclear weapon fuel.

1. Nuclear weapon triggers

For at least twenty years, the United States has controlled for export the high-precision electronic switches needed to detonate nuclear weapons. These are key components in a nuclear weapon's firing circuit and are popularly known as nuclear weapon "triggers." In 1998, Iraq tried to provide itself with a supply of these switches under the guise of medical equipment. Iraq is allowed to import medical equipment despite the U.N. embargo, so Iraq bought a half dozen machines—called "lithotripters"—to rid its citizens of kidney stones. The lithotripter pulverizes kidney stones inside the body—without surgery. But each machine must be triggered by the same high-precision switch that triggers a nuclear weapon. Iraq tried to buy 120 extra switches as "spare parts."

Iraq ordered the machines and switches from Siemens, in Germany, which sold the machines but passed the "spare parts" order to Thomson in France. The French government appears to have barred the sale. Siemens says that Iraq did get one switch with each machine and two more as spares, but to get any additional switch-

es, Iraq will have to turn in a used switch for each new one and will have to allow the United Nations to inspect the use of the machines. The switches were controlled for export because they are on the control list of the Nuclear Suppliers Group, an international regime to which France, Germany and the United States belong.

These switches, however, would have "mass market status" under the bill and would be decontrolled for export by the United States. The switches meet all the criteria listed for such status and the bill says that the Secretary of Commerce shall remove them from the control list if they meet the criteria. They meet the criteria as follows:

- They are "available for sale in a large volume to multiple purchasers," because they are used in radar, lasers and rockets as well as lithotripter machines and are advertised on the Internet by manufacturers in a number of different countries;
- They are "widely distributed through normal commercial channels," because they are sold by the thousands each year, including the hundreds sent to hospitals to keep lithotripter machines running;
- They are "conducive to shipment and delivery by generally accepted commercial means of transport," because they are small and easy to handle;
- They "may be used for their normal intended purpose without substantial and specialized service provided by the manufacturer," because they need only to be connected into an electrical circuit by attaching the appropriate wires.

Any bill that decontrols nuclear weapon triggers must be seen as seriously flawed. Despite the fact that these items are available in volume inside the countries that produce them, they are not easily available to countries that are trying to make nuclear weapons. The reason is export controls. If the United States were suddenly to decontrol them, it would dismay our allies and destroy our credibility on nuclear nonproliferation.

2. *Glass and carbon fibers*

Glass and carbon fibers are used widely in ballistic and cruise missiles. They go into solid rocket motor cases, interstages, wings, inlets, nozzles, heat shields, nosetips, structural members, and frames. Composites reinforced by carbon or glass fibers also form the high speed rotors of gas centrifuges used to enrich uranium for nuclear weapons.

In addition to these military applications, however, they are used in skis, tennis racquets, boats and golf clubs and are produced in a number of countries. This availability would give the fibers "mass market status" under the bill, despite the fact that they have been controlled for export since January 1981.

- They are "available for sale in a large volume to multiple purchasers," because they are advertised on the Internet and can be ordered in large quantities by anyone;
- They are "widely distributed through normal commercial channels," because they are shipped in large quantities to manufacturers of sporting goods;
- They are "conducive to shipment and delivery by generally accepted commercial means of transport," because they do not require special handling except for refrigeration in some cases;
- They "may be used for their normal intended purpose without substantial and specialized service provided by the manufacturer," because they can be incorporated in manufacturing processes in the form received.

In 1988, a California rocket scientist was arrested in Baltimore as he tried to illegally load 420 pounds of carbon fibers on a military transport plane bound for Cairo. The material was intended for the ballistic missile that Egypt was developing with Argentina and Iraq. The scientist was sentenced in June 1989 to 46 months in prison. It would be a big surprise to the world if the United States now decontrolled this material.

3. *Maraging steel*

Maraging steel is a high-strength steel used to make solid rocket motor cases, propellant tanks, and interstages for missiles. Like carbon fibers, it is used to make centrifuge rotors for enriching uranium for nuclear weapons. In 1986, a Pakistani-born Canadian businessman tried to smuggle 25 tons of this steel out of the United States to Pakistan's nuclear weapon program. He was sentenced to prison as a result. Maraging steel has been controlled for export since January 1981.

This steel is produced by companies in France, Japan, Russia, Sweden, the United Kingdom and the United States and it meets all the criteria for "mass market status." Several steel companies list maraging steel on the Internet and can produce maraging steel in multi-ton quantities. Over the telephone, two American companies and one British company explained to my staff how to order 25 ton quantities with

delivery in less than a month. Maraging steel is bundled and shipped much like stainless steel, which it closely resembles.

4. Corrosion resistant valves

These special valves are essential components in plants that enrich uranium to nuclear weapon grade. Both Iraq and Iran are hoping to build such plants, and will need these valves in great numbers. The valves resist the corrosive gas used in the enrichment process.

These same valves are also used in the chemical, petrochemical, oil and gas, fossil power, pulp and paper, and cryogenic industries. Their size can range from very large gate valves down to tiny globe valves used in instrument and control lines. They are manufactured by companies in Australia, Japan, Russia, the United Kingdom and the United States. Smaller corrosion resistant valves have been controlled for export since October 1994, and larger valves have been controlled since October 1981.

These valves fit all of the criteria for “mass market status.” They are advertised on the Internet and are widely available to American buyers. A quick survey by my organization revealed that dozens of companies sell them in the hundreds per year. They would therefore be decontrolled by the new legislation.

I bring this point up in order to let the Commission know that if S. 149 is enacted, China will be able to import more sensitive American technology than it has in the past.

The United States can also control sensitive exports to specific buyers—to the Chinese firms known to be linked to nuclear weapon and missile development. I pointed this fact out in my testimony to the Commission in October. As I said then, the United States publishes a list of such firms in the Federal Register. This is essentially a warning list. Before selling any such company a product that could contribute to the spread of weapons of mass destruction, an exporter is required to obtain an export license. This allows our government to turn down dangerous sales without impeding innocent ones, and enables American industry to keep its competitive edge without arming the world. There will always be the buyer who smuggles, or uses a front company, but without an export license that buyer will find it harder to get the parts and service needed to keep a high-tech enterprise going.

The United States has not published a comprehensive, worldwide list of such buyers. The U.S. warning list for China contains only nineteen names. I would like to reiterate today the fact that scores, if not hundreds of firms in China are active in nuclear, missile and military production. It is silly to pretend we don't know they exist. As a first step in building a list, I have attached to my testimony as Appendix B the same list of 50 firms that I attached in October. These firms are well-known parts of China's nuclear, missile and military complex. They have been selected on the basis of reliable, unclassified information. I recommend once again that the Commission submit these names to the Department of State, and ask for an opinion on whether the names should be included on the published U.S. export warning list. If the State Department judges that these firms should be included, then the Commission should ask the Commerce Department to add the names to the “entity” list in Part 744 of the Export Administration Regulations. American firms should not unwittingly make sales that undermine American security.

APPENDIX A

Computers (4A001–003)

Fiscal year 1998, 242 approved, \$110,248,696

Fiscal year 1999, 620 approved, \$317,897,237

Dimensional inspection equipment (2B006)

Fiscal year 1998, 4 approved, \$181,000

Fiscal year 1999, None

Fibrous and filamentary materials (1C010, 1C210)

Fiscal year 1998, 2 approved, \$163,845,500

Fiscal year 1999, 8 approved, \$1,966,600

High-speed cameras (6A003, 6A203)

Fiscal year 1998, 30 approved, \$1,101,956

fiscal year 1999, 18 approved, \$566,497

Isostatic presses (2B004, 2B104, 2B204)

Fiscal year 1998, 1 approved, \$51,000

Fiscal year 1999, 1 approved, \$223,000

Mass spectrometers (3A233)

Fiscal year 1998, 2 approved, \$518,000
 Fiscal year 1999, 1 approved, \$110,750

Neutron generators (3A231)

Fiscal year 1998, 1 approved, \$306,000
 Fiscal year 1999, 1 approved, \$500,000

Numerical control equipment (2B001, 2B290)

Fiscal year 1998, 4 approved, \$1,883,830
 Fiscal year 1999, 4 approved, \$1,700,341

Oscilloscopes (3A292)

Fiscal year 1998, None
 Fiscal year 1999, 1 approved, \$140,000

Pressure transducers (2B230)

Fiscal year 1998, 13 approved, \$620,982
 Fiscal year 1999, 18 approved, \$188,842

Equipment to manufacture and test semiconductors (3B001, 3B002)

Fiscal year 1998, 9 approved, \$456,012,990
 Fiscal year 1999, 1 approved, \$6,279,000

Vacuum induction furnaces (2B226)

Fiscal year 1998, 3 approved, \$609,000
 Fiscal year 1999, 1 approved, \$12,024,000

Vibration test systems (2B116)

Fiscal year 1998, 1 approved, \$227,020
 Fiscal year 1999, None

APPENDIX B

22nd Construction and Installation Corporation (Yichang)
 23rd Construction Corporation (Beijing)
 Aviation Industries of China I and II (AVIC) (Beijing)
 Beijing Institute of Aerodynamics (BIA) (Beijing)
 Beijing Institute of Electromechanical Engineering (Beijing)
 Beijing Institute of Electronic Systems Engineering (Beijing)
 Beijing Institute of Nuclear Engineering (BINE) (Beijing)
 Beijing Institute of Space System Engineering (Beijing)
 Beijing Institute of Technology (BIT) (Beijing)
 Beijing Research Institute of Uranium Geology (BRIUG) (Beijing)
 Beijing Wan Yuan Industry Corporation (BWYIC) (also known as the China Academy of Launch Vehicle Technology [CALT]) (Beijing)
 Chengdu Aircraft Industrial Corporation (CAIC) (Chengdu)
 China Aerospace International Holdings Ltd. (CASIL) (Hong Kong)
 China Aerospace Machinery and Electronics Corporation (CAMEC) (Beijing)
 China Aerospace Science and Technology Corporation (CASC) (Beijing)
 China Chang Feng Mechanics and Electronics Technology Academy (Beijing)
 China Great Wall Industries Corporation (CGWIC) (Beijing)
 China Haiying Electro-Mechanical Technology Academy (Beijing)
 China Hexi Chemistry and Machinery Company (Beijing)
 China Nanchang Aircraft Manufacturing Company (Nanchang)
 China National Aero-Technology Import-Export Corporation (CATIC) (Beijing)
 China National Aero-Technology International Supply Corporation (CATIC Supply) (Nanchang)
 China National Nuclear Corporation (CNNC) (Beijing)
 China North Chemical Industries Corporation (NOCINCO) (Beijing)
 China North Industries Corporation (NORINCO) (Beijing)
 China North Opto-electro Industries Corporation (OEC) (Beijing)
 China Nuclear Energy Industry Corporation (CNEIC) (Beijing)
 China Precision Machinery Import-Export Corporation (CPMIEC) (Beijing)
 China Sanjiang Space Group (Wuhan)
 Chinese Academy of Sciences (CAS) (Beijing)
 Commission on Science, Technology and Industry for National Defense (COSTIND)
 East China Research Institute of Electronic Engineering (ECRIEE) (Hefei)
 Harbin Engineering University (Harbin)

Harbin Institute of Technology (HIT) (Harbin)
 Hua Xing Construction Company (HXCC) (Yizheng)
 Hubei Red Star Chemical Institute (also known as Research Institute 42) (Xiangfan)
 Luoyang Electro-optical Technology Development Center (LEODC) (Luoyang)
 Nanjing University of Science and Technology (Nanjing)
 National University of Defense Technology (NUDT) (Changsha)
 Nuclear Power Institute of China (NPIC) (Chengdu)
 Research Institute 31 (Beijing)
 Shaanxi Institute of Power Machinery (also known as Research Institute 41) (Shaanxi)
 Shanghai Institute of Electromechanical Engineering (Shanghai)
 Shanghai Power Equipment Research Institute (SPERI) (Shanghai)
 Shanghai Xinfeng Chemical Engineering Research Institute (Shanghai)
 Shanghai Xinli Research Institute of Power Equipment (Shanghai)
 Shanxi Xingan Chemical Material Plant (Taiyuan)
 Shenyang Aircraft Corporation (SAC) (Shenyang)
 Shenyang Aircraft Research Institute (SARI) (Shenyang)
 Xidian University (also known as the Xian University of Electronic Science and Technology) (Xian)

Co-Chairman BRYEN. Dr. Godwin?

STATEMENT OF PAUL GODWIN, PROFESSOR OF INTERNATIONAL AFFAIRS, NATIONAL WAR COLLEGE (RETIRED)

Mr. GODWIN. Thank you.

I'd like to thank the Commission for asking me to testify. I'm not quite sure what I can do here, but I do appreciate the opportunity.

My colleague, Professor Bud Cole, was supposed to join me today, but he will be having breakfast with you in the morning. The reason I raise that is because Bud and I had divided up the responsibilities between us, and you will be doing things with Bud tomorrow morning. I can approach his topics this afternoon, but perhaps I should stay in my own area.

Later on—there is one list up there now—we will be using tables that Bud and I developed from the Military Critical Technologies List, Part 1: Weapons Systems Technologies (MCTL), released by the Office of the Under Secretary of Defense for Acquisitions and Technology in June 1996.

As I discuss the MCTL assessments, three cautions should be kept in mind.

First, the MCTL assessments are a single slice in time. To what extent Beijing has been able to accelerate its capabilities in selected, high priority areas since 1996 cannot be determined from the MCTL assessments. With Israeli and especially Russian assistance, China's capabilities in some advanced technology areas may be greater than the MCTL suggests.

Second, China's lack of transparency makes any assessment of China's technological and manufacturing capabilities somewhat tentative. This leads me to the third cautionary thought. The numerical assessments the MCTL assigns each country contain an important methodological problem. In assessing a country's technological capabilities, a score of "0" to "4" is assigned. "4" indicates that a country is assessed as having capabilities in all critical elements of a technology area. "3" indicates that a country has capabilities in a majority of the elements. "2" indicates a capability in some of the critical elements, and "1" indicates a capability in just a few of the critical elements. The methodological problem arises when a country is assessed with "0" capabilities in a particular

technology area. In the MCTL assessments, “0” has two potential meanings, and no attempt is made to distinguish between them. “0” can mean that a country has no known capability in a specific technology area or that the Technology Working Group (TWG) could not reach a consensus regarding that capability. Any “0” assessment must therefore be treated with caution. In any future MCTL, I would hope the TWG assessment distinguishes between no known capability and a lack of consensus with the group.

The Commission asked Bud and I to address three core questions: What technologies is China seeking to acquire for its weapons programs? What is the capability of China to integrate these technologies directly into weapons systems and into its industrial base? Does China have systematic programs to acquire those technologies that have a power projection capability or are being acquired to deny U.S. ability to conduct regional military operations, for example, carrier operations over Taiwan?

I will approach the first and third questions. I simply do not have the expertise to answer question four.

Before we get into those issues, though, I want to make a general observation about China’s industrial base. Dr. Hicks did it earlier, but I want to repeat something similar to what he said, simply because when the current military reforms began in 1979, China’s defense industrial base and R and D infrastructure was in utter, total disorganization and chaos. We can go into the reasons for that, but it was a disaster area.

Since that time, there have been consistent attempts to reform and rebuild the defense industrial base and the R and D infrastructure. Just recently, that is, in the late 1990s, the various reports of China’s State Science and Technology Commission for the Central Committee elaborated on many of the shortcomings, and I have made a short list of them here, not all of them, but just selected samples.

The State Science and Technology Commission lists among the many problems: poor organization, resource shortages, reliance on imports for main technologies for many industries, lack of an integrated, authoritative management system to control technology imports, divorce of research and development from manufacturing, excessive military secrecy, and poorly-educated workers.

The first point I will make on these reports is that they almost certainly contributed to the creation of a new general department for the People’s Liberation Army: the General Armament Department, created in 1998. The GAD absorbed many of the responsibilities previously held by the Commission of Science, Technology and Industry for National Defense, COSTIND, and for the PLA General Logistics Department. The GAD is now responsible among many other things for the entire process of arms production from R and D to testing and evaluation, production, deployment, and retirement or replacement. This also appears to include acquisition of imported technologies for military applications.

To what extent this recent reorganization has improved China’s capabilities in military research and weapons production, I just don’t know. But it is important to recognize that the GAD was created to resolve many of the problems that have plagued China since 1979.

If we look at this first chart, the 1984 capabilities in military technologies, the first thing this chart does is reflect all the deficiencies in the Chinese defense industries and R and D that they themselves have been talking about for 20 years. It also reflects why China acquires major modern weapons systems from Russia and is using Israel to develop its third-generation multi-role combat aircraft. The Chinese defense R and D and weapons production program is very, very weak.

This runs in contrast to something else. If you look at what China wants to do with its defense R and D and production, what it wants to have is as close as possible an autarkic military-industrial capability. Beijing knows this is not really possible, but China wants to become as free from foreign suppliers as possible.

To achieve this goal, China is following the same basic pattern it followed in the 1950s. It seeks to advance its manufacturing capabilities through licensed production of imported weapons and components. China hopes to “indigenize”—I don’t know if that’s a word or not—but to “indigenize” the imported technologies and spread them throughout China’s industries and R and D infrastructure.

The major change from the 1950s was I think reflected in Dr. Hicks’ comments earlier—that is, Beijing’s recognition of the close interdependence now between civil and military technologies; further, that the design and production of advanced weaponry and supporting systems is dependent on components and processes that are essentially dual-use. I think this is a major change from the 1950s.

To respond to your first question: what technologies are China seeking to acquire? In my view, China’s advanced technology acquisitions have been established through the intersection of three factors—changes in China’s national military strategy since 1985; Chinese assessments of the implications of Desert Storm, and Allied Force for the conduct of war; and, perhaps more importantly for the near term, the need to prepare for a potential military conflict with the United States over Taiwan. And finally, it is also likely that Beijing’s long-term defense industrial objectives include preparing for an extended military confrontation with the United States in the West Pacific. It just seems to me that looking at all the assessments coming out of the PLA, especially over the last decade, that the United States is seen as the greatest potential threat to China’s military security. Consequently, the PLA’s long-term goal is to offset through what is commonly known as “asymmetric methods” U.S. military capability to operate freely in the region. We can get into that in more detail if you wish.

What this has led to, this focus on the United States, and discrete, detailed analyses of Desert Storm, and Allied Force, is first, the PLA’s recognition that the traditional three-dimensional battlefield has been transformed into a battle space where cyberspace and space join the land, sea, and air realms of military operations.

They also recognize, especially from Desert Storm, that success in military operations is critically dependent on joint warfare that places very high requirements on command and control, communications, intelligence, surveillance and reconnaissance capabilities.

Consequently, China's self-defined military technology requirements go beyond armaments, which is what Dr. Cole will be discussing with you tomorrow morning at breakfast. PLA priorities include space-based and atmospheric battle space reconnaissance technologies; the capability to deny information dominance to an adversary; information warfare, and command and control technologies.

I stress this because if you want to talk about China's acquisition of high technologies—the weapons systems, combat aircraft, ships, and submarines—they can buy these. I think their focus is on things that they can't buy and things they really need—ISR, command and control, and so on. This, they may be getting from the Russians; I don't know.

Let's now look at the second chart, which is on space systems technologies. These are not very good scores—series of 1's and 2's. My own sense is that space has joined missile technologies as a new center of excellence for the Chinese military. They are putting a lot of effort into this. So space is important. How much they have achieved beyond the 1995–1996 evaluations of MCTL, I don't know, but this is one area of high technology receiving very high military priority.

Could I have the next chart, please? As with space technologies, China may well have stronger capabilities in directed energy systems technologies than the 1's and 2's that the MCTL assessments indicate. China does appear to be developing or trying to develop ground-based lasers to attack our satellites and limit our reconnaissance capabilities, which is an area of great concern to the PLA.

Could I have the next table, please?

This table on information warfare technologies shows 1's and zeros. These assessments bother me a lot. I think this is more a case—and you could find some from the TWG that handled this issue—of being unable to come to a consensus rather than zero capability. There is a whole cottage industry out there formed by extensive PLA writing on information warfare. I have no sense of what capabilities they have, however.

Co-Chairman BRYEN. This is an area where we really need a better assessment.

Mr. GODWIN. Yes. I think this needs to be done. And what technologies are involved—that is beyond my ken.

The last table I will discuss assesses command and control technologies. Given how important this is, at least in the theoretical readings I read in PLA military journals, given how important this is in China's understanding of how to conduct future warfare, I suspect that this is yet another area where the MCTL evaluations of 1's and 2's have probably increased dramatically over the past few years. This is a technology area we need to look at with some care.

These tables lead me to a partial response to the third question: does China have a systematic program to acquire these technologies that have power projection capability and are being acquired to deny the United States the ability to conduct regional military operations such as carrier operations to assist in the defense of Taiwan?

The only answer to that has to be “yes.” You can divide China’s defense modernization programs into two parts. The short-term objective is to prepare for potential conflict in the Taiwan Strait. The second objective is to prepare for a potential long-term confrontation with the United States in the West Pacific. Those of us who look at the PLA have given this military strategy a number of titles—access denial, area denial. The notion is that the Chinese, looking at U.S. long-range precision guided munitions capabilities seek to keep the United States as far back from China’s coast as possible. In my view, China’s theater weapons systems—we’re talking about ballistic missiles now—have the ability to target U.S. bases in the region. Not necessarily with nuclear weapons, but I suspect the PLA is developing the capability to strike U.S. bases, such as Kadena Air Force Base in Okinawa, with conventional warheads. The base is exposed and could be closed down very, very quickly. Shutting down Kadena Air Force Base would severely erode the USAF’s capability to support the Navy in any Taiwan Strait conflict.

So if you look at what the Chinese military are talking about as they think about the problem, you can clearly see the PLA’s technology priorities.

Co-Chairman BRYEN. Could you move to a conclusion?

Mr. GODWIN. I’m sorry; yes. I didn’t see the red light. I can stop there. That’s fine.

Co-Chairman BRYEN. Well, I think we have had two really good presentations.

[The information follows:]

ADVANCED MILITARY TECHNOLOGY AND THE PLA: PRIORITIES AND CAPABILITIES FOR THE 21ST CENTURY

PREPARED FOR THE 1998 AEI CONFERENCE ON THE PEOPLE’S LIBERATION ARMY, SEPTEMBER 11–13, 1998, WYE PLANTATION, ASPEN, MARYLAND

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INTRODUCTION

China’s military strategists and planners face an increasingly difficult dilemma as they prepare their defense modernization plans for the twenty-first century. Even as their armed forces are just beginning to acquire small amounts of the technologies, weapons and equipment designed for war in the latter part of the twentieth century, advances in military technology portend a potential revolution in the conduct of war in the twenty-first century. Extensive publications by Chinese military analysts amply demonstrate their understanding of the difficulties facing their armed forces as they grapple with the implications of advanced technologies for war in the next century.¹ Given the openness with which China’s military leaders and analysts discuss the problems faced by their armed forces, this paper will focus on four areas of inquiry.

First, it will review the implications of advanced technology warfare found in the assessments of Chinese military analysts in the years since the 1985 revision of China’s national military strategy, and particularly following the 1991 Persian Gulf War. Second, it will use the evaluations found in the Militarily Critical Technologies List Part 1: Weapon Systems Technologies (MCTL), released by the Office of the Under Secretary of Defense (Acquisitions and Technology) in June 1996, to assess China’s military industrial capabilities. Third, to determine the PLA’s technological

¹ See, for example, Lieutenant General Chen Bingde, Commander of the Nanjing Military Region, “Intensify Study of Military Theory To Ensure Quality Army Building,” *Zhongguo Junshi Kexue*, No. 3 (March 6, 1998), in FBIS-China, March 10, 1998.

modernization objectives and priorities, we will combine the results of this assessment with Beijing's acquisition of foreign military technologies and analyses of the kinds of military operations Chinese military journals suggest their armed forces seek to conduct over the next decade. Finally, the paper will analyze what kinds of feasible strategies and concepts of operations Chinese analysts are contemplating as they search for specific technologies to offset the advantages of potential adversaries.

We will not assess the implications of advanced technologies for China's nuclear force modernization. Alastair I. Johnston has thoroughly analyzed the implications drawn by Chinese analysts of technology advances in this realm for Beijing's strategic doctrine and strategy.² Rather, we shall focus on the implications for China's conventional, general purpose forces.

Deficiencies in the technologies of warfare are far from a new plight for the Chinese People's Liberation Army (PLA), as all the armed services and their branches are collectively designated. A major facet of the PLA's doctrinal heritage is Mao Zedong's principle, developed during the 1930s struggle against a technologically superior Japanese army, that military forces can successfully compensate for their inferiority in the tools of war with ingenious doctrine and concepts of operations. Nonetheless, Beijing's 1985 revision of China's national military strategy and the implications of the Persian Gulf conflict raised questions within the PLA as to whether doctrinal and operational ingenuity can compensate for technological deficiency in the twenty-first century.

CHINA'S CHANGING NATIONAL MILITARY STRATEGY

Revising China's national military strategy resulted in the most significant transformation of PLA missions since the founding of the People's Republic in 1949. Until 1985, continental defense against a massive ground assault was the PLA's primary military mission. PLA strategy and operations relied upon numerically superior forces conducting protracted, attrition warfare to sap the enemy's strength and superior technology, leaving him weak and exposed to a counter-offensive that would eject him from China's territory. In the late-1960s, nuclear deterrence joined this core strategy as China deployed its first strategic forces.³ The wars China fought in Korea and with India and Vietnam were "just outside the gate." As conflicts with bordering states they were within the scope of a continental defense strategy. In this strategy, pride of place was granted to the ground forces with naval and air forces in secondary supporting roles. The PLA Navy's (PLAN) primary mission was coastal defense, while the PLA Air Force (PLAAF) was devoted to air defense of the homeland.

In 1985, the PLA was given radically new strategic direction.⁴ China's potential military threat was no longer perceived to be a massive assault, possibly involving nuclear weaponry, designed to conquer China and overthrow its regime. Beijing's strategic assessment in 1985 saw the most likely future military threats as potentially intense, but politically and geographically limited wars fought on China's periphery, including its maritime territories and claims. It was the requirement to actively defend China's non-continental territory that brought to the fore a new mission for the PLA—force projection across maritime and aeronautical space.

*The PLA's Post-Gulf War Self-Assessment*⁵

China's armed forces were wrestling with these new requirements as the Persian Gulf war erupted. Desert Storm brought about a new awareness of the extent to which technology had changed the conduct of war. For China's military analysts, op-

²Alastair I. Johnston, "Prospects for Chinese Nuclear Force Modernization: Limited Deterrence versus Multilateral Arms Control," in David S. Shambaugh and Richard H. Yang (eds), *China's Military in Transition* (Oxford: Clarendon Press, 1997), pp. 284–312.

³For a classic statement of this strategy see, "Nieh Jung-chen's (Nie Rongzhen) 4 August Speech at the National Militia Conference," Peking (Beijing), NCNA (Xinhua) Domestic Service, August 7, 1978, in FBIS-PRC, August 9, 1979, pp. E1–10.

⁴For analyses of this revised national military strategy, see Nan Li, "The PLA's Evolving Warfighting Doctrine, Strategy, and Tactics, 1985–95: A Chinese View," and Paul H.B. Godwin, "From Continent to Periphery: PLA Doctrine Strategy and Capabilities Towards 2000," both in Shambaugh and Yang, *China's Military in Transition*, pp.179–223.

⁵In his August 6, 1993, Jiefangjun Bao essay, "Unswervingly March Along the Road of Building a Modern Army With Chinese Characteristics," General Liu Huaqing, China's then senior serving officer, specifically measured the PLA's capabilities with those of the United States armed forces demonstrated in Gulf War. General Liu's assessment was that the PLA weaknesses went far beyond those associated with arms and equipment, but were equally evident in operational doctrine, joint warfare, training, and in the comprehension of modern warfare. In FBIS-China, August 18, 1993.

eration Desert Storm manifested the advent of a probable Revolution in Military Affairs (RMA) based in large part on evolving information technology, such as micro-electronics, space-based systems and data processing. Following the Persian Gulf War, the manner in which the PLA characterized its most likely future conflicts was modified from “limited, local war” to “limited, local war under high-tech conditions.”⁶

Particularly impressive to China’s military analysts were the allies’ capabilities in offensive air operations; surveillance, including space systems and unmanned air vehicles; precision-guided munitions, including cruise missiles for long-range over-the-horizon (OTH) precision strikes; and battlefield command and control. The brief one hundred-hour ground war against Iraq was seen as demonstrating that numerical superiority is no longer the key to military victory, and that the offense now has a significant edge over defense in modern warfare.⁷

Although impressed by the display of military technology, the doctrine and operational art demonstrated by the coalition forces as they exploited these new technologies for success on the battlefield was deemed equally salient. For PLA analysts, the stunning victory of coalition forces was recognized as more than the result of advanced platforms, weapons, sensors, and improved training and doctrinal advances. The ability to conduct joint warfare was understood to be the critical factor making combat effectiveness more than simply the sum of individual service capabilities.

These analysts find China currently disadvantaged in most areas of the technologies critical to near-term and future warfare. Also evident is the PLA leadership’s understanding that China will not achieve the same broad-based technological level as the United States’ armed forces and military industrial base any time in the near future. However, published analyses by Chinese military researchers evidence a systematic effort to identify more precisely those technologies critical to the PLA’s ability to conduct war successfully in the future. A significant aspect of PLA research is the attempt to link selected advanced technologies with the analysis of potential strategies and/or military operations to counter a superior adversary. Those technologies that could offset distinct advantages held by the United States, and which also serve to support American allies, are specifically included in these inquiries.

Despite their understanding that advanced military technologies are changing the conduct of war, PLA authors continue to wrestle with a “mix” of technology and ideology. The icons of Mao’s military theory, dependency on “the people” and “people’s war” remain even though military strength is no longer measured in numbers. Despite the new emphasis placed on quality rather than quantity forces voiced by all of China’s military leaders, this continued obeisance to Mao Zedong suggests no small tinge of the Qing dynasty reformers as they espoused the principle of *zhongxue weiti, xixue weiyong*—Chinese learning for essence, Western learning for practical use. Despite widespread understanding within China’s military leadership that extensive reform is required to transform the PLA into a world-class combat force in the twenty-first century, military doctrines of the past still constrain reform and tend to place ideology before training and equipment in assessing combat capabilities.

Advanced Technologies and the Conduct of War

Advanced technologies of greatest interest and concern to the PLA are those contributing to significantly improved battlespace transparency, command and control of joint military operations, long-range precision guided munitions, and information warfare (IW).

These technologies allow the commander to obtain and communicate near real-time information on enemy forces and permit the engagement of adversary forces at greater distances with increased accuracy under all-weather and night conditions. IW technologies are used achieve information superiority over the battlespace by confusing and hindering the adversary’s information collection, processing, and utilization while simultaneously defending one’s own information-based systems and processes. IW capabilities are often referred to as the “soft” side of warfare in contrast to the “hard” capabilities of more conventional attack and defense systems.

⁶ One of the most useful essays analyzing Chinese doctrinal shifts published in a U.S. journal was prepared by a researcher at the PLA Academy of Military Science: Colonel Yao Yunzhu, “The evolution of Military Doctrine of the Chinese PLA from 1985 to 1995,” *The Korean Journal of Defense Analysis*, Vol. VII, No. 2 (Winter 1995), pp. 57–80.

⁷ See, for example, Senior Colonel Huang Xing, “Holding the Initiative in Our Own Hands in Conducting Operations, Giving Full Play to Our Advantages to Defeat Our Enemy—A study of the Core Idea of the Operational Doctrine of Our Army,” *Zhongguo Junshi Kexue*, No. 4 (November 20, 1996), in FBIS-China, November 20, 1996.

These military developments mirror increasingly computer-intensive civilian communications and financial systems, transportation control networks, and power grids. Disrupting these nominally civilian processes could well have seriously deleterious effects on a country's ability to sustain a war. Thus IW has added a new dimension to PLA analysts' appreciation of technology's role in future military conflict. Advances in military technology demand changes in concepts of operations to exploit fully the advantages of military technology on the battlefield. Desert Storm's demonstration of technology's increasing importance convinced Chinese analysts that the "battlefield" had expanded into space. It also showed that success in war was now crucially dependent on a coordinated plan of joint warfare that placed very high requirements on command, control, communications, computers, intelligence, and information (C4I²).

These implications of advanced technological warfare set especially serious demands on the PLA, a military force that lags a generation and more in the evolution of military technology. Chinese military analysts recognize that their armed forces must integrate new technologies into concepts of operations, battlefield tactics, maintenance processes and logistical support without the experience the PLA might have gained if it had gone through earlier evolutions of these technologies. Certainly there are potential benefits inherent in the requirement to make rapid, dramatic changes. The PLA's very backwardness may ease the leadership's task in shedding the baggage of entrenched organizational and operational principles. It may also mean that PLA operational commanders will resist change until the advantages of new technologies are clearly demonstrated. In either case, PLA lack of experience in the employment, maintenance and logistical support of advanced military technologies will exact a double penalty as it transitions toward a twenty-first century combat force. First, leveraging technology through military operational capability is especially difficult because technology is advancing faster than it can be acquired, tested, developed and applied in a military environment. Second, other nations' militaries will continue to advance, so PLA modernization efforts face moving technological goal posts.

Similar problems confront China's weapon design teams and defense industries when they contemplate production of advanced technology weapon platforms, sensor systems, and munitions. Design teams must integrate the various processes and technologies into coherent weapon platforms, such as ships, aircraft, tanks, etc. Systems and technology integration is a complex, demanding requirement and the heart of technologically advanced military effectiveness. Only slightly less critical is the precision required to manufacture advanced technology systems, a capability is not well established in China's industrial base.

China's defense industries parallel the PLA's experience by lagging a generation and more behind in the requirements for manufacturing advanced technology military systems and munitions. These deficiencies can be overcome, but it could be many years before China's defense industries develop the consistent quality and precision in manufacturing required to move advanced technology military items from the drawing board to the battlefield.

CHINA'S MILITARY INDUSTRIAL CAPABILITIES

Can the Chinese military industrial complex (CMIC) build what the PLA thinks it needs for next century's high technology warfare? The question is simple, but the answer is not. Mark Stokes has prepared what may be the definitive monograph on what China's military research centers are undertaking to fill the military's requirements,⁸ but the question remains. Two decades of reform have sought to rationalize the CMIC and its associated research centers and universities, but priority has been placed on reducing China's defense burden, not on building a modern, effective defense research, development and industrial base. Today, perhaps no more than 10 percent of the defense manufacturing plant is actually used for military production, with the remainder either idle or devoted to producing goods and services for the civilian market.⁹

Despite reforms initiated in the early 1980s, the CMIC remains the huge, lumbering, obsolescent behemoth built with Soviet assistance in the 1950s. Consisting of more than two thousand enterprises, each with multiple factories employing three million workers, and encompassing more than 200 hundred major research insti-

⁸Major Mark A. Stokes, USAF, China's Strategic Modernization: Implications for U.S. Security (unpublished manuscript completed for the USAF Institute for National Security Studies, October 1997).

⁹John Frankenstein and Bates Gill, "Current and Future Challenges Facing Chinese Defense Industries," in David Shambaugh and Richard Yang (eds), China's Military In Transition (Oxford: Clarendon Press, 1997), p. 132.

tutes with 300,000 engineers and technicians, the CMIC has even yet to approach the research and production capabilities that mark a major military power.¹⁰ Placing national defense fourth in the “Four Modernizations” investment priorities established in 1978 took its toll on the defense industries as well as the PLA. As late as 1994, Chinese sources state that 81 percent of military producers were losing money.¹¹

The Commission on Science, Technology and Industry for National Defense (COSTIND), as successor to the National Defense Science and Technology Commission, was established to provide the cornerstone linking the PLA and the CMIC. COSTIND’s failure is evident as military research, development and production remains weighed down by a lack of centralized coordination and fragmented, almost feudatory CMIC fiefdoms. This condition hinders the process of translating technological innovation into useable weapons and equipment.¹²

Defense conversion has not resolved this problem, and may even have exacerbated it as the CMIC entered the world of competitive civilian markets. Furthermore, by the early 1990s, defense conversion policies had created the situation where many plants no longer even wanted to undertake defense production. Peacetime military manufacturing in China involves small quantities with high production costs that leave the producer with little or no profit. Defense contracts often have to be subsidized with revenues from civilian production, which has led to PLA complaints that production plants seek to “guarantee profit, not military interests.”¹³ Defense research centers also suffered as central government funding was sharply reduced and institutes formerly restricted to defense-related research were required to commercialize their services. Frequently, civilian research and development projects had to subsidize military research.¹⁴

Despite the priority the PLA places on acquiring sophisticated military technologies, it should not be assumed that research and manufacturing employing advanced technologies for civilian products, including imported technologies, automatically leads to “spin-on” for military applications. Infrastructure deficiencies combined with the lack of experience in transforming dual-use technologies to military purposes slows down whatever spin-on exists from civilian or dual-use technologies. No doubt spin-on is taking place, but COSTIND’s own daily newspaper has complained as late as 1998 that converting defense industrial plants to civilian production in a very competitive market has not resulted in centralized, coordinated program to exploit civil and dual-use technologies.¹⁵

While there may well be advances in specific research areas and production capabilities, sometimes referred to as “pockets of excellence,” what remains to be determined is whether this progress is the result of a focused, planned response to twenty-first century military requirements or simply research centers acting independently, without direction or coordination. Here again assessment is difficult because failed projects are the norm in this kind of research activity and it takes many years, especially in the CMIC, to transform development projects into deployed systems.¹⁶ Reorganization of COSTIND mandated at the 9th National People’s Congress in March 1998, and the formation of a new General Armament Department

¹⁰ John Frankenstein, “China’s Defense Industry Conversion: A Strategic Overview,” in Jörn Brommelhorster and John Frankenstein (eds.), *Mixed Motives, Uncertain Outcomes: Defense Conversion in China* (Boulder, CO.: Lynne Rienner Publishers, 1997), pp. 14–15.

¹¹ Frankenstein and Gill, “Current and Future Challenges,” p. 132.

¹² Richard A. Bitzinger and Bates Gill, *Gearing Up For High-Tech Warfare? Chinese and Taiwanese Defense Modernization and the Implications For Military Confrontation Across the Taiwan Strait, 1995–2005* (Washington, D.C.: Center for Strategic and Budgetary Assessments, February 1996), p. 17; and Frankenstein and Gill, “Current and Future Challenges,” pp. 134–143.

¹³ Ka Po Ng, “Defense Conversion in the Chinese Press,” in Brommelhorster and Frankenstein, *Mixed Motives*, pp. 92–93.

¹⁴ *Ibid.*, p. 92, and Richard D. Latham, “A Business Perspective,” in Brommelhorster and Frankenstein, *Mixed Motives*, pp. 165–166.

¹⁵ These issues are raised by Jiang Wanjun, “Evaluation and Analysis of the International Competitiveness of China’s Science and Technology,” Keji Ribao, February 14, 1998, in FBIS-China, March 25, 1998. It should be noted that Keji Ribao is published jointly by the State Science and Technology Commission, the Chinese Academy of Sciences and the State Commission of Science, Technology and Industry for National Defense. See also, Bitzinger and Gill, *Gearing Up For High-Tech Warfare*, p. 20; and Frankenstein and Gill, “Current and Future Challenges,” pp. 154–155.

¹⁶ Frankenstein and Gill, “Current and Future Challenges,” p. 157.

(GAD) to constitute a fourth General Department of PLA, implicitly acknowledges COSTIND's failure.¹⁷

Given the evidently poor state of China's indigenous research, development and production capabilities¹⁸ other than ballistic missiles and nuclear weapons, the quickest way to embark on acquiring advanced military technologies is foreign procurement. Israel and Russia are currently Beijing's principal suppliers, with Moscow providing the most. Israel is contributing to the J-10 advanced fighter project, while Russia has provided a wide variety of weapon systems and military technology. The most visible signs of an expanding military technology linkage with Moscow are the sale of four Kilo-class diesel-electric submarines, a reported contract for two Sovremenny-class guided missile destroyers, and the recent agreement granting licensed production of Su-27 multiple-role fighters following the sale of some 50 completed aircraft.¹⁹

These technologies and production capabilities are, however, at best 1980s genre. Entering the realm of twenty-first century technologies is far more complex—and expensive. This is especially so in the realms of digitization, information technologies and the technologies required for military space operations. Yet it is in precisely these areas that many facets of twenty-first century warfare require the highest degrees of production precision and reliability. For example, any computer or artificial intelligence technologies in space-based reconnaissance systems providing real-time intelligence to battlefield commanders are not available for maintenance or repair once deployed. Furthermore, these technologies have to function in an extremely harsh environment after surviving the shock and vibration of the launch-phase of deployment. To what extent China is receiving foreign assistance in these obviously strategic technological capabilities is unknown, but even Moscow may be reluctant to provide assistance in such realms.

Assessing China's Military Technology Capabilities

The Department of Defense (DOD) process for assessing militarily critical technologies for the MCTL involved fifteen technology working groups (TWG)²⁰ which reviewed more than 6,000 technologies and identified 2,060 as militarily significant. Significance was determined by two sets of criteria: those that could (a) enhance threats by potential adversaries of the United States, and (b) provided a measurable advantage to U.S. military systems. Ultimately, 656 technologies met the "militarily critical" criteria. Within the limits set by data availability, all the world's significant defense industries were evaluated. Although the MCTL is not a classified document, because each TWG included representation from the intelligence community as well as those from industry and academe, its sources may be assumed to include "sanitized" classified data.

The TWGs assigned a numerical grade ranging from "0" to "4" reflecting their assessment of an industrial base's capability to produce a specific technology: "0" indicates that a state has no capability or that the TWG could not reach a consensus. "1" indicates a capability in only a limited set of the critical elements of a technology. "2" indicates a capability in some critical elements. "3" indicates a capability in a majority of the technology areas critical elements. "4" indicates that a country is believed to have the production capability in all elements of a technology area.

Only the United States is assessed as possessing all but two of the 84 production elements for the eighteen technology areas critical to the development and production of superior weapons.²¹

¹⁷The other three general departments are the General Staff, Political and Logistics Departments

¹⁸Eric Arnett, "Military Technology: The Case of China," in SIPRI Yearbook 1995 (Oxford: Oxford University Press, 1995), p. 395.

¹⁹For a judicious analysis of Russian transfers see Dennis J. Blasko, "Evaluating Chinese Military Procurement from Russia," Joint Forces Quarterly, Autumn-Winter 1997-98, pp. 91-96.

²⁰For Part 1, Weapon System Technologies, the TWGs evaluated the eighteen technology areas of Aeronautics Systems; Armaments and Energetic Materials; Chemical and Biological Systems; Directed and Kinetic Energy Systems; Electronics; Ground Systems, Guidance, Navigation, and Vehicle Control; Information Systems; Information Warfare; Manufacture and Fabrication; Materials; Marine Systems; Nuclear Systems; Power Systems; Sensors and Lasers; Signature Control; Space Systems; and Weapons Effects and Countermeasures. Each of these technology areas is further divided into specific technology groups, which total 84 subsets.

²¹In the relatively simple technology of "obscurants" the United States is evaluated at level "3." China is assessed at level "4." MCTL Sensors and Lasers FTA Summary, Figure 15.0-2 p. 15-2. The United States is evaluated at level "3" in the "optronics" group of Space Systems Technology. China is assessed at level "2." MCTL Space Systems FTA Summary, Figure 17.02, p. 17-2.

Of the countries included in the MCTL, we have selected five in addition to the United States with which to compare China. Selection was based on the principle that each of the countries selected must possess the range of technological capabilities China is seeking to obtain. Japan, France, Germany, and the United Kingdom (UK) fit this criterion. Russia was included because its military technologies and defense industries were subject to considerable investment during the Cold War and could provide the technologies China's defense establishment desires.

Compared with the other countries selected, China is relatively new to advanced military technologies, for it did not begin to develop a defense research and industrial base until the mid-1950s. This first step toward a modern defense establishment came to an end in 1959–1960 when the former USSR essentially terminated all of its assistance. With the exception of the nuclear weapon, ballistic missile, and nuclear-powered submarine programs which had special status, internal political dislocation associated with the Great Leap Forward and the Great Proletarian Cultural Revolution left China's defense research and industrial base essentially stagnant. By 1978, when Deng Xiaoping as China's "paramount leader" initiated his reform programs, the defense industrial base was capable of placing only Soviet technologies from the 1950s into series production. The DOD's assessment of June 1996 therefore evaluated a defense technology capability that with few exceptions has emerged since 1978—less than twenty years. Thus China's defense industrial base does not have the depth and experience in developing and producing advanced military technologies present in the other five countries used in this analysis.

We must note at the outset, however, that Beijing's deliberate lack of transparency in all matters relating to China's military capabilities means that any assessment of the CMIC must be viewed as tentative. Evaluations provided for the technological capabilities of more transparent states, such as Germany or Japan, will be more reliable than those provided for China. CMIC data are recognized as being somewhat "squishy." Thus, although we use MCTL assessments of individual technologies, we will be appraising the pattern of technological strengths and weaknesses as they relate to generic combat missions, weapons and platforms. Furthermore, an assessment published in 1996 most probably reflects data collected in 1994–95. Nonetheless, it is unlikely that the CMIC's capabilities have increased dramatically in any areas of technology included in the MCTL.

China's Production and Development Capabilities in Overview

China's overall comparative standing can be seen in Table 1. In most of the 84 technology areas critical to the development and production of advanced military weapons China is weak, having all production capabilities only for nuclear weapons and nuclear materials processing. Those areas where China has a majority of the production capabilities are in armaments and energetic materials, chemical and biological systems, materials technology, power systems technologies, and in theoretical models for signature control technology. In essentially all other areas of critical military technologies China is extremely deficient.

TABLE 1.—CAPABILITIES IN THE 84 CRITICAL MILITARY TECHNOLOGY AREAS

	China	U.S.	Russia	Japan	Germany	U.K.	France
Production Capability:							
4	3	82	14	28	20	36	29
3	11	2	30	29	40	34	39
2	37	0	34	19	17	12	14
1	26	0	4	7	6	2	2
0	6	0	2	1	1	0	0
Total	¹ 82	84	84	84	84	84

¹ China was not evaluated in two technology areas.

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

Table 2 provides another overview of China's capabilities to produce advanced military hardware. In none of the technologies essential for the manufacture of advanced military equipment does China rank higher some production capabilities.

TABLE 2.—MANUFACTURING & FABRICATION TECHNOLOGIES ¹

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
Advanced Fabrication & Processing	2	4	2	4	4	4	4

TABLE 2.—MANUFACTURING & FABRICATION TECHNOLOGIES¹—Continued

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
Bearings	2	4	2	3	4	3	4
Metrology ²	1	4	2	3	4	4	3
Non-destructive Inspection & Evaluation ³ ...	1	4	2	3	4	2	4
Production Equipment	2	4	2	4	4	3	4
Robotics	1	4	2	4	2	1	2

¹The level of this technology directly effects the cost, reliability, and level of military hardware that can be produced.

²State-of-the art hardware requires precision measurement for both development and manufacturing. The extensive list includes ships, aircraft, missiles, propellers, bearings, avionics, etc.

³Technologies essential for detecting problems in design and manufacture, and in delivered hardware. Additionally these technologies can provide the basis for determining reliability and maintenance requirements.

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

Looking at China's technological capabilities in greater detail, Table 3 lists those areas where China is evaluated with a production capability of "3" or "4." Table 4 indicates those technology areas where China is evaluated as possessing less than a majority of development and production capabilities ("1" or "2").

Table 3.

CHINA'S STRENGTHS¹

Armaments & Energetic

Materials Technology

Energetic Materials 3

Chemical and Biological

Systems Technology

Chemical/Biological Defense 3

Detection/Warning Identification 3

Materials Technology

Armor & Anti-armor Materials 3

Electrical Materials 3

Structural Material 3

Special Function Materials 3

Nuclear Systems Technology

Fission Reactor

Nuclear Materials Processing 4

Nuclear Weapons 4

Power Systems Technology

High Density Conventional Systems 3

Mobile Electric Platform Power 3

Sensors & Laser Technology

Obscurants 4

Signature Control Technology

Theoretical Models 3

Legend: Production Capabilities: 0 = No capability or no consensus. 1 = Limited. 2 = Some. 3 = Majority. 4 = All

1. Strength is defined as having the capability to produce a majority or more (levels 3-4) of specific military technologies.

Table 4.

CHINA'S WEAKNESSES¹

Aeronautics Systems Technology		Information Systems Technology	
Fixed Wing Aircraft	2	C ⁴ I Systems	1
Gas Turbine Engines ²	2	CAD/CAM	2
Human (crew) systems	1	High Performance Computing	1
Marine Systems Technology		Human Systems Interface	1
Propulsors & Propulsion System	0	Information Security	2
Signature Control & Survivability	1	Intelligent Systems	1
Subsurface & Deep Submergence Vehicles	1	Modeling & Simulation	0
Guidance, Navigation, & Vehicle Control Technology		Networks & Switching	2
Aircraft & Vehicle Control Systems	2	Signal Processing	2
Inertial Navigation Systems	2	Software	1
Radio & Data-Based Nav. Systems	2	Transmission Systems	1
Directed & Kinetic Energy Systems Technology		Information Warfare Technology	
Lasers, High Energy Chemical	2	Electronic Attack	1
Supporting Technologies	1	Electronic Protection	0
Weapons Effects & Countermeasures Technology		Optical Counter-Measures	0
Induced Shockwave from		Optical Counter-Counter-Measures	0
Penetrating Weapons	1	Electronics Technology	
Sensors and Laser Technology		Electronic Components	1
Acoustic Sensors	0	Electronic Materials	2
Marine Active Sonar	2	Fabrication Equipment	2
Marine Passive Sonar	2	General Purpose Equipment	2
Marine Platform Acoustic Sensors	2	Micro-Electronics	2
Electro-Optical Sensors	2	Opto-Electronics	1
Gravity Meters. 1		Manufacturing & Fabrication Technology	
Lasers	2	Advanced Fabrication & Processing	2
Magnetometers	2	Bearings	2
Radar	1	Metrology	1
Signature Control Technology		Non-Destructive Inspection & Evaluation	1
Materials	2	Production Equipment	2
Design Concepts	2	Robotics	1
Applications to integrated Systems	1	Materials Technology	
Manufacturing	1	Magnetic Materials	2
Logistics	1	Optical Materials	2
Testing	2	Electric Power Systems	
Computer Codes	1	Pulse & High Power Systems	1
Space Systems Technology			
Computer & Electronics	1		
Optronics	2		
Power & Thermal Management	1		
Space Systems Propulsion	2		
Space System Sensors	2		

1. *Weakness* is defined as having the capability to produce only "none" or "some" (levels 0-2) of the specific military technologies.
 2. Also applies to marine gas turbine engines for naval applications.

Legend: Production Capabilities: 0 = No capability or no consensus. 1 = Limited. 2 = Some. 3 = Majority. 4 = All

PLA PRIORITIES

Our analysis, however, is not concerned primarily with the CMIC's overall development and production capabilities, but with assessing China's advanced technology capabilities in areas of expressed interest to the PLA: those that contribute significantly to improved battle-space awareness, long-range precision strike munitions, command and control of joint military operations, and information warfare. These capabilities can be assigned to three broad operational areas generic to all combat operations—detection, location, and effective engagement, especially in a target rich environment.

Detection technologies may soon be able to provide near real-time information on the total battle area from space through air to surface, to below the ocean's surface. Knowing precisely where the adversary's forces and command and control facilities are located allows a commander to prioritize and select targets. Locating forces and facilities of the greatest significance to the battle allows him to employ joint forces in space and air, and on land and sea to engage the adversary at the most advantageous time and place and with the most appropriate weapons.

Detection and location capabilities can place the adversary in a disadvantaged position, especially when they create a relatively transparent battlefield, which permits a commander to know engagement results in near, real-time. Each of these mission areas and their associated technologies will be expanded upon as our anal-

ysis proceeds. The three sets of technologies associated with these operational mission areas as defined in the MCTL are:

Detection: Space Systems Technology; Sensors & Laser Technology; and Guidance, Navigation & Vehicle Control Technology.

Location: Sensors & Laser Technology; Guidance, Navigation & Vehicle Control Technology; and Information Technology (C⁴I², etc.).

Engagement (joint warfare): Information Technology (C⁴I², etc.); Directed and Kinetic Energy Systems Technology; Information Warfare Technology; Aeronautics Systems Technology; Marine Systems Technology; and Signature Control Technology.

In several areas, specific technologies fit more than one mission. Additionally, the technologies listed apply equally offensive and defensive operations.

China's production capabilities in space systems are assessed in Table 5. Space surveillance provides the military commander with critical information and capabilities. Beyond target detection and location, of particular value are weather information, the ability to provide precise navigation data, and robust command and control for operational forces. The critical components of space reconnaissance are optronics, for these technologies determine the parameters for detection, identification and resolution of targets. Where conditions do not permit sufficient clarity or detail, electro-optic sensors join with laser illumination to provide the essential data.²²

TABLE 5.—SPACE SYSTEMS TECHNOLOGIES

Production Capabilities	China	U.S.	Russia	Japan	Germany	U.K.	France
Computer & Electronics ¹	1	4	3	1	1	3	3
Optronics ²	2	3	3	3	2	2	3
Power & Thermal Management ³	1	4	2	2	3	2	2
Propulsion ⁴	2	4	3	2	1	1	3
Sensors ⁵	2	4	2	3	1	2	3

¹Emphasis on component reliability in high stress environments: high vibration, radiation, thermal cycling, etc.

²Emphasis on technologies enhancing target detection, identification, resolution, etc.

³Emphasis on efficiency, light weight, long duration and reliability.

⁴Emphasis on emerging chemical, low-thrust electrical and nuclear thermal technologies.

⁵Emphasis on electro-optic sensors providing real-time intelligence.

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

Although China's interest in military surveillance systems is unquestioned, its ability to design and produce the space sensors central to wide area reconnaissance is clearly limited. Beijing yet defines its military reconnaissance satellites as "experimental." China's first generation of recoverable photo-intelligence satellites (FSW-1) of the mid-1960s had an operational life of seven to ten days. A later model, the FSW-2, could remain in orbit for up to sixteen to eighteen days. Two FSW-type were launched into low earth orbit in 1994. In March 1996, however, an FSW-type satellite did not return to its Sichuan basin recovery area, but made an uncontrolled entry into the South Atlantic.²³

There may be more progress with the Ziyuan-1 (ZY-1). This commercial satellite joint venture with Brazil is scheduled to be launched in 1998 with an estimated orbit life of two years. Given China's practice of combining civil and military functions, it should be assumed that this satellite system will have military missions. The ZY-1 with three remote sensors has a real-time transmission capability and a ground resolution power of 19.5 meters. This far less than a U.S. KH-12, which has a resolution power of 1.5 to 3 meters.²⁴ Thus, despite its 30-year experience with satellites, China's ability to successfully deploy space systems with the ability to detect and locate targets in a wide battle area and provide real-time intelligence to commanders is evidently some years away.

As Table 6 indicates, nor are China's sensors for air, ground, and maritime platforms particularly advanced. PLAN anti-submarine warfare capabilities (ASW), now referred to as Under Sea Warfare (USW) by the U.S. Navy, are limited by evident weakness in acoustic and other sensors. Similarly, China has only a limited capability in the electro-optical sensors used for terminal guidance in "smart" and more

²²MCTL, pp. 17-5 and 17-11.

²³Jane's Special Report, China's Aerospace Industry—The Industry and Its Products Assessed (Coulson, Surrey, U.K.: Jane's Information Group, Inc., March 1997), pp.135-136.

²⁴Chou Kuan-wu, "China's Reconnaissance Satellites," Kuang Chiao Ching (Hong Kong), No. 36 (16 March 1998), in FBIS-China, 8 April 1998. [Kuang Chiao Ching (Wide Angle) is reputed to have close ties with China's defense establishment.

advanced “brilliant” munitions. In sum, the CMIC is demonstrably weak in essentially all areas of technology associated with precision locating and targeting.

TABLE 6.—SENSORS AND LASER TECHNOLOGIES

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
Acoustic Sensors	0	4	2	1	1	2	2
Marine Active Sonar	2	4	3	3	3	4	4
Marine Passive Sonar	2	4	2	3	3	4	4
Marine Platform Acoustic Sensors	2	4	3	3	2	4	4
Electro-Optical Sensors	2	4	4	3	3	3	3
Gravity Meters	1	4	2	1	2	2	2
Lasers	2	4	4	3	3	3	3
Magnetometers	1	2	3	2	3	2	3
Obscurants	4	3	4	4	4	4	4
Radar	2	4	3	3	3	3	3

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

Similar deficiencies in providing precise location of China’s own and enemy military platforms are equally evident, as indicated by Table 7. In twenty-first century warfare, continuous accurate position data is required to maintain real-time reconnaissance of enemy forces, and to permit effective coordination of highly mobile military forces in joint, non-linear warfare. China is deficient in these technology areas. Furthermore, both conventional and nuclear munitions rely upon precise guidance technologies for the accuracy required to fit the weapon’s footprint to the target. Yet, here again China is lacking.

TABLE 7.—GUIDANCE, NAVIGATION & VEHICLE CONTROL TECHNOLOGIES¹

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
Inertial Navigation Systems	2	4	3	3	3	4	4
Aircraft & Vehicle Control Systems	2	4	3	2	3	4	4
Radio & Data-Based Referenced Navigation Systems	2	4	3	2	3	4	4

¹ Accurate positioning, attitude, pointing and control of land, sea, air and space forces is essential coordinating highly mobile forces engaged in joint operations.

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

Deficiencies in navigation and guidance are exacerbated by poor command and control technologies, without which effective engagement of joint forces becomes extremely problematic. Table 8 indicates that China’s mastery of command and control technologies is inadequate.

TABLE 8.—COMMAND & CONTROL TECHNOLOGIES

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
C4I ² ¹	1	4	2	3	3	4	4
Information Security ²	2	4	2	2	4	4	3
High Performance Computing	1	4	2	4	3	3	3
Intelligent Systems ³	1	4	2	4	2	3	1
Networks & Switching ⁴	2	4	2	4	4	4	4
Signal Processing ⁵	1	4	2	3	3	3	4
Transmission Systems ⁶	1	4	2	4	4	4	4
Software	1	4	2	3	3	4	4

¹ Command, Control, Communications, Computing, Intelligence and Information (C4I²) Systems.

² Cryptographic and cryptoanalytic technologies essential for keeping data secure and breaking ciphertext in intelligence dissemination, global surveillance, computer and communications networks.

³ Technologies (hardware & software) allowing systems to adjust their functionality without human operator intervention or preprogrammed logic.

⁴ Technologies essential for maintaining communications at all times with all elements. They include radiation hardened telecommunications, optical switching, and equipment capable of operating in extreme heat or cold.

⁵ Technologies associated with ensuring the accuracy and reliability of data transmission in environments with high levels of interference, including intentional countermeasures.

⁶ These technologies minimize third party interception and neutralize electronic warfare capabilities used to disrupt accurate reception of transmitted information.

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

Reliable and secure C⁴I² systems are essential in military operations. Today and in the next century, the seamless integration of communications, intelligence and information complements battle-space awareness, providing the commander with real-time decision-making capabilities. This is particularly significant because near real-time assessment of the results of an engagement is now becoming critical to dominating the battle-space and in gaining tactical and operational advantage over an adversary. China's continuing deficiencies in this critical area are reflected in the failure of its most recent second generation military communications satellite, the DFH-3. Built as a joint venture with Germany's Daimler-Benz company using some U.S. components, the satellite failed to become operational following its May 1997 launch. This was the second DFH-3 malfunction, the first occurring in 1994 when the satellite failed to achieve proper orbit. Because of these failures, COSTIND leased two receivers on the commercial Apstar-1A for military use. The Apstar communications satellite was built by Hughes Electronics and sold to a commercial communications company, APT of Hong Kong.²⁵

PLA use of commercial satellites for both reconnaissance and communications demonstrates the overall pattern of weaknesses in China's military space capabilities. Thus, when command and control deficiencies are combined with detection and location frailties, China's hopes for achieving early in the twenty-first century the capabilities demonstrated by the United States in the early 1990s are slim to none.

Countering High Technology Adversaries

With these collective disadvantages, it is important to assess the ability of Chinese forces to disrupt the advantages held by technologically superior forces. Such an approach to future conflict not only fits the PLA's deeply held doctrinal and operational tradition, but can also be ascertained from Chinese assessments of their future strategy.

Of particular interest to China are the capabilities of high energy lasers (HEL).²⁶ HEL systems can deliver energy at the speed of light and show promise of being able to provide rapid retargeting of platforms ranging from satellites to ballistic missiles to aircraft.²⁷ To achieve this promise, design is now focused on supporting technologies that will permit HEL systems to acquire and track targets, conduct "kill" assessments, and then to move quickly and accurately to new targets. To achieve these capabilities, the supporting technologies must allow the system to track one or more targets, sustain the beam on target long enough to harm it, evaluate the damage produced, and then, if the level of damage is sufficient, reorient the beam to another target.²⁸ These are very complicated technologies to design, manufacture and integrate into weapon systems. As Table 9 indicates, China's assessed production capabilities in both chemical lasers and the supporting technologies essential for effective engagement are low, although clearly some progress is being made.

TABLE 9.—DIRECTED ENERGY SYSTEMS TECHNOLOGIES

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
Lasers, High Energy Chemical	2	4	3	2	2	2	2
Supporting Technologies for Directed Energy Weapons	1	4	3	1	1	2	2

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

Chinese analysts also show a high interest in information warfare (IW),²⁹ sometimes referred to as "soft" warfare. IW is a combination of old and new missions linked to emerging information technologies, and have both offensive and defensive capabilities. Offensive missions seek to harm adversary information, information-based processes and systems, and computer-based networks. The modes of attack used to execute such missions are electronic warfare (EW), command and control warfare (C²W), physical destruction, and deception. Although "hackers" have dem-

²⁵ Jeff Gerth, "Reports Show Chinese Military Used American-Made Satellites," *The New York Times*, June 13, 1998, pp. A1 & A8.

²⁶ Stokes, *China's Strategic Modernization*, Appendix Four (no page numbers).

²⁷ MCTL, p. 4-1.

²⁸ *Ibid.*, p. 4-5.

²⁹ Over the past five years and more there has been a flood of essays in Chinese military, industrial and other professional journals analyzing the implications of information warfare. Most of these essays reflect the analyses found in U.S. military and academic publications. A more recent example is Dai Kouhu, "Accepting the Challenge: China's Defense Information Modernization," *Zhongguo Dianzi Bao* (China Electronics News), October 24, 1997 in FBIS-China, January 12, 1998.

onstrated the capability to break into unprotected computer-based information systems, disrupting protected, hardened military systems is many times more difficult. Table 10 indicates China's IW technological capabilities are limited.

TABLE 10.—INFORMATION WARFARE TECHNOLOGIES

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
Electronic Attack	1	4	3	2	3	3	3
Electronic Protection	0	4	3	2	2	2	3
Optical Counter-measures	0	4	4	2	3	4	3
Optical Counter-Counter Measures	0	4	3	2	3	3	2

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

What is not evident from the available data are China's capabilities to attack unprotected systems, such as power grids, civilian telephone systems, transportation networks, financial networks and other increasingly information and computer-dependent sectors of civil society. Table 11 provides a broader assessment of China's information capabilities and exposes an even wider set of limitations.

TABLE 11.—INFORMATION SYSTEMS TECHNOLOGIES

Technology Areas	China	U.S.	Russia	Japan	Germany	U.K.	France
C4I ²	1	4	2	3	3	4	4
CAD/CAM ¹	2	4	2	4	4	4	4
High Performance Computing	1	4	2	4	3	3	3
Human Systems Interface	1	4	1	4	3	3	3
Information Security	2	4	2	2	4	4	3
Intelligent Systems	1	4	2	4	2	3	1
Modeling & Simulation	0	4	0	4	3	4	3
Networks & Switching	2	4	2	4	4	4	4
Signal processing	1	4	2	3	3	3	3
Software	1	4	2	3	3	4	4
Transmission Systems	1	4	2	4	4	4	4

¹ Computer assisted design and manufacturing.

Legend: Production Capabilities: 0 = No Capability or no consensus; 1 = Limited; 2 = Some; 3 = Majority; 4 = All.

There is a wide swath of technologies involved in information systems (IS) simply because these technologies are applied over an extensive range of military applications. The applications include IS systems as part of "smart" and "brilliant" weapons, aircraft, ships, tanks, armored fighting vehicles, communications systems and networks, including hand-held devices. Equally important are the human systems interface with these technologies, as well as the ability to model and simulate the engineering and manufacturing processes. Human interface with the technologies is central to increasing reaction time in increasingly complex platforms, such as combat aircraft and attack helicopters, and in the ability of the operator and/or user to handle high levels of information and make decisions in high stress combat situations. Here again, China's deficiencies are extensive and the speed with which its scientists and engineers can reach the level of advanced industrial and post-industrial states is questionable.

OPERATIONAL IMPLICATIONS

MCTL data are particularly important for their contribution to evaluating the military operational applications of the technologies assessed. Given that China's national military strategy has shifted from continental defense to peripheral defense, and that maritime territories and claims are now of particular concern, we shall focus on technologies associated with naval and air power, and with cruise and tactical ballistic missile capabilities. Because China's military analysts view future conflicts as potentially involving short duration high intensity combat, the PLA's operational focus has shifted from defensive to offensive operations and the need to gain the initiative early in any engagement. Naval and air power are of particular importance in such operations. Thus, even within a military strategy designed to be defensive, force projection is a major concern of China's military planners.

Maritime Forces

As Table 12 indicates, the MCTL assigns China low ratings in most of the technologies associated with naval warfare. To recognize the implications of these ratings, the analyst must consider and crosscheck more than one of the technology areas in order to translate MCTL evaluations into useful measures of operational capability in any area of naval technology. No weapon platform as complex as a modern surface or subsurface naval combatant is dependent upon a single set of technologies. Rather, to be effective a warship is a “system of systems” and must integrate a number of different technologies into a single fighting system.

Table 12. *NAVAL SYSTEMS TECHNOLOGIES*

<i>Nuclear Systems</i>		<i>Guidance and Navigation</i>	
Fission Reactor	3	Inertial	2
Materials Processing	4		
<i>Marine Systems</i>		<i>Sensors</i>	
Propulsion Systems	0	Radio & Data-Based	2
Survivability	1	Active Sonar	2
Subsurface Vehicles	1	Acoustic (Terrestrial)	0
		Passive Sonar	2
<i>Signature Control</i>		<i>Marine Platform</i>	
Modeling	3	Acoustic Sensors	2
Materials-Design	2	Magnetic Materials	2
Integration	1		
Manufacturing	1	<i>Manufacturing-Fabrication</i>	
Logistics	1	Advanced	2
Testing	1	Bearings	2
Computer Codes	1	Production Equip.	2
		Metrology	1
		Inspection & Eval.	1
		Robotics	1

Legend: Production Capabilities: 0 = No capability or no consensus. 1 = Limited. 2 = Some. 3 = Majority. 4 = All.

Submarine Technology

Evaluating the military utility of China’s submarines demands attention to a number of related technology areas. For example, despite China’s strength in nuclear systems, weakness in related technology areas impedes successful completion of a modern, quiet nuclear submarine force. This assessment, together with the crudity of China’s six nuclear-powered submarines (only four of which may be operational), indicates that China is not able to make operational use of its strong rankings in nuclear systems technology. Similar deficiencies impede development of a modern conventionally powered (diesel-electric) submarine force.

To be effective in the 1990s, let alone the twenty-first century, submarines must integrate a large number of advanced technologies both to conceal its own presence and detect its opponent. Signature control technology is crucial to designing a submarine with a low enough “signature” to avoid detection by opposing forces using submarine, ship, aircraft, space, and ocean-bottom systems keyed to sense and report audio, visual, magnetic, pressure, and infrared disturbances to the environment that would indicate the presence of a submarine. In sum, the less the submarine disturbs the ambient environment—the lower its signature—the more difficult it is to detect and the more effective it will be operationally. In these crucial areas, China receives a “3” in theoretical models technique, but only a “2” in materials and design concepts, and just “1s” in the other five sub-areas evaluated—not a strong showing. Furthermore, while minimizing its own signature, a submarine must also be able to detect opponents. Here China has a “0” rating in the crucial acoustic sensors area, and “2s” in the active and passive sonar areas. Guidance, navigation, and vehicle control technologies directly affect a nation’s ability to design and produce operationally effective submarines. This area includes the technologies on which are based inertial, radio, and database referenced navigation equipment, applying both to the submarine’s ability to navigate accurately and to fire cruise and ballistic mis-

siles, with precision. Here, China receives “2s” in inertial, radio, and data based referenced navigation systems. In other words, the CMIC is unable to provide the most advanced navigational-locating systems, which limits submarine navigational accuracy and hence operational effectiveness. This shortfall can be partially alleviated by access to American global positioning system (GPS) satellites and the Russian Global Navigation Satellite System (GLONASS), but the GPS system would certainly be downgraded by the United States in the event of a military conflict.

Modern submarine construction involves the MCTL area classified as manufacturing and fabrication technology. Here China is evaluated with capability of “2” in advanced fabrication and processing, bearings, and production equipment; and “1s” in both metrology and non-destructive inspection and evaluation. Without importing these technologies, China will be unable to construct an indigenous submarine force approaching those of the advanced industrial states.

China’s purchase of Kilo-class diesel-electric submarines from Russia stems from these deficiencies. Kilos are advanced craft, more capable than the Chinese-built Ming and Song classes. The Kilo first went to sea in 1980 and remains one of the world’s better conventionally-powered submarines. It is somewhat dated, since it does not have an Air Independent Propulsion system, but the Kilo still presents China with technological sophistication not available in the CMIC.

To increase its stealthiness for both offensive and defensive purposes, the Kilo’s hull is coated with anechoic tiles that reduce its susceptibility to sonar detection and diminish the noise created by its internal machinery. Submarines from China’s yards, especially the nuclear-powered Han and Xia classes, are relatively noisy and easy to detect. The Kilo also incorporates competent technologies for offensive operations, including acoustic sensors, electro-optical sensors, radar, lasers and wire-guided torpedoes. Clearly, by purchasing at least four and possibly twenty Kilo submarines in future years, Beijing is making a significant increase in submarine technologies available to the CMIC. Will China be able to utilize them in a CMIC-designed submarine as stepping stones to leap over the development, design, and implementation time represented by the eighteen years of technological advances that went into the Kilo since it first sailed? Or will the CMIC, after ten years of laborious effort, produce a submarine in 2008 that would have been state-of-the-art in 1988?

Surface Combatant Technology

China’s newest surface warship is the Luh-class guided missile destroyer (DDG), two of which have been placed in commission. Like most destroyers, the Luh is designed as a multi-mission ship, capable of conducting naval warfare over, on, and beneath the sea. The world’s most advanced destroyers are also designed to project power ashore. How well can the Luh carry out these missions, all of which draw directly on the technologies surveyed in the MCTL?

In building the Luh, China incorporated weapons, sensor, and propulsion systems from several foreign countries, including the United States, the USSR/Russia, France, the United Kingdom, Italy, and Spain. The most critical of these foreign components may be the propulsion system, a combined diesel-gas turbine (CODOG) arrangement built around U.S.-furnished LM-2500 gas turbine engines. Five of these engines, which the United States uses in several classes of warships and in the C-5 aircraft, were sold to China before 1989. Four are installed in the two Luhus.³⁰

Of the MCTL technology area pertinent to marine propulsion, China is evaluated as having “no” capability in marine propulsion systems and “some” capability in gas turbine engines. The CMIC apparently has been unable to manufacture a viable maritime gas turbine engine, although this technology was developed in Germany in the late 1930s and went to sea in 1962 in a Soviet combatant. This CMIC shortcoming has presumably contributed to the hiatus in commissioning additional Luh-class ships.³¹

Foreign designs also predominate in the Luh’s sensor-weapons suite. The guns and associated fire control directors are Soviet design, the torpedoes are Italian, the missiles and associated fire control systems are French, as are the ship’s two helicopters. Except for the guns and the surface-to-surface missiles, all were beyond CMIC’s capability.

China’s reliance on foreign systems in the Luh’s electronic warfare and radar systems is reflected in the MCTL’s evaluations of “1” and “2” for the six sub-areas

³⁰The fifth LM-2500 is likely on a test stand for reverse-engineering purposes, used for shore-based training or a source of spare parts, or has been accidentally destroyed.

³¹Jane’s *The World’s Warships 1997*, v. 1 (London: Jane’s Publishing Group, 1998), p. 520, reports that China is attempting to procure marine gas turbine engines from Ukraine.

in electronics technology.³² These technology areas include sonar, in which the Luhu's medium frequency system reflects the MCTL's evaluation of China's capability in marine active, marine passive, and marine platform acoustic sensors as "2." China shows no better capability in technology areas related to radar development, earning a "2" in electro-optical sensors, lasers, and radar.

The Luhu also shows no apparent stealth characteristics, a judgment supported by the MCTL's signature control technology area. Here, China is evaluated as possessing "some" (2) or limited (1) capability in seven of the eight sub-areas, with a "3" earned for theoretical modeling.

China's front-line warship, the Luhu-class DDG is multi-mission capable but with systems based on older technology, and without the ability to project power ashore. As with the Kilo-class submarine, China is attempting to compensate for CMIC shortfalls by purchasing foreign ships. An agreement may have been reached with Russia for the purchase of at least two Sovremenny-class guided missile destroyers.³³ Much larger than the Luhu, displacing 7,300 tons to the Luhu's 4,200 tons, the Sovremenny has a much better sea-keeping ability and a larger engagement envelope.

The Sovremenny is a 1980s-era DDG designed to fight as a unit in a coordinated task force against a U.S. Navy aircraft carrier battle groups. These ships were designed specifically for anti-surface ship role; their anti-air and anti-submarine warfare capabilities are limited. In Soviet naval doctrine, these DDGs would be operating in company with ships more capable of defending against air attacks and hostile submarines.³⁴ But China does not have the modern combatants to operate the Sovremenny as a unit in a multi-capability task force. Instead, they would likely be employed as raiders, or as part of a task group made up of the PLAN's best ships, Luda and Luhu destroyers and Jiangwei guided missile frigates. None of these ships, however, are any more capable than the Sovremenny at combating modern air and submarine threats. Hence, the PLAN would have to operate the Sovremennys very conservatively until they modify them or acquire other maritime means to operate more capably in a multi-threat environment.

These ships do, however, represent a significant step in many capabilities for the PLAN. Most newsworthy is the Sovremenny's anti-ship missile, the SS-N-22, or Sunburn in NATO parlance. This is an extremely capable missile, with a flight profile that includes flying altitudes of less than 100 feet over the ocean's surface, speeds in excess of Mach 2, a range for the most advanced model of over 65 miles, and possibly intricate terminal flight maneuvers designed to foil defensive systems.³⁵

³²The material technology area is also pertinent to capability in weapon guidance systems, surveillance, sensors, and electronic warfare systems. In the six sub areas evaluated, the MCTL (p.11-2) assesses China with four "3s" and two "2s".

³³Jane's identifies these as two ships laid down in 1989 and 1990 and scheduled for commissioning in 1997 and 1998. Availability of Sovremennys may take several different paths, however. The Chinese may be ordering completely new ships, which would be the most expensive path, but would give the PLAN the most control over the vessels' characteristics and quality. They may be purchasing ships built for the Soviet/Russian navy that have already served as fleet units; this would be the quickest and least expensive path for the PLAN to acquire Sovremennys, but would also give very little flexibility in customizing the ships and they would also be obtaining ships that are "used," having been subjected to unknown stresses that may have incurred significant but difficult to detect material defects. Finally, China could, as reported by Jane's, buy ships that have been under construction for the Soviet/Russian navy. This would be cheaper than building ships from the keel up and would allow flexibility in customizing the vessels, but would likely result in the PLAN receiving ships that have been laying idle on the building ways for several years, a factor which normally results in many defects.

³⁴The Sovremenny's role in this task force was to attack American capital ships using surface-to-surface missiles. The carrier was, of course, the most desirable target, but Aegis cruisers were also valuable, for their operational destruction would create a void in the battle group's air defenses, potentially exposing the carriers to "stream raids" by Soviet aircraft.

³⁵Jane's Naval Weapons Systems: 1997 (London: Jane's Publishing Group, 1998), "Surface to Surface Missiles," p. 15, also mentions a version with "an extended range" beyond 65 nm. Jane's 1995-96 Major Warships gives this range as 88 nm, but this figure is not reported in later editions. Nor is Jane's 1995-96 claim that the SS-N-22 is capable of carrying a nuclear warhead reported in later volumes. See, CRS Report for Congress, China: Ballistic and Cruise Missiles (Congressional Research Service, The Library of Congress, 97-391 F, March 21, 1997), p. CRS-11.

*Air Forces*³⁶

China's multiple weaknesses in the projection of air power are widely recognized. Despite their long-standing efforts to acquire them, a central weakness remains the People's Liberation Army Air Force (PLAAF) and People's Liberation Army Naval Air Force (PLANAF) lack of operational aerial refueling capabilities and airborne warning and control system (AWACS) aircraft. These two deficiencies alone limit both the range of China's airpower to the unrefueled distance from land bases and their effectiveness in a variety of critical combat missions. We shall not go over this well trodden ground in our essay. Rather, we will focus on the production capabilities China's combat aircraft industries. Table 13 provides the MCTL's overall assessment of these technologies. Although there is a strong crossover between military and commercial air systems technologies, the MCTL focuses on military-specific technologies representing "the key means to rapidly project fire power against an adversary in the air and on land and sea."³⁷

Table 13.

AIR POWER TECHNOLOGIES

<i>Aeronautics Systems:</i>		<i>Manufacturing-Fabrication:</i>	
Aircraft Fixed Wing	2	Advanced Fabrication	2
Gas Turbines	2	Bearings	2
Conventional		Production Equip.	2
Ammunition	1	Metrology	1
		Inspection-Eval.	1
		Robotics	1
<i>Electronics:</i>		Materials (Airframes)	3
Materials	2	Sensors	2
G.P. Equipment	2		
Micro-Electronics	2	<i>Signature Control:</i>	
Components	1	Modeling	3
Opto-Electronics	1	Materials	2
Guidance, Navigation	2	Design	2
		Testing	2
		Integration	1
		Manufacturing	1
		Logistics	1
		Computer Codes	1

Legend: Production Capabilities: 0 = No capability or no consensus. 1 = Limited. 2 = Some. 3 = Majority. 4 = All.

Using the MCTL as an indicator of China's relative status in these broad technology areas requires a narrowing of scope. Of the technologies that pertain to modern air power, China is evaluated as possessing "a majority" of the applicable technology in just two sub-areas (airframes and modeling for signature control), "some" of the technology in thirteen sub-areas, and is credited with "limited" capability in ten other areas.

The CMIC's inability to design and build modern combat airframes and power plants is compounded by China's deficiencies in essentially all other technology areas central to modern air forces. In electronics, guidance, navigation, and vehicle control, sensors and signature control technology China is evaluated as possessing no more than "some" of the required technologies.

Finally, in the technology area of armaments and energetic materials, which refers to a nation's ability "to develop and produce in quantity safe, affordable, storable, and effective conventional munitions and weapons systems," China is assessed

³⁶For a thorough analysis of China's air power history and development through the early 1990s, see Kenneth W. Allen, Glenn Krummel, and Jonathan D. Pollack, *China's Air Force Enters The 21st Century* (Santa Monica, CA.: RAND, 1995).

³⁷MCTL, p. 1-1.

as having only a “limited” capability.³⁸ For the purposes of air power, these include ammunition, bombs, fusing, and missiles.

Although Beijing’s Soviet-derived combat aircraft from the 1950s and early 1960s, such as the MiG-19/J-6 and MiG-21/J-7, have all benefited over the past 20 years from the adaptation of Western military technologies, China’s indigenous programs are best typified by the J-8 interceptor’s long and difficult development history. This aircraft began development in 1964, was first flight-tested in 1969, and entered service in the early 1980s. Even after a 20 year gestation period, the PLAAF found the J-8 unsatisfactory, and as late as 1989 yet dubbed it an “operational test aircraft.” PLAAF and PLANAF dissatisfaction with the J-8 spanned a range of requirements from a new fire control system to a more powerful engine. China’s aircraft industry was unable to satisfy these demands and turned to Western suppliers for assistance, including the United States. Ultimately, “improved” J-8-2s began service with the naval air arm in 1992. This is a total of almost 30 years development for what remains below par combat aircraft—not yet the equivalent of a 1960s-era U.S. F-4 Phantom. This aircraft began development in 1964, was first flight-tested in 1969, and entered service in the early 1980s. Even after a 20 year gestation period, the PLAAF found the J-8 unsatisfactory, and as late as 1989 yet dubbed it an “operational test aircraft.” PLAAF and PLANAF dissatisfaction with the J-8 spanned a range of requirements from a new fire control system to a more powerful engine. China’s aircraft industry was unable to satisfy these demands and turned to Western suppliers for assistance, including the United States. Ultimately, “improved” J-8-2s began service with the naval air arm in 1992. This is a total of almost 30 years development for what remains below par combat aircraft—not yet the equivalent of a 1960s-era U.S. F-4 Phantom.³⁹

Unable to design and build modern combat aircraft and their power plants, and facing technology restrictions from Western Europe and the United States, Beijing turned to Israel and Russia for assistance. Israel is providing design and technology support for the J-10 multiple-role fighter program. Russia became the source of military aircraft and power plants, complementing its role as the principal supplier of advanced naval combatants. Russia’s assistance includes provision for a manufacturing facility in China capable of producing 10–15 Su-27s a year, with a final inventory goal of 275.⁴⁰

The SU-27SK model purchased and to be produced by China is a very capable dual-mission aircraft, designed for both air superiority and ground attack. There is no evidence that the Chinese have improved their ability to absorb and replicate modern aircraft, however. Additionally, all of these aircraft reportedly are still returned to Russia for all but the most routine maintenance.⁴¹ Although basically a late 1970s aircraft, the SU-27 embodies technology and manufacturing techniques beyond the capabilities of the CMIC.

When its air power capabilities and characteristics are matched against MCTL technology areas, Russia earns a “4” in fixed-wing aircraft, China a “2.” Russia also has higher ratings in gas turbine engine technology, electronic systems “hardening” against electro-magnetic pulses (EMP), human (crew) interface, and navigation and control systems. By the time China is capable of producing Su-27s without Russian assistance, it is likely Harlan Jencks’ late 1970s assessment that the China’s J-6/MiG-19 was “the most highly perfected obsolescent combat aircraft in the world” will yet again apply.⁴²

Cruise & Tactical Ballistic Missiles

The CMIC is credited with achieving a “pocket of excellence” in missile technology.⁴³ It is generally assumed that a key objective of China’s defense establishment is to achieve a long-range reconnaissance/strike capability. The significance of

³⁸ MCTL, p. 2–1.

³⁹ For details, see Allen, et. al., *China’s Air Force*.

⁴⁰ Jane’s *All the World’s Aircraft, 1997–1998* (London: Jane’s Information Group, 1998), p. 438; Joseph C. Anselmo, “China’s Military Seeks Great Leap Forward,” *Aviation Week & Space Technology* (12 May 97), p. 69. Jane’s *Defense Weekly*, 10 June 1998, provides the 10–15 annual production figure, which seems a more likely number than the 50 reported by Jane’s *All the World’s Aircraft, 1997–1998*. When its air power capabilities and characteristics are matched against MCTL technology areas, Russia earns a “4” in fixed-wing aircraft, China a “2.” Russia also has higher ratings in gas turbine technology, electronic systems “hardening” against electro-magnetic pulses (EMP), human (crew) interface, and navigation and control systems.

⁴¹ Kenneth W. Allen, “PLA Force Logistics: What has changed?” (Unpublished manuscript).

⁴² Harlan Jencks quoted in Allen, et. al., *China’s Air Force*, p. 148.

⁴³ The term “pockets of excellence” characterizing China’s selective approach to defense modernization was used by Chong-pin Lin, “The Power Projection Capabilities of the People’s Liberation Army,” in C. Dennison Lane, Mark Weisenbloom, and Dimon Liu (eds), *Chinese Military Modernization* (London: Kegan Paul International, 1996), p. 110.

long-range precision strike was amply demonstrated to the Chinese defense establishment during the Gulf War, especially the U.S. Navy's TLAM Tomahawk successes. It is probable this demonstration contributed to Beijing's decision to employ cruise and ballistic missiles in the Taiwan Strait military exercises of 1995 and 1996. These weapons are difficult to defend against, and their targets, beyond ships and aircraft, include those critical to coordinating and sustaining high-intensive combat: command and control nodes, air defense systems, and air, naval, and logistic bases. With sufficient accuracy, tactical missiles can replace manned aircraft for precision strike on all of these targets. Table 14 provides the MCTL's evaluations of China's capabilities in fourteen applicable technologies that apply equally to cruise and tactical ballistic missiles.

Table 14. *TACTICAL MISSILE TECHNOLOGIES*

Warheads	2	Control Systems	2
Fusing	1		
		Microelectronics	2
Fabrication Materials	2	Electronic Components	1
		Electronic Materials	2
Radar	2	Electro-optical	
Inertial Navigation Systems	2	Sensors	2
Radio & Data-based Referenced		Opto-electronics	1
Navigation Systems	2		
Gravity Meters	1		

Legend: Production Capabilities: 0 = No capability or no consensus. 1 = Limited. 2 = Some. 3 = Majority. 4 = All.

Cruise Missiles

Cruise missiles have a long history going back to Germany's use of the V-1 in the closing year of WW II. As originally fielded by the United States and the Soviet Union in the early 1950s, cruise missiles were little more than pilotless aircraft. Since those early years, this weapon has gained in accuracy and range and now provides a relatively small, relatively inexpensive, fast "fire and forget" weapon that can be difficult to detect and shoot down. Cruise missiles do, however, have drawbacks that include limited warhead size, dependence on reliable target positioning data in OTH operational situations, the need for mid-course guidance, and the requirement for precision manufacturing and careful maintenance.

China makes extensive use of cruise missiles, and as with essentially all other areas of military technology, the CMIC's cruise missile developments originate in Soviet technology transfers. China's programs⁴⁴ are grouped into two families: the Hai Ying (HY—Sea Eagle) and Ying Ji (YJ—Eagle Strike) series. Both families are given the letter "C" as a prefix before the number in export versions, as in C-201. China's first success was with the HY-1 series weapons derived from the Soviet Styx. Attempts to improve on this missile began in 1974. Typically, gestation was long and the new version was not "type qualified" until December 1983. "Poor system integration and quality control" have been blamed for at least part of the extensive development time.⁴⁵ These and additional improved versions are potentially effective weapons, with the HY-2A (C-201) carrying an 1,129 lb warhead sub-sonic (Mach .9) over medium range (59 miles) using an infra-red homing sensor. This missile is deployed on the Luda DDG and Jianghu guided missile frigate (FFG). The air-launched version of the HY-2A (C-601) has a range of 68 miles and is deployed on PLAN H-6D bombers. An extended range version of the HY-2, can reach out 84 miles cruising at Mach .8 using active radar guidance and carrying an 1,100 lb warhead. This system can be both air and ground-launched.

The PLA's only known supersonic cruise missiles are the C-101 and HY-3/C-301 anti-ship missile. The C-101 has a range of 31 miles, while the ground-launched HY-3 carries a 1,126 lb. warhead 81 miles using active radar guidance.

⁴⁴Unless otherwise noted, the data for these missiles are drawn from Shirley Kan and Robert Shuey, CRS Report for Congress, China: Ballistic and Cruise Missiles (Congressional Research Service, The Library of Congress, 97-391 F, March 21, 1997).

⁴⁵Jane's Naval and Weapon Systems (1997), "China: Surface-to-Surface Missiles," Issue 21.

China's follow-on generation of cruise missiles, the YJ series, is based on the French Exocet. The YJ-1/C-801 entered service in 1985, and is smaller and lighter than China's earlier systems. Although limited in range (25 miles), it introduced a new capability by being deployed on the Han-class SSN, but a Han must come to the surface to fire the missile. The YJ-2/C-802 uses active radar guidance and cruises at Mach .9 with a range of 75 miles carrying a 363 lb warhead. The most recently deployed in this series is the air, land and sea-launched YJ-8A with a range of about 80 miles at an altitude of 20 meters.

These are capable weapons, but do not match the sophistication of the Soviet-produced SS-N-22 to be supplied with the Sovremenny. It incorporates several technology areas evaluated by the MCTL that are more advanced than CMIC capabilities. In energetic materials, crucial to warhead construction, Russia is credited with possessing a "majority" of the requisite technologies, while China is viewed as possessing only "some." In the areas of guidance, navigation and vehicle control, the missile incorporates Russia's evaluations of "3" and "4" against China's assessed "2s" in these technology areas. The MCTL data offer strong indicators that in acquiring the Sovremenny's SS-N-22 missiles, China is obtaining a weapon significantly more advanced than the CMIC is able to design, build, and place into serial production.

The extent to which China can both upgrade these capabilities and link them to the space and other remote sensors that will provide the reconnaissance/strike package the PLA desires is one of Beijing's most significant development dilemmas. That China is seeking to achieve this capability cannot be questioned. Indeed, the PLA has reportedly sought acceleration of the YJ-8A ground-launched land attack missile's development program. This weapon is believed to be the first in which China is seeking to incorporate GPS/GLONASS and a domestically developed Digital Scene Matching Area Correlation (DSMAC) guidance.⁴⁶

Tactical Ballistic Missiles

As with cruise missiles, Germany's V-2 flown in 1944 was the first ballistic missile used in warfare. China's ballistic missile development originates in Soviet technology transfers in the years 1954-59. PLA tactical missile capability was highlighted by the use of these systems in its military exercises off Taiwan in 1995 and 1996. The tactical ballistic missiles deployed by the 2nd Artillery Corps are M-series family of surface-to-surface solid-fueled systems. The "M" designation is provided to export models, with "DF" (Dong Feng—East Wind) designating systems deployed by the PLA. The DF-15/M-9 with a range of 370+ miles carrying a 1,100 lb. warhead and is believed to have an accuracy in the realm of 300 meters circular error probable (CEP).⁴⁷ Accuracy for the 180-mile range DF-11/M-11 carrying the same warhead is likely similar.

Tactical ballistic missiles with conventional warheads have limitations similar to cruise missiles: limited warhead size, dependence on reliable target positioning data and terminal guidance; and the requirement for precision manufacturing and maintenance. Once again, China's limited capabilities in all of these technologies combined with remote sensor weaknesses make progress toward a long-range reconnaissance/strike force a difficult task. The most likely source for improving China's capabilities in these technology areas is Russia, but the extent to which Moscow is willing to provide Beijing the extensive support the CMIC requires is an open question.

The militarily critical factors for the employment of both cruise and tactical ballistic missiles are target location and missile guidance. Real-time location is essential for moving targets and must be determined by either space or other remote sensing systems. Of the two space-based systems available to China, a commercial receiver using GPS can determine its position within 100 meters. U.S. military receivers receive encrypted signals that can determine their position within 21 meters. This system can be augmented by Differential GPS (DGPS), providing an accuracy of less than one meter. It is possible for China to use GPS/GLONASS commercial positioning data to adjust a cruise missile's flight to the target.

Both cruise and ballistic missiles can use terminal guidance to identify a specific point in a target area. Terminal guidance can use a variety of technologies, including radar, imaging infrared, electro-optical, laser, and DSMAC when the precise location of a fixed target is known and, for DSMAC, when satellite imaging assets are available to provide the necessary scenes.⁴⁸

To what extent the CMIC has mastered these technologies is questionable, given that MCTL assessments grant China only "limited" or "some" capabilities in these

⁴⁶ See Stokes, China's Strategic Modernization, Part III, Cruise Missiles (no page numbers).

⁴⁷ China's Aerospace Industry: The Industry and Its Products Assessed (Jane's Information Group: Coulsdon, March 1997), p. 133.

⁴⁸ Kan and Shuey, China: Ballistic and Cruise Missiles, pp. CRS-14-CRS-15.

technology areas (see Table 14.). Nonetheless, GPS/GLONASS assisted guidance is almost certainly within China's capabilities and is one of the technology areas the CMIC is attempting to apply to its missile development programs.

“WALKING ON TWO LEGS”: FUTURE STRATEGY AND OPERATIONAL CONCEPTS

China's strategists recognize that achieving their current military security objectives in the next century will require continuing technological innovation, reorganization of PLA's force structure, and continual assessment and development of doctrine and concepts of operations. Unless Beijing is willing to dramatically increase its defense expenditures, the CMIC's extensive deficiencies cannot be quickly overcome, but only partially alleviated. Assuming no dramatic improvements in overall PLA capabilities over the next decade, how is China planning to employ an early twenty-first century PLA?

Beijing's shift in strategic scenarios from continental defense to limited high-tech wars on China's periphery is unlikely to change. Therefore the PLAN and the PLAAF will continue their current focus on establishing and maintaining control of Beijing's maritime territories and claims, including the air space above them, and the ability to project power into these areas. Their primary objective will be to overcome what China's analysts refer to as the PLA's “short arms and slow legs.”

Organizationally, the PLA will continue following two complementary paths: manpower and equipment cuts, and force structure modifications essential to conduct joint operations. Reducing manpower and equipment stocks will cut the cost of sustaining what is now a bloated personnel base and obsolete arms. The force structure that emerges over the next decade will be “leaner and meaner.” It will also reflect a more appropriate balance among the services because China's strategic planners recognize the value of joint operations. PLAN and PLAAF manpower may not increase, but their status within the PLA will be enhanced and their share of the budget increase as their training and armaments bridge the transition from defensive operations supporting continental defense to missions critical in the force projection capabilities required by China's revised military strategy.

Operationally, to use a phrase from Mao's years, China's strategists appear to be “walking on two legs” by following paths set by two distinctly different potential scenarios. Beijing's most politically sensitive territorial claims—Taiwan and the South China Sea—require China to field a PLA able to achieve its military objectives in the face of possible U.S. opposition. The other scenario embodies conflicts where the United States would not necessarily be directly involved, such as potential confrontations with Vietnam or India. These possible conflict scenarios create two diverse but complementary approaches to military operations.

For conflicts not likely to involve the United States, Beijing will not hesitate to employ a strategy of force-on-force. For such scenarios, the PLA places great emphasis on developing classic force-on-force capabilities emphasizing speed, mobility and lethality in joint offensive operations. Here, many of the technologies associated with the RMA come into play, especially battle-space transparency, command and control, long-range precision strike, and information warfare. Without direct U.S. involvement in a military confrontation, China's probable technological advances over the next decade or so combined with a revised force structure and improved training, will make the PLA a close match or superior to any potential single Asian adversary not under the American defense umbrella. Japan is in secure position of being both superior to China in advanced military technologies and allied with the United States.

The PLA and Asymmetric Warfare

In conflicts potentially involving the United States, PLA analysts draw upon one of their strongest doctrinal traditions when delving into the dilemmas of defeating an adversary superior in arms and technology. They warn against the PLA developing technophobia as it faces the challenges of twenty-first century warfare. In particular, they concentrate on the potential frailties of advanced technology weapons and equipment, and the extent to which China's armed forces are capable of offsetting the technological advantages of potential adversaries. The U.S. term of art for this approach to the conduct of war is “asymmetric strategy.”

Intriguing as analyzing and predicting the consequences of asymmetric strategy may be, all competent armed forces seek to develop capabilities, strategy and military operations to offset an adversary's strengths. Thus, asymmetric warfare is not a magic formula known to only a few or unique to China's military culture. Asymmetry in the conduct of war spans the history of military conflict and has been applied by armed forces across the technology spectrum. Surely the most dramatic asymmetric operation of recent wars was the United States' use of atomic bombs to destroy Hiroshima and Nagasaki, ending WW II. The United States exploited its

unique possession of atomic weapons. The reverse of technology-dependent asymmetry is Mao Zedong's strategy of "people's war" and the strategy conducted by the Democratic Republic of Vietnam against French colonial forces and later against the armed forces of the Republic of Vietnam and the United States.

Asymmetry in warfare therefore falls into a pattern where technologically inferior forces base their asymmetric strategy on the exploitation low-technology principles, and forces from technologically advanced states base their asymmetry on technological advantage. Those equal in technology seek to enhance or develop specific technologies that an adversary has not cultivated, and introduce more effective methods of applying these technologies through new concepts of operations and organization. American and Japanese development of offensive aircraft carrier operations, and Germany's refinement of tank technology and the development of blitzkrieg operations in the interwar period are but two examples.

Similarly, military-technical transformation in the conduct of war is a central component of warfare's history.⁴⁹ The possibility that a new technological transformation will create another revolution in military affairs has attracted the attention of most major military powers because of the implications for the future conduct of war. The United States as the world's richest, most powerful and technologically advanced state has moved the furthest forward in developing and evaluating these technologies for their military utility. The USSR initiated inquiry into the potential for a military-technical revolution in the 1980s and was PLA analysts' first guidepost. Since the Soviet demise and the Persian Gulf War, China's military researchers have looked to the United States for concepts of how to apply these emerging technologies to strategy and operations.

Precisely what capabilities do PLA analysts seek to neutralize, and what technologies and methods do they seek to employ? Beijing's security analysts have been declaring for more than a decade that any war in which China is likely to be engaged will not be total but a conflict limited in geographical scope and political objective. Beijing's advanced technology focus appears to be on those that will hinder an adversary's ability, even if only for a limited period of time, to project and sustain military power in areas of high political and security value to China. The implications of this focus are that in facing a technologically superior adversary in a limited war, the PLA will seek to:

- i. Hinder an adversary's capability to dominate the battle-space with superior detection, location and command and control technologies.
- ii. Deny any navy freedom of movement in waters where they can threaten China—a sea denial strategy that includes the airspace above the oceans.

If the PLA could accomplish these goals, they would serve as a deterrent should a potential adversary not hold political objectives important enough to warrant the risk of military conflict with China.

The potential adversary of most concern to PLA analysts is the United States, either alone or in coalition with its allies. The most likely military confrontation with the United States would occur over Taiwan or the South China Sea. In both cases, the PLA would confront the joint operational capabilities of United States naval and air power. Given the seemingly overwhelming technological advantage held by American armed forces, an advantage the United States is intent on sustaining, what options are available to the Chinese armed forces over the next decade?

It is extremely unlikely that Beijing would once again contemplate a bolt out of the blue assault on unprepared American forces. First, U.S. reconnaissance capabilities now make a repeat of China's unannounced entrance in the Korean War extremely difficult to prepare and undertake. Second, the consequences for China of such an act of war could be devastating. Thus, our assessment will assume the usual high level of alertness sustained by Chinese and American forces operating in a high threat environment, even if not directly engaged in hostilities.

Choosing submarine warfare as a primary instrument would immediately face USN undersea warfare (USW) conducted by ships, aircraft and submarines. Even with the Kilo's advantages, China's submarine warfare capabilities now and over the next decade will be unable to match or defeat those of the United States. Should the PLAN assemble a threatening task group of surface and submarine combatants, it simply could not survive in the face of U.S. detection, location and engagement capabilities.

⁴⁹ See, for example, William H. McNeill, "The Structure of Military-Technical Transformation," delivered at the Sixteenth Military History Symposium of the United States Air Force Academy (Colorado: United States Air Force Academy, The Harmon Memorial Lectures in Military History, No. 37, 1994).

Similarly, references to saturating an American carrier battle group (CVBG) with a massive missile assault⁵⁰ do not appear to recognize that threatening PLAN surface and submarine combatants could not survive to launch their cruise missiles. U.S. space-based, airborne and ship-borne detection and location sensors would identify their targets long before any PLAN combatants came within engagement range of their missiles. If a ship did survive, it would fire only once, because the missiles' launch and flight signatures would provide immediate targeting data to U.S. naval and air forces.

Should the PLAN or PLAAF seek to engage within the range of land-based aircraft, these aircraft would be detected, targeted and destroyed by the USN's aircraft and long-range air defense missiles before they could approach the effective range of their stand-off cruise missiles. Similarly, land-based tactical ballistic missiles would have great difficulty detecting and locating a CVBG with sufficient accuracy, for the battle group would be operating at speed with evasive maneuvers.

What assets does China plan to develop and deploy to offset U.S. detection, location and command and control capabilities that provide so much of the American advantage? Destroying or simply eroding U.S. space-based reconnaissance and communications systems is one potential option. MCTL assessments indicate, however, that China does not have the supporting technologies that would allow either directed or kinetic energy systems to locate, track and engage the proper target and assess the damage done. Anti-satellite space systems (ASAT) face similar problems, which is why China terminated its ASAT program in the 1980s. Once again, and despite access to GPS/GLONASS systems, the combined technologies involved in successful detection, location, engagement and damage assessment required to successfully attack U.S. space-based assets are not present in the CMIC, and will not be for many years without significant foreign assistance.

Information warfare (IW) is the darling of evidently an entire school of Chinese military analysts. Is IW the "killer" asymmetry—the magic weapon of a future people's war? Here again, the MCTL working groups found only extremely limited Chinese capabilities in both IW and information systems (IS) technologies. Furthermore, IW damage assessment is an extremely difficult undertaking. A decade from now American capabilities to defend against IW attack and use its own capabilities in such areas a command and control warfare will almost certainly continue to exceed those of the PLA. Engaging USN/USAF forces under the assumption that IW has significantly eroded their detection, location and engagement capabilities would be an extremely risky endeavor, especially for the PLA, which would be required to attack and defend against forces far more capable in all aspects of warfare.

CONCLUSIONS

Focusing on joint operations and power projection has raised the PLA's priorities in the realms of intelligence, surveillance, and reconnaissance central to battlespace awareness and command and control. The emphasis on power projection and mobile, fast reacting offensive capabilities—even within a defensive national military strategy—demands greater speed, range, and precision in military operations than the PLA has used in the past. These critical factors are in turn based on advanced technology. The problem faced by the PLA is not only developing or importing modern technology, but also applying that technology to military platforms.

Recognition of this problem has not led to a clear decision on how to resolve the issue. Instead, the CMIC is pursuing multiple avenues to modernize PLA hardware: building, importing, and reverse-engineering platforms and systems. China's current and potential strength across the board of militarily critical technologies is beyond doubt, but it is a mile wide and an inch deep. When and to what degree the CMIC's potential will be fulfilled is difficult to determine, but it will not be in the coming decade. Within the scope of the technologies we have briefly reviewed, MCTL data indicate that China possesses and is in the process of acquiring or developing a broad sweep of those necessary to generate effective operational military power in submarines, surface combatants, missiles, and aircraft. But in none of these technologies does the CMIC appear able to design and manufacture the systems necessary for China to achieve effective modern status in any of the conventional military environments. Those areas where the CMIC will improve are, and will remain, heavily dependent on foreign production technologies. Even more striking is China's apparently still basic level of capability in the crucial twenty-first century military "theaters" of space and information warfare.

⁵⁰ Sun Zian, "Strategies to Minimize High-Tech Edge of Enemy," *Xiandai Bingqi*, No. 8 (August 8, 1995), in *FBIS-China*, February 22, 1996, pp. 29–30.

Information systems provide the linkage between contemporary and twenty-first warfare. IS technologies provide the critical components for detection, location and engagement whether they are used for “soft” or “hard” attack. As China’s analysts investigate the implications of these technologies for the conduct of war, IW theorists primarily repeat what they have learned from U.S. sources.⁵¹ China’s own capabilities are always viewed as future developments. In each category of IS technology, Chinese analysts focus on the need to build and design future systems.⁵² In this the IW articles reflect the same future-oriented pattern as those focused on high technology conventional arms and equipment. There is also a similar sense of urgency in much of the writing, with a 1997 essay declaring:

The strong momentum of the world’s military development undoubtedly represents a grim challenge for our units’ quality building and military preparations against war.⁵³

This sense of urgency is compounded by the connotation in all of these essays that not enough is being done; that the PLA lacks common agreement on its priorities as it prepares for the new era in warfighting. General Fu Quanyu, the PLA Chief of Staff, raised this specific complaint as late as April 1998 in the communist party’s principal journal *Qiushi*.⁵⁴ General Fu Quanyu’s frustration can be seen in his plea that the CMIC concentrate its human, technological and financial resources on “coming up with several killer weapons’ that can effectively stifle the enemy.”⁵⁵ Typically, no sense of strategic direction for the development of such weapons was provided.

PLA technology priorities clearly include the capabilities to deny any adversary information dominance, improve battlespace transparency and command and control, and develop long-range precision strike capabilities. These are not easy goals to achieve. It is critical not to underestimate the CMIC’s future capabilities, but it is equally important not to exaggerate its strengths and raise the image of an emerging military superpower.

Currently, the PLA faces national military objectives driving it toward developing capabilities across the spectrum of modern warfare addressed in this essay. These areas include space, aeronautics, shipbuilding, ordnance technology, materials engineering, precision manufacturing, and information warfare technologies. Recognizing Beijing’s lack of transparency, the MCTL is chiefly valuable because it offers carefully qualified data based on multiple, repetitive observation and evaluation, providing indicators of where China’s military stands in relation to world-wide development of the basic technologies necessary for twenty-first century warfare. Here, MCTL assessments combined with analyses of the CMIC’s progress offers very limited support for observers who conclude that the Chinese are ten technological feet tall, or are about to leap ahead into the nether reaches of the RMA.

MCTL assessments, however, provide only technology indicators. They do not, for instance, enable the observer to estimate the status of the equally important non-technological developments steps necessary to PLA modernization, such as the evolution of modern doctrine, training, and logistical support.⁵⁶ While there appears to be emerging doctrinal thought in the PLA about the role of information warfare, precision strike, and stealth-counterstealth, for instance, documents such as the MCTL only very indirectly indicate progress in such areas as joint doctrine and training. Expertise in these non-technical areas is necessary to make even the most up-to-date technology operationally effective.

The MCTL tells us that China is joining the world powers in those technology areas most likely to offer its armed forces the opportunity to participate in a revolution in military affairs, should such a revolution come to pass. The CMIC’s substantial and widespread deficiencies, however, do not justify the conclusion that China is capable of somehow leaping ahead, either generally or in “pockets of excellence.” If the recent past is any indicator, what should be anticipated is a slow and sometimes erratic expansion of CMIC capabilities in technologies applicable to areas viewed as critical in future warfare.

⁵¹This was frankly admitted in 1998 by Dai Kouhu, “Accepting the Challenge.”

⁵²See, for example, Liang Zhengxing, “New Military Revolution, Information Warfare,” *Zhongguo Dianzi Bao*, 24 October 1997, in FBIS-China, 1 January 1998.

⁵³Editorial, “Implement Military Strategic Principle for the New Period, Vigorously Push Forward Army Quality Building,” *Jiefangjun Bao*, 1 April 1997, in FBIS-China, 4 April 1997.

⁵⁴General Fu Quanyu, “Aggressive Exploration and Deeper Reforms to Promote the Comprehensive Development of Military Work,” *Qiushi*, No. 6 (16 March 1998), in FBIS-China, 13 April 1998.

⁵⁵*Ibid.*

⁵⁶For a careful overview of PLA training exercises over the period 1990–1996, see Dennis J. Blasko, Philip T. Klapakis and John F. Corbett, Jr., “Training Tomorrow’s PLA: A Mixed Bag of Tricks,” in Shambaugh and Yang (eds), *China’s Military in Transition*, pp. 224–260.

PANEL IV DISCUSSION AND QUESTIONS AND ANSWERS

Co-Chairman BRYEN. Commissioner Wessel?

Commissioner WESSEL. Thank you.

I'm still a little confused and hoping that you will help me with this. I heard from our last panel, or what I perceive from most of the last panel other than Ms. Walsh was that profits should guide our process because everything is basically available, that our technological edge is enough that they won't catch up, and we should be spending our resources on maintaining that lead, and everything else should be sold.

Mr. GODWIN. Yes.

Commissioner WESSEL. In your charts and other information we have, we see that countries like Israel tend to be taking that same attitude of being willing to sell just about anything despite the fact that I guess some of it is making its way back to the region with some of their major competitors' threats, and they may be accelerating the potential for conflict in the region.

How should we look at this? Why are countries like Israel expanding the capabilities of the Chinese, which also then allows for the leakage back to the region? Should we just throw up our hands and basically say, as I think our friend from the Semiconductor Industry Association said, that the real answer is education and that we should fully fund President Bush's "Leave No Child Behind" initiative. I apologize, but I don't see that that in the short term is going to help our security. I clearly believe that for national wealth and opportunity, we should be enhancing our education system, but I am confused. Is it hopeless? Should we just sell everything and forget about it?

Mr. GODWIN. No. I would agree with the general trend of the earlier panel. We need to focus more precisely on what it is the Chinese cannot have and not just clutter up the entire export business. I think we need to focus on what this committee is trying to do, which is to determine what technologies are critical for China's military programs.

Israel—and I'll just take a guess because I am not a specialist on Israeli security policy—what happens to Taiwan is of no concern to Israel; it is not in their vital interest. And, as far as Israel is concerned, U.S. military capabilities are so much better than the Chinese that an AWAC system does little to change the situation.

We see it quite differently, so we came down on the Israelis very, very hard, perhaps not hard enough. But the Israelis have been involved in modernizing China's defense capabilities for, what, 15 years, June?

Commissioner DREYER. At least.

Mr. GODWIN. At least, yes. Why we don't come down on them like a ton of bricks is beyond me, but we can give political reasons for that.

What I think is important to remember—and I hate to use this bumper sticker—is asymmetric warfare. Chinese writings on a war with an adversary that has to be the United States clearly demonstrate that the PLA is looking for ways to counter U.S. capabilities. The Chinese fully understand that the U.S. joint operations and the effectiveness of our standoff weapons are a function in

large part of our space systems, our communications systems, and now, obviously, with the UAVs. They are seeking ways in which they can degrade U.S. capability to conduct sustained offensive operations in the West Pacific.

That doesn't mean they have to mirror us. It means they have to keep us as far from China's coast as possible, and have the capability to inflict serious damage on U.S. Forces. The second thing they want to do—am I answering the question?

Commissioner WESSEL. Yes.

Mr. GODWIN. Okay. The second thing they want to do is to threaten U.S. bases in the West Pacific because they are essential for our sustained combat operations. This involves Japanese bases. Whether the Chinese have any problem with attacking Japan is another question. But the simple fact is that if China can deter Japan from allowing the U.S. operational use of Kadena and other military facilities on Japan's territory, that's a great advantage for them.

So the Chinese have thought through the problem; they know who the adversary is, where the potential conflict is going to occur, and what the dilemmas are that they face. In creating any military strategy and the operational concepts to support it, having this fix is central.

So, is China a threat? Under the specific constraints I have presented, most definitely.

Mr. MILHOLLIN. Was that question also addressed to me?

Commissioner WESSEL. Yes.

Mr. MILHOLLIN. I would say that the previous panel repeated arguments that I have been hearing for at least 10 years from the industry, perhaps 15 years. Before the Gulf War, industry was coming in and saying we can't isolate Saddam, we have got to engage him, we have got to sell him dual-use equipment. If we don't sell it, the Germans will sell it, the French will sell it, somebody else will sell it. It's all available; there is no point in controlling it.

That, first of all, was not true. We know from the UN inspections that there were vital technologies that the Iraqis just could not acquire, and they spent months trying to reengineer them and failed.

We also know that industry was wrong to believe that we needed to engage Saddam. We should have had a policy of isolating Saddam. The argument was—I can still hear the State Department saying "You can't isolate people; you have to engage them; you have to bring them into the mainstream." That was in fact wrong. We really just couldn't deal with Saddam. So we had to send pilots in, some of whom died, to bomb equipment that we sold to Iraq. The justification for that was the same one you have heard today for China. It is amazing how historically consistent the industry is. They seem to lack originality. They always make the same arguments, and they still are not true.

The biggest experiment in export control in world history was COCOM, and COCOM worked. Go to Russia. I have just been to about 10 former Eastern Bloc countries—the Caucuses, the Baltics, the Balkans—and I am probably going to go to more. They are all trying to transition out of the technology wasteland in which COCOM left them. They are having an awful time. The ones who were not hit as hard by COCOM are doing better than the ones

who were hit hardest. It is just empirically true that COCOM worked. It is also empirically true that export controls work today. It's not true that the Europeans are undercutting us right and left. They have the same export control laws that we do. In fact, I think the previous panel testified in effect to that, and I know that to be true. Their legislation contains the same multilateral regimes that ours do, and now, with the fact that the bureaucrats in Brussels are taking over Europe, there is going to be more uniformity, and if countries in the EU lag behind in export control, they are going to hear about it from the guys in Brussels.

So if you are looking into the future in Europe, it is going to get better. The weak members of the EU in terms of export control are going to be brought up to the level of everybody else, because it is in the interest of the strong countries to have a level playing field. The French don't want something bought from them by a Greek then going out to a place where the French aren't allowed to sell it; it's just logical when you think about it.

So I would say that the previous panel again, as has been the case for industry for 10 years, is saying that which is not, in Jonathan Swift's phrase. It's just not factually true what they are saying. Things are not available. It is not true that export controls don't work, and it is true that we need them.

Co-Chairman BRYEN. Thank you.

Let me move on to Commissioner Lewis.

Commissioner LEWIS. I'd like to ask each of you a question that you probably heard me ask the previous panels. Do you think that China is a potential security threat to the United States?

Mr. GODWIN. Yes, sir. In a sense, I think I responded to that in my previous answer. Yes.

Mr. MILHOLLIN. Yes, particularly in view of the fact that China does now have the ability to hit us with nuclear weapons, and that ability will go up over time.

Commissioner LEWIS. And do you think that we are selling them things now because, quote, it is available elsewhere, that we would not be selling them if we were the sole supplier in the world?

Mr. GODWIN. I don't know the answer to that question.

Mr. MILHOLLIN. I think that we do sell things that we shouldn't sell, regardless of whether other countries might sell them or not.

Commissioner LEWIS. And why is that done, in your opinion?

Mr. MILHOLLIN. Because I think that industry has an undue influence over the process, and I think it is growing because of the increasing amount of money that is flowing into the political process.

Commissioner LEWIS. Are you making an argument for campaign reform?

Mr. MILHOLLIN. Yes.

Commissioner LEWIS. Thank you.

I'd like to ask you another question. You said what is the PRC seeking to acquire, and the question was why, and you answered that a little bit. One of you said that the United States is seen as a threat by the Chinese military. How do they perceive us as a threat to them—that we will invade them, or what? What is the threat?

Mr. GODWIN. No, not that we're going to invade.

Commissioner LEWIS. What is the threat?

Mr. GODWIN. The threat has two forms. One, Taiwan—the PLA cannot conceive of a conflict between the mainland and Taiwan that doesn't involve the United States.

Commissioner LEWIS. Then, we would not be an aggressive threat; we would be a defensive threat against their invasion of Taiwan.

Mr. GODWIN. Yes—their conflict with Taiwan.

Commissioner LEWIS. Okay.

Mr. GODWIN. And secondly—and this is my long-term forecast that I'm getting very depressed about. At least in the Chinese military journals, I get the sense that what the PLA as a military institution would like to do is develop the capability over time—about 50 years—to offset U.S. capabilities in the West Pacific—not to invade us, but to have their military in a position where the United States cannot approach within 600 miles of China's coast without being in harm's way.

Commissioner LEWIS. For what purpose?

Mr. GODWIN. two purposes, I think. First, China doesn't like it but can live with the alliances that we have in the West Pacific right now. They can live with them, and in some sense, these alliances do them a favor. For example, the American alliance with Japan limits Tokyo's military ambitions.

But China would like to be in a position where the military security of the Asian littoral is not dependent upon U.S. capabilities but is more reliant on China's strength. This is, in a sense, a form of excluding us. Now, this is a long-term objective from the PLA point of view.

Commissioner LEWIS. Again, for what purpose? They don't see us as an aggressive threat, so why are they concerned that we are there as an offset? What do they fear from us?

Mr. GODWIN. They want freedom of action.

Commissioner LEWIS. Excuse me?

Mr. GODWIN. Freedom of action. Their ability to move; their ability to sway others. If I may thumbnail this, Asia's reaction in general to the U.S. military deployments in the West Pacific or the Asian littoral, however you want to put it, is that this is a hedge against the Chinese doing anything militarily aggressive. We are keeping China under control. We are keeping China backed up against the wall. This then gives them freedom to, quote, "fully engage" China.

Their hope is that in the 50 years I just talked about, China will change its objectives, that China will change, China will be a democracy, China will be "more like us."

So we are hedging against China's adventurous actions over this 50-year period.

Commissioner LEWIS. And how would you answer the position that the reason the leaders of China wanted to join the WTO was to make them more competitive, to increase the standard of living of the Chinese, and that can only be done if they engage peacefully in economic growth?

Mr. GODWIN. Agreed; yes, I support that.

Commissioner MULLOY. You support their entry into the WTO?

Mr. GODWIN. Very much so, yes.

Commissioner LEWIS. But you support the theory that they want to improve the standard of living—

Mr. GODWIN. Yes.

Commissioner LEWIS [continuing]. And that would then lead toward some kind of democratization, wouldn't it?

Mr. GODWIN. That's what we hope. This is the policy—we are involved in a very complex strategic exercise with China. We are both engaging China for the reasons we have talked about, and at the same time, we are hedging against China doing something we don't want them to do.

Commissioner LEWIS. Just like everything else, it is very complex and contradictory.

Co-Chairman BRYEN. We should actually return to that theme at some point. We are out of time on this round, but that's very interesting.

Commissioner LEWIS. Thank you very much.

Co-Chairman BRYEN. You need to un-retire, by the way.

Commissioner D'Amato?

Chairman D'AMATO. Thank you, Mr. Bryen.

I want to pursue this with you just a little bit longer. On the question of deterring China, my assumption from your analysis is that if there is going to be a confrontation, it is going to be from their perspective an extended one; that there is not going to be a short war, because that would end up in a disaster for them, but it would be an extended military confrontation.

I have a couple of questions on that. First, do you think there are any lessons learned drawn from Vietnam that would lead the Chinese to think that extended military confrontation really is the way to go vis-a-vis the United States?

And secondly, if it is an extended military confrontation kind of exercise that we are looking at, what is the proper kind of American deterrence under these circumstances to deter this scenario from the point of view of present policy?

Mr. GODWIN. Let me try to respond. I may have misstated my position. China's military preparations for Taiwan suggest they are preparing to conduct a war that will end quickly and in China's favor. The long-term extended confrontation with the United States the PLA fears is leading China to develop the military capability to offset our capabilities over time. It is not a long-term extended war; it is an extended confrontation. You may call it a "new Cold War," perhaps.

PLA preparation for a potential military conflict over Taiwan, however, indicates it seeks a short, decisive war. I'm not confident it will work out that way, and the various potential Taiwan scenarios have been presenting us analytical problems for some years. If you want to discuss these scenarios, we can do so, but they present distinctly different military issues than a long-term confrontation with China.

China's problem with the United States when we get to high-tech warfare is that they cannot in fact successfully conduct sustained combat operations at the high-tech level. It would even be difficult for the United States. How many PGMs do we have? I think there is a real acquisition problem here. China is a cruise missile sponge.

When you contemplate the number of targets for which we could use our PGMs, we have a real problem.

So I foresee not a war between China and the United States *per se*, but there is the distinct possibility of a military confrontation over Taiwan.

Chairman D'AMATO. Then, the most effective form of deterrence for a short war in Taiwan from the perspective of the Chinese psychology would be what?

Mr. GODWIN. I don't want to get into arms sales to Taiwan. To deter China, our position on an unprovoked attack on Taiwan must be clear. What I am concerned about now is—and you were just in Taiwan—Taiwan's interest in offensive military strategy that includes strikes on the mainland.

My concern is a very simple one. If a cruise missile—let's presume that Taiwan develops a land-attack cruise missile of some range. When that cruise missile starts distributing its bomblets over a Chinese missile base or whatever the target is, I don't think the Chinese are going to ask the question, "Is that an ROC cruise missile or an American cruise missile? Where did it come from? Did it come from a U.S. submarine in the Pacific, or did it come from Taiwan?" And if there are 30 or 40 or 50 missiles flying across the Chinese coast, they are just going to assume it was us. That either we fired the missiles or Taiwan did it with U.S. collusion as part of a combined strategy.

This is why this war is very dangerous. I was much happier when Taiwan was thinking in terms of a defense strategy, making it very hard for China to do what it wanted to do, giving us the opportunity to make the political decision to intervene militarily. If Taiwan acts on an offensive strategy, that war could get very, very nasty for us. Quite frankly, my concern is over U.S. interests, not Taiwan's interests. I don't think they are necessarily the same.

Co-Chairman BRYEN. We need to also pursue that in the future, because the other question is the question of the missile buildup by the Chinese, and they have to stand some of that down, it would seem to me.

Commissioner Dreyer?

Commissioner DREYER. Paul, I think it's necessary to add there, when you said Taiwan is thinking about taking an offensive, they have no plans to make a first strike. What they are saying is that if attacked, they will not simply sit there and try to defend their shores. They will take the action to the coast of China, which is about all they can reach at the moment. So that's really very different from the conventional definition of "offensive," which would indicate that they are planning the first strike.

Mr. GODWIN. Yes, yes.

Commissioner DREYER. Anyway—

Commissioner LEWIS. June, you're saying it would be an offensive response?

Commissioner DREYER. Yes, it would be an offensive response, yes, rather than an offensive strategy.

Anyway, what I was going to ask you is with regard to the data that you have presented here, what is your best assessment of how the situation has changed? In other words, we talked today about Moore's law, with these very quick, incremental jumps in capacity

to compute, and we heard about five-axis technology and the increases in technology and so on. And the data you mentioned, you said are based on 1994—

Mr. GODWIN. It must be 1994 or 1995, yes.

Commissioner DREYER.—about that era—and in technological terms, seven or eight years is quite a long time.

Mr. GODWIN. Oh, yes.

Commissioner DREYER. So how would you estimate that they have come up here from the shaky zero and the 1's and the 2's?

Mr. GODWIN. If it is a true zero as opposed to a TWG's lack of consensus, I would move up the assessment to a 1 or a 2. If it is a 1, I'd move it up to a 2 and a 3, and you can go all the way along.

The reason I say this is that China is focusing on key technologies. These are key projects. This is what they know they need.

Second, I don't care how bad Soviet command and control was—their mathematicians were good and they are now Russians. I suspect China is getting help from the Russians in a lot of these high-tech areas. What I don't know—and this is one of the questions the Commission asked me to address—is how well the Chinese are doing at systems integration. Systems integration is just very hard to do. That is why I think they are buying such expensive completed systems from Russia. If you look at a Luhai destroyer for example, it has a mix of French, British and Italian technology built into it. How you maintain and fight that mix of technologies effectively, I don't know. Whereas, if you purchase a Sovremenny destroyer from Russia, it may only be 1980s technology, but it all works.

Commissioner DREYER. It's integrated.

Mr. GODWIN. Yes. It all works.

Mr. MILHOLLIN. I might suggest something on that. If the question is, looking at the MCTL data from the mid-1990s, what have the Chinese been able to do since then, I think one of the major data points that is accessible to the Commission is the record of U.S. exports to China from that period to today. And the Commission does have the power to study those exports, and I recommend that you do it.

Commissioner DREYER. Duly noted. Thank you.

Co-Chairman BRYEN. Thank you.

Commissioner Mulloy?

Commissioner MULLOY. Dr. Godwin, you were actually a visiting professor at the Chinese National Defense University in Beijing for a while.

Mr. GODWIN. Yes.

Commissioner MULLOY. The Europeans, of course—you heard the testimony that they do not share our concerns. And we went into trying to understand what the thinking was and why we are out there, and one of the issues was Taiwan. I want to probe that a little further.

My understanding of American policy on Taiwan is that if the Taiwanese—we have kind of said you both claim you are one China or whatever—but if the Taiwanese want to accede to the mainland in some way or another, some kind of policy, we don't quarrel with that.

Mr. GODWIN. No.

Commissioner MULLOY. Okay. So then, they become part of China. That gets us off the hook in the short-run problem with the Chinese in terms of a military confrontation over Taiwan; is that right? Wouldn't that follow?

Mr. GODWIN. Yes. I just have great difficulty seeing Taipei agreeing to the kind of reunification that China seems to want to have.

Commissioner MULLOY. One China, two systems, Taiwan and Hong Kong. There is a lot of economic integration going on between China and Taiwan right now, which we saw both in China and Taiwan, and we talked with people about that. But you're saying that that isn't the only issue there, because their growth, economically and militarily, the so-called hegemon, they're going to want to have a sphere of influence—

Mr. GODWIN. Oh, yes.

Commissioner MULLOY [continuing]. That conflicts with what we think is our sphere of influence.

Mr. GODWIN. Right now, it does, yes.

Commissioner MULLOY. Okay. If that were the case, why wouldn't our policy for Taiwan be different? That's a forward base. If we're in a long-term rivalry with these guys, then the present Taiwanese policy doesn't make sense, does it?

Mr. GODWIN. Well, I wouldn't want Taiwan as a base myself. I would not want to be that close to China. Taiwan may be an aircraft carrier, but it is an immovable aircraft carrier, easily targeted, especially with today's weaponry.

We will want Taiwan resolved just to get Taiwan resolved. And there are a number of ways in which Taipei and Beijing could come to an agreement on this, none of which right now are on Beijing's menu of desirable outcomes.

What I think U.S. policy is based upon is the hope that as long as Taiwan is not defenseless, as long as Taiwan becomes—and I'll use the term I stole from the Singaporeans about 15 or 20 years ago—as long as Taiwan is a "poisonous shrimp," which means you can eat me, but you're not going to like it—as long as Taiwan can do that, and Beijing can be dissuaded from using force, there is a higher probability that both Beijing and Taipei will start to work out an accommodation on how they can come together under some notion of China. It could be something like a commonwealth basis; it could be like Puerto Rico. There are a number of ways in which it can be done.

Right now, regardless of China's public position on Taiwan, the people in Taipei and I think many of the people on the island—you'll know that better than I will—do not want to be part of the People's Republic of China. They do not want to be part of that regime. There are other ways in which they could be reunified with an abstract notion of "China," but not the way Beijing wants it now.

But the real question goes beyond that, sir, if I may. This is a matter of great debate among those of us who study China. In essence, if the Taiwan problem did not exist, what would the U.S. relationship with China be like? And here you confront the problem referred to in shorthand as "the hundred years of humiliation." This refers to the sense among Chinese that China—and here I am using this term as a cultural unit—was subverted by the West, was

occupied and became a semi-colony of the West. With this understanding of history, a Chinese wants China to stand up and “get off its knees.” A Chinese wants China to be recognized as a great power together with the United States. A Chinese wants China to be granted a sense of equality in the international system.

Now, China can do this economically with enough time and enough direct investment. But the military capability required, although second to this, is critically important. China wants to be seen as a great military power regardless of whether Taiwan is there or not. Now, June may have different views on that. It is not just envy the PLA feels when it looks at the U.S. military—it’s a sense of what China wants to be when it grows up.

Co-Chairman BRYEN. Let’s move on to Commissioner Robinson.

Commissioner MULLOY. Thank you.

Commissioner ROBINSON. Thank you, Mr. Chairman.

This is directed to both Dr. Godwin and Dr. Milhollin. Do you believe that the prospect of dangerous Chinese military adventures such as a military thrust to take Taiwan by force increases commensurate with the ease with which they can acquire cutting-edge conventional and nuclear technologies, equipment and know-how from the U.S. and our allies via an increasingly ineffectual multilateral export control regime and more lax domestic export controls on our part? Do you see a relationship between those two?

Mr. MILHOLLIN. High technology is an enabling force. It saves you money; it saves you time; you can do more with the same amount of effort. Everybody’s military, even ours, has economic restraints. If we make it cheaper for the Chinese to get more powerful, and if we allow them to do it faster, it just seems obvious to me that that is going to encourage them to use that power sooner and to believe that it is closer to ours.

I think that when you look at the transfer of high technology, you should realize that the American taxpayer is in effect subsidizing the whole thing. First, the taxpayer pays to develop high-tech U.S. technology, because cutting-edge technology often is developed with defense dollars in this country. Then, the industry comes in and says, “Gee, we’ve got to get our unit prices down, we need to export this stuff.” So the industry gets paid a second time when the technology goes out. Once the technology gets absorbed by the recipient, then industry comes back in and says, “They’re getting closer to us. We’ve got to invent a new series of high-technology weapons.” And then industry gets paid a third time by the U.S. taxpayer.

It is a circular process in which, in effect, we are competing against ourselves. That is what I see happening, and the result of this process is that to keep us from having other countries catch up to us because of the export of our own technology, we have to continue to spend more and more money. And if you think that “good enough” weapons are good enough, then other countries don’t have to catch up to us altogether; they can just get closer, get close enough to do us enough harm so that they can achieve whatever advantage they think they are going to achieve with military force.

So the answer to your question is yes, I think that if we enable other countries to get there faster and cheaper, more effectively, then, yes, we are encouraging those countries to think that they

can actually go up against us and therefore encourage them to pursue adventures that they might not otherwise pursue.

Commissioner ROBINSON. Dr. Godwin, do you have anything to add on that?

Mr. GODWIN. Yes. I'm still sort of puzzling over the question. It is a good question. Let me make a couple of observations first, before I even try to respond to it.

The last thing China wants or Beijing wants is a war with the United States over Taiwan. They don't want that. China is so far from achieving its strategic priorities, not just military, but through the country as a whole, that it doesn't want anything to set back this economic development, this slow process of political reform—all of these things. A war with the United States over Taiwan would do that; would stop China dead in its tracks. China, therefore, wants to avoid a war.

The question is how does China think it can best avoid a war. It thinks—I'm going to put my PLA hat on—that a credible nuclear deterrent is central to this objective. The U.S. is developing ballistic missile defenses, and China wants a credible deterrent in place when and if the United States deploys missile defenses. In essence, China wants to avoid what it refers to as “nuclear blackmail.” If the United States fears that even after a disarming first strike, there will be Chinese weapons available capable of striking American cities, Beijing believes this is sufficient for deterrence to be effective. Consequently, Beijing does not seek to match the U.S. nuclear force structure, but to have sufficient forces to create uncertainty in the mind of those who would threaten China with nuclear weapons.

Second, if Chinese conventional military capabilities increase, whether through importing American technology or through espionage or purchasing on the international market, so that we pause before we think of going to Taiwan's defense, as far as the PLA is concerned, that's enough.

Now, the real question you ask and the hard question to answer is: should Beijing believe that it has sufficient military capability to coerce Taiwan so quickly and so effectively that the United States would not have the time to come in—that's the issue—would they do it?

It depends on what Taipei does. China wants to avoid a war.

Commissioner ROBINSON. But again, that's the key, isn't it? And I'm not a Taipei expert by any stretch, but you know that developments there are not to Beijing's liking—

Mr. GODWIN. That's right.

Commissioner ROBINSON [continuing]. And that, arguably, is getting to be more so the case. You know that that is the uncontrolled variable that could pop at any time despite their desire to avoid a war, despite anything that would interrupt their ability to acquire the technologies, the finances, all that is necessary to keep that momentum going on economic development. And therefore, we have this uncertainty.

But it strikes me that on the nuclear side, Dr. Milhollin talked about mobile, solid propellant ICBMs, presumably the DF-31, DF-41, JL-21, et cetera. The bottom line, or at least one of them, is that if China felt that it did have a quick-strike capability, an over-

whelming force that could in effect neutralize Taiwan in a very short period of time—we know some of the scenarios and have talked about some of the scenarios in this Commission as to how that could be done—and the U.S. reaction time would be very short indeed, but then, they succumb to that temptation due to, in their view, provocations out of Taipei, we against perhaps the odds somewhat do intervene quickly, forcefully, and we get into a hot shooting conflict, my question is if you buy that scenario for a moment—and we could find ourselves in it in the next 5 to 10 years, very credibly, in my view—do you think with the mobile ICBMs, with that second strike capability as a credible one, that they would threaten a nuclear attack against the United States if we didn't cease and desist this very vigorous, lethal defense of Taiwan, or at minimum, a nuclear strike against U.S. forces in the region? I am just interested in whether or not you think that that is a credible situation and that we are facing the proverbial nuclear blackmail scenario.

Mr. GODWIN. The more Chinese arms control folks meet with ours over here—

Commissioner LEWIS. Excuse me. I couldn't hear what you said.

Mr. GODWIN. I'm sorry. The more China's arms control people meet with our people here and in China, the more they have become aware of the devastating consequences of a nuclear exchange. They are learning from us; they have been learning since the 1980s.

Whereas in the 1960s and 1970s, China may not have been aware, hadn't really thought through what a nuclear exchange would mean—they have now thought it through.

I in fact, to answer your question, sir—not to start an argument, but to answer your question—I think it is just as likely that China would not put its nuclear forces on alert in the event of the United States and China coming to a war over Taiwan as an indicator that they do not want to cross the nuclear threshold. In other words, the Chinese concern—now they understand far more fully how we think about nuclear weapons—is that this starts a chain reaction: They go on to nuclear alert; we see a nuclear alert; we start going up—and so on and so forth.

So I think it is just as likely China would not place its forces on alert given the overwhelming mass of weapons that the United States will always have—one SSBN right now carries more than the entire Chinese strategic arsenal.

Commissioner ROBINSON. Ninety-six plus.

Mr. GODWIN. Yes. So—

Co-Chairman BRYEN. You're way over time, so I'm going to—

Mr. GODWIN. So, yes, they could put them on alert, and in Chinese exercises since the late eighties, the Second Artillery Corps always goes on the alert—I don't know what that means, and no Chinese ever told me what it means—but the strategic forces do go on alert. Nonetheless, there is the distinct possibility that in a war over Taiwan, China would not put its forces on alert.

Co-Chairman BRYEN. We probably should look at that separately, as a separate issue.

Mr. GODWIN. It is a very complicated issue that you have raised.

Co-Chairman BRYEN. And a very important one. We haven't really gotten into that in a deep way in this group.

Commissioner BECKER?

Commissioner BECKER. Thank you.

I want to walk down that side of the street just a little bit further. After September 11, with all the wild speculation in the newspapers bordering in some cases on mass hysteria, I think, and nightly on the television shows, each commentator tried to outdo the other in speculation, and we hit a stage where we talked about Bin Laden having a nuclear device, and chills ran up and down everybody's backs. I personally believe, with no substance whatsoever except my own gut feeling, that if he had had it, he would have used it.

But having said that, if they had had one, most likely the technology would have come from China, I believe. The device would have come from Pakistan. And I think it has been documented—well-documented, at least through testimony that I have heard and others—that China has been the spreader of mass proliferation through Pakistan—

Mr. GODWIN. Pakistan, yes.

Commissioner BECKER [continuing]. And others, but the relationship between the terrorists in Pakistan and the military in Afghanistan would have been well-documented.

I guess my question really is just as to your thoughts on that, and how do you analyze within the thinking of the Chinese PRC leadership the wisdom of spreading this kind of nuclear proliferation to countries that are relatively unstable when it comes to terrorism, like Iraq, Iran, North Korea, et cetera, and what can we look forward to? I don't believe in coincidences, so they are obviously doing this for a reason. Would you speculate on it?

Mr. MILHOLLIN. I think the Chinese would be very reluctant to give another country a warhead. I think that any government would be reluctant to do that. The risks would be that such a warhead could be used in a way that the government wouldn't approve and that the government could suffer the consequences. If we were to discover that a Chinese warhead went off in a U.S. city, the consequences to China would be unacceptable to them, and it's hard for me to see what they would get in return. So if you're just looking at the inducements, at the costs and the benefits, it's pretty clearly against deliberate transfer. But the problem with proliferation is that once you see lots of countries getting some capability, getting some number of warheads, it might be hard to trace the one that goes off.

So far, we have seen the Chinese willing to help other people make nuclear weapons, but not to give them warheads, and I expect that would continue to be true.

Commissioner BECKER. When you say "make nuclear weapons," that's what they call the "dirty bomb?"

Mr. MILHOLLIN. No, no. I'm thinking of Pakistan. China has been willing to help Pakistan acquire nuclear weapon capability of its own, but has not been willing to give Pakistan a warhead.

Commissioner LEWIS. And you said that would continue?

Mr. MILHOLLIN. From what I can see, at least in the case of Pakistan, it is clear that China has a policy of keeping Pakistan

pretty much even with India strategically. That means that China will continue to supply missile technology and nuclear technology to Pakistan if Pakistan really needs it.

Right now, though, Pakistan has a pretty good design. Pakistan has the ability to make material. Pakistan is pretty much independent in terms of nuclear weapons unless it wants to go thermo-nuclear, and then it might need more help.

So I would expect the Chinese help to Pakistan to be more in the missile domain, but I would still expect China to maintain its policy of keeping Pakistan even with India.

Commissioner BECKER. I have another question, and I think this really goes to Dr. Godwin. As you were going through the charts, one of the charts that you had was on scientific knowledge, I believe—no—well, you talked about the advancing of manufacturing capabilities sort of across the board within China.

Mr. GODWIN. Yes.

Commissioner BECKER. To me, when you are talking about “manufacturing capabilities,” that is more than just the hardware, the tools, the machine tools, and so on. To me, it would mean the software, it would mean the talent, it would mean the people, and it would mean the training of workers.

Mr. GODWIN. Yes.

Commissioner BECKER. And we have heard testimony that by the year 2010, China will be the largest manufacturing entity in the world. I’m not talking about military now; I’m talking across the board in manufacturing, and I really thought that’s what you were talking about.

Do they have the capability, do they have a program, are they working to develop the talent in a concerted way to advance the skills of people to achieve this manufacturing capability, just as they are militarily?

Mr. GODWIN. Oh, yes. In one of the tables in the written testimony—that long, boring academic paper—there is a table that includes CAD/CAM, China’s capabilities in CAD/CAM, computer-assisted design and manufacture. One of the things that has happened as a function of China getting involved in foreign trade, especially as it has moved into electronics and things of this kind, is China’s awareness of the importance of precision manufacturing, not only for military purposes but also for civilian. So if we can find that chart that includes CAD/CAM, which is general manufacturing capability, I would suggest that China is progressing on that.

For example, just move away from electronics a bit. If you look at the way China’s shipbuilding is improving, they agreed to build ships for South Korea—I know that sounds strange, but they build ships for South Korea—and what they get from the Koreans is advanced welding equipment, and so on and so forth. So you go to a Chinese shipyard, and what you find there—at least the last time I was there—are German diesel engines, Korean welding, and Japanese parts. So the entire Chinese manufacturing capability across the board—I just use that as an example—is improving and will improve as a function of offsets and things of this kind.

Commissioner BECKER. As a program, as a plan, or accidentally, as a part of—

Mr. GODWIN. Okay. That is what has annoyed the State Science and Technology Commission, and that is why I think the creation of GAD, the General Armaments Department, for the PLA is so important.

As far as the State Science and Technology Commission is concerned, improvements in China's manufacturing have been random. It has been the result of individual firms importing individual pieces of equipment for individual purposes.

What they want to see is the more programmatic importation of technologies, and this new—new in 1998—General Armaments Department is supposed to supervise the importation of technologies that will be for military use.

So until recently, it was a pretty haphazard event, yes.

Co-Chairman BRYEN. Commissioner Becker, do you have one more question?

Mr. GODWIN. Does that help, sir?

Commissioner BECKER. Yes, very much so. That's what I want to know.

Thank you very much.

Co-Chairman BRYEN. Commissioner Lewis?

Commissioner LEWIS. I have two very short questions that I'd like each of you to answer. The first one is: An application is made by a United States company to sell something to China that has military implications that we would not sell if we were the only one in the world making that; but others in Europe make it and would freely sell it to China. The application is made to the United States Government for an export license. What would your response be, and how would you justify it when others would do it? That's question number one.

Question number two is what impact does China's balance of trade with the U.S., \$85 billion, and their access to our capital markets have on China's military capabilities?

Mr. GODWIN. A short answer?

Commissioner LEWIS. Yes, very short.

Mr. GODWIN. On the first question, I'd sell it.

Commissioner LEWIS. Okay, you'd sell it.

Mr. GODWIN. Yes, I'd sell it.

Your second question is very important. What it does is provide China a huge—it must be, what, \$200 billion now, their cash reserve, not including gold—something like that. What it does do is provide them with the cash to buy what they want.

Commissioner LEWIS. So our trade and the access to capital markets have military implications.

Mr. GODWIN. It does have military implications, yes. The Chinese keep reporting that their defense budget is only 1.4 percent of GDP—or whatever—but that 1.4 percent is getting bigger and bigger.

Commissioner LEWIS. Thank you.

Mr. MILHOLLIN. My answer to the second question would be the same—yes, it does. Having a large amount of dollars to spend, or a hard currency to spend, allows you to import military technology.

Commissioner LEWIS. How about question number one?

Mr. MILHOLLIN. To question number one, no, I wouldn't sell it.

Commissioner LEWIS. Even though—

Mr. MILHOLLIN. Even though I thought it was likely that the Germans or the French would sell it, I wouldn't sell it.

Commissioner LEWIS. How do you justify that?

Mr. MILHOLLIN. If I am a gun dealer, and a guy comes into my store and says, "I want a gun to rob the bank"—

Commissioner LEWIS. He doesn't tell you what for. The Chinese aren't saying, "We want that military to attack the United States."

Mr. MILHOLLIN. Well, if the guy coming in is the leading missile manufacturer in China, I have to assume I know what he is going to do with that.

Co-Chairman BRYEN. Let me call a halt at this point, if I can. That's a really good question.

Commissioner LEWIS. Thank you.

ADDITIONAL SUBMITTED STATEMENT

[CLERK'S NOTE.—The Commission has received a statement from Semiconductor Equipment and Materials International whom have asked that their statement be made a part of the record.

[The statement follows:]

PREPARED STATEMENT OF THE SEMICONDUCTOR EQUIPMENT AND MATERIALS INTERNATIONAL

Semiconductor Equipment and Materials International (SEMI) represents over 2,400 companies specializing in the manufacture of capital equipment and materials for the production of semiconductors. Our members include approximately 1,263 U.S. companies located in 41 states, contributing over 100,000 jobs to the American economy. We appreciate the opportunity to provide comments to the U.S.-China Security Review Commission on the application of U.S. export controls to China and the impact of those controls on our industry.

Our testimony will focus on the following key points:

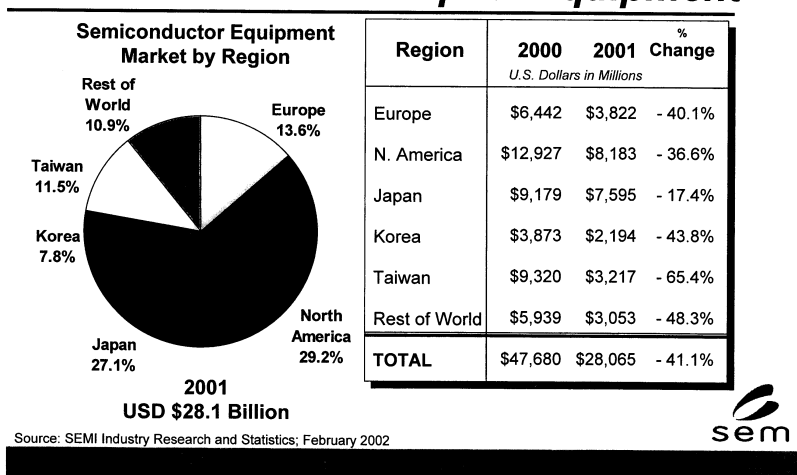
- The U.S. Semiconductor Equipment and Materials (SME) Industry's Competitive Strength Depends on Open Access to Global Markets;
- Export Controls on Semiconductor Equipment and Materials Have Not Kept Pace with the Industry's Technological Advances and Inherently Commercial Nature;
- Challenges Posed U.S. Export Controls in Light of China's Emergence as the Major New Market for Semiconductor Equipment and Materials Producers; and
- Conclusions and Recommendations for U.S. Export Control Policy Makers.

The U.S. Semiconductor Equipment and Materials (SME) Industry's Competitive Strength Depends on Open Access to Global Markets

In the United States, our industry represents a diverse infrastructure that supports the U.S. electronics industry. SEMI's members include a small group of well-known, publicly-held, global companies (e.g. Applied Materials, Air Products, Teradyne, Lam Research, KLA-Tencor, MEMC) who provide the complex semiconductor manufacturing tools and materials to supply the world's chipmakers. In addition, our members also include the large number of small, privately held firms that are suppliers to the larger companies within the industry. Whether large or small, our members are technology intensive, specializing in the production of a particular tool or material used in the semiconductor manufacturing process. Over 80 percent of our members are companies with annual sales of less than \$50 million. These firms develop the enabling materials, equipment and technology necessary to perform the complex fabrication steps that turn raw silicon into an integrated circuit.

During the 1980s, the U.S. semiconductor manufacturing equipment and materials industry (SME) faced tremendous competitive pressure from abroad, particularly from suppliers in Japan and Europe. U.S. equipment and materials firms responded to that pressure by expanding their global reach and by focusing on developing highly competitive tools and materials. Today, SEM companies in the U.S. account for 55 percent of the world's sales of semiconductor equipment and export more than 60 percent of their sales annually, much of which flows into the dynamic Asia Pacific region. Asia currently accounts for nearly 60 percent of semiconductor equipment consumption. (See attached charts.)

2001 Worldwide Semiconductor Capital Equipment



Top Ten Equipment Companies

2001 Ranking	2000 Ranking	Supplier	2001 Revenues (Billions)	% change from 2000
1	1	Applied Materials	\$6.455	-37.3%
2	2	Tokyo Electron Ltd.	\$3.557	-30.8%
3	3	Nikon	\$1.928	-26.5%
4	6	KLA-Tencor	\$1.685	-13.7%
5	5	ASM Lithography	\$1.544	-23.5%
6	9	Canon	\$1.135	-20.0%
7	10	Dainippon Screen	\$1.056	-24.0%
8	11	Novellus	\$1.016	-24.7%
9	12	Hitachi	\$0.982	-24.7%
10	7	Advantest	\$0.924	-50.5%

Source: VLSI Research, February 2002

The recovery of U.S. competitiveness would not have been possible without access to sales in important new export markets in Korea, Singapore and Taiwan. Without the growth of sales revenue from these new markets, the U.S. industry would have been unable to support the high R&D costs that are the crucial investment in keeping pace with rapid technology development. That paradigm continues to govern the current market environment. No leading semiconductor equipment or materials company can survive on the U.S. market alone. U.S. companies leveraged their early access to the Korean market to regain market share, and European companies gained market advantage by being early investors and suppliers in Taiwan. Early access to the China market may well provide the next opportunity for market lead-

ership for those companies able to establish a presence as reliable suppliers and build key relationships with leading customers.

Export Controls on Semiconductor Equipment and Materials Have Not Kept Pace with the Industry's Technological Advances and Inherently Commercial Nature

As has happened across the technology industry, the role of the semiconductor capital equipment and materials industry has dramatically shifted. The ability to produce integrated circuits, once the domain of the military, is now a widespread commercial prospect, with the military meeting its needs through off-the-shelf procurement rather than through designing chips for special military applications. The capital equipment and materials industry in turn has assumed more of a leadership role in supporting the commercial innovations that have enabled smaller, faster and cheaper semiconductors. While our industry once built tool components based on specifications delivered from our customers, increasingly they are tasked with much greater research and development challenges to develop manufacturing process technology that keeps pace with chip design.

Therefore, the inherently commercial focus of the semiconductor industry has become the fundamental driver for our industry's future. The enormous capital costs of semiconductor manufacturing and technological challenges posed by the industry's rapid pace, has reduced the number of commercial semiconductor manufacturers in the world today and spurred international partnerships and global manufacturing consortia or foundries to share the costs and risks. This in turn assures that the equipment and materials companies must provide marketing, sales and service for their products on a global basis to be successful. Given this fact, it seems illogical to continue to control the SME industry's exports as if they were driven by military end-use markets. Indeed, in this context, semiconductor manufacturing equipment and materials are indistinguishable from other types of generic manufacturing equipment whose export would be restricted only as part of a comprehensive economic embargo, not for reasons of national security.

Unfortunately, the U.S. export control system has not kept pace with technological reality. Controls on SME were instituted under CoCom at a time when any advanced technology was considered militarily relevant. They were also initiated in the early 1980s at a time when the U.S. had a monopoly on most advanced semiconductor manufacturing technology. Now an entire advanced semiconductor fabrication facility can be built and equipped without a single piece of U.S. equipment or any U.S. materials. Furthermore, the unanimity that existed between the U.S. and its allies at the time of the Cold War regarding strategic threats is no longer in effect and is certainly not shared with respect to China.

The CoCom controls on SME were updated slightly during the 1990 Core List Review in the transition to the Wassenaar regime but they still included an expansive list of mainstream commercial SME technologies. Now, after more than 10 years, the Wassenaar list for SME remains just as broad despite massive changes in technology in the industry. Despite the stated goal of controlling only the most critical technologies, the Wassenaar List includes controls for all mainstream SME technologies used in every commercial semiconductor manufacturing facility to produce every chip in the world today for millions of toys, pagers, cell phones, PCs and other consumer products. As these technologies are available in comparable quality and quantity from U.S. allies within the Wassenaar regime who do not share the U.S. viewpoint regarding restricting exports of widespread commercial technology, these controls are increasingly less relevant to China.

Challenges Posed By U.S. Export Controls in Light of China's Emergence as the Major New Market for Semiconductor Equipment and Materials Producers

China is now the most dynamic and fastest-growing market for semiconductor manufacturing and for semiconductor equipment and materials. While much of the technology industry has faced steep downturns in the last year, China has launched new manufacturing developments and an expansion of existing fabrication facilities (fabs) that has accelerated growth. The China market for semiconductor equipment, which was about \$1.2 billion in 1999, is expected to grow to \$4 billion in 2001 and to \$7 billion by 2003. By 2010, market analysts believe China will become the second largest market for semiconductors and one of the largest markets for semiconductor equipment and materials. With imports accounting for about 80 percent of semiconductors used in China, the demand for increased domestic production capacity is also significant. China's membership in the World Trade Organization is likely to accelerate this growth even further.

The worldwide semiconductor device industry is poised to establish major manufacturing facilities in China, both to support the commercial needs of the China market for information products and to provide low cost semiconductors to world

markets. All the factors are in place—low cost of capital, government supported infrastructure, large technical workforce, large technical workforce, low cost of labor and enormous market demand—to ensure that China will be the leading recipient of new semiconductor manufacturing investment over the next four years. As has been the case in Singapore and Taiwan, China is now poised to enter the next phase of industrial development. This evolutionary development in the deployment of semiconductor fabrication facilities will not be open to U.S. semiconductor manufacturing equipment and materials suppliers unless U.S. export controls are significantly revised.

Establishing a new fab often requires investment upwards of \$2 billion (USD) with nearly 80 percent of that cost residing in the manufacturing equipment. (See attached chart of new fab investment levels.) Given the significant amount of money invested in new manufacturing facilities, semiconductor device manufacturers must have access to advanced tool technology in order to secure a return on their investment. Commercial facilities must produce high-volume, low-cost chips for commercial products and to do so must have access to equipment technology that will influence yield enhancement and lower cost of ownership on the tool.

The U.S. Department of Defense has long had an unstated policy of keeping China two generations behind state of the art in its production capability. But that goal could result in a virtual economic embargo against U.S. equipment and materials suppliers. Leading fabs in China already employ advanced 0.25 micron technology, and have done so using equipment and materials legitimately supplied from our Wassenaar allies which do not view SME as military technology in need of stricter control. In fact, Japan and nations within the European Union have made bulk licensing available for semiconductor manufacturing tools for the China market. New fabs under construction in China—including the Semiconductor Manufacturing International Corporation (SMIC)—have announced their intention to begin operations at 0.25 micron and migrate to 0.18 technology levels with the help of transfers of .18 manufacturing technology from Chartered Semiconductor in Singapore. Neither level is state of the art but both are significantly below the 0.7 or 0.5 micron level approved for export of equipment to China by the U.S.

Competitors to U.S. suppliers are eager to take advantage of market openings caused by U.S. bureaucratic delay in export licensing. Such delay imposes real cost on the U.S. equipment industry: the choice of NEC as the technology partner for the Shanghai “909” project ensured that the tool suite for that facility (operating originally at 0.35 micron technology and now migrating to 0.25) would be chosen mainly from the Japanese equipment supplier base. Similarly, SMIC has indicated that original plans to buy 50 percent of its equipment from the U.S. have been changed due to bureaucratic delay in obtaining U.S. licensing. In one example, the company (which does not have any Chinese investment, but is wholly owned by Taiwanese and U.S. investors) chose a Swedish tool at a more advanced technology level after the license application to purchase a U.S. tool was delayed for six months.

Recommendations and Conclusions

Closing off markets and drying up revenue sources that drive technological innovation in U.S. companies are precisely the wrong ways to enhance U.S. national security. We would urge this commission to critically reexamine the rationale for continuing to control semiconductor manufacturing technology for inherently commercial and pervasive IT products. Rather, the U.S. should concentrate its efforts on maintaining its technological leadership through continued research and development and through promoting commercial IT exports that will enhance global economic and ultimately political benefits.

We urge the U.S. government to undertake a complete review of the controls surrounding semiconductor equipment, and with its Wassenaar partners remove outdated items from the control list. Understanding that this may be a lengthy process, we would urge the U.S. government in the interim to adopt steps that would ease the licensing burden on U.S. equipment and materials suppliers. Such steps could include the implementation of streamlined procedures such as bulk licensing for multiple tools being shipped to the same facility and for spare and replacement parts that will be needed to service these tools on an ongoing basis. It could also include the implementation of civilian end use exceptions for specific categories no longer deemed strategic for export to China.

Co-Chairman BRYEN. What I'd like to do is just announce that tomorrow, the Commission will reconvene at 9 a.m. to hold the hearing on China's commitment and compliance with the World Trade Organization. In the afternoon, the Commission will hear

testimony on three sectors of China's economy—the financial sector, intellectual property, and communications.

[Whereupon, at 4:45 p.m., the proceedings were adjourned, to reconvene at 8:00 a.m. on Friday, January 18, 2002]