

November 1999

EXPORT CONTROLS

Statutory Reporting Requirements for Computers Not Fully Addressed



G A O

Accountability * Integrity * Reliability

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Abbreviations

AMD	Advanced Micro Devices
DOD	Department of Defense
MTOPS	millions of theoretical operations per second



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Washington, D.C. 20548

National Security and
International Affairs Division

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November 5, 1999

The Honorable Thad Cochran
Chairman, Subcommittee on International Security,
Proliferation, and Federal Services
Committee on Governmental Affairs
United States Senate

The Honorable Michael B. Enzi
Chairman, Subcommittee on International
Trade and Finance
Committee on Banking, Housing, and Urban Affairs
United States Senate

The U.S. government controls the export of high performance computers to certain countries based on foreign policy and national security concerns. The Commerce Department considers a high performance computer to be one that exceeds a defined performance threshold, thus requiring an export license. In a July 1999 report,¹ the executive branch described its plans to change the controls on the exports of high performance computers by increasing the level of computing performance for which export licenses would be required. The executive branch last modified controls on high performance computers in January 1996. In the Fiscal Year 1998 National Defense Authorization Act (P.L. 105-85, sec. 1211, Nov. 1997), Congress required the executive branch to provide a report justifying proposed changes to export controls on computers. The act requires the report, at a minimum, to (1) address the extent to which high performance computers with capabilities between the established level and the new proposed level of performance are available from other countries, (2) address all potential uses of military significance to which high performance computers at the new levels could be applied, and (3) assess the impact of potential military uses on U.S. national security interests.

As you requested, we determined (1) whether the executive branch's July 1999 report to Congress satisfied the requirements of the act; (2) whether

¹ *Summary of Findings With Respect to Criteria Set Forth in Subsection 1211 (d) of the National Defense Authorization Act for Fiscal Year 1998*, attachment to letter sent to Congress, July 23, 1999 (Washington, D.C.: The White House).

the report was factually supported; and (3) how many high performance computers at the current control levels have been approved for export to certain sensitive countries, for example, Russia and China, and how many have been approved for export since 1997 to military or other sensitive end-users (for example, entities suspected of being engaged in proliferation activities).

Results in Brief

The President's July 1999 report to Congress did not fully satisfy the reporting requirements of section 1211 of the Fiscal Year 1998 Defense Authorization Act. The report did address two of the three requirements—to determine the availability of high performance computers in foreign countries and the potential for use of the newly decontrolled computers for significant military use. It did not, however, assess the impact of such military use on the national security interests of the United States. Instead, the report discussed the economic importance of a strong U.S. computer industry to U.S. national security.

A 1998 Department of Defense- and Commerce- sponsored study and data from the U.S. computer industry generally provided evidence to support the report's statements that the capabilities of high performance computers and their related components are increasing. However, the President's report implied that there is a greater level of foreign supply of high performance computers than is supported by evidence in the Commerce- and Defense-sponsored study. The study found that U.S. companies and their international business partners overwhelmingly dominate the international market for most high performance computers. Further, we were unable to assess the justification for the new export control levels because the President's report did not define key terms or explain how they were applied.

From November 1997 (the date of the act) through August 1999, the United States approved for export 4,092 high performance computers, as defined under the current export control levels, to certain sensitive countries such as China and Russia. China, by far the largest importer of high performance computers, received 1,924 of these approvals. One hundred and forty-one of the computers going to certain sensitive countries, or 3.4 percent of the total, required a license. The requirement for a license is an indication that the end-use or -user might be connected to the military or a proliferation related end-use or -user.

We make a recommendation in this report to clarify the criteria used in establishing the export control thresholds for high performance computers.

Background

High performance computers and related components (for example, processors) are controlled under the Export Administration Act.² The act establishes authority to require licenses for the exports of sensitive items that may pose a national security or foreign policy concern. The Department of Commerce administers the Export Administration Act. The Departments of State, Energy, and Defense assist Commerce by reviewing export applications and providing support to Commerce in its reviews of export control policy. High performance computers are regulated based on their performance as measured in millions of theoretical operations per second (MTOPS).

Since 1993, the President has revised U.S. export control requirements for high performance computers three times, including the revisions announced in July 1999. The export control policy implemented in January 1996 removed license requirements for most exports of computers with performance levels up to 2,000 MTOPS (an increase from 1,500 MTOPS).³ The policy also organized countries into four computer “tiers,” with each tier after tier 1 representing a successively higher level of concern related to U.S. national security interests. The policy placed no license requirements on tier 1 countries, primarily those in Western Europe and Japan. Exports of high performance computers above 10,000 MTOPS to tier 2 countries in Asia, Africa, Latin America, and Central and Eastern Europe continued to require licenses. A dual-control system was established for tier 3 countries. There are 50 tier 3 countries including China, Russia, India, and Israel. For tier 3 countries, high performance computers up to 7,000 MTOPS could be exported to civilian end-users without a license, while exports for potential military end-uses at and above 2,000 MTOPS required a license. Exports of high performance computers with performance capabilities above 7,000 MTOPS to civilian

² The Export Administration Act terminated on August 20, 1994. Pursuant to Executive Order 12924, issued on August 19, 1994 (59 Fed. Reg. 43437) the President, to the extent permitted by law, extended the application of the act indefinitely.

³ We evaluated several aspects of the 1996 relaxation of controls. See *Export Controls Information on the Decision to Revise High Performance Computer Controls* (GAO/NSIAD-98-196, Sept. 16, 1998).

end-users for all tier 3 countries required a license. High performance computer exports to countries in tier 4 (for example, Iran, Iraq, and Libya) were essentially prohibited because of national security and foreign policy concerns about these countries.

Section 1211 of the Fiscal Year 1998 National Defense Authorization Act requires an exporter to notify the Commerce Department that it proposes to export high performance computers that perform above 2,000 MTOPS to end-users in tier 3 countries. The Departments of Commerce, Defense, State, and Energy review these notifications, and if any of these agencies objects to the export, the exporter must submit a license application.⁴ According to National Security Council guidance, agency objections shall state whether the proposed export represents a risk of diversion to a military end-user or end-user of proliferation concern. Exporters that want to ship high performance computers above 2,000 MTOPS to military end-users in tier 3 countries must apply directly to Commerce for a license; they do not go through the notification process.⁵ The act also required the President to submit a report to Congress justifying any changes to the control levels for high performance computers.

On July 27, 1999, the President proposed changes to the current export control levels for high performance computers and submitted a report to Congress, as required by the act. According to a statement by the President, changes were needed because of the extraordinarily rapid rate of technological change in the computer industry. These changes were as follows:

- Four countries—Hungary, Poland, the Czech Republic, and Brazil—were moved from tier 2 to tier 1.
- The tier 2 licensing level was raised from 10,000 MTOPS to 20,000 MTOPS, effective immediately.
- The two-level system for tier 3 countries was retained, and the licensing level for civilian end-users was raised from 7,000 to 12,300 MTOPS, effective immediately. The licensing level for military end-users is to be raised from 2,000 to 6,500 MTOPS, effective January 2000. A level of

⁴ In addition to reviewing notifications, State, the Department of Defense (DOD), and Energy also review export license applications that are submitted directly to Commerce.

⁵ For more information on the Fiscal Year 1998 National Defense Authorization Act and its provisions, see *Export Controls: 1998 Legislative Mandate for High Performance Computers* (GAO/NSIAD-99-208, Sept. 24, 1999).

6,500 MTOPS was also established for the notification requirement, also effective January 2000.

Two studies commissioned by the Departments of Commerce and Defense and completed in 1995 and 1998 were key sources of information for the executive branch's review of computer export controls. These studies examined trends in high performance computing and their applications and provided much of the background analysis the executive branch used as a basis for deciding to relax export controls on high performance computers.⁶

President's Report Addressed All but One Reporting Requirement

The President's report to Congress was responsive to two requirements of the 1998 Defense Authorization Act but was not responsive to the third. The report discussed the extent to which high performance computers with capabilities at the proposed level of decontrol are available in other countries and generally described the potential uses of the newly decontrolled computers for significant military applications. However, the report did not assess how U.S. national security interests might be affected by other countries' potential military uses of the newly decontrolled computers.

Report Addressed Availability of High Performance Computers in Foreign Countries

The President's report noted that while U.S. firms control the market in processors (computer chips) and currently dominate the high performance computer market, there is some foreign competition from firms in Asia and Europe. It should be noted, however, that the law does not require a finding that these computers are currently available from non-U.S. producers or with non-U.S. origin processors and parts. The report stated that due to the rapid advances in processor speeds and related technologies, customers, including those in foreign countries, can acquire very powerful computers that can be easily assembled or upgraded by adding up to eight processors to increase computing performance levels. The report stated that the

⁶ See Seymour E. Goodman, et al., *Building on the Basics: An Examination of High-Performance Computing Export Control Policy in the 1990's* (Palo Alto, CA: Stanford University, Center for International Security and Arms Control, 1995) and *High-Performance Computing, National Security Applications, and Export Control Policy at the Close of the 20th Century* (Palo Alto, CA: Stanford University, Center for International Security and Arms Control, 1998).

capability of these computers would exceed the current export control thresholds.

Report Addressed Potential Military Uses of High Performance Computers

The report stated that high performance computers at all levels, including performance levels below current export control levels, are used in virtually all military applications, including the design, development, and production of weapon systems; military operations; cryptography; and nuclear design and simulation. The President's report determined that all of these applications are militarily significant and concluded that it is impossible to establish a limit below which computers could not be used for significant military applications.⁷ Consequently, the new control levels are not based on an assessment that these new computing levels do not involve national security applications but rather that computers in this performance range are so widely available that they are uncontrollable.

Report Did Not Assess Impact of Military Uses on National Security

The President's report did not discuss how U.S. national security interests might be affected by potential military uses of high performance computers with greater capabilities. The report noted that because of widespread availability of high performance computers, tier 3 countries can obtain computers in the 6,500 MTOPS performance range or the necessary components to build such computers. However, the report did not say how other countries' use of high performance computers that operate between 2,000 and 6,500 MTOPS would affect U.S. national security.

Specifically, the President's report did not discuss the impact of any significant military applications of high performance computers on the national security interests of the United States nor did it cite past or ongoing studies of this issue. The President's report concluded in response to the second reporting requirement that there are militarily significant applications in the new control range, and, if not for their widespread availability, these applications would need to be controlled. These applications include advanced aircraft design, antisubmarine warfare sensor development, and radar applications. However, the President's

⁷ The report noted that while some applications are currently being performed with computers at a given performance range, this typically reflects the ability of users to obtain the fastest machine within their budget constraints rather than the demands of any particular application. As with commercial applications, the report noted that demand for computing power tends to rise to what is available to the user.

report provided no assessment of how computers sold under the new control levels could impact national security.

Furthermore, the President's report did not cite any past or ongoing government studies that have examined or are examining the national security impact of the availability of high performance computers, even though such studies are available. For example, a June 1998 study by the Department of Energy assessed the potential contribution of high performance computers to the nuclear weapons programs of China, Russia, India, Pakistan, and Israel and countries suspected of proliferating weapons of mass destruction. This report found that the impact of high performance computing capability depends on the complexity of the weapon being developed and the availability of high quality, relevant test data. Also, in the spring of 1999, both the Energy Department and the Central Intelligence Agency began a study on the impact of exports of high performance computer exports in response to a directive from the National Security Council, as recommended by the House Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China. According to a National Security Council official, this study is not yet completed.

Instead of discussing the act's requirement, the President's report assessed the economic importance of marketing and developing U.S. high performance computers and processors. It also discussed the importance to U.S. national security interests of ensuring that the United States retains its technological advantage in the design, development, and production of processors and computers. The President's report concluded that failure to adjust U.S. export requirements for computers and processors would have a significant negative effect on the U.S. computer industry and harm the industry's ability to produce products with military applications.⁸

⁸ The report also noted that because of the widespread availability of high performance computers, tier 3 countries can obtain systems in the 6,500 MTOPS performance range, or the necessary components, and manufacture higher performance computer systems on their own. Although this statement offers a rationale for raising the export control level, it does not say anything about how militarily significant applications of high performance computers between 2,000 and the new control level of 6,500 MTOPS would affect U.S. national security.

Report Findings Were Generally Supported

The report's statement that the capabilities of high performance computers and related components, from both domestic and foreign sources, are generally increasing was supported. However, while the report implied that high performance computers are readily available from foreign sources, a 1998 study sponsored by DOD and Commerce found that the United States dominates the international computer market, at least in the mid- and high-range performance categories. Furthermore, we were unable to assess the justification for the new export control levels for tier 3 because the report did not define key terms or explain how they were applied.

Report's Statements on Increases in Computing Capabilities Supported

The report's conclusion that the capabilities of high performance computers are increasing was supported. The executive branch based its conclusion that these capabilities are widely available and are therefore uncontrollable on the ability of foreign countries to obtain high performance computers directly or indirectly from a vendor, a reseller, or another third party or to assemble such a computer using U.S. processors and components. The conclusion that faster processors and related components⁹ are widely sold was supported because the United States does not generally control the export of the processors and components. Under current regulations, processors that perform up to 1,900 MTOPS can be directly exported to civil end-users in many tier 3 countries, including China and Russia. Exports of processors to such users in many other tier 3 countries, such as Israel and Saudi Arabia, are not subject to any MTOPS limit. Exports of other key components for computer systems with four and eight processors are also not generally controlled; these parts can be shipped to tier 3 countries for civilian end-users, which could then use them to support the assembly of computers.

Table 1 shows the speed of processors introduced in 1999 and those expected to be introduced by mid-2000. Single processors introduced in 1999 by Motorola and Advanced Micro Devices (AMD) already exceed the export licensing control threshold of 2,000 MTOPS for tier 3 countries. Table 1 also shows estimated performance levels for computers using more than one processor and shows that an eight-processor computer using an Intel Pentium processor available since October 1999 exceeds the civilian export control licensing level of 7,000 MTOPS. The control levels announced in the President's report roughly match the expected

⁹ Related key components include chipsets, circuit boards, and memory cards.

performance levels of computers using four and eight Intel Pentium processors that are expected to be on the market in July 2000.

Table 1: Estimated Performance Capabilities of Single and Multiprocessor Computers Available in 1999 and the Year 2000

Processor	Estimated performance levels (in MTOPS)			
	Single processor	Two processors	Four Processors	Eight processors
Available October 1999				
Intel Pentium III 733 Megahertz (Mhz)	1,710	3,177	a	a
Pentium III (Xeon) 550 Mhz	1,283	2,383	4,584	8,983
AMD Athlon (K7) 700 Mhz	2,130	a	a	a
Motorola G4 400 Mhz	2,469	b	b	b
Estimated available by December 1999				
AMD Athlon (K7) 750 Mhz	2,282	a	a	a
Motorola G4 550 Mhz	3,395	b	b	b
Estimated available by July 2000				
Intel Pentium III (Xeon) 750 Mhz	1,750	3,250	6,250	12,251
Motorola G4 750 Mhz	4,630	b	b	b
Estimated available second half of 2000				
Intel Willamette 1,000 Mhz	2,667	5,000	c	c

Note: The above performance levels are estimates provided by the manufacturers and are subject to change.

^a These processors are not presently capable of being configured to this level.

^b According to Motorola and DOD officials, the G4 is multiprocessor capable. However, the DOD official is aware of only two companies making such computers, and each uses a proprietary design.

^c According to Intel officials, the Willamette processor will eventually be configured for use in four and eight processor systems.

Source: U.S. computer processor manufacturers, October 1999.

Foreign Supply of High Performance Computers More Limited Than Report Implied

The report's discussion of foreign sources of high performance computers implied that there is a higher level of foreign competition than is factually supported by available evidence. The 1998 study that the Defense and Commerce Departments sponsored stated that the controllability of high performance computer systems is not greatly influenced by their availability in foreign countries, except Japan, because U.S. companies and their international business partners overwhelmingly dominate the international market for computers, at least in the mid- and high-range performance categories. This conclusion is consistent with what we reported in our 1998 report, where we found that the only global competitors for general computer technology were three Japanese companies, two of which compete for sales of high-end computer systems sold in small volumes and performing at advanced levels.¹⁰

Controllability Difficult to Assess

While we found evidence supporting the report's conclusion that computers with greater capabilities and related components are becoming increasingly available, we were unable to assess the report's determination that computers rated below the new control levels are widely available and by implication are uncontrollable. An assessment of controllability involves critical assessments of when and in what quantities an item should be considered so widely available as to be uncontrollable. However, "widely available" and "uncontrollable" are not terms defined in current export control laws or regulations, and nothing that has been offered in support of the proposed relaxation of controls defines how these concepts have been applied in setting the new control levels.¹¹ Defense and Commerce Department officials stated that the analysis they prepared in support of the President's report relied on a definition of controllability used in their sponsored studies of high performance computers. However, the discussion of controllability in these studies is general. The 1998 study, for example, cites the following general factors "influencing" controllability:

¹⁰ See *Export Controls Information on the Decision to Revise High Performance Computer Controls*, (GAO/NSIAD-98-196, Sept. 16, 1998).

¹¹ In contrast, under the Export Administration Act, "foreign availability" is more specifically described as goods or technology available without restriction from sources outside the United States in sufficient quantities and comparable quality to those produced in the United States so as to render the controls ineffective in achieving their purposes.

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1. the performance of computing platforms that have qualities (size, price, numbers installed, vendor distribution channels, age, and dependence on vendor support) that make them difficult to monitor;
 2. the ability to increase the capability of a computer system incrementally by adding processors; and
 3. the performance of systems available from foreign sources not supporting U.S. export control policies.

The President's report did not explain how these factors were considered in setting the new control levels. The establishment of 12,300 MTOPS as the licensing level for civilian end-users in tier 3 countries¹² illustrates the difficulties in making a judgment about controllability.

- The President's report, as well as Commerce and Defense Department officials, indicated that computers with both four and eight processors are or will be sold in such volumes that they are uncontrollable. However, computers with eight Intel Pentium processors were just introduced to the market in the summer of 1999 and have been and will likely be sold in much smaller quantities than systems with either two or four processors.
- The President's report suggested that computers can be upgraded with up to eight processors and maintained without vendor support. However, according to three of the largest companies selling computers using eight Intel Pentium processors, customers must return to the company for modifications to the Pentium III processor before it can be added to the computer. In other words, the widespread availability of the Pentium III processor is not sufficient to enable anyone to upgrade a multiprocessor system without some company assistance.
- The President's report cited German and Japanese firms that produce high performance computers as examples of foreign availability. However, like the United States, Germany, and Japan maintain export controls on high performance computers. These controls appear to afford protections similar to U.S. regulations and would likely limit exports of high performance computers to sensitive countries.

¹² According to DOD and Commerce officials, the new licensing level of 12,300 MTOPS was based on the expected performance capability of an eight-processor computer using an Intel-based chip expected to be on the market in mid-2000.

Without more specific criteria and a clear explanation linking these criteria to the new control levels, it is not possible to determine whether sales of computers with eight processors are produced in sufficient quantity to make them uncontrollable or if the level of vendor involvement in upgrading computers or the current level of foreign supply makes such computers controllable.

The President's report noted that high performance computers perform sensitive military applications and it is only because of their widespread availability that the control levels are being changed. Table 2 lists examples identified in the DOD- and Commerce-sponsored study of these applications and the performance levels of the computers that support these applications. These examples highlight the importance of having clear criteria for determining whether a commodity is or is not controllable.

Table 2: Performance Levels of Computers That Support Applications of Military Significance

Computer performance level (MTOPS)	Applications
4,000 to 6,000	Joint Attack Strike Aircraft design; nonacoustic antisubmarine warfare sensor development; and advanced synthetic aperture radar computation
8,000 to 9,000	Bottom-contour modeling of shallow water in submarine design; some synthetic aperture radar applications; and algorithm development for shipboards' infrared search and track
10,000 to 12,000	Global and regional weather-related applications, image processing, and moderate-sized particle dynamics problems
15,500 to 17,500	Computational fluid dynamics applications to model the turbulence around aircraft under extreme conditions
20,000 to 22,000	Weather forecasting; impact of blasts on underground structures; advanced aircraft design

Source: *High-Performance Computing, National Security Applications, and Export Control Policy at the Close of the 20th Century*.

Small Percent of Exports to Tier 3 Countries Are Licensed and May Go to Sensitive End-Users

From November 18, 1997, when the 1998 authorization act was enacted, through August 27, 1999, the United States approved the export of 4,092 high performance computers¹³ to tier 3 countries.¹⁴ China, the largest importer among tier 3 countries, received approvals for 1,924 high performance computers. Russia, Israel, and Saudi Arabia were the next three largest authorized importers of U.S. high performance computers. The high performance computers approved for export had an average performance capability of 3,568 MTOPS. Saudi Arabia received approval to import the most powerful computer, with a capability of 28,980 MTOPS. China received approval to import the next most powerful computer, with a capability of 24,750 MTOPS. (App. I lists the countries that imported U.S. high performance computers and their MTOPS capabilities.)

Our analysis of Commerce data shows that 141 high performance computers, or about 3.4 percent of all exports approved to tier 3 countries, may have been going to sensitive end-uses or end-users (see fig. 1).¹⁵ This number is an estimate based on the number of high performance computer exports that required an individual validated license. The requirement for a license is an indication that the end-user may be connected to the military or the end-use may be sensitive.¹⁶ Licenses are required for high performance computers if the end-use or -users are known by the exporter to be connected to the military. Licenses are also required if, after a proposed export is notified to the Commerce Department, any of the reviewing agencies object based on information that the end-use or -user

¹³ These high performance computer exports included complete computers as well as processors to replace or be added to existing computers. These processor upgrades are treated as high performance computers for export control purposes when the performance capabilities enabled by the new processors exceed the MTOPS control thresholds.

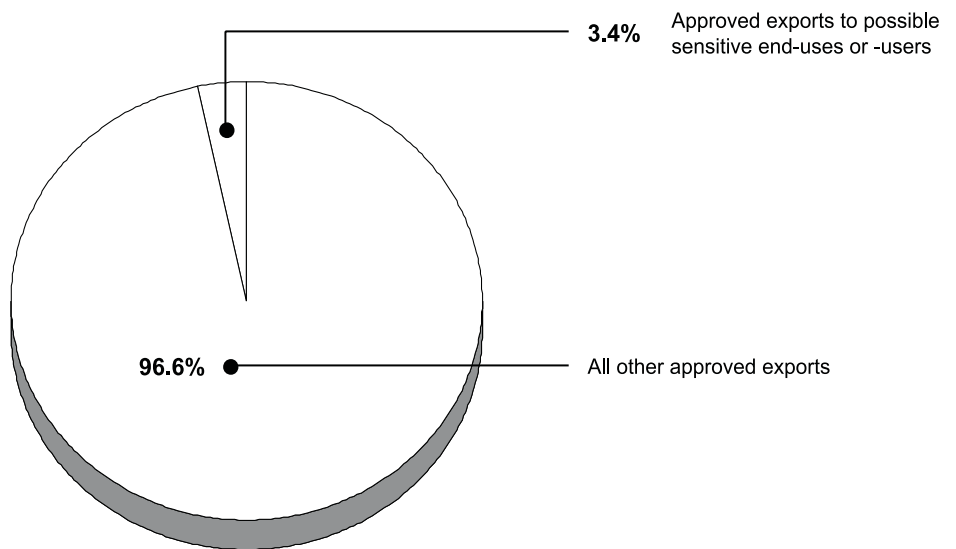
¹⁴ Because exporters do not always use approved export licenses, the quantities actually shipped to these countries may be less.

¹⁵ U.S. exports to tier 3 countries are a fraction of total U.S. exports of high performance computers. Data from January 1996 through September 1997 indicates that about 94 percent of U.S. high performance computer exports went to countries in tiers 1 and 2.

¹⁶ Commerce regulations state that a license is required to export or reexport computers rated above 2,000 MTOPS to countries in tier 3 to military end-users and end-uses and to nuclear, chemical, biological, or missile end-users.

might be connected to the military or some other sensitive end-use or -user.¹⁷

Figure 1: Percent of Approved Tier 3 High Performance Computer Exports That Required a License and May Be Going to a Sensitive End-Use or End-User, November 18, 1997, Through August 27, 1999



Notes:

- 1. Approved exports to possible sensitive end-users or -uses include approved licensed exports of computers (and processor upgrades) rated between 2,000 and 7,000 MTOPS.
- 2. All other approved exports include approved exports of computers rated above 2,000 MTOPS that did not require a license and approved licensed exports of computers rated above 7,000 MTOPS.

Source: GAO analysis of Commerce Department licensing data.

Conclusion

Key terms of widespread availability and controllability used by the administration in setting the new export control levels are not defined in regulations or explained in the President's report. Future reports to Congress explaining additional changes to the control levels for high

¹⁷ If no objection is raised, the exporter may ship the high performance computer without a license.

performance computers would be more useful if these terms were clearly defined.

Recommendation

To clarify the basis for future changes to the export control levels for high performance computers, we recommend that the Secretary of Commerce develop specific criteria defining both “widely available” and “controllability.”

Agency Comments and Our Evaluation

The Departments of Commerce and Defense provided written comments on a draft of this report (see apps. II and III, respectively). State reviewed a draft of this report but did not take an overall position on its content. DOD, Commerce, and State provided technical comments, which we incorporated where appropriate.

In regard to our recommendation that the Secretary of Commerce define the terms “widely available” and “controllability” that were used in justifying the proposed changes in control levels for high performance computer exports, Commerce noted that these terms require judgment. Commerce said that as it works with Congress to renew the Export Administration Act, it would explore the utility of defining these terms. We continue to believe that our recommendation has merit. A clear understanding of these terms and how the administration has applied them will be essential for Congress to assess future proposed changes in computer control levels. The Department of Defense did not comment on our recommendation.

DOD and Commerce said that in their view, the President’s report responds to the legislative requirement to discuss the national security impact of the new control levels. They note that the President’s report concedes that computers have many military applications and that computers at all performance levels are used in virtually all military applications. For this reason, the President’s report identifies the most serious national security issue: the reliance of the U.S. military on the high performance computer industry and the need to ensure that the industry is able to maintain worldwide market share to stay at the forefront of technological innovation. As we point out in our report, this focus is not responsive to the specific reporting requirements of section 1211(d)(3) of the Fiscal Year 1998 Defense Authorization Act. While the health of the economy overall, and the computer industry in particular, is an important element of national

security, the act requires that the President's report assess the impact of potential military uses of computers at the new control levels on U.S. national security interests. The President's report notes that computers in the performance range affected by the change in control levels have numerous military applications, but the report does not discuss the possible impact on national security from the use of these computers for such military applications.

Commerce also commented that our estimate of the number of computers approved for export to sensitive end-uses is misleading since it is based on license applications and notifications to which the reviewing agencies objected. Our figures are estimates based on license application data. As we note in the report, the requirement for a license is an indication that the end-use or -user may be connected to the military or a proliferation-related activity.

Scope and Methodology

To address whether the President's report satisfied the three reporting requirements of section 1211 of the Fiscal Year 1998 National Defense Authorization Act (P.L. 105-85), we reviewed the President's report and compared it to the requirements in the law. We also interviewed officials from the Departments of Defense, Commerce, and State and the National Security Council to discuss the report's treatment of these reporting requirements as well as the discrepancies we noted in our analysis.

To assess the factual support for the President's report, we reviewed copies of the studies and other documentation used in preparing the report. We interviewed officials from the Departments of Defense, Commerce, State, and Energy; the Central Intelligence Agency; and the National Security Council to identify the support used as the basis for the report. We also interviewed officials from the major computer and processor manufacturers and the trade group representing the computer industry, and we obtained computer sales data from a consulting firm. We also relied on our previous work on high performance computers.

To identify how many high performance computers were exported to tier 3 countries, we obtained licensing records from the Department of Commerce. We began this analysis in November 1997, when Public Law 105-85 was enacted, and continued through August 27, 1999, when the data was provided to us. We included in our analysis all approved licensed exports and all exports that exporters notified to Commerce and were

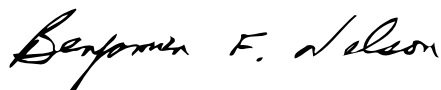
effectively approved for export after no objections were raised by Commerce or the other reviewing agencies.

We determined the number of approved high performance computer exports for military end-users or -uses going to tier 3 countries by identifying all the exports that required an individual validated license. These included those that were initially submitted to Commerce as license applications and those that were submitted as notifications and later converted to formal license applications based on an objection from one of the reviewing agencies. We did not include in our estimate license applications that were denied or returned to the exporter without action. We also did not include in our estimate license applications for computers with performance capabilities above 7,000 MTOPS because those computers always require a license regardless of the end-use or -user. Due to the time constraints on our review, we did not attempt to review each export license to determine which were going to military end-uses or other sensitive destinations.

We conducted our review from August 1999 through October 1999 in accordance with generally accepted government auditing standards.

Unless you publicly announce the contents of this report earlier, we plan no further distribution of this report until 30 days from its issue date. At that time, we will send copies of this report to other congressional committees; the Honorable William S. Cohen, Secretary of Defense; the Honorable Madeleine K. Albright, Secretary of State; the Honorable William M. Daley, Secretary of Commerce; and the Honorable William Richardson, Secretary of Energy. Copies will also be made available to others upon request.

If you or your staff have any questions concerning this report, please call me or Jim Shafer at (202) 512- 4128. Key contributors to this assignment were David Trimble, Eugene Beye, and Claude Adrien.



Benjamin F. Nelson
Director, International Relations and Trade Issues

Computers Approved by the U.S. Government for Export to Tier 3 Countries From November 18, 1997, Through August 27, 1999

Country	Total approved exports ^a			Approved licensed exports that may be going to sensitive end-users or -uses ^b			
	Quantity	Average MTOPS	Highest MTOPS level	Quantity	Percent of total exports	Average MTOPS	Highest MTOPS level
China	1,924	3,610.6	24,750.0	48	2.49	3,111.4	6,436.6
Russia	503	3,624.4	16,063.0	3	0.60	2,791.8	3,062.5
Israel	458	3,857.8	10,440.0	4	0.87	4,956.2	6,287.2
Saudi Arabia	212	9,973.2	28,980.0	2	0.94	3,958.8	5,296.3
United Arab Emirates	191	3,519.6	12,063.0	1	0.52	2,675.0	2,675.0
Algeria	117	2,228.1	5,460.0	0	0	0	0
India	113	3,449.5	11,873.0	79	69.91	3,182.6	6,008.8
Egypt	67	3,803.6	9,661.0	2	2.99	2,062.5	2,062.5
Romania	53	3,280.8	9,143.8	0	0	0	0
Kuwait	52	3,110.8	6,804.0	0	0	0	0
Vietnam	35	2,408.2	3,843.0	0	0	0	0
Kazakhstan	32	7,836.5	21,630.0	0	0	0	0
Oman	24	6,260.4	11,063.0	0	0	0	0
Qatar	31	3,545.7	6,500.0	0	0	0	0
Estonia	28	8,710.3	14,868.0	0	0	0	0
Lebanon	28	3,089.8	5,296.2	0	0	0	0
Ukraine	28	2,391.4	4,063.0	0	0	0	0
Bahrain	26	2,749.6	5,460.0	0	0	0	0
Latvia	26	2,937.7	4,612.6	0	0	0	0
Croatia	23	2,832.5	5,296.3	0	0	0	0
Bulgaria	20	3,471.5	6,780.0	1	5.0	3,461.6	3,461.6
Lithuania	19	4,275.9	8,553.0	0	0	0	0
Jordan	16	2,626.9	6,500.0	0	0	0	0
Angola	14	4,150.3	6,520.2	0	0	0	0
Morocco	11	2,305.7	2,475.0	0	0	0	0
Macedonia	8	2,666.2	4,166.6	0	0	0	0
Yemen	8	2,736.6	4,166.9	0	0	0	0
Serbia	5	2,527.7	2,772.0	0	0	0	0
Azerbaijan	3	3,213.2	5,100.0	0	0	0	0
Belarus	2	2,456.3	2,850.0	0	0	0	0
Bosnia-Herzegovina	2	3,497.8	4,612.6	0	0	0	0
Cambodia	2	2,372.9	2,372.9	0	0	0	0

Continued

**Appendix I
Computers Approved by the U.S. Government
for Export to Tier 3 Countries From
November 18, 1997, Through August 27, 1999**

Country	Total approved exports ^a			Approved licensed exports that may be going to sensitive end-users or -uses ^b			
	Quantity	Average MTOPS	Highest MTOPS level	Quantity	Percent of total exports	Average MTOPS	Highest MTOPS level
Cyprus	2	2,223.6	2,372.9	0	0	0	0
Georgia	2	3,300.0	3,300.0	0	0	0	0
Mauritania	2	2,166.7	2,166.7	0	0	0	0
Tunisia	2	3,166.8	4,166.8	0	0	0	0
Turkmenistan	2	3,023.5	3,300.0	1	50.0	2,747.0	2,747.0
Uzbekistan	1	2,166.7	2,166.7	0	0	0	0
Pakistan	0	0	0	0	0	0	0
Total	4,092	3,567.6	28,980.0	141	3.45	3,216.3	6,436.6

Continued from Previous Page

Note: Data includes authorized exports of computers and processors for computer upgrades. The quantities actually shipped to these countries may be lower.

^a Total approved exports include authorized exports of computers (and processor upgrades) rated above 2,000 MTOPS that did not require a license and approved licensed exports of computers (and processor upgrades) rated above 2,000 MTOPS.

^b Approved licensed exports that may be going to sensitive end users include approved licensed exports of computers (and processor upgrades) rated between 2,000 and 7,000 MTOPS. The requirement for a license is an indication that the end-use or -user might be sensitive. Exports of computers rated between 2,000 and 7,000 MTOPS to countries in tier 3 generally do not require an individual export license unless the export is to military end-users and end-uses or to nuclear, chemical, biological, or missile end-users.

Source: GAO analysis of Commerce Department licensing data.

Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



TECHNOLOGY
SECURITY POLICY

DEPUTY UNDER SECRETARY OF DEFENSE
400 ARMY NAVY DRIVE, SUITE 300
ARLINGTON, VA 22202-2884

October 27, 1999

Mr. Harold Johnson
Associate Director
International Relations and Trade Issues
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Johnson:

The Department of Defense has reviewed the GAO's draft report GAO/NSIAD-00-45 entitled "Export Controls -- Report on Computer Exports Does Not Address All Requirements."

The Administration established new computer control levels based on an assessment of the large volume of certain chips and chipsets to be produced by multiple sources around the world. Specifically, 6,500 mtops and 12,300 mtops were based on 4-and 8-way X86 compatible boards to be produced in millions of units and made available via IBM/Intel distribution chains around the world, making them effectively uncontrollable. We note that technology continues to move ahead. As your report indicates, individual microprocessors that will be sold in the hundreds of thousands per month will soon exceed 3,000 mtops.

With respect to an assessment of the impact on U.S. national security of HPC exports to certain countries of concern, we reiterate that computers at all performance levels are used in virtually all military applications. As with commercial applications, demand for computing power for national security applications tends to immediately rise to the level of computing power available -- that is, computing power used for national security applications is primarily determined by budgetary constraints, not technical constraints. Thus, the report focused on U.S. economic security. As U.S. military strength becomes more dependent on the commercial sector, the U.S. must retain its technological lead in the design, development, and production of computers and microprocessors. This requires timely adjustments in export requirements to assure that U.S. products continue to dominate the global computer marketplace as high levels of computing power become widely available and uncontrollable.

Sincerely,

A handwritten signature in black ink, appearing to read "Dave Tarbell".

Dave Tarbell

See comment 1.

See comment 2.

See comment 3.

See comment 4.

The following are GAO's comments on the Department of Defense's (DOD) letter dated October 27, 1999.

GAO Comments

1. Our report found that while the capabilities of processors are clearly increasing, the source of this supply is largely from generally unrestricted exports from U.S. manufacturers. As DOD notes, the source of this increasing capability comes from U.S. manufacturers and their business partners in other countries. Availability from foreign suppliers is not a critical factor in the administration's decision to change the control levels.
2. It is unclear from DOD's response and the President's report how the administration determined that four and eight-processor-capable computers are uncontrollable. DOD's response states that these systems will be produced in the millions. Data from a 1998 industry study used by DOD and Commerce, however, shows that expected sales in the year 2000 of eight-processor-capable systems will be below 200,000 units and four-processor units will be about 550,000 units. Other factors also suggest that these systems may be controllable: the large majority of these sales will be in the United States and tier 1 countries that appear to have similar export control regulations; the U.S. companies and their foreign subsidiaries are subject to U.S. export control regulations; and, customers wishing to add additional processors to such systems must return to the vendor for assistance.
3. Economic security is an important element of national security. The reporting requirement in section 1211 of the Fiscal Year 1998 Defense Authorization Act, however, specifically requires an assessment of the potential military uses of the newly decontrolled computers on U.S. national security.
4. The President's report did not provide evidence to show how requiring licenses for exports of high performance computers would be a significant burden for industry or compromise its leadership in the design, development, and production of computers and processors. We noted that exports to tier 3 countries are a fraction of U.S. exports of high performance computers. Between January 1996 and September 1997, only 6 percent of U.S. high performance computer exports went to tier 3 countries.

Comments From the Department of Commerce

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



THE SECRETARY OF COMMERCE
Washington, D.C. 20230

NOV - 3 1999

Mr. Harold J. Johnson
Associate Director
International Relations and Trade Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Johnson:

Thank you for providing the Commerce Department with an opportunity to comment on your draft report on the high performance computer export control (GAO code 711449).

Given the very short period allowed for review, we have been unable to pursue some of our questions pertaining to your study with your staff. Nevertheless, the Bureau of Export Administration has prepared several comments for your consideration as you prepare your final report.

Should you have any questions, or need further information, please contact William A. Reinsch, Under Secretary for Export Administration, at (202) 482-1455.

Sincerely,

A handwritten signature in black ink, appearing to read "W. Daley".

William M. Daley

Enclosure

**Appendix III
Comments From the Department of
Commerce**

COMMENTS ON DRAFT GAO REPORT
ON
THE PRESIDENT'S REPORT TO CONGRESS
ON
THE JULY 1, 1999, DECISION ON HPCs
GAO Job Code 711449

We appreciate the opportunity to review the GAO's report on high performance computer export control. However, we must point out that we were only given five days to accomplish this review and clearance. Accordingly, we have been unable to pursue some of our concerns with GAO staff or to complete a thorough examination of all data and assertions contained in the report.

We are pleased that the GAO recognizes that the President's Report to Congress (the Report) did address: 1) the requirement to determine the availability of high performance computers in foreign countries, and 2) the potential for use of the newly decontrolled computers for significant military use.

The GAO also found that agency studies and data from the computer industry supported the Report's conclusions. The GAO found that the assertion that "the capabilities of high performance computers are increasing is supported."

The GAO, however, asserts that the Report did not fully satisfy the requirements of section 1211 of the 1998 NDAA because the Report did not **directly** assess the impact of potential uses of military significance on the national security interests of the United States. However, in fact, the Report states unequivocally that computers at all levels have potential military applications. Indeed, because computer exports have a national security dimension, they are subject to export control.

Although the GAO adds the word "directly" as a modifier to the word "assess," the term "directly" is not used in the NDAA provision itself, and the NDAA does not require a "direct" assessment. It is clear from other parts of the GAO's review that it believes that the Report should have contained specific assessments and provided detailed examples of how exported computers were used in military applications in other countries. The Report, however, observes the language of the statutory provision and contains a section entitled: 3) Assess the Impact of Such Uses on the National Security Interests of the United States.

The GAO states that "no assessment was performed on how exported computers sold under the new control levels **could** impact national security." We respectfully disagree with this conclusion. The Central Intelligence Agency, the Department of Defense, and the Department of Energy were consulted on the security implications of exports of computers. All reviewed the Report before its submission, and the Report clearly notes that computers at all levels, including those under the new control levels, have potential military applications. The Report also points

See comment 1.

**Appendix III
Comments From the Department of
Commerce**

out that **all** the weapons in the U.S. arsenal, including nuclear weapons, were built using computers with speeds between 500 and 1000 MTOPS.

Accordingly, the Report, while conceding that computers have a range of military applications with national security consequences, properly identifies the most serious national security issue: The reliance of the U.S. military on the high performance computer industry and the need to ensure that the industry is able to maintain its worldwide market share and to stay at the forefront of technological innovation.

See comment 2.

The GAO appears to criticize the Report for discussing the economic importance of the high performance computer industry. However, as the Report sets forth, the economic health of the industry is critical to its ability to continue to provide the U.S. military with leading edge products -- clearly a national security issue. The Report further points out that the failure to adjust export requirements for computers would have a significant negative effect on the U.S. computer industry, again with national security implications.

In sum, the report does fully assess the impact of potential military uses on our national security -- acknowledging the potential military applications of computers with capabilities below the established level and at the new proposed level, observing that computers capable of a wide range of military uses already are available to Tier 3 countries. We focused on what we believe is the key national security question: ensuring that the U.S. military continues to have access to the most sophisticated leading edge products in the world.

See comment 3.

In several places, the GAO cites industry data, including performance information and approved license applications. If this information was provided directly to the GAO by industry, GAO should observe any business confidential restrictions negotiated with the companies. However, if this information was obtained from Commerce documents, including export licenses, restrictions consistent with the provisions of Section 12(c) of the Export Administration Act may apply, and the information should not be made public without Commerce's permission.

See comment 4.

The GAO states that the Report "implies that there is a higher level of foreign competition than is factually supported." However, the Report does not contest the fact that U.S. companies are preeminent in the HPC field and have the lion's share of the world market. The Report just stresses that it is essential to maintain this position. The Report accurately points out that there are **potential** competitors internationally. In such a fast-moving technology, market share can shift rapidly. Overly restrictive export controls can contribute to such shifts. And while the GAO accurately points out that many potential competitor nations maintain computers on export control lists, it fails to recognize that the export licensing policies and practices of other countries may and do vary widely, especially to countries in Tier III, such as China, Russia, and India.

See comment 5.

The GAO states that the Commerce Department **approved** 4,090 export licenses to Tier III countries from November 18, 1997 through August 27, 1999 (page 2). In another place in the report (page 15 and in the final chart), GAO states that these items were **exported**. The variation in language with the GAO study makes it unclear to us whether the GAO intends to measure the number of exports or approvals.

See comment 6.

**Appendix III
Comments From the Department of
Commerce**

Indeed, it is not clear where GAO obtained this information. If it was from NDAA notification submissions, it is important to realize that notifications do not equate to actual computer exports. In fact, the NDAA notifications often contain items other than computers, such as peripherals or components. While we have not had adequate time to confirm any of the numbers used in the GAO study, our data indicates that the number of items listed in notifications that actually end up being computer exports is significantly smaller. In addition to the fact that many of the items listed are not computers, many proposed computer sales will be lost. In other cases, companies may decide to provide computers from foreign sources not subject to the notification process or to U.S. export controls. Some notifications will be speculative, and sales will not actually be realized. We suggest meeting with the GAO staff to resolve this possible discrepancy.

See comment 7.

More troubling, the GAO asserts that 141 of these computer exports were to “sensitive end uses or end users... [who] may be connected to the military or may in some other way be sensitive.” It appears as if the GAO bases this assertion on the fact that the GAO determined that 141 is the number of NDAA notifications converted to export licenses and approved during this period. It is not appropriate to equate 141 conversions of NDAA notifications to approved licenses with the conclusion that these were exports to “sensitive end uses or end users... [who] may be connected to the military or may in some other way be sensitive.”

See comment 8.

NDAA notifications are converted to license applications at the request of any agency, including Defense, State, Energy, and Commerce. Usually, the request is made because the end user is not known and its reliability cannot be determined in the ten days allowed for reviewing NDAA notifications. Those same agencies, after gathering additional information, approved the transactions because they determined that the export would **not** be contrary to U.S. national security interests. Thus, to imply that there may have been something improper in approving sales to the “sensitive end users” and to say that the export “may have been for military use” is not justifiable.

See comment 9.

Finally, the GAO recommends that the Secretary of Commerce develop specific criteria defining both “widely available” and “controllability.” These terms are neither more nor less precise than the statutory terms “sufficient” quantity and “comparable” quality. All require judgment. However, we appreciate the GAO’s suggestions, and as the Department proceeds to work with the Congress in the renewal of the Export Administration Act, we will explore with the Congress the utility of further defining these terms.

The following are GAO's comments on the Department of Commerce's letter dated November 3, 1999.

GAO Comments

1. Section 1211 of the National Defense Authorization Act for Fiscal Year 1998 requires that the President's report to Congress "at a minimum . . . address all potential uses of military significance to which high performance computers at the new control level could be applied; and *assess the impact of such uses on the national security interests of the United States*" [emphasis added]. The President's report concluded that there are militarily significant applications in the new control range, but it did not assess the impact of these applications on the national security interests of the United States. Instead, the report discussed the national security interest of ensuring the country's technological advantage in computers and discussed the impact a failure to adjust the control levels could have on U.S. industry.
2. Economic security is an important element of national security. However, the reporting requirement in section 1211 of the Fiscal Year 1998 Defense Authorization Act specifically requires an assessment of the potential military uses of the newly decontrolled computers on U.S. national security. Furthermore, the President's report does not provide evidence to show how requiring licenses for exports of high performance computers would be a significant burden for industry or compromise its leadership in the design, development, and production of computers and processors. Exports to tier 3 countries are a fraction of U.S. exports of high performance computers. Between January 1996 and September 1997 only 6 percent of U.S. high performance computer exports went to tier 3 countries.
3. The information on processor performance speeds was provided by industry for inclusion in this report. The information presented in this report on license applications is aggregate data, and thus its use is consistent with section 12c of the Export Administration Act.
4. We agree with Commerce's observation that the President's report does not provide evidence of significant foreign sources of high performance computers. As Commerce indicates, the President's report cites "potential competitors" and suggests that the proposed changes in control levels are based, in part, on potential foreign availability. The President's report, however, does not explain in what time frame this potential competition might develop, how contingent its development is on U.S. technology, or

how likely it is to occur given the large capital investments needed to develop certain technologies.

5. The President's report does not provide information on the effectiveness of other countries' export control systems to assess whether they effectively limit the widespread availability of high performance computers. The export licensing practices of other countries is a critical factor in assessing the administration's conclusion that high performance computers are widely available and are therefore uncontrollable. Without such information and definitions of "widely available" and "controllability," it will be difficult to assess the basis for any future changes in the export control levels for high performance computers.

6. We have incorporated the suggested changes to make clear that our data refers to license applications and notifications for high performance computers and processor upgrades and not actual shipments.

7. Our data on the numbers of export applications for exports going to sensitive end-users or -uses is an estimate. We believe our approach in developing this estimate is sound. The requirement for a license is an indication that the end-user may be connected to the military or the end-use or -users are sensitive. As our report notes, licenses are required if the end-use or -user is connected to the military. Further, a license is required if State, DOD, Energy, or Commerce objects to an export notification. According to guidance from the National Security Council, agency objections shall state whether the proposed export represents a risk of diversion to a military end-user or end-user of proliferation concern.

8. We disagree with Commerce's statement that objections to export notifications from DOD, State, Energy, and Commerce are usually based on a lack of information about the end-user. In a 1999 review, we examined the notification process for high performance computers and the objections raised by the reviewing agencies.¹ We reported that of the 939 notifications we examined, agencies raised objections to 101 of the proposed exports. The majority of the agencies' objections to the 101 proposed exports were based on concerns that the end-users of the computers might have been involved in military or proliferation-related activities. Furthermore, our review of the data does not support Commerce's suggestion that once

¹ See *Export Controls: 1998 Legislative Mandate for High Performance Computers* (GAO/NSIAD-99-208, Sept. 24, 1999).

Additional information is gathered, these exports are no longer determined to be sensitive. Of the 101 license applications that were required after reviewing the notifications, only 16 were subsequently approved. Seventy-nine were returned to the exporters without action, which essentially blocks the proposed export, and 6 were denied. Moreover, the licenses that were approved had additional conditions placed on the reexport or end-use of the computers.

9. The terms “sufficient quantity” and “comparable quality” are used in the Export Administration Act to define foreign availability. The President’s report, however, does not define either “widely available” or “controllability” or explain how these terms were applied in setting the proposed control levels. Applying these terms clearly requires judgment. However, Congress will neither be able to understand nor assess the judgments reached unless Commerce develops specific criteria defining these terms.

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