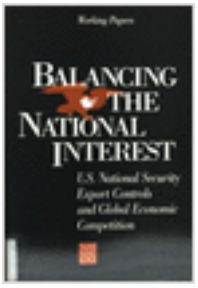

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BALANCING THE NATIONAL INTEREST

U.S. National Security Export Controls and Global Economic Competition

Panel on the Impact of National Security Controls on International Technology Transfer

Committee on Science, Engineering, and Public Policy (U.S.)

National Academy of Sciences
National Academy of Engineering
Institute of Medicine

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PANEL ON THE IMPACT OF NATIONAL SECURITY CONTROLS ON INTERNATIONAL TECHNOLOGY TRANSFER

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Carnegie Corporation of New York, the Charles E. Culpeper Foundation, the William and Flora Hewlett Foundation, the John D. and Catherine T. MacArthur Foundation, the Andrew W. Mellon Foundation, and the Rockefeller Foundation.

Preface

The United States in cooperation with its allies has imposed controls since 1949 on exports to the Soviet bloc of commercial goods and information that would be of significant value to Warsaw Pact military systems. Since the late 1970s, there has been significantly increased concern in the United States about Soviet success in acquiring and applying this commercial Western technology, a concern that was translated into a vigorous effort to improve the effectiveness of national security export controls. The Department of Defense spearheaded this initiative, which has resulted in substantial strengthening of controls on dual use technology (i.e., items with both commercial and military application), primarily under the authority of the Export Administration Act of 1979, as amended. These stricter controls, however, have caused broad concern about unintended effects that may dampen the vigor of U.S. research and technology development and unnecessarily impede trade in high-technology goods.

In 1982 a panel of the National Academy complex (now known as the Corson panel after its chairman Dale Corson) examined the effect of national security export controls on the communication of basic scientific research. The results of that study led to an executive branch policy intended to minimize restraints on the vital free flow of scientific results and research findings. During the ensuing period, representatives of industry and research institutions in the United

States expressed misgivings about the effect of export controls on the U.S. international competitive position, and this national controversy also required an objective examination. As a result the leadership of the National Academy complex decided in 1984 to organize a second panel to examine the effect of export controls on commercial trade in high-technology goods and information and on the vigor of U.S. high-technology industry.

The new panel recognized from the outset that Western military security depends in part on the technology advantages of the West as compared to the Soviet Union and that some restrictions on the flow of technology of military importance are indeed necessary. Furthermore, the panel was aware of the vital importance of maintaining the West's technological advantage through continued technological progress. It also took note of the fact that a 1976 study of the Defense Science Board (known as the Bucy report) had provided much of the theoretical basis from which to examine the current situation.

The panel found it appropriate to narrow and focus its efforts. Although controls for foreign policy purposes, controls on transfer of nuclear technology, and controls on arms transfer are all part of the total U.S. export control policy, in accordance with our charge we have focused on national security export controls (as specified by the Export Administration Act of 1979, as amended) imposed on dual use technology. Moreover, although certain countries other than the members of the Warsaw Pact are affected by U.S. national security export controls, we have focused primarily on issues relating to the Soviet Union and its Eastern bloc allies due to their central importance to the problem. We also have given particular attention to the role of friendly and neutral Free World nations that are not members of CoCom (the Coordinating Committee on Multilateral Export Controls), countries that may now or in the future be sources of indigenous technology and potential channels of West-East technology transfer.

The panel shares the concerns of many regarding the health of U.S. high-technology industries and the effect on national security of declining U.S. leadership in various sectors. We have, for example, taken note of other recent studies that address the loss of manufacturing capability in the semiconductor industry and the problems associated with defense procurement. Our focus in this study–and the overall effect of export controls–does not minimize the importance of other measures needed to retain and improve the vitality

of high technology in the United States and its contribution to U.S. military security.

Perhaps not surprisingly the panel found the central problem of this study to be extraordinarily complex and initially difficult to grasp in its totality. Moreover, we determined that reliable quantitative data regarding the effectiveness of controls–and the impact of controls on economic development and trade–continue to be very difficult to obtain. Nevertheless, at the conclusion of its efforts the panel was convinced that it had reviewed and considered sufficient information to justify its findings and recommendations. It was unanimous in the adoption of these views.

It is clear that, for this complex problem, there are valid competing interests to be weighed in considering the course of action that will be most effective in enhancing U.S. national security. The panel hopes that this report serves to identify and explain these important issues and that our findings and recommendations will be useful to those who bear the responsibility for formulating and implementing wise policy.

The panel is grateful for the assistance provided by the liaison representatives of the various federal agencies and by the hundreds of individuals and private organizations, both in the United States and abroad, who cooperated in providing information for this study. We also wish to thank the professional staff, directed by Mitchel Wallerstein, which so ably organized the panel's briefings and foreign fact-finding missions and laboriously wrote and rewrote the many preliminary drafts of this report. Finally, I personally wish to thank the members of the panel for their dedicated service in this lengthy and sometimes contentious effort.

LEW ALLEN, JR.
Chairman

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BALANCING THE NATIONAL INTEREST

Introduction

MITCHEL B. WALLERSTEIN
Project Director

As part of its efforts to understand the full complexity of the issues associated with the national security export control problem—and in part to illuminate questions raised during the course of its deliberations—the Panel on the Impact of National Security Controls on International Technology Transfer commissioned a series of background working papers, some of which were prepared by outside consultants and others by the panel's professional staff. In all, the panel reviewed a total of 13 such papers on a wide variety of topics. Because of space limitations and because some of the papers were prepared for the panel on a confidential or classified basis, it was not possible to publish all of the studies. Nevertheless, we present here 7 of the unclassified papers, each representing a significant contribution to the public literature pertaining to international technology transfer and national security export controls.*

The first paper, "The Role of Foreign Nationals in U.S. Science

*Two additional consultant papers are included in the main volume of the report: Stephen A. Merrill, "Operation and Effects of U.S. Export Licensing for National Security Purposes"; and William F. Finan, "Estimate of Direct Economic Costs Associated with U.S. National Security Controls." In addition, two other papers commissioned by the panel are available for a nominal fee from the National Academy Press through the "Papers on Demand" program: William F. Finan and Karen M. Sandberg, "Analysis of the Effects of U.S. National Security Controls on U.S.-Headquartered Industrial Firms"; and Stephen A.

and Engineering," was prepared by one of the panel's staff consultants, *Stephen B. Gould.* Gould examines the various channels through which foreign nationals contribute to the U.S. research and development infrastructure and some of the current constraints on the transfer of certain categories of technical data to foreign nationals. The analysis also considers whether existing national security export controls represent an unwarranted barrier to the employment of foreign nationals in high-technology sectors in the United States.

Stephan E. Becker and *Harold P. Luks* contributed a paper entitled "Corporate Compliance with the National Security Controls of the Export Administration Regulations." This study reviews the specific activities required of companies that wish to remain in legal compliance with the Export Administration Regulations (EAR). The structure and general requirements of EAR are summarized, including the severe sanctions that may be imposed for violations; in addition, the authors analyze each EAR element with which a company must deal as it undertakes an export transaction.

The paper by *Charles H. Ferguson*, "High-Technology Product Life Cycles, Export Controls, and International Markets," explores the relationships between commercial and military components of dual use, high-technology product life cycles and the implications of the fact that commercial applications now lead military procurement in most high-technology areas. The impact of export control policy on commercial-military product discontinuities is examined, together with the possibility of shortening the lag between commercial and military use of a new technology.

Harold P. Luks also contributed a second paper, "U.S. National Security Export Controls: Legislative and Regulatory Proposals." This report examines a series of specific national security export control measures that have been proposed in recent years in the U.S. Congress or by the Departments of Commerce and Defense. The measures were intended to accomplish two compatible goals: (1) substantially reduce the scope of U.S. export controls and (2) enhance the ability of the federal government to forestall the illegal diversion of goods and technologies. The paper also notes a general lack of information on the operation and efficacy of U.S. and other foreign export control systems.

Cormac P. Walsh prepared "National Security Controls and

Merrill, "International Business Under the Distribution License: A Base-Line Survey of U.S. Companies."

Transborder Flows of Technical Data." The paper provides an overview of the U.S. national security export controls as they affect technical data flows, and it assesses their effectiveness and impact on West-West trade.

The increasing emphasis that the People's Republic of China has placed on the acquisition of foreign technology to support its modernization program prompted the panel's commissioning of a paper by *Denis Fred Simon*. His study, "Technology Transfer and Sino-U.S. Relations: The Critical Issues," analyzes the economic and technological problems encountered by the Chinese in their drive for modernization; it also considers the advisability of further changes in U.S. national security export controls vis-à-vis China in view of the substantial political uncertainties still facing that country.

Finally, *William A. Root, Solveig B. Spielmann,* and *Felice A. Kaden* prepared "A Study of Foreign Export Control Systems." To the best of our knowledge, this is the first published cross-national comparison of national security export control systems. The paper examines the control policies and procedures of seven countries: Canada, the United Kingdom, France, the Federal Republic of Germany, Japan, Austria, and the Republic of Korea. It considers areas of compatibility and incompatibility and also some of the difficulties the latter present for multilateralization of the export control process.

U.S. national security export controls constitute an extraordinarily complex public policy regime. As a result, it was necessary for the panel and its professional staff to undertake a broad range of inquiry to understand not only how the controls operate (or are supposed to operate) but also the character and extent of the problems associated with or resulting from the control effort. The papers presented here are representative of the scope of issues considered by the Allen panel during the course of its deliberations. It is our sincere hope that this companion volume will prove useful to researchers and practitioners alike.

The Role of Foreign Nationals in U.S. Science and Engineering

STEPHEN B. GOULD*
Staff Consultant

INTRODUCTION

The U.S. economy increasingly is based on scientific and technical activities. Between 1976 and 1983, employment of scientists and engineers increased more than three times as rapidly as total U.S. employment, almost three times as rapidly as real gross national product, and two times faster than total professional employment. As a result, scientists and engineers accounted for 3.4 percent of the U.S. work force in 1983—up from 2.6 percent in 1976. Over the 1980-1983 period, employment growth for scientists and engineers accelerated, while the increase in overall employment and other resource indicators slowed considerably.[1]

The employment of scientists in industry rose by an average of 8.9 percent per year from 1976 to 1983, while engineering employment rose 6 percent per year. This was considerably above the 2 percent per year increase for all industrial employment. Growth in science and engineering employment was led by an increase in the employment of computer specialists, at a rate of almost 18 percent

*Stephen B. Gould is also director of the Project on Scientific Communication and National Security of the Committee on Scientific Freedom and Responsibility, American Association for the Advancement of Science.

per year. This suggests that industry is becoming increasingly reliant on science and technology to improve its products and processes. In 1983 U.S. industry employed more than 1.5 million engineers and 780,000 scientists.[2]

The participation of foreign-born individuals in science and engineering in the United States is already substantial, and it is growing steadily. The science and engineering work force uses two kinds of immigrant scientists and engineers: those who have become U.S. citizens and those who currently are not. As of 1982 foreign-born individuals accounted for about 17 percent of the employed scientists and engineers in the United States. In 1972, 10 percent of the science and engineering work force was foreign born. Most of these individuals are naturalized U.S. citizens. About 3.5 percent of the science and engineering work force in 1982 were not U.S. citizens. Engineers are more likely than scientists to be foreign born (18 percent versus 14 percent in 1982).[3]

Foreign-born U.S. scientists and engineers make substantial contributions to U.S. science and engineering. On average, one out of every three Nobel prizes awarded to Americans has been won by a foreign-born scientist. Foreign-born U.S. scientists have won 20 percent of all Nobel prizes since World War II. Approximately 20 percent of the members of the National Academy of Engineering are foreign-born U.S. citizens.[4]

Because naturalized citizens have legal rights that are almost identical to those of native U.S. citizens, public policy concerns about immigrants tend to focus on those whose legal status is "foreign national." However, data on both kinds of immigrants must be examined to obtain an accurate picture of the importance of the inflow of foreign nationals to the U.S. science and engineering work force. If the rate of naturalization speeds up, the United States may experience an increased dependence on inflows of foreign national scientists and engineers; but this increase would not necessarily be observable from data on foreign nationals alone.[5]

Foreign graduate students constitute another type of science and engineering resource. Graduate students provide much of the manpower for academic research in the United States. Foreign students tend to be concentrated in certain disciplines such as engineering and are primarily enrolled at the graduate level at doctorate-granting institutions. As a result, their impact on those disciplines is greater than their overall participation—less than 3 percent of total higher education enrollment—would suggest.[6]

This report reviews what is known about the role of foreign nationals in academic institutions and the role such individuals play in the science and engineering work force in the United States. The section below discusses national security export controls that potentially limit the transfer of technical information to foreign national scientists and engineers in the United States. Indeed, concerns that such controls may unduly hamper the beneficial employment of foreign nationals by U.S. institutions prompted this report.

NATIONAL SECURITY EXPORT CONTROLS ON TECHNICAL DATA

The Export Administration Regulations (EAR) define the term *technical data* as "information of any kind that can be used, or adapted for use, in the design, production, manufacture, utilization, or reconstruction of articles or materials." The data can be tangible (a prototype, blueprint, or operating manual) or intangible (technical advice). Technical data controls apply to the export of technical data in any fashion. The most obvious means of export is the actual shipment or transmission of such data out of the United States. But the controls also apply to less-obvious "exports," such as the transfer of technical information to foreign nationals within the United States, oral exchanges of information with foreigners in the United States or abroad, visual inspection by foreign nationals of U.S.-origin equipment and facilities, and the application to situations abroad of personal knowledge or technical experience acquired in the United States.[7]

The International Traffic in Arms Regulations (ITAR) set forth controls on the export of technical data relating directly to defense articles (arms, ammunition, and implements of war) and defense services. The term *technical data* is defined in ITAR as: (1) classified information relating to defense articles and defense services; (2) information covered by an invention secrecy order; and (3) unclassified information that is directly related to the design, engineering, development, production, processing, manufacture, operation, overhaul, repair, maintenance, or reconstruction of defense articles. The ITAR definition of technical data includes information that advances the state of the art of articles on the U.S. Munitions List. "Defense articles" means any item of hardware designated on the U.S. Munitions List. Information in the public domain is not considered to be

technical data subject to ITAR controls. General mathematical and engineering information also is not included in this definition.[8]

The availability of two general licenses under EAR substantially limits the constraints that national security export controls may place on the transfer of technical information to foreign nationals. General license GTDA authorizes such transfers to all individuals, without regard to nationality, if the technical data have been made generally available to the public in any form. The GTDA license also applies if the material is scientific data or data used in instruction in academic institutions and laboratories that are not directly and significantly related to design, production, or utilization in industrial processes.[9] A proposed EAR revision authorizes a general license GTDA for all technical information arising from research that is not subject to restrictions on publication or dissemination imposed by the sponsor—even if the information has not been made publicly available.[10]

General license GTDR authorizes the transfer of most technical data not exportable under general license GTDA to foreign nationals who are citizens of Free World nations, subject to specified restrictions, exclusions, and exceptions set forth in EAR. Technical data that are subject to some of these limitations cannot be transferred to such foreign nationals without written assurance from the individual that the data will not be transferred to individuals who are citizens of the Commerce Department's country groups Q, S, W, Y, or Z,[11] Afghanistan, or the People's Republic of China.

A validated license is required for the export of all technical data that are ineligible for GTDA or GTDR licenses. For Free World destinations, validated licenses are required for technologies specifically described in an export control commodity number (ECCN) entry on the U.S. Control List and for the types of data listed in EAR Sections 379.4(c) and 379.4(d), which include data relating to such areas as nuclear technology, civil aircraft, airborne electronic direction-finding equipment, hydrofoil and hovercraft watercraft, and infrared imagery equipment. Validated licenses also are required for all exports of technical data to Communist countries that are not covered by general license GTDA or that fall into one of two very limited situations in which the GTDR license may be used.[12]

A proposed revision to EAR Section 379.4 would authorize U.S. firms and universities, under general license GTDR, to release technical data otherwise exportable only under an individual validated

license when the data are being transferred to employees who are foreign nationals. To qualify, the foreign national must reside throughout the period of employment in the United States and must assure the employer that the technical data will not be transferred to other foreign nationals, except as permitted in EAR, without the written consent of the Department of Commerce. Citizens of a country listed in country groups Q, S, W, Y, and Z, Afghanistan, or the People's Republic of China would not qualify. Technical data restricted by either Section 379.4(c) or 379.4(d) could not be released under this proposal.[13]

If technical data are controlled under ITAR, a license or approval must be obtained from the State Department's Office of Munitions Control before the data are exported to any destination, or disseminated to foreign nationals. No general licenses or GTDR equivalents are available. Department of Defense approval for public dissemination eliminates any licensing requirement under ITAR, even if the technical data result from non-DoD research and development.[14]

THE CONTRIBUTION OF IMMIGRATION TO THE U.S. SCIENCE AND ENGINEERING WORK FORCE

Approximately 9,500 scientists and engineers emigrated to the United States in 1984 including 6,100 engineers, 1,500 natural scientists, and 1,400 computer specialists. During a 5-year period ending with 1984, more than 50,000 scientists and engineers were admitted to the United States as immigrants.[15]

The immigrant scientists and engineers admitted to the United States in 1984 were distributed by occupation in roughly the same proportions as the U.S. population of scientists and engineers, with engineers constituting 65 percent of the inflow. This distribution is shown in Table 1.

The largest proportion of immigrant scientists and engineers comes from the Far East, accounting for 40 percent of the total in 1984. Scientists and engineers emigrating from Eastern Europe accounted for 8 percent of the inflow in 1984. Table 2 indicates the region of birth of scientists and engineers admitted as immigrants in 1984. Table 3 shows the age distribution of these individuals.

TABLE 1 Admission of Immigrant Scientists and Engineers by Occupational Group, 1984

Occupational Group	Percentage
Engineers	65
Mathematicians/computer specialists	15
Natural scientists	14
Social scientists	6

SOURCE: National Science Foundation, based on data of the Immigration and Naturalization Service, U.S. Department of Justice.

TABLE 2 Scientists and Engineers Admitted as Immigrants in 1984, by Region of Birth

Region	Percentage
Far East	40
Western Europe	16
Near and Middle East	16
North and Central America	9
Eastern Europe	8
South America	5
Africa	5
Other	1

SOURCE: National Science Foundation, based on data of the Immigration and Naturalization Service, U.S. Department of Justice.

TABLE 3 Scientists and Engineers Admitted as Immigrants in 1984, by Age Group

Age Group	Percentage
45 and over	12
30 to 44	52
Under 30	36

SOURCE: National Science Foundation, based on data of the Immigration and Naturalization Service, U.S. Department of Justice.

THE FOREIGN STUDENT POPULATION IN THE UNITED STATES

During the 1983–1984 school year, approximately 339,000 foreign students were enrolled in U.S. institutions of higher education. Total enrollment in U.S. institutions of higher education was approximately 12.3 million. Almost 50 percent of the foreign students were in science and engineering (S&E) fields, a share that has remained steady for 20 years.[16]

Almost 60,000 foreign nationals were full-time graduate students in doctorate-granting institutions in S&E fields, and they accounted for nearly 25 percent of all S&E graduate students. The proportion of foreign graduate students is higher in certain fields, particularly in engineering where it is approximately 42 percent. For some engineering subfields (civil, electrical, mechanical), it is even greater.

Growth in foreign student participation in S&E graduate education exceeds that of U.S. citizens. The population of foreign S&E graduate students has grown considerably since 1976, when 34,400 such students constituted 16 percent of graduate students in doctorate-granting institutions. Total full-time enrollment in graduate S&E programs grew by 6 percent between 1980 and 1983. Foreign student enrollment accounted for 85 percent of the net growth. Table 4 indicates the enrollment of foreign S&E graduate students by field in 1976 and 1983.

In most science and engineering fields and subfields, the proportions of degrees awarded to foreign nationals have increased steadily since the mid-1970s. Approximately 12,900 bachelor's degrees, 9,700 master's degrees, and 2,900 doctorates in S&E fields were granted in 1981 to foreign nationals holding only temporary visas.[17] Approximately 28 percent of all engineering master's degrees were awarded to foreign nationals, as well as 22 percent of all computer and information sciences master's degrees, 18 percent of all mathematics master's degrees, and 15 percent of all physical sciences master's degrees.[18]

Foreign national students earn a particularly large proportion of doctorates from U.S. universities. Approximately 38 percent of all engineering doctorates were awarded to foreign nationals in 1981, as well as 24 percent of all doctorates in mathematics, 21 percent of all doctorates in computer and information sciences, and 17 percent of all doctorates in the physical sciences.[19] The percentage of doctorates awarded to foreign nationals in engineering fields has commanded much attention in recent years since Ph.D. awards to U.S. students

TABLE 4 Foreign Nationals as a Percentage of All Full-time Graduate Students in Doctorate-granting Institutions, by Field, 1976 and 1983

Field	1976 Total	Foreign	Percent	1983 Total	Foreign	Percent
Science	173,575[a]	21,174	12.2	180,835[a]	33,967	18.8
Physical	21,590	4,428	20.5	24,476	7,028	28.7
Biological	35,624	3,532	9.9	35,263	5,350	15.2
Mathematical	10,281	2,179	21.2	10,323	4,087	39.6
Engineering	36,231	12,221	33.7	53,553	22,409	41.8
Chemical	3,657	1,537	42.0	5,790	2,201	38.0
Civil	6,892	1,986	28.8	9,957	4,275	42.9
Electrical	8,063	2,719	33.7	12,843	5,661	44.1
Industrial	3,475	1,037	29.8	3,917	1,431	36.5
Mechanical	4,861	1,791	36.8	8,199	3,955	48.2
All other	9,283	3,151	33.9	12,847	4,886	38.0
Computer sciences	4,283	1,005	23.5	9,258	3,530	38.1
TOTAL	214,089	34,400	16.1	243,646	59,906	24.6

[a]These figures include all full-time science graduate students in doctorate-granting institutions.

SOURCE: National Science Foundation.

have declined at a time when demand has been increasing. Table 5 indicates the numbers and percentages of these awards in 1973 and 1983.

The number of foreigners holding postdoctorate appointments in U.S. universities—about 7,500—has been stable during the early 1980s. These foreign postdoctorates, some of whom received their degrees in the United States and some abroad, constitute about 36

TABLE 5 Foreign Recipients of Doctorates in Selected Engineering Fields, 1973 and 1983

Field	1973 Total	Foreign	Percent	1983 Total	Foreign	Percent
Chemical	408	161	40.3	349	176	52.1
Civil	357	177	50.1	379	229	62.7
Electrical	787	247	31.8	517	270	25.3
Industrial	109	20	19.4	86	56	67.5
Mechanical	364	126	34.9	311	179	59.7

SOURCE: National Science Foundation and the National Research Council.

TABLE 6 Estimated Inflow of Foreign National Scientists and Engineers to the U.S. Labor Market in 1981

	No U.S. Degree	Degree from a U.S. University	Total
Engineers	1,990	6,502	8,492
Ph.D. engineers	209	475	684
B.S. and M.S. engineers	1,781	6,027	7,808
Scientists	1,338	4,955	6,293
Ph.D. scientists	302	553	855
B.S. and M.S. scientists	1,036	4,402	5,438

SOURCE: Oak Ridge Associated Universities.

percent of all postdoctorates, a proportion that also has been stable in the 1980s. In 1983, 63 percent of postdoctorates in engineering at doctorate-granting institutions were held by foreign nationals, as were 55 percent of postdoctorates in computer sciences, 54 percent of postdoctorates in the physical sciences, and 53 percent of postdoctorates in the mathematical sciences.[20]

FOREIGN STUDENTS ENTERING THE U.S. WORK FORCE

Foreign students who chose to remain in this country to work made up about 80 percent of the estimated inflow of foreign scientists and engineers to the U.S. work force in 1981. Of the approximately 17,100 foreign national scientists and engineers who entered the U.S. work force in 1981, 80 percent held a degree from a U.S. university (see Table 6). Some of these individuals received science and engineering degrees in 1981.[21]

Table 7 indicates the estimated percentage of B.S. and M.S. graduates from the 1976-1979 period who were employed in the United States in 1982. Table 8 presents estimates prepared by Oak Ridge Associated Universities of the proportion of foreign national doctorate recipients from U.S. universities working in the United States in 1982. The estimates in Table 8 are limited to those who were awarded doctorates in 1981 and 1982.

Foreign nationals account for a large percentage of the most highly educated individuals entering the U.S. science and engineering work force. Table 9 presents estimates by Oak Ridge Associated

TABLE 7 Estimated Percentage of Foreign National B.S. and M.S. Graduates in Science and Engineering, 1976-1979, Who Were Employed in the United States During 1982

Degree Fields	B.S.	M.S.
Mathematics and computer sciences	100	72
Physical sciences	54	36
Engineering	48	62
Life sciences	27	50
Social sciences	5	42

SOURCE: Oak Ridge Associated Universities.

Universities of foreign nationals as a percentage of all new entrants to the U.S. work force holding a Ph.D. At least one-third of Ph.D. engineers entering the U.S. work force are foreign nationals. However, because no specific data are available indicating the extent to which these individuals are likely to obtain U.S. citizenship, the full implications of this dependence are not clear.

TABLE 8 Estimates of the Proportion of Foreign National Doctorate Recipients from U.S. Universities (Classes of 1981 and 1982 Combined) Working in the United States in 1982

Discipline	Estimates		
	Low	Midcase	High
Engineers	60.5	62.0	63.5
Civil	41.1	42.1	43.0
Chemical	67.7	69.5	71.2
Electrical	73.0	74.9	76.8
Mechanical	69.6	71.3	73.0
Aeronautical/industrial	45.4	46.4	47.4
Computer/computer science	60.1	61.3	62.6
All other	58.1	59.6	61.2
Life sciences	38.7	40.2	41.7
Social sciences (including psychology)	38.4	39.6	40.9
Physical science/mathematics	55.4	56.4	59.4

SOURCE: Social Security Administration.

TABLE 9 Foreign Nationals as a Percentage of All Ph.D. New Entrants to the U.S. Labor Force, 1980-1981

Discipline	Percentage
Engineering and computer science	36.1
Civil engineering	38.7
Chemical engineering	45.9
Electrical engineering	36.6
Mechanical engineering	44.5
Aeronautical/industrial engineering	32.5
Computer engineering/computer science	23.5
All other engineering	34.4
Life sciences	7.5
Social sciences (including psychology)	5.5
Physical science/mathematics	14.9

SOURCE: Oak Ridge Associated Universities.

FOREIGN NATIONALS IN THE U.S. SCIENCE AND ENGINEERING WORK FORCE

Overall, foreign nationals do not account for a significant percentage of U.S. scientists and engineers. In 1982 foreign nationals generally accounted for less than 5 percent of all scientists and engineers employed in the United States. Naturalized U.S. citizens, however, do represent a sizable proportion of the S&E population. Table 10 shows the distribution of scientists and engineers by citizenship status.

Table 11, which shows the proportion of employed scientists and

TABLE 10 Distribution of Scientists and Engineers by Immigrant Status and Field, 1982

Category	Percentage of Native U.S. Citizens	Percentage of Foreign Nationals	Percentage of Naturalized U.S. Citizens
Computer scientists	87.1	2.9	10.0
Mathematical scientists	81.5	5.2	13.3
Physical scientists	83.5	4.2	12.2
Engineers	81.5	3.5	14.9
Life scientists	84.8	4.0	11.2
Psychologists	89.0	1.0	10.0
Social scientists	85.1	3.8	11.1

SOURCE: 1982 postcensal survey.

TABLE 11 Employed Scientists and Engineers by Primary Work Activity and Citizenship Status, 1982

Work Activity	Percentage of Foreign Nationals	Percentage of Naturalized U.S. Citizens	U.S. Total
R&D management	4.7	6.2	6.2
Management, other	5.9	11.0	12.6
Teaching/training	10.6	7.3	9.2
Basic and applied research	17.5	10.5	10.3
Development	18.5	15.5	14.4
Design	13.4	11.7	10.6
Operations	6.5	8.0	8.6
Consulting	7.0	6.3	6.0
Computer applications	5.0	5.5	7.4
All other	13.0	9.2	12.8
No response	1.7	5.8	1.9
Total[a]	100.0	100.0	100.0

[a]Totals may not equal exactly 100 percent.

SOURCE: Oak Ridge Associated Universities.

engineers by primary work activity, indicates a greater involvement of foreign nationals in some S&E occupations than in others. Foreign nationals are relatively more active in basic and applied research, development, and design than are scientists and engineers in the United States as a whole. They are relatively less active in management, operations, and computer applications.

Half of the firms questioned during a 1985 National Science Foundation survey reported that they employ foreign scientists or engineers. Table 12 shows the percentage of firms responding to the survey that employ foreign scientists and engineers according to industry and discipline. Employment of foreign nationals by these firms averaged about 9 percent of total staffs; employment of naturalized scientists and engineers averaged 11 percent. The surveyed firms primarily employ foreign nationals in electrical and electronics engineering, computer science and engineering, chemistry and chemical engineering, biology, biochemistry, and medical sciences. The 305 firms surveyed account for 75 percent of employment for scientists and engineers in the United States.[22]

Foreign nationals accounted for 11 percent of scientific and engineering personnel in the electronics firms that employ them, 22 percent in the independent research and development laboratories,

TABLE 12 Percentage of Responding Firms Employing Foreign Scientists and Engineers by Industry and Discipline, June 1985

Category	All Firms	Chemical/ Drugs	Elec- Tronics	R&D Labs	Other
Scientists					
Computer scientists	14	8	23	15	13
Computer systems analysts	8	8	11	8	9
Chemists	9	29	a	a	13
Biochemists	8	21	a	31	a
Biologists	5	21	a	a	a
Medical scientists	6	17	a	15	a
Engineers					
Chemical	16	25	13	8	20
Computer	14	8	24	8	13
Electrical	15		20	8	21
Electronics	10	a	24	8	a
Manufacturing	9	a	14	8	11

[a]Less than 5 percent.

SOURCE: National Science Foundation.

5 percent in chemical/drug firms, and 4 percent in other industries combined.

Employment of noncitizen scientists and engineers is most heavily concentrated among independent R&D laboratories, with 72 percent of the labs listing such employees in their work force. Fifty-two percent of the firms in the electronics industry reported employing foreign S&E employees. Foreign scientists and engineers are employed by two-thirds of the Silicon Valley respondents; one-third of the S&E workers hired by those respondents between June 1984 and June 1985 were foreign.

On average, foreigners accounted for 8 percent of the scientists and engineers hired between June 1984 and June 1985 in those firms that employed them. They represented 14 percent of all newly hired scientists and engineers in the electronics firms, 12 percent in independent R&D laboratories, 7 percent in chemical and drug firms, and 2 percent among firms in other industries combined.

Foreigners hired by the National Science Foundation survey respondents have a higher level of educational attainment than that of the S&E work force of the United States. Overall, about 12 percent of U.S. S&E workers held doctorates and 29 percent held master's degrees, whereas 35 percent of the foreign citizens hired by the respondents held doctorates and 25 percent held master's degrees. Approximately three-fourths of the foreign citizens received their highest level of S&E training in the United States.

Of the firms that hire foreign scientists and engineers, 57 percent undertake sponsorship of people who do not have permanent resident status. The most frequent reasons given by respondents for hiring foreign workers were that they were the most-qualified applicants (56 percent) and that there was a shortage of qualified U.S. candidates (35 percent).

EXPORT CONTROLS AND FOREIGN NATIONALS IN U.S. SCIENCE AND ENGINEERING

As noted earlier, both EAR and ITAR may regulate the transfer of technical data to foreign nationals within the United States. In general, the most stringent controls imposed in accordance with these regulations are on technical data directly related to military systems. Once a foreign national obtains U.S. citizenship—and most of those who choose to remain in the United States eventually do become citizens—all constraints related to national security export controls are eliminated. Moreover, technical data controlled by ITAR and EAR can be conveyed without restriction to non-U.S. citizens who have been lawfully admitted for permanent residence in the United States under the Immigration and Naturalization Act.[23]

ITAR controls on technical data relating to defense articles and services, along with the use of national security classification procedures for some technical data related to weapon systems, have helped make U.S. citizenship a prerequisite for S&E employment in defense research, development, and manufacturing. No foreign nationals are employed directly by the U.S. military, although the military does employ scientists and engineers who are naturalized U.S. citizens in almost the same proportion (12.3 percent) as that for all employers.[24] No data were found on employment of foreign-born scientists and engineers by U.S. defense and aerospace contractors, but the use of such individuals is likely to follow a pattern similar to that for the military. Given the low overall reliance on foreign nationals in U.S.

science and engineering, the exclusion of noncitizens from areas of research and development in which transfers of technical data are governed by ITAR appears to pose no particular problems.

Relatively few categories of technical data require a validated license under EAR for transfer to foreign nationals from Free World nations. The proposed revision to EAR Section 379.4 authorizing general license GTDR for the transfer to U.S.-based employees who are foreign nationals of technical data otherwise exportable only under an individual validated license will further reduce the regulatory burden associated with the employment of such individuals. The GTDR license in general makes possible the transfer of qualifying technical data to foreign national employees with a minimum of regulatory burden. In particular, general license GTDR is important for transferring proprietary data to university researchers under industry-university cooperative agreements.

Proscriptions on the transfer of technical data under EAR are confined mostly to nationals of Communist countries. General license GTDR is not available in most of these circumstances. Until such individuals obtain permanent resident status or U.S. citizenship, they cannot be employed easily unless the technical data handled in the workplace qualifies for general license GTDA.

AREAS OF FUTURE CONCERN

According to a report of the secretary of defense on the militarily critical technologies program, the Department of Defense anticipates a need for more extensive technical data controls on transfers to non-Communist countries. The department has prioritized the "arrays of know-how" on the Militarily Critical Technologies List (MCTL) to identify the most critical technologies that may need to be controlled to all destinations; accordingly, it plans to seek a revision to EAR.[25] Although the proposed revisions to EAR Section 379.4 noted earlier may limit the impact of expanded validated license requirements on foreign national employees of U.S. firms, industry-university cooperation could be reduced.

The MCTL is seen by many observers to be unreasonably broad in scope, listing many widely applicable technologies that could provide a "militarily useful" capability to an adversary. The MCTL is used in part in reaching decisions on the public release of scientific papers arising from federally sponsored research. MCTL categories cover information systems and networks, computer hardware and

software, automated control of industrial systems, materials and processing, semiconductor and electronic components, instrumentation, telecommunications, optical and low-energy lasers, sensors, biotechnology, and energy systems.[26] Broad expansion of validated license requirements to arrays of know-how related to these MCTL categories would limit the potential contributions of the university research community to the advancement of technology of both commercial and military value.

CONCLUSIONS

To the extent that the restrictions imposed by ITAR and EAR on the transfer of technical data to foreign nationals in the United States can be sorted out and understood, they appear to present no unwarranted barriers to the employment of foreign nationals in U.S. science and engineering. According to many observers, the most effective means of technology transfer to other nations from the United States is direct employment of foreign nationals in U.S. industry and research facilities. If this is true, restrictions on access to the most militarily sensitive technologies by scientists and engineers who have not obtained permanent resident status or U.S. citizenship seem appropriate.

Clearly, the most difficult aspect of the regulations is determining what the requirements and proscriptions are regarding various categories of technical data and how they affect U.S. employment of foreign-born scientists and engineers who have not obtained permanent resident status or U.S. citizenship. This difficult process is likely to be the most serious problem associated with the employment of foreign nationals in U.S. science and engineering. However, the severity of this problem for U.S. industry and universities is difficult to assess.

The role of foreign-born individuals in U.S. science and engineering is substantial and growing steadily. However, the "dependence" on foreign nationals cited by some observers is not a significant problem vis-à-vis national security export controls on technical data. This finding depends on four important assumptions:

- that revisions proposed to the Export Administration Regulations by the Department of Commerce on May 16, 1986, which define technical data available to all destinations, will be finalized without restrictive changes. These proposed revisions effectively exempt most university-based research and instruction from restrictions based on

export control authority—an important exemption because foreign nationals play a major role in U.S. university research and instruction.

- that a revision to EAR Section 379.4 regarding technical data under restriction, which was also proposed by the Department of Commerce on May 16, 1986, will be finalized without restrictive changes. This proposed change makes general license GTDR available to a U.S. employer for the transfer of technical data to U.S. employees who are foreign nationals otherwise exportable only under an individual validated license in most circumstances. This revision will reduce the impact of EAR restrictions on foreign nationals employed by U.S. firms.
- that the scope of technical data now requiring an individual validated license to all destinations will not be substantially expanded. General license GTDR authorizes the transfer of most technical data not exportable under general license GTDA to foreign nationals who are citizens of Free World nations. Given the growing number and importance of industry-university cooperative agreements, expanded validated licensing requirements could inhibit necessary transfers between industry and university researchers who are foreign nationals from Free World nations.
- that available data indicating that less than 4 percent of the U.S. science and engineering work force is composed of foreign nationals suggest a trend for the future of low overall reliance on non-U.S. citizens. Between 1972 and 1982 the proportion of foreign nationals in the U.S. science and engineering work force declined from 4.5 percent to 3.5 percent.

NOTES

1. National Science Board, *Science Indicators: The 1985 Report* (Washington, D.C.: GPO, 1985), p. 52.
2. Ibid., p. 74.
3. Ibid., p. 53.
4. This statement is based on internal records of the National Academy of Engineering.
5. Oak Ridge Associated Universities, *Foreign National Scientists and Engineers in the U.S. Labor Force, 1972–1982* (report prepared for the National Science Foundation) (Oak Ridge, Tenn.: Oak Ridge Associated Universities, June 1985), p. 3.
6. National Science Foundation, *Participation of Foreign Citizens in U.S. Science and Engineering* (Washington, D.C., January 1985), p. v.
7. 15 C.F.R. 379.1.
8. 10 C.F.R. 120.21.

9. 15 C.F.R. 379.3.
10. See *Federal Register* 51, no. 95 (May 16, 1986), pp. 17986–17989.
11. Albania, Bulgaria, Cuba, Czechoslovakia, Estonia, the German Democratic Republic (East Germany), Hungary, Kampuchea, Laos, Latvia, Libya, Lithuania, the Mongolian People's Republic, North Korea, Poland, Romania, the Soviet Union, and Vietnam fall within country groups Q, S, W, Y, and Z.
12. 15 C.F.R. 379.4.
13. See *Federal Register* 51, p. 17989.
14. 10 C.F.R. 125.2.
15. National Science Foundation, *Immigrant Scientists and Engineers: 1982–84* (Washington, D.C., 1985), p. 13.
16. National Science Foundation, *Participation of Foreign Citizens*, p. 8.
17. Ibid., p. 36.
18. Ibid., p. 34.
19. Ibid., p. 36.
20. Ibid., pp. 62-64.
21. Oak Ridge Associated Universities, *Foreign National Scientists and Engineers*, pp. 6-7.
22. National Science Foundation, "Survey of 300 U.S. Firms Finds One-Half Employ Foreign Scientists and Engineers," NSF 85-336 (Washington, D.C., 1985).
23. 15 C.F.R. 370.2; 10 C.F.R. 120.11.
24. Oak Ridge Associated Universities, *Foreign National Scientists and Engineers*, p. 10.
25. Office of the Secretary of Defense, "Militarily Critical Technologies Program" (July 17, 1986), p. 21.
26. Office of the Under Secretary of Defense for Research and Engineering, "The Militarily Critical Technologies List" (October 1984).

Corporate Compliance with the National Security Controls of the Export Administration Regulations

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INTRODUCTION

This paper reviews the activities required of companies that desire to remain in legal compliance with the national security provisions of the Export Administration Regulations (EAR). We begin by briefly summarizing the structure and general requirements of EAR, including the severe sanctions that may be imposed by the U.S. government for violations. We then analyze, in order, the specific EAR elements with which a company must deal as it undertakes an export transaction and later develops an international marketing and sales program. For each element, we review the stated EAR requirements and the activities normally necessary to comply with those requirements.[1]

Exporting companies have developed a wide variety of management models and internal administrative procedures to ensure compliance with EAR. Some companies appoint one export administrator to perform or supervise all export licensing activities; others spread the responsibilities among a number of employees. Further, companies may choose to centralize export control activities within their shipping, legal, marketing, or sales departments, or they may split responsibilities among all departments. Finally, the scope and mechanics of a program will vary with the commodities being exported,

the size of the exporter, and whether or not it has a distribution license.

Nonetheless, certain activities are required of all companies that export, which can be summarized as follows:

- The exporter must properly classify each export product within a category on the Commodity Control List (i.e., the Commerce Department's Control List), normally with assistance from in-house technical experts and sometimes from outside consultants.
- If prior governmental approval is needed for exports of its products, the exporter must prepare and submit license applications, each of which may require at least several hours of effort. Individuals must be trained in how to prepare applications, and they must be prepared to monitor the progress of the applications to ensure they are not lost or delayed by the U.S. government. Assistance from outside consultants sometimes is required.
- The exporter must keep careful records of each individual shipment under an export license, submit a shipper's export declaration to U.S. Customs listing license authority for each shipment, and ensure that all shipping documents contain the required destination control statements.
- The exporter must monitor changes in the regulations and additions of parties to the Table of Denial Orders, that is, those parties denied the privilege of purchasing U.S.-origin goods or technology.
- The exporter must review all of its "exports" of technical data, including international telephone conversations, servicing and installation activities abroad, and employment of foreign nationals to ensure that necessary license authority has been obtained. In many cases the exporter must obtain prior U.S. government approval for a technology transfer or obtain a written assurance of compliance with U.S. law from the recipient of the technology.
- The exporter must maintain tight controls over servicing activities, including exports of spare and replacement parts, to ensure that proper license authority has been obtained.
- The exporter may need to advise or assist its foreign affiliates and customers in obtaining license authority for reexports of U.S.-origin products from one foreign country to another or for exports from a foreign country of a foreign-made end-product containing U.S.-origin parts and components.

Companies that obtain a distribution license—a special type of license that permits unlimited exports to foreign distributors who

may then resell the products to end-customers without seeking prior U.S. government approval for each sale—can greatly reduce the resources devoted to preparing and submitting license applications. However, such companies are specifically required by EAR to undertake an extensive control program that is not required of companies that do not hold a distribution license. Such a program requires the following activities:

- The exporter must adopt a clear statement of corporate policy regarding export control compliance, prominently display that statement in company manuals, and republish the statement "regularly and with priority" to all levels of the firm's employees.
- The exporter must maintain lists of positions and individuals within the firm and within foreign distribution companies that are responsible for compliance with EAR.
- The exporter and its distributors must have an order-processing system that assigns responsibility for all required internal control reviews.
- The exporter must have a system for prompt distributor notification of changes in EAR.
- The exporter and its foreign distributors must screen all end-users of products against the Table of Denial Orders, nuclear end-use restrictions, and "risk for diversion" criteria.
- The exporter and its foreign distributors must screen all individual sales against product and country restrictions on the use of the distribution license.
- The exporter must conduct training and continuing education programs for all of its employees involved in export-related work and for such employees of its foreign distributors.
- The exporter must conduct regular and "spot-check" internal audits to ensure compliance.
- The exporter must monitor foreign distributors for compliance with distribution license restrictions and report instances of noncompliance to the Commerce Department.
- The exporter must maintain extensive records to enable periodic Commerce Department distribution license audits.

In summary, a company engaged in exporting that wishes to remain in full compliance with EAR may be required to undertake a variety of difficult, time-consuming, and expensive activities that involve personnel at all levels of the company. The burdens of compliance are increased by the complexity of EAR and its ofttimes vague

obligations. The U.S. government may be able to reduce this uncertainty, however, by instituting a procedure for issuing interpretations and advisory opinions on a regular basis.

OVERVIEW OF THE EXPORT ADMINISTRATION ACT AND REGULATIONS

Authority for the control of U.S. exports is divided among several agencies. In general, exports of commercial equipment and technology are regulated by the Commerce Department, while exports of military equipment and technology are regulated by the State Department.[2] The Defense Department plays a key advisory role for both commercial and military exports.[3]

General Requirements

Under the Export Administration Act of 1979, as amended,[4] the Commerce Department, through the Office of Export Licensing (OEL), exercises jurisdiction over the export of most commodities and technology from the United States, as well as reexports of these items from foreign countries. OEL has issued the Export Administration Regulations,[5] which govern all exports and reexports subject to OEL's jurisdiction.

OEL exercises its control by requiring all exports of commodities and technical data to be authorized either under a general license or a validated license. Exports authorized under a general license have been approved in advance by OEL as long as certain conditions are met. For exports of products not authorized under a general license, exporters must apply to OEL for a validated license, which grants limited permission to make exports, either on an individual or bulk basis. All items on the CoCom International List require validated licenses for export to all destinations except Canada.[6] In addition, the United States maintains unilateral controls on some other items.

EAR also contains a comprehensive control system for reexports of U.S.-origin commodities and technical data from foreign countries.[7] The reexport controls are similar to those for exports; reexports that would have required a validated license if the shipment had been made directly from the United States to the country of final destination require specific OEL approval.

The Commerce Department publishes the Commodity Control List (CCL),[8] which classifies each commodity subject to its jurisdiction. In addition, the Commerce Department has divided all nations

into country groups.[9] The procedures to be followed in obtaining authorization for a particular export depend on (1) the export control commodity number (ECCN) of the item being shipped and (2) the ultimate destination of the shipment.[10] Exports of certain commodities always require a validated license. Exports of other items require a validated license only for shipments to certain country groups.

Types of Validated Licenses

The two types of validated licenses of primary interest to most companies that regularly export are the individual validated license and the distribution license.[11] An individual validated license authorizes the export of a specified quantity of products for 2 years to one customer. A distribution license authorizes unlimited exports for 2 years of specified commodities to approved customers or distributors in Free World countries.[12]

Types of General Licenses

If the CCL does not specify that the export of a commodity to a certain country group requires a validated license, the export is authorized under general license G-DEST and does not require prior OEL approval. There are 20 other general licenses available for various types of exports including shipments of limited value, temporary exports, the return of commodities to countries from which they were imported, and shipments for replacement of defective parts.

Violations and Enforcement of the Law

Penalties for Violations

The Export Administration Act empowers the government to impose severe criminal and civil penalties on violators. Under the criminal provisions of the act, which are enforced by the Justice Department in the federal courts, individuals may be imprisoned for up to 10 years and/or fined up to $250,000 for each willful violation. Companies may be fined up to five times the value of the exports involved or $1 million, whichever is greater.

The Commerce Department may also impose two types of civil sanctions without the necessity of going to court.[13] First, the department has the discretion to impose civil fines of up to $100,000

per violation in cases involving national security controls and up to $10,000 per violation in other cases.[14] Second, the department has the authority to suspend or revoke a company's privilege to participate in all types of export transactions including those that do not require a validated license. Thus, the Commerce Department may suspend or revoke a company's existing export licenses, deny the company's license applications submitted in the future, and prohibit the company from participating in export transactions that would be covered by a general license. Companies whose export privileges have been suspended are placed on the Table of Denial Orders; any company that engages in an export transaction with these prohibited companies is itself subject to all the penalties available under the act.

In addition, the U.S. Customs Service is empowered to seize unauthorized shipments, which are subject to forfeiture.[15]

Scope of Prohibited Activity

It is important to note that the above sanctions do not apply only to those who directly participate in a violation. EAR states: "No person may order, buy, receive, conceal, store, use, sell, loan, dispose of, transfer, transport, finance, forward, or otherwise service, in whole or in part, any commodity or technical data exported or to be exported from the United States or which is otherwise subject to the Export Administration Regulations, with knowledge or *reason to know* that a violation of the Export Administration Act or any regulation, order, or license has occurred, is about to occur, or is intended to occur with respect to any transaction" (emphasis added).[16]

The "reason to know" standard is extremely broad: An exporter could be held liable for participating in an illicit transaction even when it had no specific knowledge that a violation was taking place. In addition, the "reason to know" standard encompasses behavior not only by the U.S. exporter but also by its customers. Thus, EAR makes a U.S. company potentially liable for the acts of unaffiliated third parties even when the company cannot monitor or control their activities. For example, if a U.S. exporter suspects (without knowing for certain) that a foreign customer may have resold or reexported without U.S. government approval the commodity shipped to it by the exporter, the exporter may risk criminal sanctions, heavy fines, and the loss of export privileges if it does not report the unauthorized reexport to the U.S. government. The risk is compounded if the U.S.

exporter continues to do business with the foreign customer after it has reason to know of a possible violation.[17]

The degree of vigilance actually exercised by companies over their customers varies widely depending on the product involved, the customer, and the risk aversion of the exporter. For example, where the product is a large, heavy machine requiring installation by the U.S. exporter, the risk of an unauthorized reexport appears low. However, where the product is small and easily transported, like a minicomputer, the risk of diversion may be substantial. In most cases, sales and service personnel are the first to learn of possible unauthorized activities by a customer. These personnel must be made aware of the U.S. export rules and be trained to report to the firm's legal department in appropriate situations.[18]

The vagueness of the standards governing culpability requires companies to make subjective judgments regarding what they believe the Commerce and Justice Departments will consider reasonable behavior. Many exporters are also well aware that the Export Administration Act prohibits judicial review of civil sanctions or licensing decisions.[19] Recognizing the enormous discretion and power vested in the Commerce Department, these exporters usually are anxious to avoid any appearance or suggestion of wrongdoing.

CLASSIFICATION OF COMMODITIES

Regulatory Obligations

An underlying principle of U.S. export control laws and regulations is that all exports of goods and technology from the United States are subject to control. Consequently, everything that can be exported is covered by an entry in one of the control lists maintained by the U.S. government. The control lists in turn indicate whether prior governmental approval is needed for exports of each item. The first task for a company that wishes to export therefore is to determine how its products are classified.

The principal control list is the Commodity Control List published by the Commerce Department, which describes and classifies each commodity subject to its jurisdiction.[20] There are currently 238 entries in the CCL constituting about 130 pages, which are divided into 10 categories:

- Metal-working machinery
- Chemical and petroleum equipment

- Electrical and power-generating equipment
- Transportation equipment
- Electronics and precision equipment
- Metals, minerals, and their manufactures
- Chemicals, metalloids, petroleum products, and related materials
- Rubber and rubber products
- Miscellaneous

Within each category, commodity classification titles range from the very specific (e.g., "pulse modulators capable of providing electric impulses of peak power exceeding 20 MW or of a duration of less than 0.1 microsecond, or with a duty cycle in excess of 0.005. . . .") to the very general (e.g., "other electronic and precision instruments, including photographic equipment and film, n.e.s. [not elsewhere specified], and parts and accessories, n.e.s.").

Determining which classification entry applies to a company's products is a vital task with important implications because the classification determines whether or not prior OEL approval will be needed for the export. For example, if the product to be exported is an integrated circuit device covered by ECCN 1564A, a validated license will be required for exports to all destinations except Canada. But if the device falls within an exception to ECCN 1564A and is therefore covered by ECCN 6599G ("other electronic and precision instruments, . . . n.e.s."), a validated license is required only for exports to Libya, Kampuchea, North Korea, Vietnam, and Cuba.

Because the CCL descriptions are highly technical, it is usually necessary for an engineer or other technical expert to perform the classification. Even engineers, however, often find the CCL descriptions highly confusing.[21]

Necessary Corporate Activities

Recently, the Commerce Department initiated a formal procedure for issuing classification decisions in response to written requests. In addition, exporters are sometimes able to obtain informal oral advice from OEL licensing officers. At least until recently, however, the classification procedures were given a low priority by OEL, and it has commonly taken several months to obtain a classification determination.[22]

In general, OEL has relied on U.S. exporters to make good faith determinations on the proper classification of their own exports. If

the exporter decides that a CCL entry applies permitting export under a general license, it is usually advisable to prepare an internal memorandum that contains the reasoning for classifying the product under a particular ECCN and demonstrates that the company made a good faith effort. Such a document could be crucial if an export is later detained by the Customs Service or if the Commerce Department alleges a violation.

A company preparing to export for the first time or to export a new product for the first time often undertakes some or all of the following activities:

- submits a classification request to OEL;
- assigns a technical expert within the company to classify the product;
- contacts the manufacturer (if the exporter is not the manufacturer) to learn how that company classifies the product;
- prepares an internal memorandum setting forth the company's classification reasoning; and/or
- obtains an opinion from an outside consultant.

The greater the number of products to be exported, of course, the more complicated and burdensome the classification process.

APPLYING FOR A VALIDATED LICENSE

After classifying the product to be exported and determining that a validated license is necessary, the exporter must then undertake to obtain the license. There are several types of validated licenses, but for a shipment to one customer an individual validated license (IVL) is appropriate.[23]

The length of time needed by OEL to approve (or reject) a license application varies, depending on the destination of the export. Applications to export to the CoCom countries can now be approved within 15 days. Applications to export to a country such as India, however, may require 2 months or longer because the application must be referred to other agencies for review.[24]

Regulatory Requirements

Applications for IVLs must be submitted on form ITA 622P.[25] The basic required information is as follows:

- name and address of the applicant;

- name and address of the recipient (known as the consignee);
- name and address of the purchaser (if different from the consignee);
- name and address of the intermediate consignee (if any);
- a detailed description of the products to be exported, their quantity, and their value;
- the appropriate ECCN; and
- the *specific* intended end-use of the product by the consignee.

In addition, depending on the destination and the classification of the export, an import certificate or end-use statement must be included with the application as follows:

- If the destination is a CoCom country or Hong Kong and the product is on the CoCom list (items designated with an "A" suffix), an international import certificate covering the shipment, issued by the government of the importer, must be included.
- If the destination is a CoCom country and the product is not on the CoCom list, a Commerce Department form, "Statement by Ultimate Consignee and Purchaser," must be completed, signed by the customer, and included.
- If the destination is Switzerland, a Swiss blue import certificate issued by the Swiss government must be included.
- If the destination is Yugoslavia, a Yugoslav end-use certificate issued by the Yugoslav Chamber of Economy must be included.
- If the destination is the People's Republic of China (PRC), if the product is on the CoCom list, and if the shipment is valued at $5,000 or more, a PRC end-use certificate issued by the Chinese government must be included. If the product is not on the CoCom list or if the shipment is valued at less than $5,000, the "Statement by Ultimate Consignee and Purchaser" may be used.
- If the destination is India, if the product is on the CoCom list, and if the shipment is valued at $5,000 or more, an Indian import license issued by the Indian government must be included. If the product is not on the CoCom list or if the shipment is valued at less than $5,000, the "Statement by Ultimate Consignee and Purchaser" may be used.
- If the destination is country group T (primarily Latin America), no end-use statement or import certificate is needed.[26]

Import certificates or licenses issued by other countries are not acceptable as replacements for the "Statement by Ultimate Consignee and Purchaser."

Additional documentation or information such as product brochures, copies of the customer order, a certification that the customer is not engaged in nuclear activities, and so forth may be needed for certain products and destinations.

Even more substantial documentation is sometimes needed for applications to export to the Communist countries. For example, applications to export computer equipment to the Communist countries must be accompanied by form ITA 6031P, "Digital Computer System Parameters," on which the exporter must fill in highly detailed technical information concerning the capabilities and characteristics of the computer system.[27]

Applications that are not filled out properly or that are lacking necessary documentation are "returned without action" by OEL to the exporter. The exporter must then obtain any missing information or documentation identified by OEL and resubmit the application.

Necessary Corporate Activities

To apply successfully for IVLs, the following corporate activities are usually necessary:

- Because a substantial amount of time may be needed to prepare an application and obtain approval, sales and/or marketing personnel must be trained (1) not to offer unreasonably short delivery times to customers and (2) to notify immediately those responsible for obtaining licenses for any new orders from foreign customers. Otherwise, licenses may not be obtained in time to make promised deliveries and sales may be lost.
- Personnel must be assigned to prepare and file license applications and must be trained to understand the relevant EAR portions. The license preparer often will need support from the engineering department in classifying the shipment and support from the sales department in obtaining the needed end-use statement or import certificate from the customer. Typically, an attorney from the legal department or a supervisor from the shipping or traffic departments is assigned the task of preparing license applications. This person also must be prepared to call OEL if the application is lost or delayed and to correct and resubmit the application if it is returned without action. The preparation and filing of a single license application typically can require several hours of effort.
- Some companies hire an outside consultant for assistance. The consultant advises the license preparers on what documentation

is needed for a particular application to maximize the chances for approval and monitors the processing of the application by OEL.

MAKING THE EXPORT SHIPMENT

Regulatory Requirements

The exporter's task does not end when the IVL is granted. There are additional documentation requirements that must be fulfilled when making an export.

SHIPPER'S EXPORT DECLARATION

Exporters must submit a shipper's export declaration (SED) covering each shipment to the Customs office at the point of export.[28] Among other information the SED must state what license authority permits the shipment. Thus, if the export is being made under a general license, the specific type of general license (e.g., G-DEST) must be entered. If a validated license is being used, the license number must be entered.

USE OF A VALIDATED LICENSE

If an IVL authorizes the shipment, the exporter must list on the back of the license the following information for each shipment under the license:[29]

- a description of the commodities, their quantity, and their dollar value;
- name of the exporting carrier;
- point of export;
- date of export; and
- initials of the person making the entry.

DESTINATION CONTROL STATEMENTS

EAR requires that for virtually all exports a destination control statement be entered on all copies of the bill of lading, the airway bill, and the commercial invoice covering the export shipment. Responsibility for making the entry is placed primarily on the exporter and only secondarily on the carrier.[30]

There are several statements that may be used, depending on the specific circumstances. For example, an export under an IVL

must be accompanied by the following statement: "These commodities licensed by the United States for ultimate destination (name of country). Diversion contrary to U.S. law prohibited."

RECORDKEEPING

EAR expressly requires that exporters retain records of all export transactions for 2 years after the export is completed.[31] This requirement encompasses export control documents (such as validated licenses, shipper's export declarations, and import certificates), memoranda, notes, correspondence, contracts, and similar documents.

Necessary Corporate Activities

To comply with the regulations governing export clearance, the following exporter activities usually are necessary:

- The shipping department must be trained to hold all export shipments until confirmation that the necessary license authority has been obtained.
- Personnel must be assigned the tasks of recording shipments on the back of validated licenses and returning them to OEL when they have expired. Normally, this assignment is made to the traffic or shipping departments.
- Personnel must be assigned the task of filling in appropriate license authority on the SED. Note that if an exporter holds IVLs authorizing exports to different consignees, different license numbers must be entered on the SEDs for the shipments to each consignee.
- Personnel must be assigned the task of ensuring that the proper destination control statement is entered on the shipping documents. Some companies have the statements preprinted on such documents or design a computer program to enter the statement. Other companies enter the statement manually with a rubber stamp.
- The company must have a recordkeeping program.

In some cases a freight forwarder can assume some of the above tasks. However, because of the severe liability attached to even inadvertent violations of EAR, some companies are reluctant to rely on a freight forwarder. For the same reasons, some freight forwarders are reluctant to assume responsibility for these activities.

MONITORING REGULATORY CHANGES

Number and Types of Regulatory Changes

From April 1, 1985, to May 10, 1986, the Commerce Department published at least 69 notices in the *Federal Register* relating to EAR. These notices for the most part concerned amendments to the regulations, revisions of control list entries, announcements of orders in export enforcement cases, and corrections.

The consequences of not staying abreast of these regulatory changes can be significant. First, exporters risk serious violations of EAR if they ignore the notices because the public is deemed to be notified of announcements on the date they are published in the *Federal Register*. In the case of an order denying export privileges to a company or individual, an exporter might continue to deal with the prohibited party in violation of the law because the exporter was unaware of the *Federal Register* notice.

Second, exporters may experience needless procedural delays. For example, exporters that were not aware of the new requirements for submitting import certificates issued by the Chinese and Indian governments in support of applications to export to those countries may have their applications returned without action; in that case, they will have to resubmit them after obtaining the needed import certificates.

The amendments physically are incorporated into the regulations through update bulletins published by OEL, which are distributed to subscribers to OEL's looseleaf version of EAR. OEL issued only four update bulletins in 1986. Sometimes, there has been a lag of up to several months between publication of an amendment in the *Federal Register* and publication in an update bulletin.[32]

Consequently, an exporter can only stay abreast of EAR changes by monitoring the *Federal Register*—an annual subscription to which now costs $300. In addition, reviewing the *Federal Register*, which is published daily and contains amendments to all of the regulations of the U.S. government, requires a substantial investment of time. Therefore, many exporters accept the risks of not being completely up to date.

Necessary Corporate Activities

To stay abreast of regulatory changes the following activities usually are necessary:

- The company must subscribe to the *Federal Register* or a privately published newsletter that contains notices of EAR amendments.
- Personnel must be assigned the task of reviewing regulatory changes and notifying others within the company to whom the changes are relevant. For example, if the ECCN description of the company's product is revised, a classification review by the engineering department may be needed.
- The company may hire an outside consultant to monitor relevant changes.

THE DISTRIBUTION LICENSE

Background and General Regulatory Requirements

As discussed above, the IVL typically is used to obtain approval for an export to one customer in one country. As a company's sales abroad increase, the IVL procedure can become extremely cumbersome and impractical.

The U.S. government, recognizing this problem, permits use of the "distribution license." The distribution license is a type of validated license designed to permit U.S. exporters to make unlimited shipments to designated foreign distributors, who in turn may resell and reexport the commodities within sales territories approved by OEL.[33]

The distribution license procedure can bestow a number of special benefits on the U.S. exporter and its foreign distributors. Because OEL approval is not needed for each sale, foreign distributors can maintain inventories and make immediate deliveries. In addition, U.S. exporters can greatly reduce and simplify the paperwork (namely, applications for IVLs) associated with shipments. For large companies with hundreds or thousands of foreign customers, the distribution license is often considered a necessity.[34]

However, the very aspect of the distribution license procedure that makes it attractive to exporters—the privilege of making sales without prior OEL approval—has been the cause of U.S. government concern. Critics have viewed the distribution license procedure as a significant source of diversions of U.S. equipment and technology to the Soviet bloc. In response to this concern, the Commerce Department published substantial amendments to the distribution license procedure in May 1985, which were designed to improve its ability

to limit and control use of the license. Great emphasis was placed on corporate compliance programs, which are audited by OEL. To this end, the summary of the amendments warned exporters that:

- "Top management of firms must be directly involved in assuring compliance and maintain the quality of the control programs.
- "Effective utilization of the DL [distribution license] requires that license holders and their consignees know their customers. Effective means must be devised to establish the bonafides and reliability of recipients of commodities under the DL.
- "Adequate resources must be committed to comply with the new DL control requirements. The special privilege [of the distribution license] can only be granted if proper steps are taken to safeguard the national security."[35]

This warning, in combination with the authority of OEL auditors to limit or suspend a company's distribution license, has caused companies to treat these regulatory requirements with great seriousness.

In summary, notwithstanding the advantages of the distribution license, there are various—and considerably burdensome—responsibilities that an exporter must undertake in order to be eligible for such a license. Failure to fulfill these responsibilities can result in the loss of distribution license privileges and possibly civil and criminal penalties.

The principal elements of the internal control program that distribution license holders and their consignees are specifically required to have in place are as follows:

- a clear statement of corporate policy, which is communicated to all levels of the company involved in export sales, traffic, and related functions, emphasizing the importance of distribution license compliance;
- identification of positions in the license holder firm and distributor firms responsible for compliance;
- an order-processing system affixing responsibility for all required internal control reviews;
- a system for timely distribution to consignees and verification of receipt by consignees of the Table of Denial Orders (TDO) and the regulatory material necessary to ensure compliance;
- a system for ensuring compliance with product and country restrictions, including controls over reexports by distributors and over direct shipments to distributors' customers;

- a methodology for screening against the TDO orders/shipments to customers covering servicing, sales of commodities, software sales, and training;
- a system for ensuring compliance with the limits on delivery to nuclear end-uses/end-users;
- a process to screen customers for diversion risk;
- a program for informing and educating employees of the distribution license holder and its distributors in the applicable regulations;
- a system for monitoring in-transit shipments and shipments to bonded warehouses and free trade zones;
- a program for recordkeeping;
- an internal audit system or compliance review program for the applicant or license holder extending to all distributors; and
- a system for notifying OEL promptly if the distribution license holder has knowledge that a distributor is not in compliance with the above rules.[36]

Some of these required activities are identical to those described previously for exporters that do not hold distribution licenses. Holders of the distribution license, however, must institute these activities on a more formal basis and must be prepared to show written procedures to OEL auditors. Further, distribution license holders are required to engage in some activities that are not required at all of exporters who use only IVLs.

In particular, the requirement that foreign distributors, as well as the U.S. exporter, implement extensive internal control programs raises a number of difficult practical problems for U.S. companies. An example in point is the EAR mandate that the distribution license holder "be satisfied" that its consignees understand the obligations imposed by the U.S. rules and will maintain adequate procedures to comply with them. Depending on the particular circumstances of the relationship between the distribution license holder and its consignees, the U.S. company may have to send representatives to visit consignees for periodic training and review, or it may be able to satisfy its obligations by correspondence. Particularly for smaller U.S. companies, the requirement to train not only their own employees but also those of their consignees is a significant burden. Distribution license holders must either generate substantial educational materials themselves or hire outside consultants to do it for them.

Finally, it should be noted that the distinctions between the distribution license and the IVL are not always clear. In some circumstances, OEL will approve an IVL authorizing an export to a foreign consignee for distribution to unknown third persons. Approval of such licenses appears to depend on the nature of the product and the destination.[37] In other cases the distributor's customers must be individually approved. Where a U.S. company is able to obtain IVLs permitting distribution by foreign distributors to unknown third parties, the burdens of the distribution license (in particular the formal internal control program) must be weighed against its advantages:

- The distribution license has no value or quantity limits; the IVL does restrict value and quantity.
- The distribution license is valid for 2 years and can be extended for 2 additional years; the IVL is valid for 2 years and normally cannot be extended.
- The U.S. exporter may list foreign distributors on the distribution license who are permitted to reexport products to several countries within OEL-approved sales territories; with the IVL procedure, a distributor may be needed in each country.
- In some circumstances, applications for IVLs must describe the products to be exported in more detail than applications for distribution licenses.

Necessary Corporate Activities

The required elements of the distribution license internal control program listed above are described in EAR and in a December 1986 OEL publication, "Export Management Internal Control Guidelines" (hereinafter the Guidelines). Although the Guidelines are not part of EAR, they have been prepared by OEL and are relied upon by OEL auditors. Consequently, many companies feel it is advisable to follow the recommendations of the Guidelines as closely as possible.

Statement of Corporate Policy

EAR requires that applicants for a distribution license must "certify to the existence of an internal control program" that includes a "clear statement of corporate policy communicated to all levels of the firm involved in export sales . . . and related functions."[38] The Guidelines direct that this policy statement should emanate from

"upper management, preferably the president or chief executive officer," and must "reach all levels of the organization and be reinforced through a continuing education program." The Guidelines also recommend that the policy statement be displayed prominently in new employee orientation materials, in-house publications, and training and procedure manuals, and be communicated "regularly and with priority."

Accordingly, the requirement that a distribution license holder and its consignees certify the existence of a "clear corporate policy statement" regarding export controls imposes a responsibility to do far more than simply have a staff employee add a paragraph to the back of a corporate policy manual. Rather, this requirement demands the time of top management, prominent display in major employee publications, and the assignment of responsibility to some individual or office to see that the policy is republished at regular intervals.

MAINTENANCE OF LISTS OF RESPONSIBLE PERSONS

EAR requires that the distribution license holder identify the positions in the company *and* in foreign consignee companies that are responsible for compliance with the license procedure.[39] In addition, the distribution license holder must maintain a current list of all persons occupying those positions.

The Guidelines recommend that companies produce an organizational chart describing line responsibilities for compliance activities with names, titles, and telephone numbers of the responsible individuals. The Guidelines further suggest that the company distribute this chart throughout the organization and include it in company manuals. In addition, the company is asked to formalize policies, procedures, and job descriptions for positions responsible for export controls to ensure smooth transitions when personnel change. Development of these programs requires a substantial amount of initial effort by an export administrator or outside consultant and thereafter periodic review and updating by an export administrator within the company.

MAINTENANCE OF AN ORDER-PROCESSING SYSTEM

A distribution license applicant must certify to the OEL that it maintains an order-processing system "affixing responsibility for

all required internal control reviews."[40] The Guidelines state that a license holder should conduct periodic reviews of its screening and other programs required by the distribution license regulations. The frequency of such reviews is left to the discretion of the license holder.

The Guidelines also recommend that a distribution license holder's order-processing system have "hold functions" whereby an order may only proceed after each necessary screening procedure has been performed and "signed-off" by the responsible employee.

Timely Distribution of Denial Orders and Regulatory Changes to Consignees

Distribution license holders bear responsibility for promptly notifying all foreign consignees of any additions to the Table of Denial Orders or relevant EAR changes. In addition, such license holders are specifically required to obtain "verification of receipt" from consignees for such notifications.[41] This requirement imposes a formal obligation to monitor new developments continuously, to keep accurate records of mailing dates, and to obtain, by telex, letter, or other means, verification of receipt by the consignees. In addition to forwarding notices of regulatory changes, the Guidelines recommend that the distribution license holder notify consignees of changes in company operations or products that may result in a change in the application of EAR.

Compliance with Product and Country Restrictions

EAR requires that distribution license holders and their distributors have a system for ensuring compliance with product and country restrictions, including a mechanism for ensuring that reexports by distributors and direct shipments by the distribution license holder to distributors' customers comply with those restrictions.[42]

This requirement derives from various EAR restrictions on the use of the distribution license for exporting certain products that are technologically advanced or nuclear related.[43] The Guidelines require distribution license holders to develop a "product/technology matrix" (more descriptively termed a "product/country matrix") identifying which of the company's products may be exported to which countries under the distribution license. It is recommended that all exports be screened against this matrix prior to shipment. The Guidelines further suggest that employees sign a screening checklist

for qualifying orders and identify nonqualifying orders for processing under an alternative licensing procedure.[44]

SYSTEMS FOR SCREENING CUSTOMERS

Because OEL does not have an opportunity to review the customers to whom foreign distributors sell the distribution license holder's products, EAR imposes a responsibility on the license holder and its distributors to screen the customers themselves.[45] The distribution license holder and its distributors are expressly required to avoid sales to customers that have been denied U.S. export privileges, that are engaged in nuclear-related activities, or that possess characteristics suggesting they intend to engage in illegal diversions. EAR and the Guidelines require that this screening process be documented with employee sign-offs to ensure accountability and permit an audit trail.

In many cases the U.S. company does not know (at least in advance) the customers of its foreign distributors. Even when the U.S. company does know the identity of the customers, it is often not in a position to perform the required investigation itself. Consequently, the burden of the screening process generally falls primarily on the foreign distributors that actually make the sales and have direct contact with the customers.

Screening Against the Denial List EAR requires that all new customers be screened against the Table of Denial Orders to ensure that they are not the subject of a denial order.[46] The Guidelines state that this screening may occur when the order is received or when the order is shipped. It is normally advisable, however, to screen before accepting the order to avoid contractual liabilities. To ensure complete compliance, the distribution license holder and its consignees must recheck their current customer base and pending orders whenever the Table of Denial Orders is updated.

Screening for Nuclear End-Usage EAR forbids the use of the distribution license for exports to customers engaged in certain nuclear-related end-uses, and it also requires license holders and their distributors to screen their customers to ensure compliance with this restriction.[47] The Guidelines offer a word of caution: "Because some countries attempt to clandestinely obtain the necessary technology to develop nuclear facilities and equipment, it may be necessary to

provide [foreign distributors] with specific training on determining the end-use . . . before the sale." The Guidelines provide a "sample checklist" for use by sales personnel in evaluating their customers. There are no clear guidelines, however, on how much a company must do in investigating its customers' activities.

Screening for Diversion Risk EAR similarly requires the U.S. exporter and its foreign distributors to screen customers against a "diversion risk profile" set forth in the regulations.[48] Where any of the listed characteristics are present, the transaction is to be placed "on hold" until a further investigation is completed. EAR cautions: "If the license holder is unable to resolve the problem, a request for assistance should be made in writing to contact . . . OEL, to explain the basis for the concern regarding the proposed customer and to determine if there is information available on the reliability of the customer."[49]

System for Monitoring In-Transit Shipments

EAR requires that distribution license holders exercise special control over shipments made through intermediate consignees such as a bonded warehouse or an operation in a foreign trade zone.[50] According to the Guidelines, this requirement stems from OEL's concern that foreign governments do not assume responsibility over in-transit or in-bond shipments. The principal element of this requirement is that distribution license holders must screen their intermediate consignees in the same way they would an end-customer.

Continuing Programs for Training Employees and Consignees

EAR and the Guidelines both state that distribution license holders should develop training programs to ensure that all employees (including those of their distributors) in export-related positions are "knowledgeable" concerning EAR. In addition, license holders are to develop a "continuing training program" to reinforce distribution license responsibilities and ensure continuous compliance when employees change.[51]

The Guidelines envision a substantial training program, involving "different types of training tailored to the levels and duties" of different employees. The Guidelines state that education will be

"required at different points, such as orientation training of new employee[s], refresher courses, and periodic sessions for updates and changes." These training sessions are to address not only specific distribution license obligations but "all applicable sections" of EAR including "general licenses, license requirements for engineers traveling with samples or technical data, authorized reexports, cases when IVL's are required, recordkeeping requirements, etc." The Guidelines suggest that distribution license holders may wish to solicit outside consultants to provide the necessary training.

RECORDKEEPING

Distribution license holders and consignees are required to maintain accurate records of all exports and keep them readily available for inspection by OEL auditors.[52] The Guidelines recommend that these records be maintained in a centralized recordkeeping system, but they permit a decentralized system so long as invoices and shipper's export declarations may be matched easily. These recordkeeping requirements are similar to those for companies that do not use a distribution license; the difference is that the distribution license holder and its consignees must have a formal written procedure setting forth their document retention programs.

INTERNAL AUDIT SYSTEM

Distribution license holders must undertake periodic audits of the export management performance of their own employees and those of foreign distributors.[53] The Guidelines direct that both spot checks and regular audits should be performed—generally by a person not involved in daily export functions.

Internal audits must be carried out to review records and ensure that they are being properly kept and are readily accessible. Each of the screening processes—for product/country restrictions, nuclear end-use restrictions, risk of diversion restrictions, and denial order restrictions—is to be reviewed to determine whether the restrictions are being enforced. In addition, auditors are to examine records documenting that other aspects of the internal control program required by EAR have been properly implemented including an appropriate statement of corporate policy, internal control manuals, education programs, lists of responsible persons, and so on.

The internal audit constitutes a significant undertaking for many

distribution license holders, especially as the audit requires participation by staff or outside personnel not associated with day-to-day export management.

NOTIFICATION TO OEL OF NONCOMPLIANCE BY CONSIGNEE

EAR states that, if a distribution license holder "has knowledge that a consignee is not in compliance" with the rules governing the license, the license holder must promptly notify OEL.[54] The Guidelines recommend that distribution license holders instruct all employees who deal directly with distributors to report any suspicions of noncompliance to the firm's export administrator. The export administrator normally then consults with the legal department, which must determine whether the suspicions warrant a report to OEL. This decision is particularly difficult when the distributor is a company affiliated with the U.S. exporter.

EXPORTS OF TECHNOLOGY

Exports of technical data are subject to rules that are similar but not identical to those for exports of commodities.

Definition and Scope of Technical Data

EAR defines *technical data* as information of any kind that can be used, or adapted for use, in the design, production, manufacture, utilization, or reconstruction of articles or materials. The data can be tangible (e.g., a prototype, blueprint, or operating manual) or intangible (i.e., technical advice).[55] The definition is intended to be as broad as possible and to cover any technical information relating in any way to an article or material.

The technical data controls imposed by EAR apply to the export of technical data in any fashion. The most obvious means of export is the actual shipment or transmission of technical data out of the United States. However, the controls are also deemed to apply to visual inspection by foreign nations of U.S.-origin equipment and facilities, oral exchanges of information with foreigners in the United States or abroad, and the application to situations abroad of personal knowledge or technical experience acquired in the United States.[56]

License Requirements

All exports of technical data subject to the jurisdiction of OEL must be authorized by one of three types of license. Two of these—GTDA and GTDR—are general licenses. No application is required to export technical data covered by these licenses, although certain conditions must be met before export in the case of some types of technology exported under general license GTDR. The third type of license is the validated license, which is obtained by submitting an application to OEL together with the necessary supporting documentation.

General License GTDA

This general license is available for exports to all destinations, even those in controlled countries. It covers data that have been made generally available to the public (1) through publications (readily available at nominal cost or in libraries open to the public) or (2) through release at conferences, lectures, trade shows, or other media open to the public. It also covers scientific or educational data that are not directly and significantly related to design, production, or utilization in industrial processes.[57]

General License GTDR

Free World Destinations The majority of technical data subject to OEL's jurisdiction can be exported to Free World destinations under general license GTDR. As in the case of GTDA, it is not necessary to obtain prior approval from OEL for exports under GTDR. However, in the case of some types of technical data exported under GTDR, the U.S. exporter must obtain a written assurance from the foreign recipient of the data that it will not reexport the data itself; in many cases, the exporter also must obtain assurance that the foreign recipient will not export the product of that data to the restricted destinations specified in the regulations.[58]

Communist Countries and Afghanistan Technical data exports to most Communist countries and Afghanistan are only eligible for general license GTDR in two circumstances. First, data in the form of manuals, instruction sheets, or blueprints may be sent without separate approval if they are part of a transaction involving a commodity

licensed for export from the United States. Second, the GTDR license may be used for certain technical data supporting a prospective or actual quotation, bid, or offer to sell, lease, or otherwise supply any commodity, plant, service, or technical data, provided the data do not relate to nuclear technology or CoCom International List items.

VALIDATED LICENSES

A validated license is required for the export of all technical data that are ineligible for general licenses GTDA or GTDR.[59] For Free World destinations, validated licenses are required for technologies specifically described in an ECCN entry and for the types of data listed in EAR Sections 379.4(c) and 379.4(d), which include information relating to such areas as nuclear technology, civil aircraft, airborne electronic direction-finding equipment, hydrofoil and hovercraft watercraft, and infrared imagery equipment. Validated licenses are required for all exports of technical data to Communist countries that are not covered by general license GTDA or one of the two very limited situations in which the GTDR license may be used.

Necessary Corporate Activities

To ensure full compliance with the rules governing exports of technical data, it is necessary for the exporting company to review what, if any, technical data are being exported with commodities or separately. In this regard there must be a review of plant visits by or employment of foreign nationals; communications by telephone, telex, or mail with foreign nationals; presentations by salesmen abroad; and servicing activities abroad by company engineers and technicians. In each situation involving the export of technical data, there must be a determination of which type of license applies. If the GTDA license applies, no further action is needed; if GTDR is applicable, written assurances of compliance with U.S. regulations must be obtained from the foreign recipients of the technical data. If a validated license is needed, an application must be filed. Often, this review is conducted by the company's legal department.

In some circumstances, personnel such as salesmen or technicians may have to be given instructions on what they are permitted to say to customers. In addition, it is advisable to keep written assurance letters in a centralized location for convenient review.

Particularly difficult issues may sometimes arise in connection with the employment of foreign nationals in U.S. companies. Under

EAR, the U.S. company may be required to obtain a written assurance from the individual employee that he will not export the U.S. technology he acquires to controlled countries without U.S. government approval, even after he leaves the U.S. company and returns to his home country. Although in some cases the written assurance parallels restrictions companies place on use of their trade secrets by employees, in other cases the assurance may be considered an unwarranted burden on the free exchange of information.

SERVICING EXPORTED COMMODITIES

Regulatory Requirements

In many cases, when a commodity requires a validated license for export, a validated license will also be required for spare and replacement parts. In addition, in some cases a validated license is necessary for exports of replacement parts even though the product into which it will be incorporated was originally exported under a general license. For example, in most cases, a microprocessor embedded in a medical instrument raises few national security concerns, and export of the instrument may be authorized under a general license. However, if a replacement microprocessor is exported separately, there will be strong concern about the use of the microprocessor for other purposes. Therefore, a validated license may be needed.

The license authority required for servicing activities varies with the particular activities involved as noted below.

Replacement of Defective Parts

When export of the commodity has been authorized under a validated license and a part or component is found to be defective after export, a replacement part may be exported under general license GLR.[60]

Temporary Exports of Servicing Equipment

When a service technician must carry with him equipment that normally requires a validated license, the exporter may be able to use general license GTE, which authorizes temporary exports (for up to 1 year) of commodities that will be returned to the United States. To use general license GTE, an exporter must first register with OEL and obtain a GTE registration number.[61]

EXPORTS OF SPARE AND REPLACEMENT PARTS

When replacements are needed for parts that have worn out, there are several types of validated licenses that may be appropriate:

- *Individual validated license*—The exporter may include a reasonable quantity of spare parts on an application for an individual validated license authorizing export of the equipment. If the original license has expired, the exporter can apply for a new license separately that authorizes export of the replacement parts.
- *Distribution license*—Normally, spare parts can be exported and reexported under the authority of a distribution license.
- *Service supply license*—The service supply license is similar to the distribution license in that it permits unlimited exports of replacement parts to approved destinations. The service supply license can also authorize reexports by a foreign-based service facility within approved service territories.[62] But there are important distinctions between the service supply and distribution licenses. The service supply regulations do not require the exporter to have a formal internal control program, as do the distribution license regulations; instead, holders of service supply licenses must file quarterly reports with OEL listing exports and reexports made under the service supply license. In addition, the service supply license can authorize exports of limited amounts of replacement parts to controlled countries; the distribution license cannot be used for any exports to controlled countries.

Necessary Corporate Activities

To comply with the rules governing exports of spare and replacement parts, a company normally must arrange that all proposed servicing activities be reviewed by the export administrator or other appropriate personnel to ensure that the necessary license authority has been obtained. To this end, service personnel must be trained to consult with the export administrator and/or to clear their exports with the shipping department.[63]

REEXPORTS

Regulatory Requirements

As discussed earlier, EAR applies not only to exports from the

United States but also to reexports from the original country of destination to third countries.[64] In general, the same rules that apply to exports apply to reexports: If a validated license would be required to export the commodity or technical data directly from the United States to the new country of destination, a validated license is required for the reexport. Special rules apply to the reexport of U.S.-origin parts incorporated into otherwise foreign-made products.

REEXPORT OF U.S.-ORIGIN PRODUCTS

There are several alternative types of license authority that may be used for reexports, including the following:

- *General license*—If the product could be exported directly from the United States to the new country of destination under one of several general licenses, including G-DEST (uncontrolled), GTE (temporary exports), G-COM (low-technology exports to CoCom countries), and GLV (limited value), the product may be reexported to that country without prior OEL approval.[65]
- *Individual validated license*—The exporter can obtain an individual validated license authorizing both an export and a reexport.
- *Distribution license*—As discussed previously, a distribution license can authorize reexports by foreign distributors within OEL-approved sales territories.
- *Reexport authorization*—When no other validated license authority is available, reexporters may apply for a reexport authorization. The reexport authorization is much like an individual validated license in that it authorizes a shipment to one customer and is valid for 2 years. The application may be filed either by the original U.S. exporter or the foreign company that has possession of the commodities.[66]

REEXPORT OF U.S.-ORIGIN PARTS AND COMPONENTS

Special, more restrictive rules apply to reexports of parts that are incorporated into foreign-made end-products. EAR Section 376.12 specifies a three-part test for determining whether prior OEL approval is required for the export from a foreign country of a foreign-made end-product containing U.S.-origin parts or components:

1. Could the U.S.-origin part or component be exported from the United States to the new country of destination under general

license G-DEST? If the answer is "yes," prior written approval for incorporation in the foreign-made end-product is not required.

2. If the answer to no. 1 above is "no," does the U.S.-origin part or component constitute the principal element in the end-product, and can it feasibly be removed or used for another purpose? If the answers to both are "yes," prior written approval *is* required.

3. If the answer to either question in no. 2 is "no," could the foreign-made end-product, if it were of U.S.-origin, be exported to the new country of destination under general license G-DEST? If the answer is "no," prior written approval *is* required. (EAR Section 376.12)

The above rule is more restrictive than that applied to reexports of U.S. products because the only exceptions to the requirement for prior OEL approval are when the component or the foreign-made end-product could be exported to the new country of destination under general license G-DEST. In contrast, U.S.-origin *products* may be freely reexported under general licenses GLV, GTE, G-COM, and others—as well as G-DEST.

The distinction between the two sets of rules can be illustrated as follows. A U.S. company could export a box of integrated circuits valued at $500 to a customer in France under general license GLV without prior OEL approval.[67] That customer could then reexport the box of integrated circuits to Italy, also under general license GLV. But if the French customer incorporated the integrated circuits into a French-made computer, general license GLV would no longer be available. Written OEL approval now would be required to export the computer to Italy.[68]

Although the procedure is not published in EAR, OEL has informed exporters that foreign companies may submit "parts and components" applications requesting blanket authority to reexport U.S.-origin parts incorporated into foreign-made end-products to a group of customers or countries.

Necessary Corporate Activities

To comply with the rules governing reexports, the following activities are often necessary:

- When the reexport is being made at the behest of the U.S. company or by an affiliated company, the reexport must be analyzed in the same way as an export would be to determine what license

authority is needed. An application for reexport authorization may have to be filed in appropriate cases.

- Some companies, in an effort to avoid any possibility of liability for their customers' actions, may undertake to educate customers on the requirements of EAR and/or obtain written commitments of compliance from their customers.
- Some companies actively assist customers in applying for reexport authorizations.

CONCLUSIONS

As described in this paper, a company engaged in exporting that wishes to remain in full compliance with EAR may be required to undertake a variety of difficult, time-consuming, and expensive activities that involve personnel at all levels of the company. Although some companies may feel that full compliance is not necessary, the potential penalties for violations are too great for most companies to ignore.

The complexity of EAR and the oftentimes vague obligations it imposes on exporters may have additional costs that are not easily measured. In an effort to avoid violations, some companies "overcomply" with EAR; they routinely apply for a validated license when none is necessary, thereby handicapping their own sales and marketing programs. Other companies, intimidated by the burdens and uncertainty created by EAR, may avoid certain types of sales completely even though such avoidance is not required by the regulations.

In the pervasive ways it affects U.S. companies, EAR may be comparable to such laws as the Foreign Corrupt Practices Act. Although a quantitative comparison of burdens appears impossible, EAR appears to be distinctive for several reasons: (1) the number and rapidity of changes in the regulations, (2) their potential effect on each individual export sale and shipment of virtually all commodities and technology to virtually all destinations, and (3) the tremendous discretion vested in the U.S. government by virtue of the lack of judicial review.

If the current level of controls is to be maintained and a simplification of EAR is not possible, it may be of significant benefit to U.S. companies for OEL to begin issuing, on a regular basis, interpretations and advisory opinions that would be accessible to the general public on regulatory and classification issues. For example, in 1980 OEL published a useful list of questions and answers concerning the

proper interpretation of the technical data regulations as they related to the then-current U.S. embargo of the Soviet Union.[69] Because the questions and answers gave clear guidance on what was permissible behavior, they removed some of the uncertainty associated with EAR.[70]

Other agencies such as the Internal Revenue Service, the Federal Trade Commission, and the Antitrust Division of the Justice Department regularly publish advisory opinions, and it appears that OEL would not need either explicit congressional authorization or permission from other executive agencies to begin issuing interpretations or opinions. Doing so may be the simplest way to reduce the confusion engendered by the complexity and vagueness of the regulations and thereby reduce some of the burdens of compliance.

APPENDIX A: COUNTRY GROUPS

For export control purposes, foreign countries are separated into seven country groups. Listed below are the countries included in each group. Canada is not included in any country group but instead is referred to by name throughout the Export Administration Regulations.

COUNTRY GROUP Q

Romania

COUNTRY GROUP S

Libya

COUNTRY GROUP T

NORTH AMERICA

Northern Area
- Greenland
- Miquelon and St. Pierre Islands

Southern Area
- Mexico (including Cozumel and Revilla Gigedo Islands)

Central America
- Belize
- Costa Rica
- El Salvador
- Guatemala
- Honduras (including Bahia and Swan Islands)
- Nicaragua
- Panama

Bermuda and Caribbean Area
- Bahamas
- Barbados
- Bermuda
- Dominican Republic
- French West Indies
- Haiti (including Gonave and Tortuga Islands)
- Jamaica
- Leeward and Windward Islands
- Netherlands Antilles
- Trinidad and Tobago

SOUTH AMERICA

Northern Area
- Colombia
- French Guiana (including Inini)
- Guyana
- Surinam
- Venezuela

Western Area
- Bolivia
- Chile
- Ecuador (including the Galapagos Islands)
- Peru

Eastern Area
- Argentina
- Brazil
- Falkland Islands (Islas Malvinas)
- Paraguay
- Uruguay

COUNTRY GROUP V

All countries not included in any other country group (except Canada)

COUNTRY GROUP W

Hungary
Poland

COUNTRY GROUP Y

Albania
Bulgaria
Czechoslovakia
Estonia
German Democratic Republic (including East Berlin)
Laos
Latvia
Lithuania
Mongolian People's Republic
Union of Soviet Socialist Republics

COUNTRY GROUP Z

Cuba
Kampuchea
North Korea
Vietnam

APPENDIX B: INDICATIONS OF POTENTIAL ILLEGAL EXPORTS

Listed below are some of the "red flag" indications that signal possible illegal exports or diversions. The list is not exhaustive; it is provided as an aid to further public awareness and the private sector's effort to combat illegal exportation of U.S. technology.

- **Customer's/purchasing agent's reluctance to provide end-use or end-user information**
- **Performance/design requirements incompatible with destination country resources or environment or with consignee's line of business**
- **Stated end-use incompatible with the customary or known industrial applications for the equipment being purchased**
- **Stated end-use incompatible with consignee's line of business**
- **Stated end-use incompatible with the technical capability of the consignee or destination country**
- **Customer willingness to pay cash for a large-value item or order**
- **Little or no customer business background information available**
- **Apparent lack of customer familiarity with the commodity's performance/design characteristics or uses**
- **Customer's/purchasing agent's declination of installation or service contracts that are normally accepted in similar transactions**
- **Ill-defined delivery dates or the use of delivery locations inconsistent with the type of commodity or established practices**
- **Use of freight forwarders as ultimate consignees**
- **Use of intermediate consignee(s) whose location/business is incompatible with purported end-user's nature of business or location**
- **Packaging or packing requirements inconsistent with shipping mode and/or destination**
- **Evasive responses to questions regarding any of the above as well as whether equipment is for domestic use, export, or reexport**

SOURCE: U.S. Department of Commerce, International Trade Administration, Office of Export Licensing.

NOTES

1. The paper does not address the policies underlying the regulatory burdens of the U.S. control system nor the issues relating to the processing of license applications by the Commerce Department.
2. This paper does not specifically address corporate activities relating to compliance with export controls other than those enforced by the Commerce Department.
3. With regard to commercial exports, the Defense Department is authorized by statute to review all exports to "controlled countries" (primarily the Soviet bloc and the People's Republic of China). Under a presidential directive issued in January 1985, the Defense Department is also permitted to review applications to export certain high-technology products to 15 Free World countries.
4. 50 U.S.C. App. Section 2401 *et seq.*
5. 15 C.F.R. Sections 368-399.2.
6. CoCom is the Coordinating Committee on Multilateral Export Controls, which is composed of all of the members of the North Atlantic Treaty Organization (NATO) (except Iceland) and Japan. It maintains a list of strategic goods and technology whose export to Communist countries is controlled by mutual agreement.
7. This control system encompasses, under certain circumstances, U.S.-origin parts and components incorporated into end-products manufactured abroad and exported to third countries.
8. EAR Section 399.1.
9. Appendix A lists the Commerce Department country groups.
10. If the U.S. exporter has reason to know that the person or firm to which it exports an item will reexport it to another destination, the U.S. exporter is responsible for obtaining approval for the reexport. Thus, for example, an exporter that ships a product or technology to Canada knowing that it is to be reexported to another destination must comply with the relevant license requirements for exports to the ultimate destination.
11. Other types include project licenses, which authorize the export of commodities for up to 1 year for use in specific projects such as the building of a plant; service supply licenses, which authorize the export of spare and replacement parts; and reexport authorizations, which are similar to individual validated licenses except that they are used for reexports rather than exports.
12. Distribution licenses are often used by U.S. companies to cover shipments to foreign distributors. The distributors may reexport commodities to OEL-approved third countries without individual approval by OEL of each transaction.
13. It is important to note that, unlike the criminal penalties, these sanctions apply even to *unintentional* violations of the act.
14. Each unauthorized shipment of controlled commodities is considered a separate violation.
15. U.S. Customs has an extensive program for EAR enforcement, including random checks of outgoing shipments for license authority.
16. EAR Section 387.4.
17. In 1985 an individual named Timothy Stelter was fined $15,000 and placed on the Table of Denial Orders for 5 years, in part because he had not

notified OEL when he had reason to know that a computer he had exported to West Germany was subsequently reexported to the United Kingdom.

18. The U.S. government has published a list of factors (see Appendix B) that it believes should signal to an exporter that its customer may intend to violate U.S. law.
19. Export Administration Act Sections 13(c) and 13(e). Appeals to an administrative law judge are permitted. Decisions of the administrative law judge are then referred to the assistant secretary for trade administration for affirmance or reversal.
20. EAR Section 399.1. Similarly, the State Department's Office of Munitions Control publishes the U.S. Munitions List, which describes the commodities subject to its jurisdiction.
21. Technical issues aside, many companies are troubled by the vagueness of CCL descriptions. For example, it is common for a CCL entry to cover equipment "specially designed" for certain purposes or parts and components "specially designed" for use with certain equipment. In some cases, it is difficult to distinguish between general purpose and "specially designed" items.
22. The Export Administration Amendments Act of 1985 requires that OEL respond to classification requests within 10 working days (Export Administration Act Section 10[1]). However, this statutory requirement has not yet been implemented.
23. The IVL is the most basic and most commonly used type of validated license.
24. OEL has an "emergency procedure" under which an application can be approved in as little as 5 or 6 days. However, OEL takes the position that its processing of applications under the "normal procedure" is fast enough so that the emergency procedure should be used only rarely. There are no published criteria for qualifying for the emergency procedure; rather, OEL licensing officers make their own judgments as to whether the exporter truly has an emergency requiring immediate shipment. Typically, a failure by the exporter to understand EAR requirements until the last minute is not considered sufficient justification.
25. EAR Section 372.4(a).
26. EAR Section 375.2.
27. EAR Section 376.10.
28. EAR Section 386.3.
29. EAR Section 386.3.
30. EAR Section 386.6.
31. EAR Section 387.13.
32. The notices also are incorporated into the Code of Federal Regulations published by the Government Printing Office, which is revised only once a year.
33. End-customers may also be designated as consignees on distribution licenses.
34. The distribution license is available for exports only to Free World countries.
35. *Federal Register* 50 (May 24, 1985):21,562.
36. EAR Sections 373.3(e)(1) and 373.3(e)(2).
37. Sometimes OEL limits distribution and use to the original country of destination.

38. EAR Section 373.3(e)(1)(i).
39. EAR Section 373.3(e)(1)(ii).
40. EAR Section 373.3(e)(1)(xi).
41. EAR Section 373.3(e)(1)(iii).
42. EAR Section 373.3(e)(1)(v).
43. For example, the distribution license may be used for exports of computers with a processing data rate of up to 1,000 million bits per second to the countries in Supplements no. 2 and 8 to EAR Section 373 (the CoCom countries plus Australia, New Zealand, and Switzerland). However, for countries in Supplement no. 3, the limit is 250 million bits per second. Finally, for Free World countries not listed in Supplements no. 2 or 3, the limit is 20 million bits per second.
44. In 1986 OEL asked a number of distribution license holders to submit copies of their product/country matrix for OEL review.
45. EAR Sections 373.3(e)(1)(iv), 373.3(e)(1)(vii), and 373.3(e)(1)(ix).
46. In 1984 Digital Equipment Corporation paid a fine of $1.1 million because its foreign distributor in West Germany had made a series of sales to a party on the Table of Denial Orders.
47. EAR Section 373.3(a)(2).
48. EAR Sections 373.3(e)(1)(ix)(A) through 373.3(e)(1)(ix)(I).
49. EAR Section 373.3(e)(1)(ix).
50. EAR Section 373.3(e)(1)(xii).
51. EAR Section 373.3(e)(1)(viii).
52. EAR Section 373.3(e)(1)(x).
53. EAR Section 373.3(e)(1)(vi).
54. EAR Section 373.3(e)(1)(xiii).
55. EAR Section 379.1(a).
56. EAR Section 379.1(b)(2).
57. EAR Section 379.3.
58. EAR Section 379.4(f).
59. EAR Section 379.5.
60. When a part has worn out through normal operation, general license GLR does not authorize export of a replacement. See EAR Section 371.17.
61. EAR Section 371.22.
62. EAR Section 373.7.
63. Especially difficult practical problems are sometimes caused when service technicians hand-carry service equipment or replacement parts on trips out of the United States. Because such equipment and parts are not exported through the shipping department, personnel may neglect to consider the legal obligations of EAR.
64. Under EAR, it is irrelevant whether or not the reexporter has obtained an export authorization from the country in which the commodity is situated. The only "exception" to this rule is when the reexport is being made from a CoCom member country to a Communist country and the reexport has received unanimous approval from CoCom—including, of course, the United States [EAR Section 374.3(e)].
65. EAR Section 374.2.
66. EAR Section 374.3.
67. The GLV limit for integrated circuits covered by ECCN 1564A is $1,000.
68. A proposal to exempt foreign-made products from U.S. licensing requirements when the U.S. components constitute less than a specified percentage

of the value of the end-product is now under consideration by the U.S. government.

69. **These questions and answers have been codified as Supplement no. 1 to EAR Section 379.**
70. **It would be especially useful to exporters if OEL were to publish official classifications of commonly exported items such as the IBM personal computer.**

High-Technology Product Life Cycles, Export Controls, and International Markets

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INTRODUCTION

This report explores two issues arising from relationships between export controls and the life cycles of dual use, high-technology products, and particularly differences between the commercial and military components of these life cycles. The first issue is that commercial trade could lead to military technology leakage, and to relative advances in Soviet military capabilities, in instances in which widely marketed U.S. civilian technology leads military applications. The second, conversely, is that U.S. export controls based on military product cycles might reduce significantly the ability of U.S. firms to compete in international markets. Although the available data base is limited, my conclusion is that both problems are significant. Commercial high-technology trade sometimes may increase leakage risks while current export control policies sometimes damage U.S. competitiveness—and in some instances do so without producing national security benefits.

This discussion proceeds by reviewing (1) product life-cycle models of production and trade; (2) the evolution and special features of military and civilian dual use product cycles, particularly in microelectronics, computer systems, capital goods, and software; (3)

the nature of product cycle effects on export controls and U.S. competitiveness in these industries; and (4) some conclusions and policy alternatives suggested by the analysis.

PRODUCT LIFE-CYCLE MODELS

In the late 1960s and early 1970s, the product life-cycle model was developed by Raymond Vernon, Louis Wells, and others to explain patterns of trade and technology transfer that seemed to contradict conventional economic theory.[1] Although this model neglected the military and relevant product cycles have since dramatically changed, I will describe it for two reasons. First, parts of it are still useful. Second, its declining explanatory power is the result of changes in product cycles, trade, and international competition that directly affect the export control issues under consideration here.

The conventional economic model—Hecksher-Ohlin theory—explained trade in terms of static comparative advantage derived from factor endowments and costs.[2] For example, nations with abundant capital stocks but expensive labor would export in capital-intensive sectors and import in labor-intensive sectors; nations with abundant natural resources would export primary products in order to import manufactured goods.

Although factor endowments do influence trade, it has long been apparent that Hecksher-Ohlin theory depends on unrealistic assumptions (e.g., the absence of scale economies), is of limited explanatory value, and is often contradicted by observable trade patterns.[3] The product cycle model was developed in response to one such observation, namely, that the most advanced industrial nations—and principally the United States—seem to produce and even export many labor-intensive goods while often importing goods requiring capital-intensive technologies.

The product cycle model explained this observation as follows.[4] First, it seemed reasonable to suppose that even global corporations developed products for their home markets first; second, new technology and the highly skilled labor able to develop it were sources of comparative advantage that were as important as conventional factor endowments; and third, products tended to have life cycles involving several distinct, predictable phases.

Given the United States' dominance of high technology and the world economy between 1945 and 1970, most products were developed first by American firms and for American markets. New

products based on new technology initially had small markets and required large quantities of specialized, highly skilled labor. As the technology, product, and market were gradually developed and hence better understood, costs and uncertainty declined, production volume increased, and exports began. Eventually, the technology matured, enabling standardized foreign production using less-skilled labor to replace domestic production dependent on innovation and highly skilled labor. At the end of a product cycle, the United States might even become a net importer of the high-volume, low-cost good.

This model appeared to fit product cycles in commodity semiconductors, consumer electronics, petrochemicals, and several other products. It also appeared more consistent with actual trade patterns than the Hecksher-Ohlin model alone. A slightly more robust version could even have taken Hecksher-Ohlin theory into account as follows. All exports of new products came from the United States because for immature technologies, learning and innovation were primary and the United States possessed a comparative advantage in advanced technology. However, as markets mature and manufacturing comes to dominate costs, production location choices—and therefore trade flows—will be dominated by factor endowments (i.e., by traditional economic considerations). The size of mature U.S. production therefore would be proportional to the capital intensity of the mature technology.

In retrospect, however, the model suffered from several defects related to emerging questions with respect to export controls and international competition. The life-cycle model tended to assume that advanced or high-income demand naturally would be found in the same nation(s) as the production capabilities most able to service that demand; in other words, both would be dominated by the United States. Such a model, therefore, could neither predict the rapid eclipse of American technological superiority nor the nature of subsequent product cycles in a world of multiple, interdependent high-technology competitors. The model also tended to neglect institutional and political factors such as market structure, strategic protectionism, and national (including military) research and development (R&D) and/or procurement policies. Finally, it neglected technological and market dynamics other than design and early production experience.

In the case of electronics, for example, rates of technical change were so high that two unusual market characteristics interfered with the "normal" product cycle. First, even mature products such as

TTL continued to show impressive technological change and dependence on innovation. And second, new products often completely destroyed demand for earlier product generations within a short period, precluding the evolution of a "mature" phase involving net U.S. imports of low-margin, high-volume commodities. The model would not predict, for example, that the U.S. industry would dominate SSI/MSI component markets continuously for 20 years—which it did. Nor did such models appreciate the effect of market structure and competitive dynamics on rates of technology development, uptake, and/or transfer. Consider once again the semiconductor industry. For 20 years, the U.S. industry dominated world markets despite its entrapment in a cycle of fragmentation, short-term planning, instability, and suboptimal capitalization, all of which reduced its efficiency and resilience.[5] The industry's progress remained rapid and profitable only because it had no effective competitors. The advent of a challenge from oligopolies of well-capitalized, stable, vertically integrated Japanese—and now also Korean—firms led to the Americans' rapid collapse. Large Japanese industrial complexes licensed American technology massively and then deployed and improved it more rapidly than the U.S. industry itself. Yet, the product life-cycle model would certainly not have predicted that Japan and Korea would rise from obscurity to prominence in world semiconductor markets in 10 years. Nor would it have predicted that they would do so through growth derived principally from technology extraction, import substitution, and then dominance of global markets for the industry's most advanced commodities, rather than from novel, initially specialized domestic demand.

Furthermore, although the original model did not acknowledge it, the U.S. military was an important component of many postwar product cycles in dual use, high-technology areas such as semiconductors, computers, numerically controlled machine tools, airframes, jet engines, and radar systems.[6] Until the late 1960s or early 1970s, the military funded much dual use R&D and represented 80 to 100 percent of early purchases, frequently through cost-plus contracts that effectively subsidized learning applicable to subsequent commercialization. U.S. production funded in this way typically accounted for 60 to 100 percent of total *world* production of these new high-technology goods. Hence, the military constituted a large proportion of the low-volume, advanced high-technology demand that the product cycle model held to be a major force in determining production and trade patterns. In the case of semiconductors, for example, the military

clearly dominated advanced markets until the late 1960s. Military R&D support led to product development; military purchases led to learning curve improvements and commercialization, first in domestic markets and then in foreign markets as the technology matured. Since approximately 1970, however, the military's role has changed both with respect to advanced technology development and in dual use high-technology markets generally.[7] Concomitantly, commercial product life cycles in dual use areas have changed dramatically as the United States has fallen behind Japan in semiconductors, numerically controlled machine tools, robotics, and other markets.[8]

THE EVOLUTION OF PRODUCT CYCLES IN DUAL USE AREAS

From the end of World War II through the 1960s, the Department of Defense led commercial markets—in the United States and indeed throughout the world—in basic and applied research, technology development, new product development, procurement, and applications in a wide spectrum of dual use high technologies. The two most important—and closely related—product families were probably aerospace (e.g., airframes, jet engines, rockets, and satellites) and electronics (e.g., integrated circuits, computers, networking, software, and computer-aided design/computer-aided manufacturing [CAD/CAM]). In both areas, defense support led to commercial products and sustained the development of American industries, which dominated world markets for 30 years. In both cases, however, it appears that the military's role as a technology developer and leader began to decline in the late 1960s. By the late 1970s the Defense Department had become a follower, sometimes a free rider, and a relatively small purchaser—hence, a market *taker*—in many though not all areas. Concomitantly, American firms found themselves facing serious foreign competition, at first primarily from Japan, in dual use, high-technology industries. The result has been a major change in the relationships between commercial and military product cycles and therefore in the total product cycles of dual use technologies. I will now describe this process as demonstrated by the case of electronics, by which I mean electronics-based producer goods sectors—integrated circuits, semiconductor capital equipment, CAD/CAM and robotics, computer systems, computer networks, and software. In all of these sectors except semiconductor capital equipment, defense funding played a major, direct role

in the industry's early development. Now, all of these sectors face strong foreign competition, and several are literally fighting for their survival.

Electronics Product Cycles, 1945–1970

For 20 to 30 years after World War II, various Department of Defense (DoD) organizations typically funded a large fraction of university electronics R&D and sometimes as large a proportion of corporate R&D in those areas in which potential defense applications were judged important. For example, the Air Force funded research at the Massachusetts Institute of Technology (MIT) that led to development and demonstration of the first numerically controlled machine tools, and a now-standard language (APT) for programming them, in 1948. The Air Force continued to fund numerically controlled development through support of R&D and contractor procurement, particularly at aerospace firms such as Boeing and General Electric, through the 1960s. The Office of Naval Research funded much of the early R&D on digital computers (including some early software work on stored program control, operating systems, and languages), while development of the SAGE (Semi-Automated Ground Environment) air defense system for the Air Force led to IBM's second-generation commercial computer systems in the 1950s. Magnetic core memories also were developed at MIT through military funding, and the first parallel supercomputers were developed with military funds. Until the mid-1970s, U.S. defense demand (e.g., from intelligence agencies, weapons laboratories, and defense contractors) accounted for nearly the entire world supercomputer market.[9]

Some early semiconductor R&D was funded by DoD, but the most important period of defense funding followed the invention of integrated circuits in 1960. Only with the development of integrated circuits did semiconductor logic clearly supersede other technologies and concurrently offer step-functional improvements in military C3I, guidance systems, and the like. Early integrated circuits rapidly were perceived as critical to such systems as the Minuteman missile. DoD's reaction essentially created the merchant semiconductor industry, and particularly Texas Instruments; during the early and mid-1960s, U.S. military purchases increased rapidly, typically accounted for 80 to 100 percent of total demand for the most advanced circuits, and represented 50 percent of the total U.S. semiconductor market. By

the early 1970s, conversely, military demand was 20 percent of the market; currently, it is less than 10 percent.[10]

DoD funding also played a major role in the early development of computer networking. The ARPANET, a university and national laboratory network funded by ARPA in the late 1960s and early 1970s, was the first large-scale, packet-switched computer network; the TCP/IP networking protocol, developed with DARPA funding, now is widely used and is directly supported by the Berkeley UNIX system, itself developed for DARPA.[11]

These and many other postwar military efforts involved funding mechanisms that were inherently different from those of commercial industry and that formed a specific portion of any given product life cycle. These product cycles, in turn, were very different from those that now typify electronics markets. DoD funding of corporate R&D (and to a lesser extent, university R&D) was unique in at least two respects: It was large relative to other sources, and it clearly funded many important efforts that would have advanced less rapidly if they had depended on private funding alone. Often, the funding mechanism was ostensibly a purchase order—but one that involved "cost-plus" payment, "on-specification" purchase commitments, or both.[12] The first of these subsidized development and early production until learning reduced costs; the second committed the government to purchase products not yet developed on the condition that they met agreed-upon specifications. Furthermore, DoD contracts often guaranteed several years of continued procurement, facilitating planning and efficient scale investment.

In the semiconductor and related industries, these DoD activities—university R&D funding, development subsidies, guaranteed purchases, and consumption of a high proportion of early production—typically were followed by commercial product cycles somewhat consistent with the Vernon product cycle model described above.[13] The initially military product was commercialized, often by a newly formed or relatively young "start-up" firm. One or a few firms typically enjoyed a short period of quasi monopoly—perhaps 1 year domestically, 2 or 3 years in Europe—followed by severe competition as imitators introduced comparable products. The original innovator sought to retain growth, market share, and profitability by exploiting learning effects in both products and processes, typically by lowering costs and prices and by introducing successive improvements in the original product. Initial sales were largely domestic, followed in a year or 2 by exports, then in 3 to 5 years by foreign

production of the relatively "mature" product once its technology and market were more stable and/or well understood.

These industries, however, remained net exporters and continued to dominate world markets, even in relatively established areas such as mainframe computers, discrete/SSI/MSI logic, and linear integrated circuits, for 20 to 30 years. Even when individual firms frequently had short life spans, the industry and world market remained dominated by American supply and demand. Equally importantly, a combination of technological factors, historical accidents, and by-products of government decisions led to a particular collection of related industry structures.[14] Initially, semiconductor technology seemed relatively labor intensive and devoid of strong scale economies or minimum scale requirements; furthermore, a 1956 antitrust settlement opened AT&T's patent portfolio to all interested firms. Finally, internal production by users failed to inhibit open-market suppliers because the largest consumer was the military. Semiconductor production consequently became concentrated in an independent "merchant" industry that continues to account for approximately 60 percent of U.S.-based production.

This merchant industry was (and largely remains) dominated by young, nonintegrated firms whose market success frequently was short-lived. Employee turnover was high (20 percent industrywide), in part because the most gifted technical staff and executives repeatedly defected from their employers to join new start-up firms offering large stock options. The industry also was extremely fragmented, both horizontally and vertically. It depended on separate infrastructure industries, also composed of small and unstable firms, for capital goods, materials, venture financing, and services. Often, the growth and success of firms in the semiconductor and related industries depended on a product family or technology viable for only one or two product generations. As the original technology base of the firm was superseded by new generations, the firm's growth slowed, and its market position was usurped by others. Because product and technology generations lasted only about 5 years, many semiconductor firms failed or were acquired within 10 years of introducing their first successful products.

The U.S. telecommunications equipment and computer industries, conversely, were dominated during the 1960s and early 1970s by large, vertically integrated firms (AT&T in communications, IBM in computers). Beginning in the late 1960s, however, the pattern of

entrepreneurialism and generational instability entered these industries as well.[15] The new submarkets of the computer and telecommunications industries—digital switches, minicomputers, microcomputers, supercomputers, attached processors, hard disk drives, local area networks—began to look more like the semiconductor industry. They were increasingly dominated by young, entrepreneurial single-market firms such as Cray, Teradata, Symbolics, Rolm, Digital Switch, Sytek, 3Com, Bridge, Data General, Encore, Prime, Apple, Seagate, Apollo, Tandem, Stratus, Convergent Technologies, Fortune Systems, Sun, Daisy, Sequent, Osborne, Compaq, and many others. This sectoral fragmentation and proliferation of specialized entrepreneurial firms began in the 1960s but assumed astonishing proportions in the late 1970s and early 1980s.

Unlike AT&T and IBM, these new systems firms relied almost exclusively on other firms—each other and the merchant semiconductor industry—for their components. Hence, they resembled the semiconductor industry in their lack of vertical integration and dependence on separate infrastructural industries, which included the semiconductor industry itself. (Unlike the semiconductor merchants, however, the new systems firms and industries largely arose after DoD funding policies had changed and most targeted commercial markets from their inception.) These newer firms depended principally on venture capital financing followed by public stock offerings. Until recently, they seemed to dominate emerging world markets in their areas just as completely as the semiconductor and computer industries had. However, there are now clear signs that this short era of entrepreneurial fragmentation, like that of the merchant semiconductor industry, is nearing its end.

The Evolution of Electronics Product Cycles, 1970–1986

By the 1980s military demand lagged rather than led the commercial market in many fields, was no longer a major formal or informal source of R&D, constituted less than 10 percent of the domestic demand in many markets, and was increasingly dependent on foreign sources of supply, particularly in semiconductors and advanced materials. In several dual use areas—primarily semiconductors, semiconductor capital equipment, robotics, microcomputer peripherals, supercomputers, and IBM-compatible computers and peripherals—American suppliers rapidly were losing both technical leadership and market share to Japanese—and sometimes Korean,

TABLE 1 Percentage of U.S. Semiconductor Sales by End Market

Market	1960	1968	1974
Military	50	35	14
Computer	30	35	29
Consumer	5	10	24
Industrial	15	20	33

Taiwanese, or Brazilian—producers. (Similar changes appear to be under way in some aerospace markets, but they will not be considered here.) As a result, both the commercial and military product cycles of many dual use technologies have changed dramatically. Several of these changes affect and/or are affected by export control issues. Current product cycles result from several forces that began to appear in the early 1970s and whose impact is still increasing. It may therefore be useful to describe these forces at least briefly.

Consider first the changing role of military demand in the market, once again exemplified by the semiconductor industry. Domestic open-market semiconductor sales evolved as shown in Table 1 during the industry's formative period;[16] by 1974 military demand had substantially decreased. There are several reasons for this change. First, the total market for any major category of dual use, general-purpose electronic products—ranging from standard logic circuits to robots to supercomputers—is inherently a large multiple of the demand represented by any single sector or purchaser, whether it be the military or anyone else. Any technology-driving, leading purchaser therefore will constitute a larger fraction of early markets than of later ones. Thus, the military's fraction of the *total* market would have decreased over time even if it remained a persistently high fraction of advanced markets.

Second, however, the military has *not* remained a consistent technology leader in its purchasing patterns. This is the result of at least two distinct processes, corresponding approximately with new acquisition policy and maintenance, respectively.

Consider new procurements first. There is now substantial consensus that several changes in procurement, budgetary, and weapons mix policies and procedures dating from the early 1970s have reduced drastically the tendency of DoD and its contractors to use advanced

or even competitive technology. First, the military greatly reduced its cost-plus and on-specification purchasing, which thereby reduced both its role as an R&D funding source and simultaneously its access to newly developed technologies and products. Subsequent to legislation that took effect in the early 1970s, the military also replaced many multiple-year contracts with repeated 1-year contract cycles. There appears to be substantial agreement that this policy has increased lag times and decreased the propensity of firms to engage in military technology development. DoD contractors also appear to have reduced their use of earlier funding practices, with similar results. Although defense contractors still sometimes represent a disproportionate share of the market for newly developed products (e.g., artificial intelligence workstations such as the Symbolics 3600) and DoD recently has taken some steps to reverse these trends (e.g., the VHSIC program, resumption of some multiple-year contracting), the average age of technology procured by DoD still seems to be increasing.[17]

Furthermore, the state of affairs detailed above appears to be the case for both purely general-purpose systems (e.g., computers used for administrative purposes) and for military-specific systems such as weapons platforms and C3I equipment, although primarily the latter (military-specific systems). It is frequently asserted that newly procured weapons systems now use electronic components that are roughly 5 to 8 years behind the commercial state of the art. Weapons platforms and ordnance now entering deployment generally use 8-bit or early 16-bit microprocessors such as the Intel 8085 or TI 9990. Few if any systems now being deployed use advanced 16-bit systems based on the Intel 8086, 80186, or 80286, or the Motorola 68000. Use of 32-bit systems such as the Motorola 68020 or the National 32032 appears essentially nonexistent.[18]

Yet, the purely technical requirements of military-qualified circuits (primarily ruggedization, stringent quality control, wider operational temperature ranges, and radiation hardness) only imply *at most* 2 years' delay past commercial availability;[19] furthermore, 40 percent of DoD electronics procurements are of uncustomized commercial parts.[20] It would therefore seem that military systems design and procurement are now less efficient, or at least slower, than they formerly were—and than their civilian analogues currently are. The only alternative explanation, that older products are deliberately chosen as more cost effective, is unlikely for at least two reasons. First, it would be surprising if cost/benefit trade-offs never favored

technology less than 5 years old, even if newer technology uniformly was more expensive. And second, it is one of the strongest characteristics of the electronics industry that new technologies frequently are less expensive and more reliable than those they replace. In fact, continued demand for older products can increase absolute costs because small-batch production of obsolete components constitutes a highly specialized business devoid of scale economies.[21]

In addition to increasing technology lags in new procurement, the average age of DoD procurements has increased as a consequence of inventory demographics. Many military systems, ranging from B-52 bombers to Minuteman missiles, have long life spans and require substantial maintenance or even reconstruction during their use. Consequently, many systems procured in volume 10 to 25 years ago, embodying what were then state-of-the-art electronics, must still be maintained, or even reprocured in low volumes, today. The result, given military purchasing policies, is continued demand for obsolete components and subsystems. It appears that military demand now represents a far higher proportion of demand for mature or obsolete devices than for new ones. The relevant parts of DoD, particularly the Defense Electronics Supply Command (DESC), have recognized this problem, but the current policy (the Diminishing Manufacturing Sources Program, or DMS) partially contributes to its impact on supply demographics.

DESC/DMS policy, apparently, is to procure only at maintenance levels until notified that the last U.S. source plans to cease production. Only at that time will DESC, if necessary, purchase a stock of components equal to the total estimated life-cycle requirements, a procedure known as a life of type (LOT) buy. LOT buys often equal 5 to 10 years' maintenance.[22] This policy, particularly when combined with the others described above, renders DoD procurement cycles considerably longer and less stable than those of 1970. Rather than producing at efficient scale for approximately the normal length of an electronics life cycle, contractors produce at high levels during initial production and deployment, then at less than efficient scale for several years, and then (possibly) at high levels just before discontinuing obsolete products. This suggests, and most semiconductor executives agree, that these DoD policies increase costs and create technological drag. Consequently, DoD's own policies, behavior, and requirements have directly driven many of the transformations in dual use product cycles. Two further issues, however, require mention.

The first is the impact on electronics markets of continued technological progress in microelectronics. Each new technology generation widens the spectrum and increases the size of application areas available to electronic systems. For several reasons, this appears to be occurring at a higher rate in commercial than in military applications, not merely in the United States but worldwide, and despite the fact that military budgets recently have risen faster than gross national product (GNP) in most Organization for Economic Cooperation and Development (OECD) nations. For example, advances in microelectronics have at least two effects in consumer electronics. First, generic cost/performance improvements yield disproportionate growth in this market, and in semiconductor production to service it, because consumer demand apparently is more price elastic than military demand. Second, VLSI—which has yet to reach military products in a major way—creates enormous opportunities to digitize previously analog functions (e.g., music recording) and enhance system quality and capability. Consequently, this general trend—rapid progress in dual use microelectronics technology—contributes to reducing the relative importance, although not the absolute size, of military demand.

Second and probably far more important, the United States now faces serious international competition in advanced dual use technologies, including many areas of electronics as defined above. The problem is most severe in the semiconductor industry and in robotics, but it increasingly affects the computer and telecommunications sectors as well. These developments plausibly are of great importance to export controls and possibly to other policy areas. My recent research indicates (and many senior executives have confirmed) that with the exceptions of IBM and AT&T, U.S. semiconductor processing is now, as a general rule, 1 to 3 years behind Japanese technical practice.[23] In an industry in which progress exceeds 20 percent annually, 3 years is a very long time. Furthermore, Korea has now entered world-class competition, and the lead enjoyed by Japanese producers relative to the U.S. merchant industry is increasing. Similarly, extrapolation of recent trends implies that in 5 to 7 years the world's most powerful and cost-effective commercial supercomputers will be produced by Japan—not by the United States.[24] These matters are discussed further below.

The rise of technically sophisticated foreign competitors affects product life cycles and DoD policy in at least four respects. First, DoD's role as a technology driver is reduced yet further because it has

a negligible role in the Japanese, Korean, Taiwanese, and Brazilian industries. Second, the rise of foreign competition, to the extent that U.S. firms come to lag foreign technology, tends to force DoD procurement to lag the world market even further than previously. Third, product cycles now have qualitatively new international dimensions with major implications for current and future policy. Finally, the characteristics of future technology and international competition imply major increases in the worldwide availability of dual use, high-technology products whose markets until recently were assumed to be controllable by CoCom (Coordinating Committee on Multilateral Export Controls) policy, and frequently by unilateral American policy.

The recent evolution of semiconductor, supercomputer, and personal computer markets exemplifies these dilemmas. The rise of foreign competition, particularly in areas in which foreign industries have achieved technical superiority and market dominance relative to the United States, has forced shorter product cycles and growing globalization of technology and production. Yet, especially in the semiconductor industry, these developments have been accompanied by increasing delays between first product availability worldwide, first U.S. production, and general U.S. availability to military designers. Although the demand-side (i.e., military procurement) policies described above are partially responsible, some responsibility lies with the industry itself. Many national industries seem to have habitual parameters of growth, investment, technical change, and technology deployment—parameters that influence, and in turn are affected by, the behavior of both producers and consumers. A national industry driven by high rates eventually will reach parity with, and then rapidly displace, another industry whose rates are chronically lower.

Much of what has happened to the United States semiconductor industry can be described in this way. Consider, for example, the compound growth rates in Table 2 for various semiconductor technology families in the United States and Japan over the past decade.[25] Similarly, investment levels, domestic consumption, and market share growth in Japan consistently have outpaced those in the United States. In 1986 the Japanese semiconductor market will equal America's in size, and Japan's share of world markets has more than doubled in the last decade to reach its current level of approximately 45 percent.[26] These developments have affected product life cycles in at least two respects. First, product cycles have

TABLE 2 Compound Annual Growth Rates (percentages) by Product Category Shipments, North America and Japan, 1974-1984

Product Category	North America	Japan
All semiconductors	14	21
Integrated circuits	19	31
Metal-oxide semiconductor (MOS) integrated circuits	24	38
CMOS integrated circuits	32	63

shortened as they have been driven increasingly by Japanese rather than American rates of growth and change. Second, the Japanese industry has assumed technical leadership in many areas, thereby presenting DoD policymakers with an unpleasant choice: DoD must radically increase its dependence on foreign sources or, alternatively, fall even further behind the world state of the art by continuing to purchase domestically.

The impact of this problem, already substantial, is expected to grow; and it is a subject of increasingly serious concern within the U.S. government. It is widely expected that by 1990 Japan will have increased its world market share to over 50 percent. Furthermore, Japanese market dominance is not confined to mature or commodity devices. Japanese producers, for example, now control 75 percent of world semiconductor memory markets, 40 percent of world microprocessor markets, 40 percent of world metal-oxide semiconductor (MOS) gate array markets, more than 60 percent of world microcontroller markets, and 35 percent of the world market for semiconductor capital equipment.[27] Japanese firms also are expected to dominate 1-megabit dynamic RAM markets, and two Japanese firms (NEC and Hitachi) are known to possess prototype 32-bit microprocessors.[28] The United States is now a net importer of dynamic RAMs, static RAMs, EPROMs, and microprocessors relative to Japan.[29] More strikingly, all U.S. computer firms except IBM and AT&T now purchase 25 to 50 percent of their semiconductor requirements from Japanese firms—in some cases, from their direct competitors in systems markets.[30]

The recent dynamics of supercomputer markets reflect both increasing Japanese strength and the impact of microelectronics on downstream markets. In the last 4 years, the three largest Japanese

computer vendors—Fujitsu, NEC, and Hitachi—have marketed advanced supercomputers, two of which are IBM compatible. The principal U.S. supercomputer vendors—Cray, Control Data (CDC), and CDC's successor, ETA Systems—all depend heavily on Japanese firms, including their competitors, for microelectronic components.[31]

Personal computer markets, conversely, demonstrate the rise of another phenomenon: widespread foreign availability of dual use products, particularly mass-produced commodities, shortly after their initial development by U.S. and/or Japanese firms. Many dual use product cycles now have distinct international components as a consequence of widespread licensing, second sourcing, increasingly competitive foreign technology bases, and national development strategies. IBM-compatible personal computers appeared in the United States approximately a year after IBM's open-architecture product reached the market. Soon thereafter, Japanese "compatibles" appeared. By 1985, however, IBM PC-compatible machines were not only marketed in dozens of countries but were produced by literally hundreds of independent firms in Brazil, Mexico, Korea, Taiwan, Argentina, and other non-CoCom nations.[32] The principal inputs to such machines—8088 and 80286 microprocessors, imitations of IBM's Basic Input-Output System (BIOS), various integrated circuits, floppy disk drives, Winchester hard disk drives, and the MS DOS operating system—were available through dozens of original vendors, second sources, imitators, counterfeiters, and remarketers in many nations.

Although personal computers are an extreme case, they should not be regarded as an isolated one. Apple 2 compatibles are produced in several nations, including Taiwan and Brazil.[33] Superminicomputers are produced in Brazil under licenses from DEC, Data General, and other firms;[34] recent Korean agreements indicate the likelihood that AT&T 3B20 series and Pyramid minicomputers soon will be produced in Korea and remarketed by Korean firms.[35] And it is all but certain that these nations, and perhaps others, will develop independent systems designs within the next 5 to 10 years, probably at first based on open-market technologies such as 32-bit microprocessors, the UNIX operating system, VME or other bus architectures, and networking standards such as Ethernet.[36] Consequently, many dual use product cycles seem, increasingly, to have a new commercial phase because a progressively higher fraction of American technologies becomes available on the open market soon after their development. This appears to be particularly but not

exclusively the case in fragmented sectors whose member firms often license technology more freely, and on less favorable terms, than do larger multinational market leaders. Firms in the newly industrializing countries (NICs) now systematically and rapidly obtain, use, and repackage these technologies, thereby shortening the period during which the United States and/or CoCom effectively can control them.

All of these developments—the dominance of commercial relative to military markets, the increasing technical lead of the commercial state of the art relative to defense procurement, and the rise of technically sophisticated foreign competition, particularly from NICs, in dual use, high-technology markets—seem to have serious implications for export control policy. They appear to increase the tension, at least in the short run, between defense goals motivating export controls and economic objectives such as increased U.S. competitiveness and improved trade balances. However, I will suggest that, in the long run, defense and commercial objectives may be more harmonious than is sometimes assumed. This potential congruence derives from the export control and security implications of decreased U.S. innovation and market share.

IMPLICATIONS FOR EXPORT CONTROLS AND COMPETITION

It is widely agreed that the Soviet bloc is 7 to 10 years behind the world state of the art in dual use electronics and that this lag has remained approximately constant for the last 20 years.[37] There is also general agreement, however, that in the Soviet Union the military constitutes a very high proportion of both total electronics demand and of demand for the newest technologies and products, a demand that perhaps is even higher than that of DoD 20 years ago. There is some evidence, moreover, that the Soviet Union has narrowed the United States' lead in deployed, electronics-intensive *military systems*.[38] Consequently, there is increasing concern as to the United States' ability to maintain the superiority of its military technology relative to that of the Soviet bloc. Given this concern, recent and foreseeable developments in commercial and military dual use, high-technology product cycles clearly pose several dilemmas for long-range U.S. defense objectives. These objectives presumably include both an effective export control policy and a strong U.S. dual use, high-technology industrial base. Consequently, at least two large-scale questions arise. The first is how export control and

related policy requirements are affected by the fact that commercial trade has increasingly dominated and preceded military applications in dual use technologies. The second is how such policy requirements are further affected by increasingly intense foreign competition.

Consider first the implications of commercially led, dual use product cycles. Most obviously, widespread high-technology commercial trade, particularly international trade, increases the risk of technology leakage. The damage to U.S. military interests caused by such leakage is proportional, presumably, to the technology lead enjoyed ex ante by U.S. military hardware over Soviet bloc hardware and also to the technology lead of commercial trade relative to U.S. military application. (Essentially, this assumes that production for military applications yields far less technology leakage than does commercial trade.) If commercially traded goods have a sufficient technology lead over U.S. military systems, if the extent of leakage is sufficient, and if the bloc incorporates the technology into military hardware with sufficient speed, it is possible that product life-cycle problems could significantly narrow the military technology lead enjoyed by the West.[39]

Furthermore, as advanced electronics increasingly is driven by and incorporated into mass-produced goods, any export control regime sufficiently strict to eliminate transfers of potential military value soon will become exceptionally (i.e., unrealistically) wide in scope.[40] Many consumer electronics products—compact disk players and home computers, for example—already contain digital signal-processing circuitry that probably is more advanced than any now manufactured in the Soviet Union. This trend will accelerate; emerging high-definition television technology, for example, probably will involve extremely sophisticated digital image-processing and data compression/regeneration systems.[41] Other consumer durables that are likely soon to contain advanced technology include digital telephones, cameras, and hand calculators. Additionally, many categories of compact, mass-produced office goods soon will incorporate technology beyond Soviet bloc capabilities. Examples include 32-bit personal computers, local area networks, digital PBXs, and imaging systems (e.g., copiers and facsimile machines). Hence, current policies, together with trends in dual use product cycles, imply increasing technology leakage, at least in absolute terms, and enormous growth in the complexity of export control administration.

These difficulties are greatly magnified by foreign competition—or, more precisely, by the internationalization and foreign production

of advanced dual use technologies and products.[42] If foreign governments have more permissive export control policies than the United States, leakage will increase, perhaps more than linearly, with foreign market share. Moreover, if foreign technologies and market shares surpass U.S. levels, potentially larger and more politically sensitive problems arise. First, there arises the conflict between security of supply and use of best technology that I mentioned briefly above. For example, many U.S. military systems are dependent on dual use high technologies increasingly dominated by Japan. Second, the United States will be in the difficult position of asking foreign governments to bear most of the economic costs of military export controls. Such export controls primarily may be intended to sustain Western military power relative to the Soviet bloc, but they also reduce the competitiveness and growth of nations whose economic and political interests may diverge from those of the United States. Hence, as U.S. technical and market leadership declines, so too will its ability to influence export control policy.

Whatever its other merits, any policy that reduces American competitiveness in dual use areas ultimately is in conflict with export control objectives for at least two reasons. First, it reduces the technological progress of the dual use industry, which reduces the technology levels available to future military systems; and second, it reduces American capacity to control technology leakage through either unilateral controls or multilateral negotiations. If U.S. export control policies themselves have such effects, their technology denial benefits must be weighed against costs to American technical superiority and political leverage.

Hence, the evolving characteristics of product cycles generate potentially major problems for export control that are at once military, economic, and political. The size of such problems, however, is far more difficult to assess and depends on judgments involving high levels of inherent uncertainty.[43] Our knowledge regarding Soviet technical capabilities is far from total. Our understanding of the sources of Soviet technology and of the relative importance of legal versus covert mechanisms of acquisition is even more limited; and our understanding of how controls affect Soviet military power or the Soviet-U.S. balance appears very limited indeed. Although current trends in dual use electronics appear certain to increase absolute leakage, we have no way of quantifying the importance of this leakage to Soviet power nor even of determining whether it will improve the Soviets' position relative to the West. To be sure, we presumably know

somewhat more about the effects of export controls on U.S. competitiveness and the role of product cycle characteristics in producing these effects. Even here, however, no rigorous analysis is available publicly, and none may yet exist. Nonetheless, the available evidence suggests that U.S. national security export controls appear to cause significant damage to U.S. firms in international competition.[44] To the extent that this damage arises from real control as opposed to inefficient administration, its costs must, of course, be weighed against the benefits of increasing the Soviet bloc's weapons costs relative to those of the West. Because these benefits may be impossible to quantify, as noted above, the net calculation may be impossible to make.

In addition, however, the presence of foreign competition introduces the possibility, at least in principle, that the new characteristics of product cycles could cause export controls to damage U.S. competitiveness without any offsetting national security benefit. Such harm to U.S. firms could exceed that accruing under conditions of American technical monopoly—but only if foreign competitors benefit from more permissive and/or efficient export control regimes than the regime under which U.S. firms must operate. The evidence I have seen indicates that the current export control regime *does*, in fact, cause some unnecessary damage to U.S. competitiveness.

The problem seems to have several distinct sources. One is the pure inefficiency with which U.S. policies are administered; a second is the unrealistic complexity and stringency of the policies themselves. U.S. firms unanimously report that U.S. export license processing requires 5 to 30 times longer than Japanese licensing procedures, even where no such license application has ever been denied in the firm's history.[45] U.S. individual validated licenses for exports to non-CoCom nations such as Austria require 2 to 3 months, while licenses for China frequently require 6 to 10 months.[46] In contrast, Japan grants such licenses within 2 weeks. In many high-technology markets, 6-month delays are a large fraction of factory construction time or even of an entire product cycle and therefore are wholly unacceptable. Several U.S. firms have suffered significant business losses to Japanese firms in Austria, Switzerland, China, and other nations. One firm, a leading vendor of automatic test equipment, showed me correspondence canceling a major order as a result of licensing delays; by the time the license was processed, a Japanese machine already had been installed.[47] The direct and indirect costs of such

licensing delays—lost business, increased inventory costs, administrative burden—appear, in some firms, to reach several percent of total sales. Furthermore, long-run costs may be far greater in those cases in which penetration of initially small markets (e.g., China) may prove important to future business. The primary explanation for U.S. licensing delays appears to be the inefficiency of the relevant Commerce Department and Defense Department bureaucracies.

Moreover, current U.S. policies require, at least in principle, individual validated licenses for most product maintenance and frequently even for presale distribution of promotional literature.[48] In many high-technology industries, such requirements border on the absurd: For example, U.S. vendors must wait months before repairing a broken machine, possibly halting production at a customer's factory. Although these regulations appear to be disregarded with some frequency, they are both a source of competitive disadvantage where heeded and of regulatory risk where ignored. Additionally, U.S. policy currently requires validated licenses for most software sales and for subsequent software maintenance or enhancements.[49]

In principle, all of these requirements also apply to any foreign producer using technology licensed from U.S. firms, even in instances in which this technology is a small percentage of the total product and even when the foreign country has approved a license independently. Recent changes in export control regulations also have increased reporting and recordkeeping requirements, which affects not only vendors but often customers as well. Several firms have expressed concern that these requirements represent significant barriers to small U.S. firms seeking to export for the first time, to firms seeking first sales to new customers, and to firms exporting to small foreign customers.[50] Firms also have expressed concern at the burdens imposed by documentation and control of reexports of both technology and products. Relaxation of these regulations is being considered, but at this writing they remain in place.

As the globalization of dual use technologies, production, and markets continues, the difficulties posed by such policies will increase. Foreign and particularly non-CoCom nations are an increasing share of high-technology production and consumption. For example, domestic Brazilian computer production totaled less than $400 million in 1980, of which only $95 million was accounted for by Brazilian-owned firms (as opposed to American multinationals). By 1985 Brazilian computer production totaled $2.5 billion and was growing at a rate of 40 percent annually; local firms accounted for 60 percent

of production. In the same year, Brazil imported more than $1 billion in electronic components.[51] Brazil also is now the fifth largest weapons exporter worldwide. Other nations such as Korea display similar patterns; in 1986 Korea's semiconductor production probably will exceed that of Western Europe, and more than half will be exported. Korean exports of IBM-compatible personal computers may reach $1 billion in the same year.[52]

Consequently, reexport constraints and foreign availability determinations constitute further channels through which dual use export controls affect competitiveness. In 1979 revised legislation mandated the creation of a division of foreign availability in the Commerce Department and established criteria for decontrol of U.S. goods based on the availability to the Soviet bloc of competitive products from foreign sources. Although foreign availability issues appear not to have been a major source of U.S. competitive disadvantage, growing actual foreign competition may cause this to change. Once again the system is inherently cumbersome relative to high-technology product cycles. Foreign availability determinations imply decontrol after 18 months if such "availability" cannot be negotiated away. This is approximately one-fourth of a typical dual use life cycle. And it appears that foreign availability decontrol often is blocked by the Department of Defense, which tends toward a "maximalist" position in export control matters generally.[53] The difficulties posed by reexport requirements, on the other hand, arise not only from foreign competition but from the process of economic globalization generally. A growing fraction of controlled American technology and products will be reexported repeatedly. As the high-technology content of globally produced goods increases—as with the integrated circuit content of automobiles and consumer electronics—the complexity of technology tracking will greatly increase.

CONCLUSIONS AND POLICY ALTERNATIVES

Clearly, changes in dual use product cycles do have strong implications for export control policy and international competitiveness. The traditional mechanisms of U.S. export controls increasingly are challenged by the rapidity of technological change; the proliferation of mass-produced, high-technology goods containing dual use electronics; the rise of technically advanced global competitors; and the fact that current policies damage U.S. competitiveness. Advanced

commercial markets imply greater absolute levels of technology leakage while decreased competitiveness weakens the U.S. technology base on which our military systems depend. Yet, the export control problems generated by widespread commercialization of advanced dual use technology and the apparent conflict between control and competitiveness might best be resolved by considering the larger purposes of export control policy. The purpose of export controls is to increase the long-term superiority of U.S. military systems relative to those of the Soviet bloc—rather than to control economic activity. Actions that clearly contribute to U.S. military advantage are preferable to those whose effects cannot be measured or those that might prove counterproductive. From these assumptions, several conclusions follow.

First, the administration of controls should be improved. It should not require 9 months to obtain a license whose approval is certain when competitors can obtain approval within weeks. The relevant standard is, minimally, that set by other CoCom nations. Sufficient resources, including both personnel and computers, should be allocated to ensure that U.S. licenses require no longer than, say, Japanese licenses. After initial improvements, American performance then should be periodically measured relative to the international standard. Furthermore, it may prove desirable to establish special efforts to assist smaller firms in understanding and negotiating licensing processes. The difficulties of reexport and other multinational controls perhaps could be reduced through the establishment of global information systems, possibly including a computer network.

Second, the scope of controls should be reviewed and probably reduced—both with respect to the classes of technologies controlled and the nature of the controls required. Individual validated licenses should not be required to distribute promotional literature or to service a machine. Such a review of the scope of controls might not only reduce their direct effects but might greatly ease the processes of understanding, using, and policing them. More generally, sophisticated assessment of technological networks can assist in isolating truly critical areas requiring detailed control. Others should be subject to less detailed control, and all controls should be efficiently administered. Controls that require American firms to impose burdens on their customers—for example, detailed recordkeeping—should be minimized. Again, the relevant standard is the behavior of other CoCom nations. The advent of foreign competitors in advanced technologies

implies that the United States can no longer afford export control arrangements that are any less efficient or any more hostile to industry than those of foreign nations. Whereas previously the drag caused by administrative inefficiency simply caused marginal reductions in economic rents at the national level, such drag now translates directly into competitive disadvantage.

Third, shortening the lag between commercial and military use of new technology, to whatever extent possible, could bring major and *verifiable* improvements in U.S. positions without either increased leakage or decreased competitiveness. The analyses of the Packard commission and other groups are nearly unanimous in their conclusion that significant deterioration in military procurement efficiency has occurred over the last 15 years and that significant improvements in the military deployment of high technology are achievable. One possibility, for example, concerns military procurement patterns over time. Large purchases over a time span more closely matched to commercial life cycles—4 to 6 years in electronics—could yield significant benefits relative to the current tendency to stretch purchases over longer periods. Borrowing methods from private industry might also help. It appears, for example, that automobile producers (whose electronics ruggedization standards often equal those of the military) are able to insert microelectronics into cars more rapidly and reliably than DoD or its contractors can insert them into weapons systems.[54]

Fourth, the Defense Department and other government organizations must reconsider the underpinnings of current policies. Ultimately, the goal of export controls is to maintain technical superiority in defense products relative to Soviet bloc nations. In dual use, high-technology areas, the rate of progress of American industrial technology inherently is a critical determinant of U.S. advantage. Abundant research and development funds and success in global competition contribute to the progress of American technology. Conversely, current export control policy at least marginally impedes it. Consequently, even effective export controls may prove counterproductive in the long run if their detrimental impact on American industrial growth exceeds the damage they cause to Soviet industrial advances.

NOTES

1. See Louis T. Wells, ed., *The Product Life Cycle and International Trade* (Cambridge, Mass.: Division of Research, Harvard Business School, 1972), for the most detailed description of the model.

2. For an excellent theoretical analysis of neoclassical trade theory, see Krugman and Helpman, *Market Structure and Foreign Trade* (Cambridge, Mass.: MIT Press, 1985).
3. The theoretical critique is developed extensively in Krugman and Helpman. A strong empirical critique is found in Bruce Scott, "U.S. Competitiveness: Concepts, Performance, and Implications," in Scott and Lodge, eds., *U.S. Competitiveness in the World Economy* (Cambridge, Mass.: Harvard Business School Press, 1985).
4. This exposition is based on Wells, *The Product Life Cycle*, and the work of Raymond Vernon.
5. This analysis, which was developed by the author, remains somewhat controversial but is increasingly accepted in industry and in the academic community. See Charles H. Ferguson, *American Microelectronics in Decline: Evidence, Analysis, and Alternatives*, MIT VLSI Memorandum 85-284 (Cambridge, Mass., 1985).
6. A comprehensive analysis of these issues has yet to appear, but the pattern is clear. See, for example, the annual research reports of the Massachusetts Institute of Technology (MIT); AT&T Bell Laboratories, *A History of Engineering and Science in the Bell System*; Franklin B. Fisher et al., *I.B.M. and the U.S. Data Processing Industry: An Economic History*; Herman Goldstine, *The Computer from Pascal to Von Neumann*; Braun and McDonald, *Revolution in Miniature: The History and Impact of Semiconductor Electronics*; Okimoto et al., eds., *Competitive Edge*; and a forthcoming book, still in manuscript form at this writing, by Ken Flamm of the Brookings Institution, covering the computer industry.
7. This change has received even less analysis than the earlier period of large-scale Department of Defense (DoD) support. For microelectronics, see Ferguson, *American Microelectronics in Decline*; Braun and McDonald, *Revolution in Miniature*; and Arati Prabhakar's analysis in U.S. Congress, Office of Technology Assessment, *Microelectronics Research and Development* (Washington, D.C., 1986). For both semiconductors and several downstream industries, particularly the defense and computer industries, the proceedings of the Defense Science Board Task Force on Foreign Semiconductor Dependency contain much valuable information regarding this issue.
8. For semiconductors, see Ferguson, *American Microelectronics in Decline*. For machine tools, David Friedman's unpublished Ph.D. thesis (MIT, political science, 1986) is excellent. For robotics, market research firms such as Dataquest and the Yankee Group probably have the best open-market information.
9. Military demand still accounts for a high proportion of supercomputer markets. See, for example, the annual reports of Cray Research and Control Data Corporation.
10. Braun and McDonald, *Revolution in Miniature*.
11. This information is derived from personal interviews and the author's experience with UNIX and networking analysis while employed by IBM.
12. See Braun and McDonald, *Revolution in Miniature*, for semiconductors. For information about other industries, the author relied on personal interviews.
13. See Edmond Sciberras, *Multinational Electronics Companies and National Economic Policies* (1977); James Tilton, *The International Diffusion of Technology: The Case of Semiconductors* (1971); Braun and McDonald, *Revolution in Miniature*; and Ferguson, *American Microelectronics in Decline*.

14. This analysis is derived from the author's research and doctoral thesis.
15. This analysis is derived from the author's industry experience and current doctoral research. No comprehensive treatment of recent computer industry dynamics yet exists. For statistics and information regarding market entry and exit, market research and securities research reports are the best public sources. See, for example, the periodic reports produced by Future Computing, the Gartner Group, Dataquest Corporation, and First Boston.
16. See Ferguson, *American Microelectronics in Decline*, or Charles River Associates, *Innovation, Competition, and Government Policy in the Semiconductor Industry* (1980).
17. These conclusions are based on personal interviews. Although the information is less rigorous than one would prefer, the unanimity of the interviewees and the wealth of detail offered by them leads the author to believe that the conclusions are highly reliable.
18. This information is based on personal interviews with DoD employees and with executives in the semiconductor and defense industries.
19. Industry interviews.
20. Interviews with Defense Electronics Supply Command (DESC) and other DoD managers.
21. One senior executive, a founder of a major semiconductor firm and now vice-president of a major computer producer, stated that this phenomenon contributed significantly to the high cost of military electronic components.
22. This information was obtained through the Defense Science Board Task Force on Foreign Semiconductor Dependency.
23. Based on industry interviews conducted both for this research and during the author's doctoral research. The principal variables used to assess technology levels were wafer size, clean room class ratings, device geometries, circuit integration levels, gate delays, and device clock rates.
24. Five years ago, 100 percent of the world-installed base of supercomputers was U.S.-produced. Conversely, a recent issue of IEEE *Computer* reported on benchmark tests that measured several Japanese supercomputers against the Cray XMP and found them comparable or superior in performance.
25. These statistics courtesy of Andy Prophet, Dataquest Corporation. Examination of current growth rates yields similar results—that is, Japanese production still is increasing twice as fast as American production.
26. Dataquest Corporation Semiconductor Industry Service.
27. Ibid.
28. Industry sources. Reports also have appeared in the trade press, and the NEC device was described in a paper presented to the International Solid State Circuits Conference (ISSCC) in early 1986.
29. Dataquest Corporation and Semiconductor Industry Association (SIA) statistics.
30. Confidential industry interviews. The author has interviewed executives of most major U.S. computer producers, including IBM, DEC, Burroughs, Data General, AT&T, and others.
31. Confidential industry sources confirm trade press reports to this effect.
32. For information regarding IBM PC-compatible production and markets, the author has relied on his personal industry experience at IBM; industry interviews; unpublished manuscripts by Paolo Bastos Tigre (Brasil) in Evans and Botelho, eds., "The Computer Question in Brasil" (MIT Center for International Studies); Allen Krause (Mexico), forthcoming as a Harvard Business School case; Alice Amsten (Korea), a 1985 Harvard Business School case; and trade press reports.

33. See Bastos Tigre unpublished paper.
34 See Bastos Tigre unpublished paper and unpublished papers by Claudio Fruitschak of the World Bank, Peter Evans of Brown University, and Paolo Fleury, a Brazilian professor of management.
35. AT&T owns 44 percent of Goldstar Semiconductor and has coproduction and technology transfer agreements covering both semiconductors and computers with that firm. Pyramid, a small Silicon Valley start-up, recently announced an agreement with Hyundai.
36. For example, Brasil's current informatics policy envisions domestic proprietary development and relaxation of the market reserve policy to allow international competition by the early 1990s.
37. See, for example, Seymour Goodman's article in Bruce Parrott, ed., *Trade, Technology, and Soviet-American Relations* (Indiana University Press, 1985). The FY1985 report of the Office of the Under Secretary of Defense for Research and Engineering (OUSDRE), *The FY1985 Department of Defense Program for Research, Development, and Acquisition*, indicated that U.S. computer and software technology was *gaining* relative to the Soviet Union.
38. See, for example, the interim report of the Packard commission or the 1985 report of OUSDRE.
39. There appears to be considerable debate as to the merit of these assumptions. I have therefore not relied on any specific assumptions in this area.
40. To reach this conclusion, it is only necessary to believe that one could not apply export controls to every consumer electronics product in the OECD (e.g., television sets, compact disk players, and so forth).
41. Advanced digital and high-definition chip sets or systems already have been developed by ITT Germany and by several Japanese firms.
42. See, for example, Carmela S. Haklisch, *Technical Alliances in the Semiconductor Industry* (New York University Graduate School of Business Administration, 1986), which lists more than 200 international agreements among semiconductor firms between 1980 and 1984.
43. As one analyst said to me, "This is a mystery, not a secret."
44. The Young commission reached this conclusion. However, I have based my conclusions primarily on personal interviews over the last 2 months.
45. Confidential interviews with corporate executives.
46. All firms reported similar delays. One firm whose export control personnel were interviewed maintains (and permitted the author to examine) extremely detailed records regarding these matters.
47. This firm reported average delays similar to those reported by other firms and similarly that its Japanese competitors typically received approval within 2 weeks. This firm had never been denied a license.
48. Interviews with corporate managers and personnel of the Commerce Department's Office of Export Administration.
49. Interviews with corporate managers.
50. Confidential interviews with corporate managers.
51. See papers cited above by Bastos Tigre, Fleury, and Fruitschak, and an unpublished manuscript by David O'Connor of the World Bank.
52. Dataquest Corporation and trade press reports.
53. Confidential interviews with Commerce Department officials and corporate managers.
54. Confidential interview with General Motors/Delco executive.

U.S. National Security Export Controls: Legislative and Regulatory Proposals

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INTRODUCTION

Methodology

The purpose of this report is twofold: (1) to review briefly the evolution of U.S. national security export controls and (2) to evaluate legislative and regulatory proposals either to expand or contract the scope of these controls. The proposals reviewed in this paper fall generally into three categories:

1. proposals to remove controls from specific categories of goods and technologies to certain destinations or in specifically defined circumstances;
2. proposals to reduce the Commodity Control List (CCL) [i.e., the U.S. Control List] and the Militarily Critical Technologies List (MCTL); and
3. organizational proposals to improve the administration of existing controls.

The particular proposals reviewed in this report are strategies that, on the basis of previous consideration by Congress and the Departments of Commerce and Defense, are intended to reform U.S.

export controls. Historically, reform has not always been synonymous with a reduction of controls but has included many proposals to improve the day-to-day process of investigating and licensing exports. In reviewing individual proposals, the report in most instances includes (1) a description of the proposed amendment or regulation; (2) a description of its effects on existing controls as described by its proponents and critics; and (3) a review of the history of the proposal and the circumstances that may have prevented its adoption or its full implementation.

There has been continuing debate over many years about a number of export control issues: (1) eliminating controls on exports to CoCom countries, (2) reducing controls on scientific instruments and medical equipment with embedded microprocessors, (3) scaling back controls on items unilaterally regulated by the United States, and (4) narrowing the scope of reexport controls. The lack of action on these issues demonstrates the apparent inability of either Congress or the President to establish a long-term export control policy.

This paper reviews a series of specific measures that were intended to accomplish two compatible goals: (1) reduce substantially the scope of U.S. export controls and (2) enhance the ability of the federal government to forestall the illegal diversion of goods and technologies. These goals would be achieved, according to the proponents of these measures, by enabling the government to focus on a manageable range of goods and technologies—a worthwhile but elusive goal.

This paper also notes a general lack of information on the operation and efficacy of U.S. and other foreign export control systems. In effect, Congress and the executive branch are debating critical policy issues bearing directly on the national security of the country without the benefit of comprehensive, detailed analyses of specific issues. For example, the debate over eliminating controls on exports to CoCom countries (members of the Coordinating Committee on Multilateral Export Controls) is being conducted in an information void in which conjecture has been substituted for fact.

Until the problem of the absence of information about the effects of controls is corrected, the President and Congress will be unable to evaluate reform proposals. Congressional oversight and examination of export control issues, coupled with a long-term *public* program to bring together individuals from the executive branch, Congress, and the private sector, are indispensable to resolving the information problem and building a consensus on export control policy.

DEVELOPMENT OF THE U.S. SYSTEM OF EXPORT CONTROLS: AN OVERVIEW

The Export Control Act of 1949 empowered the President to "prohibit, or curtail the exportation from the United States . . . of any articles, materials and supplies, including technical data, except under such rules and regulations as he shall prescribe."[1] A comprehensive system of export licensing was institutionalized to protect U.S. national security, advance foreign policy goals, and prevent domestic short supplies and related demand-pull inflation. These controls were administered by the Office of International Trade (OIT) within the Department of Commerce. According to an estimate by the Department of Commerce, by 1949 approximately 24 percent of U.S. exports were regulated by licensing controls.

With the onset of the Cold War, the Export Control Act was transformed from an instrument of adjustment to post-World War II economic conditions and the recovery of Europe into an instrument with which to retard the economic development of the Soviet Union, the Eastern bloc, and the People's Republic of China. The Department of Commerce was assigned the tasks of ensuring that only goods and commodities with approved export licenses left American shores and that reexport prohibitions were observed by foreign entities and enforced by foreign governments.

In the immediate postwar period, financial and personnel resources proved insufficient to meet the demands of administering and enforcing a comprehensive export control system. Moreover, the Department of Commerce organizationally was not structured to administer a peacetime system of export controls. In 1949 the secretary of commerce complained that OIT "was hamstrung by a lack of funds" and that it "existed on a beggar's rations and occupied a death cell."[2]

A complex and inefficient license-processing system was accompanied by an equally complex and inefficient system of enforcement. Reports from the period indicate that export licenses often were forged or altered and that goods were transshipped or diverted to unauthorized end-users or applications. To enforce controls more effectively, the intelligence agencies, the FBI, and Department of State officials stationed abroad, as well as allied foreign governments, became involved in tracing exports to prevent illegal diversions. Export licenses issued by the Commerce Department and shippers' export declarations (SEDs) collected by the U.S. Customs Service became

the principal instruments to administer export controls. The practice emerged whereby customs inspectors either searched or halted exports to ascertain whether a valid export license was issued by the Department of Commerce. At times, even properly licensed exports were detained by the Customs Service.

Since 1949, either by legislation, regulation, or executive order, most departments and agencies within the executive branch have become involved in administrative, investigatory, or enforcement activities relating to export controls. In addition to the Departments of Commerce, State, and Defense and the intelligence agencies, specific export control responsibilities have devolved to the Departments of Treasury, Energy, Justice, and Agriculture, as well as the National Aeronautics and Space Administration (NASA) and the Nuclear Regulatory Commission. Governmental panels (e.g., the Defense Science Board) and private sector institutions (e.g., the Industry Coalition on Technology Transfer or ICOTT, an organization of U.S. international trade associations) have also been drawn into the process of recommending changes in U.S. export control policy.

The basic structure of the Department of Commerce's involvement in export controls has remained unaltered by either the legislation in 1969, 1979, or 1985 (although since 1981, the secretary of commerce has issued numerous departmental orders reorganizing the export control functions of the department—a factor that has hampered further the ability of the department to administer export controls). The coordination of export control activity is the responsibility of at least two interagency committees. The ability of these committees to coordinate and direct policy continues to be the subject of intensive investigation and criticism.[3] For example, according to a March 1979 report by the General Accounting Office (GAO) entitled *Export Controls: Need to Clarify Policy and Simplify Administration*:[4] "The [U.S.] Government does not have an effective policymaking structure to reconcile the conflicting goals of export promotion and export control. Further, the decision-making apparatus for determining what technology should be controlled is unwieldy and time consuming. On top of these problems, the export licensing system is characterized by delay, uncertainty, and lack of accountability."

Since 1949 the purposes and objectives of export controls have undergone numerous and significant changes. In 1969, with the onset of detente, the Export Control Act was modified and metamorphosed into an instrument to encourage East-West trade. Exports were

no longer restricted only to Communist countries but rather to all potential adversaries of the United States, which were identified as "countries to which exports are controlled."

During the early years of detente, many members of Congress supported legislative proposals to narrow the scope of export controls. Other members were chary of such proposals, however, and also were concerned that U.S. goods and technology were being acquired by the Soviet Union to enhance its strategic capabilities. By the early 1970s, several influential Democratic and Republican members of Congress maintained that inadequacies in the export control law were contributing to an "acute hemorrhaging" of advanced Western goods and technology to the Soviet Union and the Eastern bloc, thus diminishing the military security of the Western Alliance.

Negative reaction to detente and East-West trade became manifest in 1974 with the enactment of two statutes that increased the involvement of the Department of Defense (DoD) in regulating exports. First, the Department of Defense Appropriation Authorization Act of 1975 authorized the secretary of defense to recommend to the President the denial of any export of technology developed with Department of Defense funding that would "significantly increase the potential military capability of a controlled country." The act also provided that if the President disagreed with the secretary's recommendation, Congress could override the President's decision by approving a concurrent resolution. Second, the Export Administration Amendments Act of 1975 authorized the secretary of defense to review exports of dual use goods and technology that might increase the military capabilities of countries to which exports were controlled.

Apprehension in Congress over the direction of East-West trade was summarized by Senator Henry Jackson in a letter to President Carter dated July 25, 1977. A decade later, the concerns expressed in his letter continue to reflect a major segment of opinion about U.S. export control policy. Senator Jackson identified four problem areas:

(1) The development of an adequate assessment capability aimed at establishing, on an ongoing basis, the nature and extent of Soviet acquisition of high technology, its absorption into the Soviet military sector and its long-term potential impact on Soviet military capabilities.
(2) The adequacy of existing government procedures and institutions to control the flow of technology and know-how, directly and through third countries, to the Soviet Union and its allies.
(3) The coordination of government agencies for implementing and controlling national policies affecting the transfer of technology.

> **(4) The clandestine acquisition of technology and know-how which cannot be transferred by legal means. . . .**

During 1979 the Subcommittee on International Economic Policy and Trade of the House Committee on Foreign Affairs held 23 hearings on amendments to extend and revise the Export Administration Act of 1969 (the subcommittee's hearing record totaled 1,419 pages). A parallel undertaking of similar magnitude was conducted by the Senate Committee on Banking, Housing, and Urban Affairs. Appearing before both committees, many U.S. corporate representatives, and a limited number of government officials, echoed the GAO critique of the government's schematic for preventing the export or reexport of certain goods and technologies to potential adversaries of the United States.

Without dissent, the Committee on Foreign Affairs summarized the principal objectives of the Export Administration Act of 1979: (1) "to reduce the number of items subject to validated license controls," (2) "to increase and improve the scrutiny devoted to items remaining subject to validated license controls and of greatest potential significance to the military capability of countries threatening U.S. national security," (3) "to improve the efficiency of the licensing process," and (4) "to establish a set of criteria and procedural requirements to govern the use of foreign policy controls."

As this paper will illustrate, the Export Administration Amendments Act of 1985 was a tortuous compromise between the advocates of reducing substantially the scope of U.S. export controls and the proponents of stanching the alleged "hemorrhage" of advanced technology to the East. As a result the 1985 act fell short of meeting the objectives of either the House of Representatives or the Senate. With the exception of implementing one amendment that prompted the immediate decontrol of certain low-technology products to CoCom countries, the Reagan administration continued to pursue its own agenda on export controls, a policy that allows for increasing the involvement of the Department of Defense in export control policymaking.

In summary, in the 37 years since the enactment of the Export Control Act, opinion within Congress has continued to be deeply divided over how to identify what should be subject to national security export controls.

The balance of this report is divided among legislative and regulatory proposals to "reform" the Export Administration Act.

PROPOSALS TO EXEMPT ALL U.S. EXPORTS TO COCOM COUNTRIES FROM LICENSING CONTROLS

Virtually no other issue in the 2-year debate to reauthorize the 1979 act proved more contentious than the proposal to eliminate the requirement of validated licenses (that is, prior Commerce Department approval) for exports to CoCom and certain other Free World countries. The proposal found expression in several related forms, which varied in the extent to which they decontrolled U.S. exports from Export Administration Act licensing requirements.

The Bonker Proposal

In 1983 Representative Don Bonker introduced legislation to revise and extend the Export Administration Act (EAA) of 1979. Reflecting deep dissatisfaction in Congress with presidential use of the act's provisions authorizing export controls for reasons of national security and foreign policy, the Bonker legislation proposed severe restrictions on the President's ability to control U.S. exports.

The most controversial of the Bonker amendments proposed the elimination of the requirement that U.S. exporters obtain the prior approval of the Department of Commerce for the export of multilaterally controlled items to CoCom countries. As approved by the House Committee on Foreign Affairs, the Bonker proposal exempted from the requirement of prior approval exports of multilaterally controlled items to CoCom countries. As a substitute for a comprehensive licensing system, the Department of Commerce was to require U.S. exporters to notify the department of exports to CoCom countries and to obtain validated licenses for exports to end-users suspected of diverting goods or technology to controlled countries.[5]

The Committee on Foreign Affairs couched the proposal as being merely the extension to other CoCom members of the licensing treatment already accorded to exports to Canada.[6] The committee maintained that the current treatment of exports to Canada "facilitated United States-Canada trade without harm to U.S. national security." Because very few license applications for exports to CoCom countries were denied by the Commerce Department, the committee stated that such applications were "routinely approved." In the committee's view, the United States always had the option of vetoing in CoCom the export of any CoCom-controlled item or the reexport of U.S.-origin items to the Soviet Union or the Eastern

bloc.[7] Therefore, in the committee's view, lifting controls on U.S. exports to CoCom countries would not harm U.S. national security.

Origins of the 1983 CoCom Licensing Proposal

THE 1969 REAUTHORIZATION

During the 1969 reauthorization and revision of the Export Control Act of 1949, Representative Thomas Ashley offered a series of amendments to reduce dramatically the number of individual export licenses.[8] The Ashley proposal restricted validated licenses to items capable of military applications and to exports intended for shipment to Communist countries. In addition, the proposal appeared to exempt shipments to most non-Communist countries from validated license controls unless the President imposed controls on specific products. Furthermore, the proposal probably would have eliminated the requirement of "end-use statements" signed by the foreign recipient, thus restricting severely the ability of the Department of Commerce to impose reexport controls.

Representative Ashley further sought to ensure that governmental licensing authorities would not deny export licenses capriciously. His proposal, which was recorded as H.R. 11472, provided that, when validated licenses were required, they would not be denied unless the Department of Commerce had substantial evidence that the proposed export would be diverted to military purposes. The Ashley bill of 1969, even in the heyday of detente, was far more sweeping in its scope of decontrol than any "reform" amendment adopted by Congress in subsequent years. For the first time, however, the Ashley bill caused a reassessment of whether a comprehensive system of West-West controls was necessary to achieve the purposes of the U.S. export control law and the CoCom arrangement.

THE CARTER ADMINISTRATION

During the 1979 reauthorization of the export control statute, Congress was also considering the adoption and implementation of the agreements negotiated during the Tokyo round of multilateral trade negotiations. With the adoption of these agreements, Congress in the Trade Agreements Act of 1979 obligated the President to report and evaluate U.S. trade policies including export disincentives, which were defined to include export controls. The report incorporated extensive comments from the U.S. business community that,

inter alia, called for the treatment of exports to CoCom members to be "more or less" like the treatment of those to Canada. However, the private sector's proposals for policy initiatives did not call for the complete elimination of U.S. licensing controls over exports to CoCom countries. Instead, these recommendations included a requirement "that the exporter file assurances at the time of export that there will be no reexport of the items involved *outside CoCom, Australia and New Zealand* unless U.S. reexport licensing requirements have been satisfied [emphasis added]."[9] The administration rejected the business community's proposal and proposed, alternatively, that the efficient processing of licenses would address its concerns.

Nevertheless, during the Carter administration, senior officials of the Department of Commerce and the Office of the United States Trade Representative developed a proposal to eliminate licensing requirements to CoCom countries, Australia, and New Zealand. In 1979 a study is believed to have been prepared within the Department of Commerce outlining and justifying such a proposal.[10] At that time, the Departments of Justice and Defense vigorously objected to the proposal. These departments argued that the information contained in license applications was essential to detecting and forestalling illegal diversions from the United States and CoCom countries and that validated licenses were often crucial in establishing the basis for criminal prosecutions.

THE GENERAL ACCOUNTING OFFICE REPORT ON NATIONAL SECURITY CONTROLS

In May 1982 a GAO report on national security controls found that "almost half the export license applications received each year could be eliminated without [adversely] affecting national security."[11] In the years following the release of this report, proponents of eliminating licensing controls to CoCom countries have often maintained that the GAO endorsed their proposal. GAO specifically recommended that the secretaries of commerce and defense "[r]eexamine the need for licensing of high-technology products to CoCom countries and other allies by exploring various alternatives that would satisfy control objectives and reduce or eliminate the burden of licensing." At a minimum, GAO urged the government to evaluate "[s]electively (country by country) eliminating high technology product licensing requirements for those allies who have demonstrated

a continuing commitment to control and who cooperate with the United States in a uniform system of enforcement."

REPORT OF THE PRESIDENT'S EXPORT COUNCIL

In March 1983, when Congress began hearings on amendments to the 1979 act, a subcommittee of the President's Export Council (PEC) endorsed the elimination of validated licensing requirements to CoCom countries, Australia, New Zealand, "and others which share with the U.S. common strategic objectives or with which the U.S. has military production agreements or with which the U.S. obtains an understanding about local controls over U.S. origin exports."[12]

Commentary on the Proposals[13]

EVALUATION OF COCOM AND MEMBER STATES' ENFORCEMENT OF COCOM CONTROLS

The CoCom decontrol proposals described above were based on the premise that other Western governments were prepared politically and institutionally to devote the manpower and financial resources to enforce a comprehensive system of national security export controls. In fact, however, Congress and the administration have been acting without detailed information on the export control programs of other major Free World trading nations.

There has been much criticism of CoCom since the 1970s. Former Representative Jonathan Bingham, who was chairman of the Subcommittee on International Economic Policy and Trade of the House Committee on Foreign Affairs, wrote in 1979 that "CoCom seems almost designed for evasion" and "that it . . . has not worked very well." In October 1981 Bingham acknowledged to President Reagan that "circumvention of U.S. and multilateral export controls has contributed more to Soviet military capabilities than the technology approved for sale" and recommended that discussions with our allies could "result in stepped-up enforcement of controls and investigations of diversions" of strategic goods to the East.

The belief that CoCom is an ineffective means to coordinate a multilateral export control regime was reinforced by a 1983 study issued by the Atlantic Institute for International Affairs, which stated that "[r]ecent reports suggest a thriving and lucrative business based on the surreptitious sale of strategic and military technology

to the Soviet Union and Eastern Europe." Moreover, the study concluded:[14]

> Interviews and discussions in Europe led me to the belief that covert circumvention of CoCom controls will be a continuing problem. One Customs agent in a European capital stated, "Everything I touch turns to gold; every lead uncovers illegal sales."
>
> In view of exceedingly lax law enforcement by certain CoCom countries the cases that are detected and investigated may represent only the tip of the iceberg. And the fact that the United States reported [to CoCom] more than 50% of the exception requests in the late 1970s and exported less than 15% of the products destined for the Communist bloc suggests that considerable East-West commerce circumvents CoCom.[15]

In addition, during the Carter and Reagan administrations, Defense Department officials have strongly criticized CoCom. For example, during a 1984 Senate hearing on the attempted diversion of U.S.-origin computer equipment to the Soviet Union through non-CoCom and CoCom countries, Stephen D. Bryen (then deputy assistant secretary of defense) remarked: "[I]n many cases even some of the CoCom countries lack the legal mechanisms to enforce technology transfer problems." He concluded that "there's a long way to go to get a coordinated [multilateral] system" of export controls.[16]

The administration has not produced and Congress has not authorized the preparation of a comprehensive, detailed study to assess the operation and effectiveness of CoCom controls. In the absence of such studies,[17] it is difficult to imagine the development of an export control policy particular to CoCom that garners the support of both Congress and the President.

Even assuming that a comprehensive analysis were available on the control programs of every CoCom member, Congress and the administration still would be faced with the policy question of how to encourage an upgrading of the control programs of individual CoCom members and other Western countries.

Licensing and Enforcement: The Paper Trail

As previously discussed, a principal objection to the elimination of licensing controls is that the government's prior review of exports is fundamental to a control system. U.S. export control officials are in agreement that attempts to divert controlled goods and technology directly from the United States to the Soviet Union or the bloc occur only infrequently. Virtually all surreptitious diversions to the East

that are detected by U.S. officials have occurred through intermediary countries. In the absence of the government's prior approval of export license applications, exports to "suspect" companies—companies not identified publicly on the U.S. Denial List[18] but suspected of engaging in surreptitious trade with the East—could not be investigated and prevented.

U.S. officials also have testified to the unwillingness of certain CoCom enforcement authorities to investigate diversions from their territory of U.S.-origin goods. Therefore, it is argued that U.S. licensing controls must constitute the principal barrier to illegal exports and reexports of goods and technology. In the infamous Bruchhausen/Maluta diversion case, Commerce and Customs officials pointed to the existence of licensing as the means by which the diversion ring was uncovered and its members indicted and convicted. The Bruchhausen case revealed, however, that hundreds of illegal shipments occurred prior to any investigation or interdiction of exports by federal authorities, thus raising serious additional questions about the effectiveness of the existing licensing system.

THE CANADIAN EXEMPTION

For many years the United States has not imposed validated licensing controls on exports to Canada. A review of the Canadian and U.S. press between 1979 and 1985 revealed few reported incidents of diversion. U.S. government officials concede that there is little information on the extent of illegal trade in advanced technology products between the two countries. It is also widely reported that Department of Defense officials consider the absence of licensing controls for Canada a serious flaw in the U.S. control system.[19]

The volume of trade between the United States and Canada and the potential for disrupting well-established trade flows are major disincentives to the imposition of licensing controls. In the absence of a documented record of abuse by diverters of U.S.-Canadian export control arrangements, other CoCom members have questioned why a similar arrangement is not suitable for their trade with the United States. Obviously, eliminating licensing on U.S. trade with CoCom countries would remove a major disincentive to U.S. exports.

Possible Alternatives to the Elimination of Licensing to CoCom and CoCom-like Countries

Notification of Exports at Time of Shipment in Lieu of Validated Licenses

U.S. licensing controls for transfers of goods or technology to CoCom or to individual CoCom members could be replaced by a notification system. For the export of products subject to multilateral controls, an expanded version of the shipper's export declaration (SED) could provide to the Department of Commerce the information contained in an export license.

A provision also could be added to attach an international import certificate (IIC) to the SED. Although the import certificate is not used by all CoCom countries and furthermore is not issued for identical categories of goods, a multilateral effort is in progress to harmonize the use of such a certificate. The U.S. Customs Service could assume the responsibility of transferring to the Department of Commerce, on an expedited basis, the export control information in an expanded SED.

Advocates of eliminating licensing note that the falsification of SEDs or other notification documents or the failure to submit such documents in advance of exportation would still provide the evidentiary basis to investigate and prosecute diverters. In 1983 such a proposal was suggested by several members of the Foreign Affairs Committee and reviewed with Commerce, Census, and Customs officials.

Elimination of Licensing with Prior Notification

In the absence of validated licenses, exporters could be required to submit notification documents prior to exportation. During the last Export Administration Act reauthorization, a proposal was considered to require notification of exports between 15 and 30 days in advance of actual shipment. Within this time period the Department of Commerce would have the opportunity to prohibit specific export transactions. A system of prior notification also would enable the Department of Commerce to conduct prelicense checks at a rate limited only by budgetary considerations governing the number of export licensing officers.

In addition, a minority of Foreign Affairs committee members maintained that uniform application of the IIC by CoCom members,

combined with the application of the delivery verification document to certain technologically advanced dual use items, would serve as the functional equivalent of licensing. The import certificate would constitute a verification by the foreign government to the U.S. Department of Commerce of the bonafides of the foreign company importing U.S.-origin goods or technology.

Elimination of Licensing on a Country-by-Country Basis

In May 1986 the House Committee on Foreign Affairs adopted a provision that could provide for the elimination of validated licensing controls to countries that impose and enforce a system of national security controls comparable to that of the United States.[20]

The proposal is specifically framed to provide the secretary of state with the authority to terminate licensing controls to those countries that agree to maintain controls cooperatively with the United States. Following the conclusion of such an agreement, and a determination by the secretary that the controls have been effectively maintained for 1 year, validated licenses would not be required for exports to that country. Should the secretary reverse his determination regarding the effectiveness of the foreign country's export control program, he could reinstate U.S. licensing requirements.

The Proposed "Gold Card" License for Reliable Exporters and Importers

Origin

During the 1983–1985 reauthorization debate, a compromise proposal was developed to address the objections to eliminating licensing controls. Licenses would be required for exports to unreliable end-users. An alternative proposal was to eliminate licensing controls for reliable U.S. exporters and end-users overseas.[21] The proposal was criticized severely by the Departments of Commerce and Defense on the grounds that it was unadministrable and would encourage diverters to establish "reliable" companies in preparation for future surreptitious activities.

The Current Proposal

The Department of Defense has proposed a new type of license

based on the reliability of foreign customers. A "gold card" license would shift the focus of export controls from goods and technologies to the ability of foreign importers to be certified by the U.S. government as "reliable" companies, presumably based on a review of internal corporate control programs. This new form of licensing is being considered for U.S./CoCom-country trade, as well as trade with other countries that maintain a system of export controls comparable to that of the United States.

Representatives of U.S. high-technology industries and trade associations have expressed interest in the proposal. But several such representatives have expressed reservations about the gold card license if it is predicated on the involvement of the Department of Defense in the certification of internal control programs. Furthermore, there appears to be considerable apprehension that gold card certification could include not only an examination of the foreign subsidiary, affiliate, or importer but also its principal foreign customers.

PROPOSALS TO EXEMPT EXPORTS OF SPECIFIC CATEGORIES OF GOODS TO SPECIFIC DESTINATIONS

During the reauthorization of the 1979 act, an amendment was proposed by the House Republican leadership to eliminate licensing controls for so-called "low-technology" items to all Free World countries, which are defined under the act as countries to which exports are not controlled. The amendment was adopted by the House but subsequently rejected during further debate; it ultimately was incorporated into the 1985 act although its decontrol provisions apply *only* to exports to CoCom countries.[22]

Origin of the Proposal

In its 1982 report, *Exporting Licensing Could Be Reduced Without Affecting National Security*, the General Accounting Office recommended the elimination of "licensing requirements to non-Communist countries for low technology products falling below the Communist country threshold." That threshold is a series of technological parameters commonly known as the administrative exception notes (AENs) to the CoCom International List. Under CoCom rules, products that fall below the parameters of the AENs may be exported by CoCom

countries to the Soviet Union and the bloc without prior CoCom approval. With minor modifications and clarifications, the CoCom AENs are printed in the U.S. Control List as advisory notes.

In a 1982 report, GAO estimated that removing licensing requirements for AEN items to Free World countries would reduce by one-half the number of individual validated licenses.[23] Responding to a congressional request for confirmation of this estimate, GAO in May 1984 submitted an updated analysis based on a sampling of license applications. The updated report estimated "at the 95 percent confidence level, that the number of applications processed by OEA [Office of Export Administration] would be reduced by 26 to 38 percent. . . . This means that between 31,200 and 45,600 applications would be eliminated from OEA's projected workload of 120,000 applications for the current fiscal year."[24]

During GAO's licensing survey, 14 percent of the licenses reviewed could not be categorized owing to insufficient information on the application. This situation led to the following estimate: "If the proportion of these . . . applications falling below the Communist country threshold is the same as the rest of the sample, then the 95 percent confidence interval for applications that would be eliminated would be between *30 and 44 percent*[25] *of all applications* [emphasis added]."

Proponents of eliminating all licensing controls to CoCom countries estimated a reduction of one-third in the total number of individual license applications. Based on the GAO estimates, advocates of the AEN proposal asserted a comparable reduction in licenses but one that was limited to exports of low-technology items. In their view, there was little risk to U.S. national security if such exports were ultimately acquired by the Soviet Union or the bloc.[26]

Implementation of the G-COM License

Following implementation of the G-COM license for exports to CoCom countries, the Department of Commerce estimated a 10 to 15 percent reduction in individual licenses. This estimate now appears quite low in light of the number of licenses identified by GAO for exports of AEN items to CoCom countries. In the 7 months since promulgation of the regulations, there appears to be limited knowledge among U.S. exporters of the G-COM license and the specific products exempted from licensing controls. Moreover, the Department of Commerce is believed to be processing license applications

for AEN items without notifying exporters that the export of such items do not require the prior approval of the department.

Proposals to Expand the G-COM License

PROPOSALS TO INCLUDE ALL FREE WORLD COUNTRIES

The amendments to the 1985 act recently approved by the House Committee on Foreign Affairs expand the G-COM license to include all AEN items to all Free World countries.[27] The amendment also provides that the secretary of commerce may require "any person exporting such goods or technology to a country other than a controlled country" to notify the department of such exports. This notification requirement would be satisfied by submitting a notification document at the time of exportation.

PROPOSALS TO INCLUDE THE PEOPLE'S REPUBLIC OF CHINA WITHIN THE SCOPE OF THE G-COM LICENSE

In the view of many technical specialists, the emergence of a separate export control policy for the People's Republic of China (PRC) has further complicated the U.S. licensing system. However, the liberalization of licensing requirements to the PRC also established a basis to reduce even further the total number of goods subject to licensing controls. Under the terms of the so-called China policy coordinated by the Department of Commerce, most exports are divided into three zones (green, yellow, and red) according to a series of technological parameters. Each zone also indicates the likelihood of the department approving license applications.[28] Based on technical parameters released by the Commerce Department, exports in the yellow and red zones are subject to full review by the Department of Defense and require the unanimous approval of CoCom. Zone categorization indicates the following:

- Green—According to the Department of Commerce, license applications that fall within the green zone are likely to receive, with some exceptions, expeditious consideration and approval.
- Yellow—Export license applications that fall within the technological parameters of this zone are subject to a case-by-case review, often with the concurrence of the Department of Defense and other agencies. According to recent information, the department has classified the upper parameters that define this zone.

• Red—Export license applications that fall within this zone are considered to have significant military importance. Applications for the export of such goods are presumed to be denied unless special circumstances can be established to warrant the sale.

The United States is the only CoCom member to restrict the export of AEN items to the PRC, the Soviet Union, and the bloc. Thus, because AEN items are "low-technology" goods, advocates of decontrol argue that such items are freely available to "controlled countries." On this basis, a number of representatives of U.S. high-technology companies and their spokesmen in trade associations have proposed including China within the G-COM license and increasing the scope of decontrol by harmonizing the AEN/advisory note levels with those in the green and/or yellow zones. This objective could be realized, they propose, by the following measures:

1. Compare the green zone levels with the U.S. advisory notes and redesignate the zone according to the AEN levels, thereby extending the G-COM license to the PRC.
2. When the green zone incorporates parameters of greater technological sophistication than the advisory notes, increase the level of the advisory notes.
3. Review each of the export commodity control number (ECCN) categories for which there is a so-called yellow zone *and* promulgate regulations that *exempt exports to CoCom countries* below this level from licensing requirements.

Proposal to Extend the G-COM License to the Soviet Union and the Bloc

Based on the general availability of AEN items to the Soviet Union from other CoCom and non-CoCom countries, it is argued that the continuation of validated licensing controls on such items does not enhance the strategic security of the United States.

Proposal to Eliminate Reexport Controls on All AEN/G-COM Items Traded Among Free World Countries

Because there are compelling reasons to eliminate validated licensing controls on AEN items to all Free World destinations and the PRC, it has been proposed that all reexport controls be eliminated on these items. Based on the availability of AEN items to the Soviet

Union and the bloc, it does not seem likely that the Soviets would seek to acquire, through third-country diversionary schemes, goods that can be obtained directly from other CoCom countries.

A number of U.S. industry representatives do not favor, for political reasons, the elimination of controls on exports of AEN items to the Soviet Union. At the same time, however, relying on foreign availability criteria, they cannot justify the maintenance of such controls. As a "practical" compromise, they propose the complete elimination of reexport controls on AEN items traded among Free World countries.

REDUCTION OF CONTROLS ON SCIENTIFIC INSTRUMENTS AND MEDICAL EQUIPMENT

Origins of Previous Efforts to Reduce the Scope of Controls

In the mid-1970s a number of U.S. companies and trade associations proposed that certain types of "embedded" microprocessors be removed from unilateral U.S. export controls. (For example, U.S. exporters were concerned that sewing machines or microwave ovens with embedded microprocessors were unnecessarily subject to national security licensing controls.) Although the embedded products in question have changed, a decade later the same debate persists—a debate that hinges on the question of whether the Soviet Union, the bloc, and the PRC are willing to purchase an end-use item intended solely for civilian application to extract a microprocessor or array processor for incorporation into a product with strategic significance.

CREATION OF THE TECHNICAL ADVISORY COMMITTEES

The debate over the creation of private sector technical advisory committees (TACs) illustrates why it took more than a half decade of concerted efforts by industry to convince the government to decontrol embedded microprocessors.

The ability of the private sector to recommend the elimination of controls over specific products such as embedded microprocessors was strengthened significantly by the 1972 amendments to the Export Control Act. The 1972 amendments provided for the creation of the TACs, each of which represented a different industry or cluster of products. The House committee with jurisdiction over export controls favored the creation of the TACs because of the government's

difficulty in evaluating the technical factors that determine the relationship between controls on specific products to U.S. national security.[29] The Senate report on the same 1972 act conveyed the expectation that the "establishment of industry-government technical advisory committees will enable the government to utilize more effectively the technical and commercial expertise which only representatives of industry affected by export controls can provide."[30]

Nevertheless, there was strong opposition to the creation of the TACs, and arguments were presented that the private sector was ill suited to make recommendations regarding matters affecting national security. One proponent of this view maintained that the decontrol of goods "involved broad judgments concerning the national interest including evaluations of technical information, intelligence data, and strategic and political considerations . . . these judgments are governmental responsibilities which industry experts are not in a position to make."[31]

The General Accounting Office Report on Export Control of Microprocessors

According to a GAO study, in 1978 six TACs agreed that the decontrol of embedded microprocessors should be considered in light of three criteria:[32]

1. Products should be judged on overall capability, not on what they contain. . . .
2. Products will not be purchased simply to remove the microprocessor.
3. No differentiation should be made between types of users of a product (consumer, commercial, or industrial) due to difficulties in differentiating their use of it.

The TACs also recommended that technological indexing be applied to the control standards, thus making it possible to decontrol less-sophisticated end-use products and unembedded microprocessors.

The Departments of Defense and Commerce were at odds over the TAC report. Defense maintained that certain civilian products would be purchased by adversaries of the United States to extract the embedded microprocessor: "The problem, for example, is whether a sewing machine with an embedded microprocessor should be considered a microprocessor or sewing machine." Commerce "vigorously dissented" and maintained that "adding general-purpose computers or microprocessors to non-strategic items, such as *medical x-ray machines and microwave ovens* does not make those strategic devices.

Any concern that the Communists would purchase the product to extract the computing element was difficult to believe, since even the most advanced microprocessors are sold over the counter in hobby shops and electronic supply houses throughout the Western world [emphasis added]."[33]

The 1983–1985 Congressional Reauthorization Debate

From the standpoint of U.S. exporters, by mid-1983 few goods containing embedded microprocessors had been decontrolled. At that time, Representative Don Bonker introduced H.R. 2761, which provided, inter alia, that goods containing nonreprogrammable embedded microprocessors would be subject to licensing controls on the basis of (1) the function of the end-use product, and (2) the contribution of that product to the military capability of a potential adversary. However, the bill stipulated that end-use products could not be controlled solely because of an embedded microprocessor, provided the processor "cannot be used or altered to perform functions other than those it performs in the good in which it is embedded."[34]

When this legislation was introduced, the Department of Commerce had proposed the decontrol of 94 categories of equipment that incorporate microprocessors. The Department of Defense objected to the scope of the proposal, and thereby prevented the secretary of commerce from promulgating regulations to decontrol the products in question. In addition, the Department of Defense communicated to Congress its strong opposition to the Bonker proposal, objecting to statutorily mandated decontrol and stressing the need for "flexibility to streamline the licensing process."[35]

The 1986 House Foreign Affairs Amendment

In May 1986 the House Committee on Foreign Affairs approved an amendment to EAA that requires a 40 percent reduction over 3 years in the U.S. Control List. Among the goods specifically identified for removal were "all medical instruments and equipment, and goods so widely available to the general public in retail outlets that the export controls on those goods are rendered ineffective in achieving their purpose."[36] By endorsing this provision, the committee reiterated that "goods are to be controlled on the basis of essential functionality and not whether they contain or utilize electronic computers."[37] Dissent to this provision echoes previous objections to

decontrol products with embedded microprocessors and computers; the minority views to the report on H.R. 4708 state that "array processors used in *CAT scanners* . . . are used for nuclear weapons design, intelligence analysis, antisubmarine warfare . . . and detection of stealth aircraft."

Commentary on the Proposals

After nearly a decade of deliberations over the strategic value of embedded computer products, the Departments of Commerce and Defense have been unable to agree on a common export control policy. The Department of Commerce does not have the authority to remove unilaterally controls on entire classes of products. Conflict between these two agencies has been destructive to efforts to narrow the scope of U.S. export controls.

PROPOSALS TO ELIMINATE LICENSING CONTROLS ON REEXPORTS OF U.S.-ORIGIN GOODS AND TECHNOLOGY

Extent of the Controls

Since the enactment of the Export Control Act of 1949, the Department of Commerce has sought to prevent the unauthorized transshipment of goods and technologies. Reexport controls were formulated to "prevent frustration of U.S. export controls." Thus, the Department of Commerce "exercises vigilance over exports and reexports . . . in order to prevent such exports or reexports from being used for a purpose detrimental to the national security or foreign policy of the United States."[38] Theoretically, the scope of U.S. reexport controls extends to every item approved for export.

The Departments of Commerce and Treasury, with assistance from U.S. embassies, are responsible for ensuring foreign compliance with U.S. reexport controls. Postlicense checks are considered by these departments to be both an important means to enforce reexport controls and a deterrent to diversion. However, most countries, including members of CoCom, do not look with favor on U.S. government officials conducting physical inspections of businesses located in their territories and interviewing their nationals.[39]

At the same time the departments with the operational responsibility to conduct postlicense checks have complained that insufficient financial resources have restricted the number of personnel assigned

to perform these verifications. In addition, U.S. foreign service officers have resisted conducting on-site verifications of U.S. equipment, contending that such tasks interfere with other duties.

It is widely believed that CoCom countries and other Free World governments do not engage in a systematic program of postlicense checks, either at the request of the United States or on their own initiative.

Origin of Proposals to Reduce U.S. Reexport Controls

With the onset of detente and official U.S. government encouragement of East-West trade, U.S. exporting companies questioned the utility and practicality of reexport controls. In addition, U.S. firms expressed concerns that reexport controls were impeding their ability to compete abroad. Twenty years ago, the Senate Banking Committee heard testimony that "the exportation of components to Western Europe is now falling off" and that the committee might consider "the adverse effect of our export control system on our trade with Western Europe in connection with the East-West trade problem. . . ."[40] The Banking Committee heard allegations that "[t]he West Germans are now going around England saying 'Why buy from the United States, where you have all that rigamarole? . . . Why buy component parts from the United States when the United States will insist on knowing by whom the end product is to be used and to whom it will be resold, even to another Western Country?'" Following this comment, Senator Walter Mondale said that "foreign businessmen, understandably, deeply resent an American official. . . seeking to assert American control by suggesting that they were cheating on a [CoCom] commitment and asking for the right to go through their books, [and] be a spy in their plants. . . ."[41]

In the early 1970s the executive branch considered eliminating the so-called dual licensing requirement that the Department of Commerce separately license reexports of U.S.-origin goods from CoCom countries to proscribed countries. Although CoCom members were in agreement on obtaining unanimous CoCom approval of such exports, the United States did not consider the control programs of other member governments to be sufficiently effective to ensure that reexport of U.S.-origin items would be brought to the attention of CoCom.[42] Under the current Export Administration Regulations (EAR), most such reexports do not require separate U.S. government approval.

The 1979 Reauthorization

In 1979 the House Committee on Foreign Affairs recommended the elimination of reexport controls on exports to CoCom countries. During the committee's consideration of this proposal, Representative Lester Wolff offered an amendment to restore reexport control authority for the following reason: "Even though the reexport controls . . . have not always been effective . . . it is essential that we still try to keep some control over those items if we don't want them to go to third countries. Obviously, deleting reexport controls would create a giant loophole for third country transfers. . . ."[43] A Department of Defense spokesman criticized the committee's provision and maintained that "reexport controls are a necessary evil . . . other things being equal, we would be only too happy to get rid of this additional requirement. Other things, however, are not equal at the present time."[44]

Proponents of scaling back the controls were critical of the dual licensing system required by the United States for reexports from CoCom countries to the East. They did not, however, examine in detail the issue of reexports from CoCom members to other Free World countries and the possibility of diversion subsequently to controlled countries.

Representative Wolff's amendment was defeated in committee, but it was adopted subsequently during debate by the full house. The argument that "we cannot rely on CoCom procedures to protect vital technology and technical data" was sufficiently persuasive to convince the chairman of the subcommittee who authored the CoCom proposal to recommend adoption of an amendment striking his own proposal.[45]

The 1983–1985 Reauthorization

During the most recent reauthorization of the act, reexport controls were frequently criticized, but neither the House nor Senate bills proposed the elimination of such controls on exports regulated for reasons of national security.[46]

The 1985 Export Enhancement Act

Following the rejection by Congress of the proposal to eliminate all licensing controls on exports to CoCom, the U.S. business community redirected its attention toward reexport controls. The effort

to narrow the scope of controls returned to the goals of previous years: (1) eliminating reexport controls on transfers of goods and technology to CoCom members and (2) formulating a standard or set of standards by which to exempt a large class of U.S. exports from reexport controls.

THE U.S. "HIGH-TECH" INDUSTRY PROPOSAL

In March 1986 the Industry Coalition on Technology Transfer (ICOTT) urged the Commerce Department to establish by regulation de minimis levels of U.S. content to permit the reexport of foreign-made products that incorporate U.S.-origin goods and technology without the prior approval of the Department of Commerce. The proposal[47] calls for:

1. 50% for CoCom and other cooperating countries that participate in a system of export controls;

   35% for signatories to the nuclear non-proliferation treaty; and

   20% for all other destinations.

2. Create a new multiple reexport license for items that currently are eligible for the Distribution License (*i.e.*, not listed in supplements 1 and 4 to the EAR Section 373.3) that would permit reexport to T & V countries, providing the recipient passes the Denial Order and nuclear screens.[48]

It is known that the Department of Commerce is considering a de minimis proposal, although not necessarily one that adopts the levels proposed by ICOTT.

The Export Enhancement Act of 1986

RECOMMENDATIONS OF THE HOUSE COMMITTEE ON FOREIGN AFFAIRS

In May 1986 the House Committee on Foreign Affairs recommended to the full House a series of amendments to the 1985 act that, inter alia, (1) revive the 1979 reexport amendment on exports to CoCom countries and (2) establish de minimis levels to exempt certain reexports from U.S. controls.[49] The provisions on reexport controls provide for the following:

- elimination of controls on reexports from CoCom countries;
- elimination of controls on reexports from countries that agree to implement export restrictions "comparable in practice to those maintained by the Committee. . . .";[50]

- maintenance by the secretary of commerce of requirements for export licenses for reexports to specified end-users suspected of diversion (the list of such end-users would be made public through the *Federal Register* and supplements to the Export Administration Regulations); and
- elimination of reexport controls when the U.S.-origin goods incorporated into a foreign-made good are: (1) not in excess of $10,000 in value and (2) not in excess of 20 percent of the total value of the foreign-made good.

The committee endorsed the views of several U.S. trade associations that foreign manufacturers were de-Americanizing their products to avoid U.S. reexport controls.[51] Moreover, a majority of the committee was in agreement that U.S. reexport controls were unenforceable.

Critique of the Committee's Recommendations

The Reagan administration maintains that reexport controls are necessary to track U.S.-origin exports through international commerce to prevent diversion. It also maintains that "[o]ur CoCom allies neither have the personnel resources nor the political will to police the embargo. . . . Indeed, we have discovered remarkably few pre-license or post-shipment checks conducted by other countries. The United States must maintain the diplomatic *leverage of effective enforcement* abroad to encourage the allies and neutral but friendly countries to enforce export controls vigilantly."[52] Similar views were expressed by a minority of the House during the debate on H.R. 4800.[53] The administration and a minority of the House also maintain that reexport controls, with attendant criminal penalties for violations, are necessary to deter diversion. These policymakers are also critical of the penalties imposed by most CoCom member governments for diversion as insufficient to deter such actions.[54]

Additional Legislative and Regulatory Proposals

Other proposals to scale back the scope of U.S. reexport controls include those discussed below.

Proposals to Maintain Reexport Controls Only for Products Excluded from the Distribution License

By either legislation or regulation, U.S. reexport controls could

be eliminated on all products except those excluded from the distribution license procedure.

EAR excludes from the distribution license certain advanced technology products including items applicable to nuclear research and design. Certain products may be eligible for export under a distribution license to certain countries and precluded for export to other countries. These products are considered to be of military significance and, depending on the ultimate destination of the export, remain subject to individual validated licensing controls.

PROPOSALS TO ELIMINATE REEXPORT CONTROLS FOR SHIPMENTS WITHIN COCOM AND TO COUNTRIES WITH COCOM-LIKE CONTROLS

The congressional debate on reexport controls continues to evidence some confusion about the responsibilities of CoCom governments to prevent diversion through third countries. For example, the report of the Committee on Foreign Affairs emphasizes that reexport controls are: ". . . a duplicative paper exercise, since the United States has the opportunity at CoCom to veto *any* proposed reexport of a CoCom-controlled good or technology." However, the U.S. veto in CoCom is restricted to exports to the Soviet Union, the bloc, and the PRC. Exports to other countries are not brought to the attention of CoCom.

The selective elimination of U.S. reexport controls would require that destination control statements, which accompany virtually all exports, be modified to indicate that reexport other than to countries on a list of CoCom and CoCom-like countries is prohibited under U.S. law unless the reexport is approved by the Department of Commerce.

Comment

There are no publicly available studies regarding the effectiveness of U.S. reexport controls in either preventing or uncovering the diversion of goods and technology. In the absence of such information (which might be gathered or acquired by reviewing approvals and denials of reexport requests to Free World and controlled countries), the debate within Congress and the administration will continue to be conducted on the basis of conjecture. Specific information also is necessary to demonstrate that the controls in question indeed have resulted in the loss of U.S. exports.

REDUCTION OF THE SCOPE AND NUMBER OF UNILATERAL CONTROL CATEGORIES

The Scope of Unilateral Controls

For purposes of national security, the United States restricts the export of 29 categories of goods and technology that are not incorporated into the CoCom International List.[55]

Congressional Concerns Prior to the 1985 Act

Generally, the congressional committees with responsibility for drafting export control legislation have sought to reduce unilateral controls by encouraging the Department of Commerce to determine whether goods licensed by the United States are available to controlled countries from outside the United States.

THE 1969 REAUTHORIZATION

On balance, the legislative record of the 1969 act indicated considerable expectation that the executive branch would reduce the number of goods subject to export controls. Strong criticisms were voiced about unilateral export controls; for example, Representative Thomas Ashley argued that unilateral controls "risked American political goodwill with our allies."[56] Such controls also were explicitly linked with the issue of foreign availability and the burden of lost sales imposed by controls on U.S. exporters. This view was endorsed by the Senate Committee on Banking: "[One] of the greatest frustrations to American business is its extreme competitive disadvantage caused by the *unilateral* trade restrictions imposed by the United States."[57]

THE 1972 AMENDMENTS

Although Congress was dissatisfied with the pace of decontrol efforts by the executive branch, specific amendments were not adopted to compel a reduction of unilateral controls. Referring to the 1969 act, the House Committee on Banking and Currency complained that "[t]wo and one-half years have passed since this legislation was enacted, yet . . . [the committee] finds that the required reviews and revisions [of unilateral and multilateral controls] have not been

made promptly and consultations with industry have left much to be desired."[58]

A similar sense of frustration was expressed in the Senate. The Committee on Banking observed that the United States maintains unilateral export restrictions on 461 classifications of goods and technology,[59] and it directed the secretary of commerce to review both "items under unilateral control which are available from foreign sources," and other items "which are unnecessarily controlled."[60]

THE 1977 AMENDMENTS AND 1979 REAUTHORIZATION

Neither the 1977 amendments nor the 1979 reauthorization specifically addressed the issue of unilateral controls. Both bills, however, sought to increase reliance on foreign availability criteria to decontrol goods.

Several changes resulting from the 1977 amendments sought to focus U.S. controls on those goods and technologies that, if acquired by a potential adversary, would increase its military capability *and* be detrimental to U.S. national security.[61]

Legislative and Regulatory Proposals

THE 1983–1984 CONGRESSIONAL DEBATE: COMMODITY DECONTROL BY COUNTRY GROUP

In 1983 the House Committee on Foreign Affairs approved an amendment that established a scenario for decontrolling products subject to unilateral controls. The amendment provided that if all licenses for a particular product were approved for export to a particular country group (as defined by EAR) within any 1-year period, then licensing requirements would be eliminated for exports of that product to that country group.

The secretary of commerce also was authorized to require licenses for exports to end-users suspected of diverting goods or technology to controlled countries. Such a list would be published in the *Federal Register* and in supplements to EAR.

Justification Sponsors of the amendment maintained that only multilateral—not unilateral—controls could prevent the acquisition by controlled countries of militarily critical goods and technologies. A statement by the Export Administration Subcommittee of the President's Export Council reflected the views of the sponsors of

the amendment: "Absent a unique U.S. product capability, U.S. licensing controls . . . which are imposed unilaterally simply serve to divert export business to our CoCom allies and other competitors. Unilateral controls do not, with very rare exception, deprive the potential adversary of anything, but instead only act to harm U.S. export performance."[62]

Critique The administration opposed the elimination of licensing and reexport controls: "[T]here would be no way administratively to assure that a product decontrolled for one country group would not be diverted to another country group for which controls on that product continue to apply."[63] Furthermore, the opponents to the amendment alleged that publication of a list of unreliable end-users would simply cause diverters to establish new "front companies" and surreptitious networks for the illegal transfer of goods and technology. In addition, it was argued that diverters would merely wait for the expiration of the 1-year approval period, or seek to create a record of license approvals, to obtain the elimination of validated licensing controls.

THE PROPOSED EXPORT ENHANCEMENT ACT OF 1986

The report of the House Committee on Foreign Affairs urges the Department of Commerce to "immediately initiate a review of all unilateral national security controls to justify continuation or delete such controls."[64]

REVIEW AND TRANSFER OF UNILATERAL ECCN CATEGORIES TO THE MUNITIONS LIST

The next three proposals have been considered by congressional staff but were not proposed as amendments during the most recent reauthorization of the Export Administration Act. Several unilateral control categories appear to indicate that controls may be more appropriate under the International Traffic in Arms Regulations (ITAR) than under the Export Administration Act. A detailed review of such categories (e.g., ECCN 4516B, communications countermeasures equipment) could warrant the imposition of ITAR controls. Such reclassification was to be predicated on two conditions: first, that the goods were not "dual use" items; and, second, that such items were not available to controlled countries from other "Free World" countries.

ADDITION OF U.S. UNILATERAL CATEGORIES TO THE COCOM INTERNATIONAL LIST

Following a review to determine whether certain unilateral control categories belong more appropriately on the U.S. Munitions List, Congress could require that the United States propose the incorporation of the remaining unilateral categories into the CoCom International List. If these categories or parts thereof did not become subject within a specified time period to CoCom controls, then the executive branch could maintain controls *only* if the controls satisfied a two-part test: (1) if there were a specific finding that foreign availability of items in these categories did not exist and (2) if acquisition by a controlled country would make a substantial contribution to its military capability and threaten the national security of the United States. Notices of such determinations would be published in the *Federal Register* and communicated in greater detail to the TACs, if necessary in closed session.

AUTHORIZATION OF THE DEPARTMENT OF COMMERCE TO DECONTROL ITEMS SUBJECT TO UNILATERAL CONTROLS

By legislation, the Department of Commerce could be authorized to coordinate an interagency review of those ECCN categories that account for the preponderance of items subject to unilateral controls. The department would report its findings to Congress by a specific date and, following oversight hearings, issue regulations to implement its decontrol recommendations. Of course, the President could prohibit the publication of the regulations by overriding the recommendations of the secretary of commerce.

IMPLEMENTATION OF THE MILITARILY CRITICAL TECHNOLOGIES LIST

The 1979 Reauthorization

The recommendations in 1976 of the President's Defense Science Board[65] led directly to the provisions in the Export Administration Act of 1979 creating the Militarily Critical Technologies List (MCTL). The principal recommendation of the report recognized the potential trade-offs and conflicts that were likely to result from a comprehensive effort to reduce the scope of U.S. export controls: "U.S. export control activity should focus primarily on the active transfer

mechanisms. The recommended trade-off is to devote less scrutiny to product sales having low strategic impact, and shorten drastically the CoCom list, for the sake of devoting thorough scrutiny to requests that would transfer vital design and manufacturing know-how." At the same time, a strengthened U.S. export control system would "release to non-allied, non-Communist countries only the technology we would be willing to transfer to Communist countries directly. This rule should extend to such technology embodied in weapons sales."[66]

To achieve these and other objectives, Congress in 1979 adopted a detailed set of provisions (1) to formulate an MCTL and (2) to cause the MCTL to become the means to reduce the number of items on the U.S. Control List (then known as the Commodity Control List).[67] It was the intention of Congress that the MCTL "shall be sufficiently specific to guide the determinations of any official exercising export licensing responsibilities. . . ." An "initial version" of the list was to be published in the *Federal Register* not later than October 1, 1980.[68]

The actual implementation of the MCTL was to occur according to a set of criteria in the 1979 act for adding to or deleting items from the U.S. Control List. Items were to be added to the list based on agreement between the secretaries of commerce and defense.[69]

Evaluation of the Implementation Process

Within Congress and the U.S. business community, there is widespread disenchantment with the MCTL. The publication in 1985 by the Department of Defense of a detailed index to the MCTL was not regarded as a significant step forward in the implementation process. The task of defining "militarily critical" or "strategic significance" has become a conundrum—and one that has not been solved by more than two decades of investigation. In 1965 a report by the Library of Congress observed: "These ephemeral characteristics have bedeviled the administrators of programs purporting to control exports of strategic goods, and particularly in negotiations with allies for a common workable concept of strategic goods to serve as a basis for multilateral export control."[70]

In the absence of contract funding from the Department of Defense, few private sector and academic institutions have sought to evaluate the MCTL.[71]

CONGRESSIONAL EXPECTATIONS REGARDING THE MCTL

In 1979 the chairman of the House Committee on Foreign Affairs foresaw the MCTL permitting "the relaxation of controls on less significant items which have little or no military importance and will allow the focusing of controls on the more highly advanced technologies."[72] Although the Bucy report found legislative expression only in 1979, from its release in 1976 it became an important factor in shaping export control policy. Thus, an amendment to the International Security Assistance Act of 1977 required the President to submit to Congress a detailed study on U.S. export controls and technology transfer policies. The President's report was criticized severely by the Congressional Research Service:

> As the executive report did not respond in a comprehensive manner to many of the questions raised by Congress and did not provide extensive analysis and criticism of existing institutions and procedures, it follows that Congress might have to turn to methods other than required reports with detailed guidance or to sources other than the executive if it wishes to obtain critical, probing analysis and a review of possible alternatives regarding the transfer of technology.[73]

In subsequent years the executive branch proved unable to develop standards to evaluate the reasons for controlling exports of specific products and to develop the MCTL. By 1983 the MCTL did not appear to conform with the objectives of the 1979 act or the understandings of the ranking members of the committees of jurisdiction over EAA regarding its development. Congress in 1983 sought to develop the MCTL with technical resources under its control.

The 1983 Amendments

In 1983 a detailed amendment was proposed by the House Committee on Foreign Affairs to guide the integration of the MCTL with the Commodity Control List (CCL). The amendment was based on the assumption that the Departments of Commerce and Defense would not be able to agree jointly over the terms of integration. Therefore, the committee amendment provided that GAO would oversee the efforts to merge the MCTL with the CCL.[74] The original amendment approved by the Committee on Foreign Affairs contained the following elements.

FINAL DATE

The MCTL and CCL were to be merged "with all deliberate speed" but not later than April 1, 1985.

REPORTS

First, the Departments of Defense and Commerce were to report to Congress prior to the completion date any circumstances "which would preclude the completion of the integrated list. . . ." Second, the final report to Congress was to be a joint report on executive branch actions to carry out the amendment. Third, GAO was to report to Congress no later than April 1, 1985, on its evaluation of the program undertaken by the secretaries of commerce and defense to integrate the two lists.

FOREIGN AVAILABILITY

The integrated list was to include only goods or technologies that met a stringent foreign availability test. A good or technology could not be included on the integrated list if a country "to which exports are controlled" possessed (1) that good or technology or (2) a similar good or technology *and* (3) such a good or technology was available in sufficient quantity and quality to vitiate the purposes of maintaining U.S. export licensing controls. The authority to make such determinations was assigned to the secretary of commerce.

OBSERVATION BY GAO OF EXECUTIVE BRANCH DELIBERATIONS

Under the terms of the amendment, GAO would be granted access to all executive branch materials pertaining to the MCTL/CCL integration and to all meetings pertaining to the integration. To ensure the participation of GAO, the appropriate executive branch agencies were obligated to notify GAO of such meetings.

MCTL DECONTROL CRITERIA

The Committee on Foreign Affairs reviewed and with slight modifications adopted four criteria developed by the National Academy of Sciences to streamline the MCTL. The amendment provided that

the executive branch and GAO should consider, among other criteria, for removal from the MCTL goods or technologies in one or more of the following categories:

> (i) Goods and technology the transfer of which would not lead to a significant near-term improvement in the defense capability of a country to which exports are controlled. . . .
>
> (ii) A technology that is evolving slowly.
>
> (iii) Technology that is not process-oriented.
>
> (iv) Components used in militarily sensitive devices that in themselves are not sensitive.[75]

Congressional Preparation of a Critical Technologies List

During 1983 the House Committee on Foreign Affairs considered providing funding to GAO and to the congressional Office of Technology Assessment (OTA) to prepare, independently of the Department of Defense, an alternative version of the MCTL.

The concepts behind the MCTL proposal were earlier congressional and presidential initiatives that created the program. First, in 1979 Congress authorized a related approach in authorizing the Veterans Administration and OTA to conduct epidemiological studies of persons who served in the Armed Forces in Vietnam and were exposed to dioxins known as agent orange.[76] Second, early in the Reagan administration, the President commissioned two independent teams to assess Soviet strategic capabilities. Following the preparation of a congressionally mandated MCTL, the appropriate committees with jurisdiction over export controls could: (1) conduct oversight hearings to evaluate the administration's recommendations to revise the MCTL and (2) similarly review the recommendations of the congressional agencies. Following this review process, Congress would have the option of directing by legislation the secretary of commerce to implement either the DoD or GAO/OTA recommendations as the mechanism to reformulate the Commodity Control List.[77]

Establishment of an Interagency Committee to Develop the MCTL[78]

During the reauthorization of the 1979 act, several House members considered but did not offer an amendment to create a new interagency committee to revise the MCTL.

It is extremely difficult for Congress to impose organizationally created bureaucratic models on the President. More often than not, congressionally created interagency committees have encountered stiff resistance from the participating cabinet departments. In addition, congressionally created committees within the executive branch have little influence on the policy process should the President choose to utilize other mechanisms of his own creation. The creation by President Reagan of several interagency councils and committees to formulate trade policy, while virtually ignoring the statutorily created Trade Policy Committee, illustrates the inability of Congress to organize the executive branch policymaking process.

Nevertheless, Congress could establish an interagency committee whose membership would be determined by Congress with the sole function of producing an MCTL. Furthermore, the designated chairman would have the authority to coordinate all activities related to the work of the committee.

Decisions and recommendations submitted to the President would be based on a majority vote of the committee. The chairman also would have the responsibility of preparing any dissenting views for submittal to the President. Finally, provision could be made that the committee's recommendations, unless the President rejected them, would become the policy of the administration and binding on all federal agencies and departments.

Limitations on Controls over Technical Data

In early 1985 the Industry Coalition on Technology Transfer (ICOTT) began the development of a far-reaching white paper on U.S. national security controls. ICOTT's views on controls over technical data mirror a number of informal regulatory proposals to narrow significantly such controls.[79]

First, ICOTT proposed that only data necessary to make a commodity militarily critical should be subject to controls. The coalition stated that "[t]his is the approach taken in controlling U.S. munitions related technology, . . . as well as the general approach supported by CoCom allies in controlling West-East transfers."

Second, ICOTT recommended that data accompanying commodities or supporting sales offers not be controlled. The white paper states: "[T]he significance of data which must accompany a

commodity export should be considered when authorizing the commodity export, regardless of the nature of the commodity or the destination."

In 1979 a related approach was endorsed by the President's Export Council, which proposed that licensing decisions be made on the basis of intended end-use and directed away from strict reliance on technical parameters. This approach appears to be in accord with the views of Fred Bucy, who in 1976 recommended that "a screening approach based on capability as contained in a product's intrinsic utility would provide simplified criteria that could be applied rapidly to classes of license applications. This approach would also lend itself to the application of data processing for initial screening."[80]

DECONTROL BY FOREIGN AVAILABILITY DETERMINATIONS

Consideration Prior to the 1986 House Amendments

THE 1972 AMENDMENTS

In 1972 there was considerable debate in Congress over proposals to ensure that foreign availability would result in the decontrol of products subject to export controls. In a debate that presaged the foreign availability debates of 1983–1985, members argued over the definition of foreign availability and what standards should be used to judge whether the absence of controls would endanger U.S. national security. Several senators supported language requiring the secretary of commerce to decontrol goods available from overseas sources to controlled countries unless "the absence of such a control would constitute a *threat* to the national security of the United States [emphasis added]." In part, the debate revolved around the standard for determining whether an item decontrolled for reasons of foreign availability would endanger U.S. national security. Advocates of substantial decontrol favored a "threat" standard; advocates of preserving the existing statutory criteria favored retention of a "determination" standard. The opponents of the "threat" standard prevailed, maintaining that "[i]t may be difficult, if not impossible, for government to find that the export of any strategic item which is not a military weapon constitutes a threat to national security."[81]

THE 1977 AMENDMENTS

During the development of the 1977 EAA amendments, both the House and Senate endorsed proposals requiring the President to justify controls following a determination of foreign availability. Moreover, the 1977 act obligated the President to include in the Commerce Department's annual report on export controls the specific reasons why, in light of foreign availability, export controls continued to remain in force. For the first time the President was required to initiate negotiations to eliminate the foreign availability of goods controlled by the United States.

THE 1985 REAUTHORIZATION

The 1985 amendments are distinguished by (1) establishing within the Department of Commerce an Office of Foreign Availability, (2) mandating procedures whereby goods are decontrolled following an affirmative finding of foreign availability, and (3) specifying procedures either to eliminate foreign availability by negotiation or, if such negotiations are not successful, by decontrolling the specific good or class of goods. Congress also imposed various deadlines for the completion of foreign availability determinations and international negotiations. Yet, in spite of these procedures and deadlines, the secretary of commerce has the final authority to accept or reject industry claims of foreign availability.

The Proposed Export Enhancement Act of 1986

"AVAILABLE IN FACT TO CONTROLLED COUNTRIES"

Foreign availability determinations are directed toward evaluating what is "available in fact" to controlled countries. The newly proposed foreign availability amendments expand the current definition of "available in fact" to include the availability of goods and technology to controlled countries from countries that do not restrict exports and from countries that have an ineffective system of export controls.[82]

The purpose of this change is to focus the attention of the secretary of commerce on goods and technologies that are available to the Soviet bloc from a variety of Free World sources. If such availability is not eliminated as a result of bilateral negotiations between the

United States and the exporting country, then the proposed amendment would require the elimination of all U.S. licensing controls for such products.

DECONTROL TO COUNTRIES THAT MAINTAIN AN EFFECTIVE SYSTEM OF EXPORT CONTROLS

The Export Enhancement Act also proposes the elimination of licensing controls for goods and technologies that are available to controlled countries from any noncontrolled country that agrees to maintain a system of export controls comparable to those of the United States. The elimination of licensing controls would apply only to countries that agree to control exports in a manner similar to that of the United States *and* only if the country in question can demonstrate for 1 year, and to the satisfaction of the United States, its ability to enforce such export controls. It is significant to note that the secretary of state, rather than either the Departments of Defense or Commerce, is given the authority to conduct foreign availability negotiations and to trigger the decontrol provisions of the amendment. The People's Republic of China is included among those countries that could be certified as enforcing comparable export controls.[83]

JUSTIFICATION

Based on the historical record, the proponents of these foreign availability amendments are acting out of dismay that congressional objectives concerning foreign availability determinations have been ignored by successive administrations. The House Committee on Foreign Affairs commented that the foreign availability provisions in the 1979 and 1985 export control statutes have not resulted in even one instance of decontrol.

Moreover, there is dismay among a majority of committee members that the Departments of Commerce and Defense cannot come to terms over what constitutes foreign availability. An exchange of views during a hearing in 1961 between Representative Lipscomb of California and William P. Bundy is illustrative of the discussion in 1986.[84] As Representative Lipscomb stated: "What concerns me is this business that Defense in the past has had reservations on more items than Commerce has taken reservations to. . . . Defense has objected in the past, and Commerce has not objected to it." To which

the assistant secretary of defense responded: "There were categories of cases . . . where the alternative source argument existed and Defense stuck to its objections and did not withdraw them even though there was alternative source evidence."

CRITIQUE

Opponents of the provisions assert that foreign availability determinations are exceedingly complex and often require the delineation of very fine lines between U.S. and foreign technologies and goods that, if acquired by a controlled country, could endanger U.S. national security. In part, their objections are based on the detailed foreign availability investigations undertaken in 1986 by the Department of Commerce. Opponents view this effort as a "good faith" attempt to eliminate controls. If claims by U.S. exporters of foreign availability are not substantiated by the U.S. government, it is not the control system that is at fault, say the critics of the amendments, but the judgment of U.S. exporters.

PERCENTAGE REDUCTION OF GOODS WITHIN THE CONTROL LIST

Proposal to Reduce the Control List

On May 21, 1986, the House of Representatives approved an amendment requiring a 40 percent reduction in the number of items on the U.S. Control List. The proposal was developed by the House Committee on Foreign Affairs.[85] The amendment requires that the secretary of commerce, in consultation with the secretary of defense, identify those goods that are subject to export controls and that "contribute least directly to the military potential of any controlled country." The goods identified must constitute "approximately" 40 percent of all goods on the U.S. Control List. The amendment requires that the control list be reduced progressively by 40 percent over a 3-year period[86] as follows:

1. Within 1 year following enactment of the measure, the secretary of commerce would submit to Congress the list of items to be decontrolled. Following this submission, the secretary would have 90 days to reduce the control list by 10 percent.
2. Within 1 year following the initial 10 percent reduction, the secretary would reduce the control list by another 10 percent.

3. Finally, 1 year later, the secretary would reduce the control list by an additional 20 percent.

Justification

Proponents of the amendment argued that there was no other method to guarantee a reduction of the U.S. Control List. Neither the MCTL nor the foreign availability provisions of the act were expected to result in any decontrol. Moreover, they expected that medical instruments and equipment; goods now subject to controls but sold so widely in retail outlets worldwide as to constitute foreign availability; and low-technology AEN items would probably account for the majority of the proposed reduction.

Moreover, decontrolling goods that contribute "least directly" to a controlled country's military potential is an attempt to distinguish entire categories of goods that, if acquired by a controlled country, would not make a significant contribution to its military potential from those that are militarily significant. Thus, the proponents of the amendment were disagreeing in statutory language with assertions by the Department of Defense that personal computers could make a significant contribution to the military potential of the Soviet Union.[87]

Critique

Opponents of the measure criticize the 40 percent reduction in the control list as arbitrary and unsupported by any research or documentation that the percentage proposed in the amendment reflects a reasonable goal—that is, a goal that does not endanger U.S. national security.

CONCLUSIONS REGARDING MAJOR POLICY ISSUES AND PROBLEMS

From its inception in 1949, U.S. export control policy has been a source of conflict among the executive branch, Congress, and the U.S. business community. Unlike other U.S. trade statutes, there is no identifiable part of the export control statute that benefits a segment of the U.S. business community.

Moreover, within the executive branch there is a record of discord among the Departments of Commerce and Defense and the Customs Service over the scope and enforcement of export controls

that reaches back to the enactment of the Export Control Act of 1949.

The task of administering unilateral and subsequently multilateral export controls has proven to be a Herculean task beyond the capabilities and resources of the Department of Commerce. A measure of this responsibility is borne by Congress, which, during the past 37 years, has adopted a parsimonious attitude in light of the enormous effort required by the U.S. government to enforce a comprehensive system of export and reexport controls.

Since its enactment the export control statute has often been utilized by presidents as an important instrument to conduct foreign policy. For example, President Truman saw the Export Control Act (ECA) as a means to limit sales to the Soviets and to regulate the flow of U.S. goods and commodities to Western Europe. President Nixon modified ECA and changed it from an instrument of the Cold War into a means to facilitate detente through trade. President Carter relied on the act as a means of retaliation against those countries that contravened U.S. national security and foreign policy interests. In no case, however, did these and other presidents become involved in the actual implementation of the statute. Presidents have remained aloof from the strong interagency rivalries that have characterized much of the history of postwar U.S. export controls.

Generally accepted principles of public administration are largely absent from the export control decision-making process. Instead, there exists a plethora of interagency committees, the members of which are not working toward a common goal of improving the operation of U.S. export controls. These committees have not demonstrated the ability to evaluate carefully which goods and technologies should be subject to export controls. The historical record confirms that the cabinet departments that share responsibility for export controls are not inclined to agree on a common policy.

Admittedly, the Departments of Defense and Commerce were created and organized to pursue differing missions—the former securing the national defense and the latter promoting U.S. commerce. Therefore, two options remain to achieve a comprehensive review and reformulation of U.S. export control policy. First, the President could designate one cabinet officer to coordinate export control policy and to communicate this decision to Congress. Second, Congress could impose an administrative framework on the executive branch. The first option appears to hold a greater likelihood of success, especially in light of the inability of previous congressional attempts to

impose an organizational framework on trade policy decision making. Moreover, the existing policy disarray over export controls within the executive branch limits the accountability of the President and his appointees to Congress. The only other alternative is for Congress, possibly over a presidential veto, to enact major reductions in the scope of existing controls.

In 1971 Roy L. Ash, chairman of President Nixon's Advisory Council on Executive Reorganization, observed: "The eclectic structure of today's departments and agencies, whose missions are often overlapping, places the President's office alone at the pivot point on many detailed and individual issues." The President surely is not in the position to resolve interagency disputes over the military criticality to the Soviet Union of an array processor in a CAT scanner—but the existing law contemplates the President resolving such disputes. One cabinet department, with the authority to coordinate and direct interagency reviews of control issues, should have the final responsibility for determining the scope of the control list. There simply does not appear to be a practical organizational substitute for this authority.

NOTES

1. Export Control Act, Section 3(a).
2. U.S. Senate, Committee on Expenditures in the Executive Departments, Subcommittee on Investigations, *Hearings Pursuant to Senate Resolution No. 189* [80th Cong., 2d Sess. (1948), p. 612]; S. Rep. No. 1775, part 2, 80th Cong., 2d Sess. (1948), p. 16.
3. The inability to develop and coordinate trade policy through interagency committees is not unique to export controls. For example, in Reorganisation Plan No. 3 of 1979, Congress vested the Office of the U.S. Trade Representative (USTR) with primary responsibility for developing and coordinating U.S. trade policy. At various times, however, the Departments of State, Treasury, Commerce, and Transportation have developed and coordinated significant aspects of trade policy. At times, USTR was not even included in the interagency preparations for multilateral economic summits at which trade policy was the issue of paramount importance.
4. The General Accounting Office (GAO) has prepared the most detailed and critical evaluations of the interagency committees responsible for export control policy. See U.S. Government Accounting Office, "Administration of U.S. Export Licensing Should Be Consolidated to Be More Responsive to Industry," Report GAO/ID-10-78-60 (October 31, 1978), pp. iii, v, and 35–39. GAO recommended that export licensing management be centered in the Department of Commerce and that its Office of Export Administration (OEA) coordinate all technical evaluations. Furthermore, "problem" applications should be assigned to a team manager located in OEA. To strengthen the department's role, GAO recommended that

Congress provide a statutory basis for an interagency export policy advisory committee. In addition, GAO urged the secretary to abolish the existing interagency structure, which has the responsibility to review problem applications. The new interagency committee would have responsibility for addressing major export control policy issues.

5. Throughout the congressional debate, a majority of the committee opposed a regulatory system that provided for notification of exports at the time of actual shipment as a system functionally equivalent to that for individually validated licenses.
6. Under the Export Administration Regulations (EAR), the general policy of the Department of Commerce is to permit the export of goods and technical data to Canada, for use in Canada, without an export license. See EAR Section 385.6.
7. U.S. House of Representatives, Committee on Foreign Affairs, *Export Administration Amendments Act of 1983*, H.R. Rep. No. 257, 98th Cong., 1st Sess. (1983), pp. 4, 17–18.
8. See U.S. House of Representatives, H.R. 11472, 91st Cong., 2d Sess.
9. U.S. Senate, Committee on Banking, Housing, and Urban Affairs, *Export Promotion, Export Disincentives, and U.S. Competitiveness (Reports by the President)*, Committee Print, 96th Cong., 2d Sess. (1980), pp. 103–104.
10. Neither the Office of Export Administration nor the Commerce Department's archivist has been able to locate a copy of this study, although a number of documents refer to it.
11. U.S. General Accounting Office, *Export Control Regulation Could Be Reduced Without Affecting National Security*, Report GAO/ID-82-14 (May 26, 1982), pp. 10–14.
12. President's Export Council, Export Administration Subcommittee, *Recommendations on Amending the Export Administration Act of 1979* (March 1983), pp. 37–38. Three members of the PEC dissented from this recommendation.
13. The issue of reexports is reviewed in the next section of this paper.
14. Gary K. Bertsch, *East-West Trade, CoCom and the Atlantic Alliance*, Atlantic Papers no. 49 (Paris: Atlantic Institute for International Affairs, 1983), pp. 41, passim. Recent developments within CoCom are described by David Buchan in *Western Security and Economic Strategy Towards the East*, Adelphi Papers no. 1992 (London: Institute for Strategic Studies, 1984).
15. The members of CoCom have agreed to embargo the export of most high-technology products to the Soviet Union and the bloc. Member governments may, however, request an "exception" to the embargo. CoCom approval of such exports requires the unanimous agreement of all CoCom members.
16. U.S. Senate, Committee on Banking, Housing, and Urban Affairs, *Hearings on Enforcement of the Export Control Enforcement Act* (S. 783), 98th Cong., 2d Sess. (1984), pp. 57–58.
17. A few academic studies have addressed the issue; see for example Russell Baker and Rolf Bohlg, "The Control of Exports—A Comparison of the Laws of the United States, Canada, Japan, and the Federal Republic of Germany," *International Lawyer* 1 (January 1967):163–191.
18. A foreign company placed on the denial list may be denied access to all exports from the United States. U.S. companies and persons can

be prohibited from having any dealings whatsoever with foreign firms or persons placed on the denial list.

19. Neither the Carter nor Reagan administrations have proposed extending licensing controls to trade with Canada. U.S. reexport controls apply to all goods and technology that either transit Canada or are subsequently reexported from Canada to third countries.
20. See H.R. 488, Section 322(f)(1), 99th Cong., 2d Sess. (1986).
21. This became known as the "White List" proposal in contrast to the "Black List" proposal for unreliable end-users.
22. Section 5(k) of the 1985 act provides for the extension of this measure to other countries that participate, either formally or informally, in a CoCom-like system of export controls. The provision to "decontrol" low-technology (below AEN) products was implemented on September 25, 1985. Under these regulations, exports and reexports of AEN items can be made without the prior approval of the Department of Commerce. For such exports, the regulations created a new type of General License known as G-COM. See *Federal Register* 50, no. 184 (September 23, 1985), pp. 38512–38514.
23. U.S. General Accounting Office, *Export Control Regulation*, p. 7.
24. U.S. General Accounting Office, *Licensing Data for Export to Non-Communist Countries*, GAO/NSIAD-84-105, Letter Report B.201919 (May 1984), passim.
25. The percentages translate to 36,000 and 52,000 license applications, respectively.
26. The proposal to eliminate *all* licensing controls for export to CoCom countries would have applied to individual and multiple licenses (e.g., the distribution license, which authorises unlimited exports for a 2-year period to consignees approved by the Department of Commerce in Free World countries). During the reauthorisation of the 1979 Export Administration Act, the elimination of multiple license controls for exports to CoCom countries received scant attention. Between 1983 and 1984, the Departments of Commerce and Defense began to evaluate the effectiveness of the distribution license as a means of export control. This reassessment of the license's effectiveness led the Department of Commerce to (1) assign additional staff to monitor each license and (2) publish new procedures for granting, monitoring, and possibly revoking a distribution license. See *Federal Register* 50, no. 21 (May 24, 1985), pp. 562–576.
27. See H.R. 4800, Section 332(c), 99th Cong., 2d Sess. (1986); and U.S. House of Representatives, Committee on Foreign Affairs, *Export Enhancement Act of 1986*, H. Rep. no. 99-580, Part 1, 99th Cong., 2d Sess. (1986), pp. 22–23.
28. Examples of ECCN categories for which the Department of Commerce has established these three zones include computers (1565A), microcircuits (1564A), electronic instruments (1529A), recording equipment (1572A), semiconductor production (1355A), and oscilloscopes (1584A).
29. U.S. House of Representatives, Committee on Banking and Currency, *International Economic Policy Act of 1972*, H. Rep. no. 92-1260, 92d Cong., 2d Sess. (1972), pp. 4–5.
30. U.S. Senate, Committee on Banking, Housing, and Urban Affairs, *International Economic Policy Act of 1972*, S. Rep. no. 92-890, 92d Cong., 2d Sess. (1972), p. 4.
31. Ibid., pp. 13–16. See the remarks of Senator John Tower.

32. U.S. General Accounting Office, *Export Controls: Need to Clarify Policy and Simplify Administration*, Report ID-79-16 (March 1, 1979), pp. 19, 29–31.
33. Ibid., p. 30.
34. *Export Administration Amendments Act of 1985*, Public Law 99-64 (July 12, 1985), Section 5(j); 50 U.S.C. App. 2404.
35. U.S. Department of Defense, "Decontrol of Microprocessors" (Talking Points Paper) (1983).
36. H.R. 4800, 99th Cong., 2d. Sess., Section 332(e). This provision was adopted by the House but was not considered by the Senate.
37. U.S. House of Representatives, *Export Enhancement Act of 1986*, H.R. Rep. no. 99-580, Part 1, H.R. 4708, 99th Cong., 2d Sess., p. 25.
38. U.S. Senate, Committee on Banking and Currency, Subcommittee on International Finance, *Hearings on S.J. Res. 169 Concerning East-West Trade*, Part 2 (Washington, D.C.: GPO, 1968).
39. An important device for preventing unauthorised reexports is end-use statements, which in most instances must be submitted with the original U.S. license application. However, no end-use statement or international import certificate is required by the United States for exports to North, Central, and South America, Bermuda, and the Caribbean.
40. U.S. Senate Committee on Banking and Currency, *Hearings on S.J. Res. 169*, Part 1, pp. 244–245. See testimony of Harold J. Berman.
41. Ibid.
42. U.S. General Accounting Office, *Export Controls: Need to Clarify Policy*, pp. 14–17.
43. U.S. House of Representatives, *Hearing on the Extension and Revision of the Export Administration Act of 1969*, Part 2, 96th Cong., 1st Sess. (1979), pp. 168–169.
44. Ibid., pp. 169–170.
45. *Congressional Record* (September 11, 1979), pp. H24038-H24039. For discussion of end-use controls, see pp. H24053-H24054.
46. The extraterritorial application of U.S. controls is reviewed in Paul B. Savoldelli, "Extraterritorial Application of the Export Administration Act of 1979 Under International and American Law," *Michigan Law Review* (April 1983): pp. 1308–1336.
47. Letter from B. J. McKelvain, chairman of ICOTT, to Paul Freedenberg, assistant secretary for trade administration, U.S. Department of Commerce, March 7, 1986.
48. Country group T is composed primarily of the Latin American countries. Country group V is the category for so-called Free World countries, including CoCom but not Canada.
49. The committee's amendments were subsequently approved by the House of Representatives. An amendment to strike most of the committee's EAA recommendations was defeated on a recorded vote of 181 to 238. The reexport control amendment is found in Section 332(b) of H.R. 4800, 98th Cong., 2d Sess. See also U.S. House of Representatives, *Enhancement Act of 1986*, H.R. Rep. no. 99-580, Part 1, 99th Cong., 2d Sess., (1986) pp. 22–23, 51–52.
50. *Export Administration Amendments Act of 1985*, 50 U.S.C. App. 2404. See Section 5(k), "Negotiations with Other Countries."
51. For example, see U.S. House of Representatives, Committee on Foreign

Affairs, Subcommittee on International Economic Policy and Trade, *Testimony of Allen Frischkorn, Jr., Electronic Industries Association*, 99th Cong., 2d Sess. (April 10, 1986), pp. 11–13.

52. Letter from Caspar Weinberger, secretary of defense, to Thomas P. O'Neill, Jr., May 13, 1986.
53. U.S. House of Representatives, "Remarks of Representative Roth," *Congressional Record* (Daily Edition) (May 21, 1986).
54. See. "Minority Views," *Export Enhancement Act of 1986*, H.R. Rep. no. 99-580, Part 1, 99th Cong., 2d Sess. (1986), pp. 79–80.
55. A list of these categories by U.S. Control List entry and a brief justification for each control is contained in the U.S. Department of Commerce publication, *Export Administration Annual Report FY 1984* (Washington, D.C.: GPO, 1985), pp. 145–153.
56. U.S. House of Representatives, Committee on Banking and Currency, H.R. Rep. no. 91–524 (September 1969), p. 10.
57. U.S. Senate, Committee on Banking, Housing, and Urban Affairs, S. Rep. no. 91-336, 91st Cong., 1st Sess. (July 1969), p. 3.
58. U.S. House of Representatives, Committee on Banking and Currency, H.R. Rep. no. 92-1260, 92d Cong., 2d Sess. (July 1972), p. 4.
59. In subsequent years, the number of categories of unilaterally controlled products was reduced substantially due to the "decontrol" of products and the consolidation of categories designed to include one product in "basket" categories of related products.
60. U.S. Senate, Committee on Banking, Housing, and Urban Affiars, S. Rep. no. 92-890, 92d Cong., 2d Sess. (June 1972), p. 3.
61. This dual test was designed to allow for the decontrol of goods and technology that, if acquired by a potential adversary of the United States, could increase its military capability without being detrimental to U.S. national security—a delineation that has proven difficult to discern.
62. President's Export Council, Export Administration Subcommittee, "Summary" (December 3, 1982).
63. Administration "talking paper," dated April 1983.
64. The committee noted that "no decontrol actions took place" during the reporting period for the department's 1984 annual report on export controls. In April 1984, however, a number of items included in ECCN 4529B were transferred to ECCN 6599G. See Interpretation 8, Supplement No. 1 to Section 399.2 of EAR. Further decontrol of ECCN 4529B or the transfer of items to ECCN 1565A depend on agreement between the Departments of Commerce and Defense and, in certain instances, other departments. The position and role of DoD in this decontrol effort is provided in a letter from John Konfala, director of strategic planning (DoD), to John Boidock, director of the Office of Export Administration, Department of Commerce, July 15, 1983.
65. U.S. Department of Defense, Office of the Director of Defeuse Research and Engineering, *An Analysis of Export Control of U.S. Technology—A DoD Perspective* (Report of the Defense Science Board Task Force on Export of U.S. Technology) (Washington, D.C.: GPO, 1976), hereinafter cited as DoD, *An Analysis of Export Control*. Since its release, the so-called Bucy report has been the subject of intensive examination by Congress. For example, see U.S. Senate, Committee on International Relations, Subcommittee on International Trade and Commerce, *Export Licensing of*

Advanced Technology: A Review (Hearings on S. 212-229), 94th Cong., 2d Sess. (1976). This hearing record contains testimony by J. Fred Bucy on how to implement the Militarily Critical Technologies List (MCTL). See also U.S. Senate, Committee on Governmental Affairs, Subcommittee on Investigations, *Transfer of Technology and the Dresser Industries Export Licensing Actions, 1978*, 95th Cong., 2d Sess. (1978). For a summary of the development and expectations associated with the MCTL, see Janet E. B. Ecker, "National Security Protection: The Critical Technologies Approach to U.S. Export Control of High Technology," *Journal of International Law and Economics* 15 (1981)573–604; and J. Fred Bucy, "Technology Transfer and East-West Trade: A Reappraisal," *International Security* 5 (Winter 1980-1981):132–151.

66. See DoD, *An Analysis of Export Control*, recommendation 4.
67. See 50 U.S.C. App. Section 2404(d), which incorporates the MCTL changes included in the 1985 reauthorization.
68. See *Federal Register 45* (1980), pp. 65,014–65,019, which contains the "Table of Contents for the MCTL."
69. Section 106(c), 50 U.S.C. App. Section 2404(c).
70. U.S. Senate, Committee on Foreign Relations, *A Background Study on East-West Trade, 1965*, 89th Cong., 1st Sess. (1965), pp. 12–13.
71. A critical view of the scope of the MCTL is contained in the National Academy of Sciences study, *Scientific Communication and National Security*, vol. 1 (Washington, D.C.: National Academy Press, 1982), pp. 58–59, 71.
72. See *Congressional Record* (Daily Edition) 125 (September 28, 1979):8716.
73. U.S. House of Representatives, Committee on International Relations, *International Technology Transfer: Report of the President . . . Together with an Assessment of the Report by the Congressional Research Service*, H.R. Doc. No. 52-54, 95th Cong., 2d Sess. (1979).
74. For the text of the Foreign Affairs amendment, see U.S. House of Representatives, Committee on Foreign Affairs, *Export Administration Amendments Act of 1983*, H.R. no. 257, 98th Cong., 1st Sess. (1983), pp. 40–42. (Hereafter, this text will be cited as H.R. no. 257.) The Department of Defense and the House Committee on Armed Services opposed the amendment and were successful in obtaining the elimination of mandatory criteria to reduce the scope of the MCTL (see H.R. no. 257, pp. 5–7).
75. H.R. no. 257, p. 42. The House Committee on Armed Services disagreed with this approach and favored the removal of items from the MCTL "based primarily on the assessment of military criticality, taking into account the level of comparable technology available to proscribed countries" (Ibid., p. 7).
76. See *Agent Orange Study Act of December 20, 1979* (Title III, Section 307), Public Law 96-151, 93 Stat. 1097. The act provided detailed instructions by which the agencies were to conduct their studies and specific dates for submitting their reports to Congress.
77. A revised control list could govern licensing procedures regarding exports to noncontrolled countries. Technically, the CoCom International List would still govern U.S. licensing decisions regarding West-East trade until such time as the list were revised to reflect the MCTL approach.
78. This entire section is, of course, based on the premise that the MCTL is still a workable concept.
79. ICOTT, "Draft White Paper" (January 8, 1985).

80. U.S. House of Representatives, Committee on International Relations, *Hearings on Export Licensing of Advanced Technology*, 94th Cong., 2d Sess. (1976), pp. 218–219.
81. U.S. Senate, Committee on Banking, *Equal Export Opportunity Act*, S. Rep. no. 890, 92d Cong., 2d Sess. (1972), pp. 12–16.
82. H.R. 4800, Section 332(g).
83. H.R. 4800, Section 332(f)(1).
84. U.S. House of Representatives, Select Committee on Export Control, *Investigation . . . of the Export Control Act of 1949 and Related Acts*, 87th Cong., 1st Sess. (1961), pp. 222–223. The differences between the Departments of Defense and Commerce, and Congress' attempt to delegate authority to Commerce, is seen in *Hearings on Extension and Revisions of the Export Administration Act of 1969*, 96th Cong., 1st Sess. (1969), pp. 655–658. The current debate is found in U.S. House of Representatives, H. Rec., 99th Cong., 2d Sess. (1986), pp. 3100–3101.
85. H.R. 4800, Section 332(e).
86. It remains to be determined how many goods are subject to controls. This determination would be based on Schedule B of the Statement Classification of Domestic and Foreign Commodities Exported by the United States.
87. U.S. House of Representatives, *Congressional Record* (Daily Edition), May 21, 1986, pp. 3100–3102.

National Security Controls and Transborder Flows of Technical Data

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INTRODUCTION

This study examines the problem of regulating transborder technical data flows and to that end reviews in detail the laws, regulations, interpretations, and perceptions that constitute the U.S. national security export control system, as well as the impact of these various components of the system. The paper's emphasis is on technical data (technical information), corresponding to the dictionary definition of technology as knowledge.

The vast majority of the U.S. population is only dimly aware of national security controls and probably equates them with classification. The bulk of the exporting community likewise is uninformed about national security controls. Certain segments of the community are acutely aware of the controls but, with certain exceptions, seem unable to interpret them properly. Furthermore, the administrative agencies of government charged with exercising the controls appear willing to accept many of the misinterpretations for the sake of convenience, thus perpetuating them.

In this paper, we shall concentrate our attention on the national security controls on technical information or technical data. Tangible items, variously referred to as products, commodities, hardware,

or articles, will be discussed in those cases in which they are inextricably entwined with technical data. Likewise, foreign policy controls on exports to such countries as South Africa, Libya, Cuba, Kampuchea, North Korea, and Vietnam will be introduced only in passing. Controls related to commodities in short supply will not be discussed.

Throughout the paper we shall use the very high speed integrated circuit (VHSIC) program of the Department of Defense as a paradigm. The VHSIC program, which is designed to increase the U.S. lead in integrated circuit technology by developing state-of-the-art military microcircuits, involves all of the national security controls as well as Department of Defense and VHSIC-peculiar controls. It encompasses the Departments of Defense, Commerce, State, and Treasury; the three military services; major industrial contractors; merchant manufacturers; research laboratories; and the academic community. The VHSIC program will serve to illustrate all the features of the control systems.

BACKGROUND

It is evident that in recent years markets for goods and services are becoming increasingly global, not only for multinational corporations but for medium-sized and small companies as well. Growing reliance on countertrade and offset (including a variety of coproduction and joint venture arrangements) to facilitate international commerce reinforces the need for an ever-expanding flow of technical information across borders. An expanding infrastructure also is appearing internationally to support the increasing demand to provide, organize, and manage this information flow. This in turn attracts more users and more information transfers.

At the same time, efforts to impede the orderly, rapid, and efficient movement of information take two different forms, which are curiously separated geographically and are different in impact. In the United States the major impediment, or at least hindrance, is the U.S. system of national security controls—the topic of this paper. In many other parts of the world—Europe and the Third World, in particular—national security controls on information are hardly noticeable, and the main impediment stems from considerations of sovereignty. Many governments regard data on their economic status and potential as national resources and guard such information jealously. Other governments resent the power and independence

of multinational corporations that carry on business within their borders while maintaining decision-making centers elsewhere.

National economic considerations also play a role. Fears that indigenous information may be more rapidly exploited by a competitive nation or that information needed for the nation's planning and management will be widely disseminated are both at work. Sometimes, just the need to assert sovereignty contributes to hindering transborder data flows. The control techniques are sometimes regulatory and sometimes infrastructural. For example, communications in many countries are controlled through government post, telephone, and telegraph (PTT) agencies whose services can be configured to manage the types and volume of information that can be transmitted and received. Deregulation of U.S. telecommunications and the prospect of international competition in satellite services may well herald the demise of PTT restrictions for fear of U.S. dominance of the information-handling market. On the other hand, increased international competition may stimulate more regulation.

NATIONAL SECURITY EXPORT CONTROLS

Multinational Export Controls

U.S. national security export controls represent another effort to limit the international flow of technical data although, as we shall see, the impact of these controls is mixed at best. U.S. national security export controls on technical data take several different forms, and we shall review these different forms of and approaches to control and their impact.

The United States has banded together with its NATO allies (excluding Iceland) and with Japan voluntarily (and with no treaty commitments) to embargo the flow to the Communist bloc* of munitions, nuclear-related commodities, and high-technology commercial products suitable for military application. The participating countries also have agreed, to the extent permitted by their own laws, to control technical data related to the embargoed commodities. The embargo can be overridden in individual cases by unanimous consent

*Albania, Bulgaria, Czechoslovakia, Estonia, the German Democratic Republic, Hungary, Laos, Latvia, Lithuania, the Mongolian People's Republic, North Korea, the People's Republic of China, Poland, Romania, the Union of Soviet Socialist Republics, and Vietnam.

of the participating countries. The functions of determining embargoed commodities and voting on exceptions are performed by the Coordinating Committee on Multilateral Export Controls (CoCom), which consists of representatives of all the participating countries. Because it is informally constituted, CoCom functions entirely on the basis of unanimity.

The United States has included the CoCom embargo procedures in its own laws and regulations. However, to achieve other ends such as foreign policy and nuclear nonproliferation, the U.S. control systems apply to virtually all destinations in addition to the Communist bloc. The U.S. system, then, is properly termed a system of controls and not of embargo. The U.S. system also is more specific than that of CoCom with respect to technical data controls.

CoCom munitions controls generally are folded into the U.S. Munitions List, which is implemented by the International Traffic in Arms Regulations (ITAR). These and other regulations will be discussed in some detail below. For certain reasons to be elucidated later, equipment for the manufacture of munitions is controlled by the Export Administration Regulations (EAR), as are high-technology commercial commodities. Nuclear commodities are controlled by the Nuclear Regulatory Commission under 10 C.F.R. 110, although some nuclear commodities are controlled by EAR. Nuclear technical data are controlled by the Department of Energy under 10 C.F.R. 810 and by EAR. Nuclear controls will not be treated further.

With the exceptions of national security classification and nuclear nonproliferation controls, there are no export controls to Canada, which is exempt from the U.S. export control system.

National Security Classification

AUTHORITY

The system of national security classification for information and hardware was established under Executive Order 12356, April 2, 1982, and is governed by regulations issued in Department of Defense Directive 5220.22. Various manuals are issued under this directive relating to government agencies and industrial contractors and persons.

THE CONTROL SYSTEM

Executive Order 12356 establishes three classification levels for

national security information: top secret, secret, and confidential. These terms are used to denote the relative seriousness of the damage to national security that could result from unauthorized disclosure of the information.

The basic philosophy of national security classification is to deny access to classified data to those who do not have a legitimate need for it. Thus, a system has developed that involves the investigation of persons to determine whether they are likely to safeguard classified information properly and whether they have anything in their backgrounds that might make them vulnerable to blackmail; the system also requires certification of a "need to know" before providing information, and distinctive document markings, safes, locked and guarded facilities, alarms, and extensive recordkeeping.

In general, the system works very well. The most common breaches occur through disclosure to the media by political appointees in the executive branch or by members of Congress and their staffs. Cases of espionage sometimes are uncovered, most often motivated by financial gain. Penalties for violation of the national security regulations are a $10,000 fine and up to 10 years in prison (18 U.S.C. 793 et seq.) except in wartime, when the death penalty can apply. Through the years the sensitivity levels ascribed to the three levels of classification have expanded to control information that was previously uncontrolled and to control other information at higher security levels than previously. This expansion of coverage both reduces respect for the system and makes it more vulnerable to accidental or deliberate breach, as witnessed by the increasing incidence of espionage cases.

The classification system concerns itself with details of weapons systems and technical data related to requirements, performance, reliability, and the like. The impact of the system on the overall issue of transborder technical data flow is minimal. The export control regulations, on the other hand, can and do have significant effects on the nature of the data flow and its effectiveness.

Controls on Primarily Military Commodities and Technical Data

AUTHORITY

The export of commodities and technical data, including classified material, primarily applicable to military use is controlled under

the Arms Export Control Act (22 U.S.C. 2751 et seq.), particularly in Section 38. This section permits the President to designate items as "defense articles" and "defense services" for purposes of control. The stipulation that they be primarily military is a matter of convention and regulation, not law. The designated items constitute the U.S. Munitions List.

The control of the export of defense articles and defense services is largely dictated in the act by foreign policy considerations: "In furtherance of world peace and the security and foreign policy of the United States. . . ." The Arms Control and Disarmament Agency specifically is brought into the export licensing process to assess whether an export "will contribute to an arms race, increase the possibility of outbreak or escalation of conflict, or prejudice the development of bilateral or multilateral arms control arrangements."[1] In practice, however, most licensing decisions are made on national security grounds.

CONTROLS

Executive Order 11958 delegates the authority of Section 38 of the act to the secretary of state, requiring the concurrence of the secretary of defense in designating defense articles and defense services. The authority is exercised by the Office of Munitions Control (OMC) within the Bureau of Politico-Military Affairs of the Department of State. OMC issues the International Traffic in Arms Regulations (ITAR) (22 C.F.R. 120, et seq.), which contain the U.S. Munitions List, controls on technical data, licensing and other procedures, and provisions concerning violations.

Many articles, particularly in electronics, pose no significant foreign policy questions (e.g., spare parts shipments to England). Consequently, national security concerns tend to dominate licensing decisions. OMC typically does not make national security decisions but forwards somewhat less than 20 percent of the license applications to the Defense Technology Security Administration (DTSA) for review. DTSA relies on the cognizant service to determine whether a particular transaction is acceptable in terms of technology transfer, military capability enhancement, depletion of U.S. inventory, or other criteria. OMC generally accepts the DTSA recommendations.

With the exception of category III(d) of the U.S. Munitions List (ammunition manufacturing machines), ITAR does not control manufacturing equipment nor the technical data for operating such

equipment. It does, however, control technical data related to defense articles and defense services, using fairly broad definitions. ITAR defines technical data as, inter alia, "[i]nformation which is directly related to the design, engineering, development, production, processing, manufacture, use, operation, overhaul, repair, maintenance, modification or reconstruction of defense articles."[2] The Export Administration Regulations (EAR) contain a similar definition: "Technical Data means information of any kind that can be used, or adapted for use, in the design, production, manufacture, utilization or reconstruction of articles or materials."[3]

The official view is that technical data must be specifically and directly related to a defense article to be controlled. Under this interpretation, blueprints, circuit diagrams, design information on magnetic tape, and other such materials related to a specific article are eligible for control, but manufacturing process information not specific to a particular article is not.

In the VHSIC program, for example, ITAR controls were invoked from the outset. The perceptions of the VHSIC contractors and of a number of contracting field activities were that ITAR controls *all* VHSIC information. In fact, it does not. It controls only technical data directly and particularly related to specific VHSIC chips. Nevertheless, no move was made to dispel these misperceptions as the resulting information control was eminently satisfactory from a national security point of view. However, as VHSIC contractors come to recognize the applicability of the technology to commercial products, they may begin to find these limits bothersome. Presumably, they will come to recognize the limits of ITAR controls; at that point, other control mechanisms will need to be invoked.

ITAR controls on unclassified technical data differ in a significant way from classification controls. As described earlier, the purpose of the latter is to *deny access* to information. ITAR, on the other hand, *proscribes disclosure* of information abroad or to foreign nationals in the United States. ITAR thus does not produce a requirement for safes, locks, guards and fences, or document markings. Combined with the restrictive interpretation of technical data discussed above, this leads to controls on technical data that are significantly less effective than generally perceived. Nevertheless, manufacturers generally apply for licenses for technical data transactions not meeting the specificity test, and OMC issues such licenses.

Most software is treated by ITAR as technical data except for cryptographic software, which is a defense article.

OMC issues licenses for manufacturers to transfer technical data in sales promotions, and manufacturers of defense articles usually will apply for a license before undertaking discussions with potential foreign customers. In addition, OMC licenses manufacturing agreements and technical assistance agreements that convey bodies of technical data.

In controlling technical data under both ITAR and EAR, the government recognizes but does not explicitly state that placing information into the public domain does not constitute an export. Once in the public domain, the information can be exported subject only to a general license.

It is noteworthy that U.S. government agencies are exempt from the provisions of ITAR but not from those of EAR.

Penalties for ITAR violations range in severity from the loss of exporting privileges to severe fines and imprisonment, depending on the nature of the violation.

IMPACT

U.S. exporters of technical data can be divided into several groups and subgroups. In the arena of munitions (defense articles) controlled by ITAR, the major manufacturers are well versed in the controls. Many, although not all, are aware of the official restrictive interpretation of the above definition of technical data. Nevertheless, they find it easy, convenient, and perhaps redounding to their reputations as responsible exporters to take the broad definitional view and apply regularly to OMC for technical data transfer licenses. As noted, OMC obligingly issues the licenses.

This comfortable arrangement has intruded on serious commerce in two major areas. Satellite communications long have been featured on the U.S. Munitions List, and the broadly interpreted ITAR technical data controls have significantly impeded U.S. sales abroad. Fortunately, the United States has held until recently a major technological advantage in communications satellites. That advantage offsets the restrictive effects of ITAR on marketing. This edge is diminishing, however, and the ITAR restrictions could impose a significant competitive disadvantage on U.S. firms. A similar situation existed with respect to aircraft inertial navigation systems (INS). Congressional action was required to move control of aircraft INS from ITAR to EAR. Nonetheless, ITAR still controls INS technical data.

A second group of munitions exporters constitutes companies whose business base is primarily the U.S. military and who are faced with fortuitous opportunities to expand into overseas markets. These companies are unlikely to be aware of any export regulations; and until such time as the transfer of actual hardware comes about and freight forwarders, customs agents, and others concerned with effecting the transfer intervene, technical data are apt to flow freely and undetected. A significant number of cases could be uncovered of such companies seeking to legitimize past transgressions.

Controls on Dual Use Commodities and Technical Data

AUTHORITY

The Export Administration Act of 1979, as amended (50 U.S.C. 2401 et seq.), controls the export of commodities with dual military and civilian use, the export of commodities in short supply, or the export of commodities restricted in furtherance of foreign policy aims; it also controls the technical data related to them. In principle, then, no commodity or technical data (except those under the jurisdiction of other acts) may be exported without a license. In practice, there are available a number of "general" licenses that are self-issued and mostly not reported. The failure of the population to invoke these licenses normally is overlooked on the basis of "no harm, no foul."

The control of commodities and technical data related to short supplies, foreign policy, and nuclear nonproliferation will be passingly treated, with emphasis given to national security export controls. The act specifically designates the secretary of commerce as the administrator of the act and gives significant consultancy and concurrence powers to the secretary of defense.

CONTROLS

The Commerce Department control system appears in the Export Administration Regulations (EAR) (15 C.F.R. 368 et seq.) and centers around the Control List (EAR Section 399), formerly the Commodity Control List. This list contains individual entries that generally are very specific with respect to characteristics and performance. Each entry has a number, the export control commodity number (ECCN). The ECCN is a four-digit number followed by a letter. The first digit describes the source: 1 = the CoCom industrial list; 2 = the CoCom munitions list; 3 = the CoCom atomic energy

list; and higher numbers = unilateral U.S. controls. The second digit refers to commodity groups, as follows:

0= Metal-working machinery
1= Chemical and petroleum equipment
2= Electrical and power-generating equipment
3= General industrial equipment
4= Transportation equipment
5= Electronics and precision instruments
6= Metals, minerals, and their manufactures
7= Chemicals, metalloids, petroleum products, and related materials
8= Rubber and rubber products
9= Miscellaneous

The subsequent digits are sequential identifiers. The following letter is an "A" for all CoCom-controlled items. A letter "B" indicates unilateral U.S. control for national security (or nuclear nonproliferation and short supply) reasons. Other letters are used for various foreign policy controls.

In addition, countries are placed in groups, the Western Hemisphere being one group, the remaining Free World another. The Communist bloc is assembled into several groups, while terrorist countries and "outcast" countries (e.g., Cuba and Vietnam) constitute two groups. Afghanistan and the People's Republic of China are treated individually. The country group distinctions are most useful for foreign policy controls. In other cases, the Western Hemisphere and Free World are lumped together, with the remaining groups forming another cluster.

The EAR technical data controls (Section 379) are arcane and largely inferential. Because a complete treatment would serve to confuse rather than illuminate, a simplified version will be presented. Moreover, there are numerous exceptions and nuances that will not be explicated.

Basically, all technical data (and all commodities) require a license of some sort. Data that are in the public domain may be exported under general license GTDA, self-issued and unreported, to any destination. No other technical data may be exported to the terrorist and "outcast" countries without an individual validated license issued by the Office of Export Licensing of the Department of Commerce. Technical data that are not eligible for GTDA may not be exported to countries other than those of the Western Hemisphere

and Free World without a validated license; the only exceptions to this policy are sales data, which are a restricted type of data needed to negotiate a sale, and operations data, which are the normal operational data for a commodity and are sent with or shortly after an approved export. These may be exported under general license GTDR, which is self-issued and unreported.

Technical data may be exported to Western Hemisphere and Free World countries under general license GTDR except when the data relate to a commodity controlled for national security or nuclear nonproliferation reasons. In those cases, the exporter must first obtain written assurance from the importer that neither the data nor any product of the data will be exported or reexported to other than Western Hemisphere or Free World countries. The written assurance is placed in the exporter's file.

There are two categories of technical data controlled by EAR that do require validated licenses for export to nonbloc destinations. The first category (see EAR Section 379.4[c]), which covers data pertaining to commodities and services related to nuclear nonproliferation, is controlled to all destinations and has been so controlled for decades. The second category, EAR Section 379.4[d], controls technical data for commodities and processes to all destinations except Canada. These data are controlled for national security purposes, generally at the request of the Department of Defense, and many of the restrictions that apply to them have been in effect for periods of up to several decades. Since 1985, this category has been expanded to cover specific technical data that became controlled as a result of the 1982–1984 CoCom list review. These controls were adopted as "items" (or portions of items) on the CoCom International List. In the United States, the control of technical data ("technology" items or subitems in CoCom) was removed from the respective entries on the U.S. list and placed into the technical data regulations (EAR Section 379.4.[d]) to conform to the format of existing regulations. Validated licenses for this group of technical data are required to all destinations except Canada.

IMPACT

It is obviously too early to analyze the impact of the technical data controls that were imposed in 1985. The older national security controls generally have not had a significant impact on transborder flows of technical data except as noted below. Validated licenses for

this class of technical data are processed routinely by the Department of Commerce for Free World destinations without review by the Department of Defense; thus, processing time tends not to become excessive.

A large proportion of the technical data so controlled relates to transportation equipment and airborne navigation and communications gear. Technical data controls are made particularly onerous by the necessity of obtaining a validated license for the export of maintenance, repair, and operation data and for installation data for equipment that itself was previously exported under a validated license. Particularly in the case of aircraft and airborne equipment, there are numerous instances in which technical bulletins are issued subsequent to the sale of such equipment. These bulletins are issued to correct faults in equipment, to facilitate maintenance and repair, to clarify operating procedures, or to revise installation procedures. Although safety and economic considerations argue for rapid dissemination of these bulletins, the requirement that exporters obtain a validated license for such technical data imposes significant delays. As a consequence, exporters are critical of this requirement and with good reason.

As in ITAR, software is treated as technical data under EAR. Software and technical data specifically called out in the U.S. Control List require validated licenses to all destinations.

Equipment for VHSIC processing generally is under Commerce Department control under ECCN 1355A, although certain test equipment and materials are covered elsewhere. Export license applications for such equipment to Western Hemisphere and Free World countries are approved routinely with a few exceptions that are subject to Department of Defense (DoD) review. Technical data for design, processing, and test purposes come under EAR, as does the software used in the program. Penalties for violations are similar to those imposed under ITAR.

In the arena of dual use commodities and technical data controlled by EAR, the situation is compounded by the inherent difficulty in interpreting the regulations. As a rule, most data are eligible for general license GTDR, which is self-issued and unreported. The only requirement is that the recipient of the data provide a written letter of assurance that the data, or any product of the data, will not be exported or reexported to the Soviet bloc.

Multinationals, of course, could not reasonably function if they had to generate written assurances for each and every individual

data transfer by telephone, TWX, or corporate data network. For this reason, they tend to operate under "bulk" licenses, such as the distribution license. This license permits wholesale export of commodities and technical data to approved end-users, generally subsidiaries, after the exporter and the end-users have been suitably investigated for their commitments to protecting U.S. technologies. Congress has created a new bulk license, the comprehensive operations license, in the Export Administration Amendments Act of 1985; specifically tailored to multinationals, the license is not yet reflected in the regulations. Presumably, however, it will make commercial data transfers considerably easier, while making collection of data on transborder data flows virtually impossible.

The three remaining categories of exporters include the medium-sized companies that are aware of the regulations and that dutifully stuff their file drawers with written letters of assurance. Even here, however, they generally fail to distinguish among the many forms of transactions that convey technical data. A letter of assurance may be sought to cover the transfer of a written technical data package, but onsite technical assistance in product use often is not covered, nor are other oral exchanges of information.

The second category is the most tragic. This involves the small to medium-sized companies that are new to exporting but are aware that there are regulations. Because specialist attorneys or export service assistance companies are beyond their budgets, they try to interpret the regulations on their own. The definitions alone are intimidating, to say nothing of the regulations. When combined with the need to master letters of credit, import certificates, and the like, the task becomes daunting indeed. These problems, combined with the uncertainties in the export regulations, have discouraged a number of potential exporters who prefer to tend to the more comfortable and familiar domestic market.

Although no statistics are available to support the assertion, it is highly likely that a great deal of technical data is interchanged outside of the export control system by companies and individuals who either are not aware of or who ignore the system. In several years of operation, the U.S. Customs Service's Project Exodus has uncovered approximately 1,500 attempted exports per year of controlled commodities without licenses. The bulk of these were cases of unlicensed shipments of controlled commodities in which the shippers simply were unaware of export controls on their products. Such a lack of awareness concerning commodities argues strongly for a similar lack

of knowledge on the part of the general public with respect to technical data. Furthermore, although awareness campaigns are being conducted by the Customs Service and other agencies to sensitize the public to the requirements of export controls, these programs have concentrated on commodities and not on technical data.

Multinationals and large international companies long have argued that the best protection of technical data lies in the proprietary interests of the companies holding the data. This is undoubtedly true of these companies. However, in times of severe economic stress, weaker companies may be forced to sell their technology just to survive. (Note the infusion of Japanese funds into small U.S. companies during the recent semiconductor market downturn.) Thus, reliance on self-policing is probably not good policy.

Defense Department Withholding of Unclassified Technical Data

AUTHORITY

The authority to withhold unclassified technical data is contained in the Defense Authorization Act of 1984 (10 U.S.C. 140[c]). The act authorizes the Department of Defense to withhold from public release (particularly under the Freedom of Information Act) export-controlled technical data with military or space application. However, this authority has not been utilized significantly.

CONTROLS

Unlike export controls, DoD Directive 5230.25 is concerned with the public release of information. The primary mechanism of control is the certification of contractors and persons who agree not to disseminate such information without authorization. The penalty for violation is withdrawal of certification to receive such information. Under the directive, the information may be transferred only to other certified corporations or persons for legitimate business purposes. Documents must carry appropriate warnings concerning distribution.

The directive does contain a fatal flaw. It permits distribution without authorization if this is accomplished according to the applicable export laws. Thus, for example, VHSIC processing technical data could be sent to a Free World country under general license GTDR with only a written assurance in the contractor's file; data

could be sent to Canada without a license. The Canadian or European firm could in turn send the data to an uncertified U.S. contractor or another company elsewhere in the Free World.

VHSIC-specific Controls

DoD imposes additional restrictions on the release and dissemination of VHSIC technical data. These restrictions (contained in DoDI 5230.26) are similar to the national security classification process, but they can be imposed only by contractual agreement between the VHSIC contractor and the government. The issue, then, is one of economics and, for the VHSIC contractors, one of whether they should voluntarily accept these controls. Some contractors may conclude that they are close enough to completing the development of VHSIC chips with commercial applications that they are in a position to reject these restrictions and thus forgo further government support. Of course, there are other levers (e.g., defense contracts) available to the government, particularly with the vertically integrated systems houses that depend heavily on DoD contracts. The merchant houses are less dependent on such contracts and thus under much less pressure. These firms are less likely to acquiesce; and in fact the contractors that are capable of VHSIC development but are not involved in the VHSIC program are not bound at all. In the end, reliance would be on the manufacturers' basic instinct to protect proprietary data, and each firm would be the arbiter of what is proprietary.

Controls on Fundamental Research

AUTHORITY

National Security Decision Directive 189 (September 21, 1985) defines the federal government's position with respect to federally funded fundamental research at colleges, universities, and laboratories. The directive defines fundamental research as:

> . . . basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as distinguished from proprietary research and from industrial development, design, production and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons.

The stated federal policy with respect to federally funded fundamental research is that the results of such research should remain unrestricted. If control is required for national security purposes, classification is to be used as the only method of control and is to be established prior to any contract or grant award.

This directive followed a long and often strident conflict between the Department of Defense and the academic community. Because of the extreme positions taken by both sides, there appeared to be no room for compromise. Certain elements within DoD called for widespread and heavy-handed application of ITAR and EAR to the academic research community; the academic community, on the other hand, wanted basic research to be defined as any research conducted within the community. The National Academy of Sciences 1982 study, *Scientific Communication and National Security* (known as the Corson study) calmed the situation somewhat but left a requirement for executive action. The directive represents this action, and it attempts to defuse the issue by switching from "basic" to "fundamental" research. Regrettably, one is no clearer than the other, and a gray area remains.

The problem, however, is real and has not in fact been solved. Demographics and economics have put pressure on universities, which are compelled to compete for students and to replace DoD funding sources with industry grants and contracts. As a result a large population of foreign nationals has appeared on campuses, particularly in technical disciplines such as engineering and mathematics. Moreover, the nature of the research performed in university laboratories has become more oriented toward processes and applications. Both of these developments are significant for ITAR and EAR. The directive does not solve this problem.

Universities will deny that they accept any proprietary restrictions or prepublication review requirements in industry grants, although principal researchers privately admit such restrictions. Government agencies can avoid the directive by obtaining prior agreement that the contemplated research is not fundamental or by making off-the-record agreements with principal researchers. Within DoD, opinions may vary widely on the necessity for restricting technical information, with the Office of the Under Secretary for Policy arguing for strict controls and the Defense Advanced Research Projects Agency vehemently resisting any controls but classification, even in manufacturing technology programs.

CONCLUSIONS

Although frequently criticized as overly restrictive, the U.S. national security export control system for technical data flow is in fact weak and largely ineffective. Although technical data related to controlled dual use commodities do require validated licenses to the Soviet bloc and to a few pariah countries, controls to Free World destinations largely are illusory. The bulk of these data is exported on the basis of self-issued licenses. In other cases in which validated licenses are required, the system selectively hinders those exporters of technical data who are not large or knowledgeable enough to avail themselves of the procedures open to multinationals nor small enough to escape unnoticed. There are some other real causes for concern: The validated license requirements for technical data related to after-sale maintenance, repair, and operations can be onerous, and the future adoption of additional technology controls by CoCom is likely to expand the requirements for validated licenses for technical data. In sum, then, U.S. controls on transborder technical data flows are limited and uneven in their impact.

NOTES

1. Arms Export Control Act, *Legislation on Foreign Relations Through 1982*, vol. 1 (Washington, D.C.: U.S. Government Printing Office, 1983), p. 216.
2. U.S. Department of State, *International Traffic in Arms Regulations*, Part 120.21 (January 1, 1985).
3. U.S. Department of Commerce, *Export Administration Regulations*, Part 379.1, Export Administration Bulletin 242 (December 18, 1985).

Technology Transfer and Sino-U.S. Relations: The Critical Issues

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INTRODUCTION

Science and technology have played a unique and pivotal part in the normalization of relations between the United States and the People's Republic of China (PRC). In many respects the expansion of bilateral science and technology cooperation and exchanges has been symbolic of the overall progress in the evolving Sino-U.S. political relationship. Within this broad context the issue of technology transfer to China has taken on great significance, especially as Beijing has affirmed its commitment to maintain an "open door" to the outside world and to secure foreign technology and capital to support its economic modernization. For leaders in both countries, technology transfer seems to present some critical challenges and significant opportunities. And, based on recent heightened attention to technology transfer, it is clear that bilateral technology-related issues will continue to occupy a central position on the agenda of current and future leaders in China and the United States.

Publicly, the U.S. government is on record as supporting China's economic and technological modernization program. Our principal working assumption is that a stable, economically modernizing China will be more prone to moderate foreign policy behavior than a China beset by a host of intractable political and economic problems.[1] Given

the general state of China's current industrial and technological capabilities, the success or failure of its "four modernizations" program will depend to a great extent on how effectively and efficiently China can apply foreign technology. Thus, alongside the obvious commercial and economic dimensions of technology transfer to China, there are also a number of significant political aspects as well.

Both the United States and China have taken a number of fundamental steps to facilitate the flow of technology and the expansion of trade relations. Each of these steps has been taken with certain expectations, both explicit and implicit, in mind. Some of these expectations have been fulfilled; others remain largely unfulfilled. On the Chinese side, for example, a patent law was inaugurated in April 1985 to complement a series of investment statutes to protect the rights of foreign corporations and guarantee the sanctity of their respective contracts covering the technology involved in joint ventures and other projects. China's hope has been that the presence of these regulations might alleviate the concerns of foreign companies about the security of their proprietary know-how and thereby increase foreign investment and technology transfers. For the most part, however, the rate of growth in these two areas generally has not been to China's satisfaction.

On the U.S. side, since 1981 a substantial relaxation in government export controls has occurred to allow more advanced technologies and equipment to be sold to China.[2] These actions were taken in large part in response to a set of postulated compatible or complementary global and regional interests shared by both countries. The respective changes initiated by the two governments represent major accomplishments in terms of the expanding dialogue between the two countries. And these initiatives have helped, to some degree, to increase Sino-U.S. "high-tech" trade. Nonetheless, aside from the generally stabilizing role China has played in East Asia since the late 1970s, the tangible political benefits to the United States frequently have been slow to materialize—when they have materialized at all.

Any effort to understand the evolving role of technology transfer in Sino-U.S. relations must come to grips with four fundamental questions. First, it is clear that we need to have some fix on China's technology acquisition priorities and strategies. For example, as China's modernization program moves ahead, the United States (both the public and private sectors) needs to understand more fully how to respond to the emerging trade and investment opportunities provided by China's open door to the outside world. We need to learn

whether current examples of increased protectionism in the Chinese market portend fewer opportunities for foreign firms than heretofore anticipated.

Second, we need to have a better grasp of the principal acquisition mechanisms being used by China to secure foreign technology. How significant are foreign investment and joint ventures as channels for technology transfer? At the same time, we also need to know whether our existing export controls are working or whether the Chinese have been able to bypass them through alternative legal or clandestine means—for example, the use of dummy firms in Hong Kong. In this regard, we need to develop some measure of the effectiveness of China's mechanisms for importing technology.

Third, we need to evaluate China's capacity to assimilate foreign technology, specifying the implications of successful or "unsuccessful" assimilation. For example, what role will a more economically and technologically modernized China play in the international economy? Will China's drive to expand exports, supported in large part through increased technology imports, lead to the emergence of a new source of competition for U.S. firms? In the defense area, we need to understand how technology imports are being used to support advanced weapons programs. In addition, should the United States decide to assist China with the modernization of its military through assorted technology transfers and equipment sales, it is imperative for us to discern the principal obstacles to absorption as well as which problems are amenable to short-term versus long-term remedies.

Finally, we need to have a better understanding of China's intentions and long-range political objectives in order to assess the risks and trade-offs associated with various levels and quantities of technology transfer to China. Are U.S. expectations vis-à-vis the Sino-U.S. relationship unrealistic? Are we caught up in what Gabriel Almond in *The American People and Foreign Policy* characterized as the tendency of the American people to base foreign policy more on mood or disposition than on factual information and analytic processes? What are the payoffs to the United States from extensive technology transfers to China? To what extent do we share common assumptions with our allies in Western Europe and Japan regarding the risks from and benefits of transferring technology and equipment to the PRC?

This paper will address many of these critical issues through an analysis of major trends in China's science and technology (S&T)

system as well as by an examination of the multiple dimensions of China's science and technology relations with the industrialized world and the Soviet bloc. A major aim will be to shed some light on a number of the major political and economic dimensions of the technology transfer issue by specifying how and why technology transfer will continue to assume long-term importance for China's modernization and the evolving Sino-U.S. relationship.

CHINA'S SCIENCE AND TECHNOLOGY MODERNIZATION OBJECTIVES

Since the formal announcement of the four modernizations program in early 1978, the Chinese have paid increasing attention to the critical role science and technology play in advancing their country's civilian economy and its defense capabilities. The upgrading of domestic S&T capabilities continues to be one of the regime's highest priorities. The importance attached to science and technology is reflected in the recently announced Seventh Five-Year Plan (1986–1990), which provides increased funds for research and development (R&D) as well as for the technological modernization of industry and agriculture.[3] In many respects, the PRC leadership has moved away from its overexaggerated expectations for science and technology. Chinese leaders increasingly have recognized that their modernization problems stem not only from China's own technological backwardness but more importantly from a combination of factors that includes the structure of economic incentives, the price system, attitudes toward scientific and technical personnel, and misdirection in previous policies regarding imports of foreign technology.

In October 1984 China's Central Committee announced its "Decision on Reform of the Economic System." The reform document spells out a number of significant changes regarding management of the Chinese economy at the macro and micro levels. In simple terms the reforms represent a distinct move away from a broadly based, command-oriented planning system toward greater reliance on a looser form of administrative guidance in which economic levers and market forces play a more important (although not predominant) role. The leadership has introduced these reforms in the belief that such changes are needed to achieve, in a more effective way than previous policies, sustained improvements in industrial productivity as well as overall economic development and social welfare.

In a complementary fashion, Chinese leaders also have attempted

to modify drastically the country's entire program for modernizing science and technology and expanding the application of new technologies to the civilian economy and defense sector. According to Deng Xiaoping, without expanded applications of science and technology, the modernization of agriculture, industry, and national defense will not be realizable. The core features of the reform effort in science and technology are contained in the March 1985 Central Committee "Decision on Reform of the Science and Technology System."[4] The reform document is in many ways a reaffirmation of a number of policy experiments that were begun as early as 1981. These initiatives have included the establishment of new funding mechanisms for research and the formation of "technology markets" for the commercialization of R&D results, the granting of improved status and benefits to scientific and technically trained persons, and a shift away from reliance on whole plant imports as the primary vehicle for acquiring foreign technology.

In effect, the last several years have seen the increasing sophistication of Chinese leaders regarding the necessary elements for sustaining their S&T modernization drive. This is reflected most clearly in the explicit attempt that has been made to link the economic reforms at the enterprise level with the S&T reforms within the research sector so as to build incentives for greater communication and coordination of activities. As this paper suggests, this increasing sophistication has had important implications for China's activities in relation to acquisition and utilization of foreign technology.

Chinese technological priorities include energy, agriculture, transportation, telecommunications, and microelectronics and computers. One of the more visible aspects of the science and technology modernization program, however, is the special attention that has been given to the so-called "new global technological revolution"—or what Alvin Toffler has termed "the third wave" of the world's industrial revolution.[5] The leadership, from Premier Zhao Ziyang on down, sees a qualitative change emerging as the basis for both technological advance and industrial growth. As a result, it has stressed how important it is for China to make substantial progress in the four key emerging areas of technology cited by Toffler: information technology, microelectronics, materials science, and biotechnology.[6]

Most importantly, several Chinese leaders have argued that unless China is able to make significant advances in the four areas noted above, the technological gap between China and the West will grow even wider in the future. It is clear that such a development

would be politically unacceptable to the current leadership—whose credibility is based in many ways on an ability to close appreciably the prevailing gap by the year 2000 and establish China as a major force in global economic and S&T affairs.

In fact, the emphasis on third-wave technologies has sparked a recurring debate among some members of the science and technology community, a debate with important implications for foreign technology acquisition. Rather than catching up with the West by the year 2000, which had been the original goal announced at the March 1978 National Science Conference, Chinese leaders developed a more realistic target—that is, attaining Western technical levels of the 1970s and 1980s by the year 2000. Yet, recent developments in the West and Japan in microelectronics and biotechnology have had a major impact on the thinking of several influential individuals, leading some to suggest that the more moderate goal would merely leave China permanently behind the West without much hope of ever catching up.[7] As such, the notion that China must somehow "leapfrog" stages of scientific and technological development through imports of advanced technology and equipment and indigenous programs—a notion that was popular in 1978—is still in vogue within the leadership circle:[8]

> A new technological revolution is currently taking place in the world. This presents both an opportunity and a challenge to the economic development of our country. We should seize this opportunity and make selective use of the new scientific and technological achievements so as to accelerate our modernization and narrow the economic and technological gap between China and the developed countries.[9]

THE ROLE OF FOREIGN TECHNOLOGY: THE HISTORICAL CONTEXT

Currently, foreign technology is viewed as a catalyst in China's modernization program. Today's open door to foreign technology, however, as well as the broad thrust toward technological modernization, must be viewed against the backdrop of a series of pendulumlike swings that have been characteristic of the regime's policies toward technology imports as well as economic modernization since 1949. Essentially, China's experiences regarding the importation of technology can be broken up into five phases. Phase 1 (1950–1960), was the period of close Sino-Soviet cooperation. Estimates are that during this period, China imported 156 complete sets of equipment and whole plants as well as a significant quantity of other related

equipment from the USSR. Most of the import activity was designed to support the development of heavy industries such as metallurgy, machine-building, electric power, and chemicals.[10] It is these factories that have formed the focal point of recent discussions between Moscow and Beijing about the possibility of Soviet technical assistance to modernize physical plants and equipment.

Phase 2 (1962–1968) was a period of relative closure as far as technology imports were concerned. In spite of the Sino-Soviet split, some technology and equipment were imported from Eastern Europe. More importantly, China also signed 84 contracts worth US$260 million for complete plant and equipment imports from Western Europe and Japan. These imports were focused primarily on heavy industries as well, although there was some machinery acquired for the textiles, mining, and electronics industries. Phase 3 covered the immediate post-Cultural Revolution period (1973–1977). In spite of the political dominance of the Gang of Four, more than 120 contracts were signed with foreign firms (mainly from Japan but with some U.S. involvement—e.g., Kellogg, Inc.), 69 of which were for whole plant and equipment imports to support primarily steel, petrochemicals, and fertilizer production. It was also during this period that China signed its first licensing agreement with the Rolls Royce Company for acquisition of the technology to build 50 Spey engines—a major project that appears to have failed in terms of the initial expectations of the Chinese and British participants.[11]

Phase 4 (1978–1979) was the first expression of China's outward-looking policies in the post-Mao era. The period also was characterized by a significant number—105 in 1978 alone—of large, whole plant purchases with an estimated value of US$4.52 billion. These imports were part of the overambitious "four modernizations" program announced in early 1978 by former Chinese leader Hua Guofeng. After rushing to sign contracts for massive imports of foreign equipment and assistance, the Chinese quickly found out they had neither the infrastructure nor the personnel (technical and managerial) to handle the demands of such a large-scale acquisition program.[12] As a result, a number of the projects were either cancelled or scaled back by 1979–1980. Here again, as in the past, the primary emphasis was on hardware and increasing output through additional capital construction as opposed to the acquisition of know-how, with industries such as steel and petrochemicals being the primary targets.

China is now in the midst of phase 5 (1980–present) of its technology import activities. The period is characterized by a distinct

move away from whole plant imports, a sharper focus on the import of key technologies, and a strong emphasis on alternative forms of acquisition such as joint ventures and licensing. "Software" (i.e., know-how) is being stressed over hardware; technology imports are no longer viewed simply as a means to increase output through added capacity but rather as a way to alter the qualitative aspects of production. Chinese policy also reflects a growing attention to the problem of assimilation and diffusion of imported technologies, particularly in the aftermath of the utilization problems encountered during phase 4.[13]

China's current technology import program appears to be more credible than those of the past because it is being accompanied by an array of broadly based organizational and managerial reforms that promise to alter in a major way the climate in which research and the application of foreign technology take place. In particular, more attention is being given to assimilation issues. As one Chinese has indicated, for example, "because of problems such as poor management, even the presence of the most advanced technology will not have its desired impact. By upgrading the quality of project managers, as well as enterprise and R&D managers, we hope to promote the increased application of technology to the economy."[14] And although many process and planning-related problems still exist, the fact remains that the domestic environment now is more conducive to the effective and efficient use of imported items than it was in the past.

THE ROLE OF FOREIGN TECHNOLOGY: THE CURRENT THRUST

A number of critical alterations have been introduced in China's technology modernization program from the perspective of technology transfer. These can be broken down into several categories. First, there is the growing stress on the technical transformation of enterprises,[15] which has meant an emphasis on *intensive* rather than *extensive* development within Chinese industry.[16] Although initially announced in mid-1980, this new emphasis has meant that greater attention is being paid to modernizing existing plants and facilities. As indicated previously, stress is being placed on the acquisition of know-how and selected equipment rather than on whole plants or large quantities of equipment.[17] Both foreign investment and technology licensing are viewed as key mechanisms for bringing

to Chinese enterprises the know-how and managerial expertise to implement needed plant renovations.

The emphasis on know-how (as opposed to simple hardware acquisitions) is designed to yield productivity increases as well as to reduce potential long-term dependency on foreign sources and to promote China's goal of greater technological self-reliance. In spite of the constant reminders by China's leaders of the strategic nature of the open door, the Chinese have not backed away from their firm commitment to greater national self-reliance. As one prominent official has stated, "Introducing advanced technology is not just our purpose, but is a means to improve our technological level and production capacity. Our purpose is to improve our ability to carry out self-reliance and to speed up our economic and technological development."[18] For example, a recent Chinese analysis of the importation of 13 chemical plants in the early 1970s suggests that China (unlike Romania, which was able to produce copies of 7 plants) was unable to produce any copies because it failed to purchase patents for crucial parts and secure other manufacturing techniques from the suppliers.[19]

In fact, from 1950 to 1980, more than 90 percent of China's foreign exchange expenditures on technology imports went for whole plant imports rather than for the licensing and acquisition of know-how.[20] This situation has begun to change as more and more emphasis is being placed on technology acquisition mechanisms other than whole plants.[21] For example, according to interviews conducted in Beijing in January 1986, the percentage of software imports increased from about 1.3 percent in 1978 to 34.4 percent in 1984. In a related phenomenon, according to the Ministry of Foreign Economic Relations and Trade, the number of licensing agreements also has steadily grown (see Table 1). In May 1985 Chinese authorities issued a series of guidelines to regulate the process of technology importation.[22] These guidelines, which are aimed at maximizing China's use of imported technologies, impose limits on the use of so-called "restrictive business practices" by foreign suppliers. Interestingly, even though they are somewhat strict, the guidelines are quite consistent with many of the principles advocated by the Group of 77 in their negotiations for a code of conduct on multinational enterprises at the United Nations.[23]

In spite of the current commitment to the open door, China's willingness to rely on foreign imports of technology remains, nonetheless, tempered with a dose of caution, deriving in part from its own

TABLE 1 Technology Imports and Equipment Agreements by Year and Value (in US$ billion)

Year	No. of Cases	Value
1979	95	2.48
1980	115	1.98
1981	73	0.11
1982	102	0.36
1983	212	0.57
1984	336	1.06
1985	665	2.96

SOURCE: Ministry of Foreign Economic Relations and Trade, Beijing, January 1986.

history, from its past experiences with the Soviet Union, and from its realistic appreciation for what it can and cannot buy. Recent articles in the Chinese press have chastised production units for excessive reliance on imported items and for seeking only advanced items, thereby ignoring indigenous capabilities.[24] According to recent remarks by Minister of Defense Zhang Aiping in December 1985, Beijing does not want to depend entirely on outside sources for technology, especially since foreign suppliers are unlikely to make available their latest technology. Nor does China want to overconcentrate its technology purchases on one or two partners.[25] As such, the effort to expand technology relations is as much a reflection of the desire to diversify technology sources as it is a manifestation of foreign policy interests and the wish to reintegrate China with the world economy.[26]

A second dimension of the recent changes that holds importance for technology transfer is the increased emphasis on upgrading and expanding S&T and management training programs, both domestically and abroad.[27] The Chinese are retraining factory and R&D managers, putting more individuals with technical competence in positions of authority, expanding overseas training through commercial as well as bilateral programs, and restructuring their higher education system. The stress on managerial improvement is designed to complement the "production responsibility system" (discussed below) whereby factory directors are being given greater discretionary authority in the day-to-day operations of their facilities. Management training programs have been arranged with the United States, Canada, West Germany, Japan, Sweden, and Hong Kong. Each of these programs offers China a particular perspective on management

technology—thus providing the Chinese with the raw material to develop their own Chinese style of management.

The importance of China's attempt to create a well-qualified manpower base should not be underestimated. The absence of a large, well-trained manpower base has been one of the major weaknesses in China's technology import program.As one Chinese author has suggested, "This is an important reason why some equipment which has high efficiency and good economic results in foreign countries loses efficiency and economic results as soon as it is transferred to our hands."[28] These ongoing efforts promise to help alleviate a major bottleneck in terms of improving industrial productivity, increasing R&D output, and ensuring more efficient use of imported technologies. Moreover, by having persons with greater managerial competence in key positions within technology acquisition units, China will be able to increase further its selectivity and performance with respect to tasking acquisition organizations.

An important aspect of China's education policies is its overseas scholarly exchange programs with the United States, Japan, and Western Europe.[29] Chinese statistics indicate that more than 33,000 Chinese have studied abroad since 1978, including 26,000 who were funded by the government and 7,000 who were self-funded.[30] According to an official from China's Ministry of Education, these programs have been only partially successful because not enough guidance and direction have been given to students and scholars being sent abroad for advanced education and training.[31] A similar concern was expressed by Lu Jiaxi, president of the Chinese Academy of Sciences, during a visit to the United States in late 1984. In the future, it appears likely that more and more persons being sent abroad will be better prepared with specific research topics and skills development assignments.[32] Although such tasking did take place in the past, it appears that it occurred only in selected cases.

A third area in which recent changes promise to be of long-term significance for technology imports involves the ongoing movement toward greater decentralization of decision making and the granting of greater autonomy to operating units. In some cases, specific enterprises, such as those under the Ministry of Machine-Building and the Ministry of Electronics Industry, have been divested from direct ministerial control.[33] In addition, within the industrial sector, a system of taxation has been introduced as a replacement for the previous system of profit delivery.[34] If successful, these efforts will

improve to a greater degree than is currently true the process of technology selection; they also may increase Chinese demands for foreign technology. With increased autonomy, even though enterprises and R&D institutes cannot totally bypass the notoriously cumbersome Chinese bureaucracy when making most purchases, they nonetheless may tend to be less reluctant to seek out foreign items.[35] Increased responsibility at the local level also will make these organizations more selective in their technology choices, especially since the costs of waste and inefficiency increasingly will be directly borne by the importing entity.

THE EMERGING STRUCTURE OF CHINA'S SCIENCE AND TECHNOLOGY SYSTEM

Perhaps the most important development over the last several years in terms of the structure of the Chinese S&T system has been the establishment of special "leading groups" or task forces for managing national and provincial priority areas. These groups are designed to break down the barriers to greater interministerial and interregional coordination—what the Chinese call the "tiao tiao kuai kuai" problem. At the highest level, the most significant example has been the creation of the Special Leading Group for Science and Technology under the State Council.[36] Discussions in Beijing in early 1984 revealed that this leading group was created specifically because of the need to put the imprimatur of the premier's office on the effort to promote S&T modernization. According to a speech made by Premier Zhao Ziyang at the National Science Awards Conference in October 1982, too many people in the bureaucracy were merely paying lip service to the call for advancing S&T. The special leading group is directly under the control of Premier Zhao Ziyang, although the day-to-day workings of the group are now the responsibility of Song Jian, the newly appointed head of the State Science and Technology Commission.

Song has been associated with the so-called "big-push" model of science and technology, the roots of which derive from the legacy of Soviet influence on the Chinese R&D system. Both China's nuclear weapons and missile programs have benefited as a result of the ability of centralized organs to create a critical mass of expertise and to coordinate an array of diverse resources to achieve a priority objective. Seen from this perspective, Song's role will be to promote this type of cross-institutional coordination—which is a necessity given China's

current organizational structure and the related bureaucratic obstacles to such cooperation and coordinated efforts. Song's task will be facilitated somewhat by the greater attention being paid to S&T activities within other national-level organizations such as the State Planning and State Economic Commissions.

The formation of the Special Leading Group for Science and Technology has been complemented by the establishment of several high-level, highly focused groups in the areas of electronics and computers *and* equipment development and acquisition. Created in September 1984, the special group in electronics is now headed by Vice-Premier Li Peng. Its prime responsibility is to ensure that China makes sustained and substantial progress in such critical areas as large-scale integrated circuits. In addition, the group is directly attached to the State Council, thus alleviating for the most part the bureaucratic boundary problems encountered by the Ministry of Electronics Industry in its efforts to coordinate electronics development among the various ministries with an interest and capability in this area.

In the ministerial sector, a most important development, as far as S&T activities are concerned, is the growing linkage between civilian and military units, both in terms of research and of production. In the past, primarily because of the dearth of high-quality S&T resources, it was common for civilian research entities, such as those within the Chinese Academy of Sciences, to assist the defense sector. On the whole, however, the military was highly compartmented and did not have regular interactions with the civilian sector. Now, Chinese leaders are encouraging more two-way interaction. In 1984 more than 8,000 items of military industrial technology were transferred to the civilian sector.[37] Tianjin municipality and many of the production facilities under its control have been working closely with the National Defense Science, Technology, and Industries Commission to foster more interaction. Personnel as well as some production capacity are being turned over for the manufacture of civilian goods.[38] Nuclear scientists who worked on previous weapons programs, for example, are being encouraged to assist with programs aimed at the peaceful uses of nuclear technology.[39]

In essence, the military stands to benefit as much as the civilian sector from such an approach, especially since it can frequently take advantage of the technology and equipment flowing into civilian industry. Additionally, through producing for the civilian market, especially in the area of consumer goods, the military will become

more efficiency-conscious in its use of resources. Unfortunately, this will make it increasingly difficult in terms of specifying the actual end-users of technology and equipment secured from the United States and its allies, especially since we can expect to see more of this type of interaction as the barriers to compartmentalization break down further.

At the provincial and municipal levels, a growing number of special leading groups concerned with both science and technology affairs and technology imports have appeared. Shanghai, for example, has organized a special task force for handling the importation of critical technology. In Hubei province, a high-level entity above the provincial S&T commission has been created to oversee S&T activities.[40] The appearance of these organizations suggests that as the authority for making decisions in the S&T areas has devolved to lower levels, local leaders are attempting to avoid costly errors and maximize existing opportunities by relying increasingly on a select group of experts to assist in making appropriate policy decisions.

To summarize, we are witnessing a significant alteration in the way things have been done in China in comparison with past practices. As Chinese leaders have discovered, the acquisition of foreign technology means very little unless domestic reforms accompany the currently stepped-up acquisition efforts. As the research system improves its efficiency and effectiveness, and as current education programs begin to produce larger and larger numbers of qualified individuals, the Chinese S&T modernization program and the accompanying technology acquisition effort are likely to become even more sophisticated. In other words, there is a high degree of synergy between these various activities. Such synergy has major implications, particularly regarding the assimilation of technology—suggesting that in certain critical areas China might move much farther and faster in its modernization program than was previously thought possible.[41]

THE SCOPE OF CHINA'S FOREIGN TECHNOLOGY RELATIONS

Technology Transfer and Foreign Policy

China's leaders consider the issue of technology transfer to be intimately related to matters of "high politics," viewing controls on the export of technology as incompatible with their country's national sovereignty. As such, Beijing generally is reluctant to accept

foreign-imposed end-use requirements on equipment and technology transfers.[42] At the same time, the Chinese have indicated a willingness, though somewhat reluctantly as well, to accept restrictions on possible third-country transfers.[43] The essence of the Chinese position is most clearly reflected in their views on nuclear energy technology.[44] From a domestic perspective, as a nuclear weapons state, China has resisted for the most part attempts to impose formal inspection requirements on use of the technology. From an external perspective, however, the Chinese have reaffirmed their support for nonproliferation—even though in the past they allegedly have conveyed nuclear technologies to Pakistan.[45] In nonnuclear areas as well, the Chinese officially are on record with the U.S. government as stating that they will not transship sensitive U.S. technologies to other parties—a substantial concession on Beijing's part.[46]

As mentioned earlier, China's general policy orientation is to diversify its modes of acquisition as well as its foreign technology relations.[47] The Chinese have developed S&T cooperation programs, educational exchanges, and commercial technology relations with all the major Western industrialized nations and Japan, with Eastern Europe, and with the Third World. Each of the bilateral exchange programs brings China research and training opportunities as well as access to advanced technology and equipment. The Chinese have placed particular emphasis on their bilateral government-to-government S&T programs (see Table 2), seeing them as a cost-effective way to secure training and assistance from the West and Japan.[48] Cooperation with Eastern Europe, although we have little in-depth information about such programs, is designed to complement and in some cases augment these other programs. We do know that since 1980, Chinese leaders have placed increasing emphasis on expanding S&T (and economic) relations with such countries as Hungary, Romania, East Germany, and Czechoslovakia.[49]

A general aspect of the various bilateral programs is the growing interrelationship between bilateral government-to-government cooperation and commercial technology developments. For example, cooperation in nuclear science with France appears to have contributed in part to possible sales of French nuclear energy equipment.[50] Cooperation in petroleum sciences and geology with the Japanese and the French has resulted in commercial ties vis-à-vis offshore oil development. Although this is not meant to imply that bilateral cooperation is a necessary prerequisite to expansion of commercial relations, at times it has been a sufficient condition; engaging in the former does

TABLE 2 A Selected Sample of China's Bilateral Agreements Relating to International Science and Technology

Country	Date of Agreement	Fields of Cooperation
United States	1/79	Management, physics, agriculture, health, and energy
West Germany	10/78	Energy, metallurgy, space, patents, and agriculture
United Kingdom	11/78	Chemistry, biology, and electronics
Pakistan		Earth sciences, energy, textiles, and railways
Italy	10/78	Space, energy, electronics, and chemicals
Hungary	1958	Transportation, health, and chemicals
Poland	1954	Energy, electronics, health, and food processing
East Germany	1959(?)	Food processing, optics, and chemicals
Romania	1959(?)	Electronics, chemicals, food processing, and mechanical engineering
North Korea	1960(?)	Geology, energy, and transportation
France	1/78	Energy, earth sciences, space, and chemicals
Sweden	10/78	Biology, medicine, computers, and energy
Japan	5/80	Energy, computers, production technology, communications, and transportation

SOURCES: Assorted articles in the Foreign Broadcast Information Service, Renmin Ribao, and Western newspapers.

NOTE: The "?" by certain entries indicates that the dates for these agreements were estimated/extrapolated using other information.

seem to facilitate the latter. This is especially true in the case of China's dealings with Western Europe and Japan, where the increased China business of state-owned firms in the commercial area seems to flow naturally from expanded government-to-government S&T cooperation.

Sino-U.S. Technology Relations

The Sino-U.S. technology relationship continues to be the largest and most active of China's proliferating international S&T activities.

As of early 1986, 24 protocols for cooperation in science and technology had been signed in fields ranging from high-energy physics to industrial technology to agricultural science. In addition, there are more than 13,000 Chinese students and scholars here in the United States, a figure that does not include the growing numbers of Chinese technical personnel who come to the United States for short- and medium-term training in the commercial sector. Finally, in the first 11 months of 1984, "high-technology" trade grew to US$2.8 billion—up from US$1.1 billion in 1983.[51]

Two major questions arise out of the Sino-U.S. S&T relationship. The first has to do with the extent to which these programs are contributing to China's overall development needs and whether they are moving the Chinese research community and industrial sector into areas that are more closely related to the interests of the industrialized world. Although no easy answer can be found, it is clear that in the area of research, the opportunity to engage in international state-of-the-art activities is appealing to China's scientific community, even as basic research has been downgraded. China's S&T system also has benefited from learning more about U.S. R&D funding procedures and standards (e.g., peer review practices). On the other hand, much more remains to be done in basic manufacturing processes and production procedures as well as management training—areas that neither the Chinese nor the Americans consider to be very appealing or exciting from their respective points of view but that are essential to China's long-term economic modernization efforts.

The second major issue deals with the impact that the recent relaxation of U.S. export controls (in November 1983) and the relaxation of controls by the international Coordinating Committee on Multilateral Controls (CoCom) (in late 1985) will have on China's economic and defense modernization. To a large extent the Chinese have institutionalized their technology relations with the United States, having established a network of multiple formal and informal channels for the flow of technology to the PRC. This network includes an extensive set of relations with Americans of Chinese descent, many of whom have become unofficial advisers to the PRC government on a host of S&T-related issues. In addition, cross-border flows of information between the two countries have steadily increased through such channels as the National Technical Information Service and China's participation in various U.S. and international professional

TABLE 3 U.S. Computer and Related Equipment Sales to China (in thousands of dollars)

Item	1981	1982	1983	1984	1985
Analog and hybrid computers	163	5,041	1,715	2,082	6,767
Digital computers	5,158	11,337	11,324	25,265	80,062
Digital central processing units	5,179	2,169	10,816	32,494	35,411
Random access aux storage	1,052	1,049	1,849	1,519	7,399
Serial access aux storage	140	430	680	1,995	5,204
Terminals	699	1,108	2,241	2,261	3,900
Printers	645	626	1,063	1,814	3,454
Communication and peripherals	268	1,644	2,301	8,006	9,175
Parts, etc.	3,763	8,376	11,913	20,476	31,710
Microprocessor integrated circuits	104	25	4	50	47
Printed circuit boards	258	58	557	1,407	2,245
Cathode ray tubes	8	91	22	179	417

SOURCE: Office of Chinese Affairs, U.S. Department of Commerce, 1986.

associations such as the Institute of Electrical and Electronics Engineers. Overall trade has begun to grow, and foreign equity-based investments by U.S. firms in China gradually have begun to expand. The Chinese are particularly interested in U.S. electronics and computer technology—a reflection of the high priority attached to these fields in China today.[52] Accordingly, it has been recorded by the U.S. Department of Commerce that almost 70 percent of the Chinese requests under the 1983 revised export control regulations fall into the categories of microelectronics, computers, scientific instrumentation, or equipment to produce these items (see Table 3).[53]

The largest portion of this newly released U.S. technology will go to support China's civilian modernization program. At a minimum the needs of Chinese industry at all levels for precision machinery, advanced testing equipment, computerized machining, and computers for financial management, production scheduling, and inventory analysis remain substantial. Certain types of advanced technology such as industrial process controls also are needed to modernize traditional industries.[54] At the same time, however, in spite of the

restrictions in the regulations that ostensibly limit the transfer of technologies contributing to advanced weapons programs, it is by no means certain that U.S. authorities or companies can prevent the unauthorized use of this technology, particularly within China's high-priority strategic weapons programs. In fact, according to interviews conducted by the author, U.S. export control decisions increasingly have taken domestic diversion of goods into certain areas of the PRC military as a given in the export license review calculations.

In many cases, it has been assumed that China's appetite for advanced technology would be satiated by the relaxed controls—first in 1983 and then in 1985.[55] Evidence already exists, however, that such is not the case.[56] Chinese leaders still complain about the remaining imposition of national security controls, admonishing the United States that China should not fall under any sort of restrictions. And in spite of recent changes, they also complain about CoCom controls and the pace of the CoCom review process.[57] There is also evidence that the Chinese are continuing to use clandestine means to secure foreign technologies, some of which might have been approved under the existing set of guidelines. The September 1984 issue of the *China Trade Report* published in Hong Kong has noted that some equipment continues to be smuggled into China through Hong Kong.[58] In mid-1986, for example, a semiconductor manufacturing company in San José was found guilty of selling items that were "high up on the list of strategic technology" and not eligible for export to a Hong Kong subsidiary allegedly set up as a pass-through to the PRC.[59] Various provinces and municipalities have set up technology import offices in Hong Kong (see Table 4) as a way to facilitate the import of technology into China.[60] In effect, China looks as if it will be taking advantage of its now "special" relationship with Hong Kong, relying on it more and more as a channel for the acquisition of sensitive and at times restricted technologies.[61]

These activities suggest that the Sino-American S&T relationship has not weathered its final storm regarding technology transfer and that the potential for serious political controversy still exists. There is ample evidence to indicate that within a reasonable time frame the Chinese are likely once again to press up against the high end of the technology spectrum, demanding even further relaxation of current controls.[62] Unfortunately, Washington lacks a coherent approach to deal with the issue of future technology sales to Beijing; nor does there appear to be a focal point in the U.S. government

TABLE 4 Selected PRC Organizations with Hong Kong Offices

Organization	PRC Affiliation
Can High International Trading, Ltd.	Anhui province
Chun Hsing Trading Co.	Jilin province
Chung Liao Trading Co.	Liaoning province
Everbright Enterprises, Ltd.	All of China
Fujian Enterprises Co., Ltd.	Fujian province
H.H.K. Consultancy and Development Co., Ltd.	Heilongjiang province
Hebei Enterprises	Hebei province
Heng Shan Trading Co.	Shanxi province
Hunan Trading Co.,Ltd.	Hunan province
Jialing (Hong Kong) Co., Ltd.	Sichuan province
Scriven Co., Ltd.	Beijing municipality
Shanghai Industrial Investment, Ltd.	Shanghai municipality
Shum Yip Holdings Co., Ltd.	Shenzhen special economic zone
Tsinlien Trading Co., Ltd.	Tianjin municipality
Yi Feng Trading Co.	Hubei province
Zhong Shan Co., Ltd.	Jiangsu province

SOURCE: Business China, September 12, 1985.

for coordinating and planning technology transfers from the perspective of overall U.S. interests.[63] The very fact that the U.S. Defense Department seems willing to engage in discussions over the sale of end-use military items, some of which appear to fall within the category of the so-called "six special mission areas," at the same time that the Department of Commerce continues to apply export controls to China only baffles the Chinese further and produces greater resolve in Beijing to be removed entirely from both CoCom and U.S. export controls.[64]

China's Science and Technology Relations with Western Europe and Japan

To appreciate the full extent to which technology and know-how are flowing into China, it is necessary to go beyond analysis of the U.S. scene and focus on Western Europe and Japan as well. In recent years, because of the rise in global competition—particularly in third-country markets such as China—detailed information about emerging commercial transactions has become scarcer. Nonetheless, a substantial body of data does exist related to China's rapidly expanding technology interactions with such countries as France,

West Germany, Sweden, and Italy (see Table 5). What emerges from a preliminary examination of these data is that China's relations with Western Europe and Japan are developing at a very rapid and sustained pace.[65] In 1985, for example, the Federal Republic of Germany led all countries in the value of "technology transfer" projects concluded with the PRC with US$790 million out of total technology imports of US$2.96 billion.

Some key points stand out in this regard. First, in the past the Chinese have warned that, unless the United States was more forthcoming with respect to its technology export policies, they would buy from Western Europe. Such purchases seem not to have materialized in many cases.[66] In most areas the Chinese either did not seek out or were unable to gain substantial access to sensitive technologies through Western Europe. At times, the Chinese have come up against their own limitations in Western European markets in much the same way that they have faced similar problems in their dealings with the United States. Their inability to sort out technological priorities and the excessive caution they exercise with respect to spending their foreign exchange reserves have been just as important in limiting their purchases as U.S. technology export controls.

Today, however, this situation is gradually changing as Western European firms, especially the French, wish to take advantage of trade opportunities in China, opportunities that remain open in such areas as microelectronics and industrial manufacturing. According to an official at the State Science and Technology Commission, "Western Europe has emerged as one of China's most important partners

TABLE 5 China's Technology Imports by Country and Value (in US$100 million), 1985

Country	No. of Contracts	Value
Japan	174	5.5
United States	137	6.9
Federal Republic of Germany	123	7.9
United Kingdom	40	0.79
Switzerland	36	0.97
France	34	3.2
All others	121	4.34
TOTAL	665	US$29.6

SOURCE: Beijing Review, March 10, 1986, p. 20.

in science and technology."[67] These recent developments seem to stand in sharp contrast to China's statement that it prefers U.S. technology—a statement that on the whole appears to be an accurate reflection of Chinese views. China's turn toward Western Europe seems to reflect not only its wish to diversify technology sources but also its frustration in dealing with U.S. firms and regulations.

The key point regarding China's S&T relations with Western Europe is that they are a critical part of an emerging picture that reveals a series of multidimensional, cross-national interactions spread out over China's own modernization priorities, with energy, electronics and computers, transportation and communications, and industrial manufacturing being the dominant areas of activity.[68] As with the United States, relationships exist at all levels of society and industry.[69] A key component underlying the successful expansion of these activities has been the financial element.[70]

One final point vis-à-vis the Sino-Western European relationship deserves mention, and that is the attitudes of the respective CoCom members toward the current level of technology controls invoked for exports to China. It is clear that Western Europe, led by the French, has a much more sanguine view of China's intentions and capabilities and thus feels much less constrained in its technology transfer policies toward the PRC.[71] In general, most of the European members of CoCom share similar beliefs about the nature of a potential Chinese threat. In reality, they are more concerned with the Soviet Union and continue, at least informally, to see China as a potential military counterweight—occupying the attention of more than 50 Soviet divisions on the Sino-Soviet border. Many West Europeans have viewed U.S. policies toward China (as well as the USSR) as overly restrictive. Relatedly, they often perceived U.S. use of CoCom as a means to further American commercial interests. Without full cooperation and support from the majority of CoCom members, it may be self-defeating and politically costly for the United States to impose continued controls or to oppose further relaxation of existing controls in the future.[72]

Although the Sino-U.S. science and technology relationship has grown rapidly during the last several years, it is still outpaced in some important respects by the Sino-Japanese relationship.[73] This remains the case despite the larger number of Chinese in the United States than in Japan, despite State Councillor Fang Yi's criticism of Japan several months ago due to the relatively modest level of Sino-Japanese bilateral scientific cooperation, and despite extensive

Chinese complaints about Japan's failure to transfer technology at a level and rate commensurate with the level of Sino-Japanese trade.[74] Initial estimates suggest that there are more than 3,000 Chinese in Japan attending Japanese universities or conducting joint research. In reality, however, relations involving technology transfer, especially in the commercial area, have grown substantially since the late 1970s. PRC-Japanese trade reached US$19 billion in 1985, almost three times the level of U.S.-PRC trade; Japanese exports to China accounted for US$12.5 billion. Japan has helped set up some of China's largest television manufacturing facilities; has assisted with the future manufacture of heavy trucks in China; has helped develop several semiconductor and integrated circuit lines; has contributed concessionary financial assistance for the development of PRC energy, transport, and port facilities; and is responsible for the establishment of several computer software centers in China.[75] The Japanese also are heavily involved in the development of China's telecommunications infrastructure.

Japan has become deeply involved in China's technical transformation of enterprises program, forgoing some of the more visible projects in China after its problems with the Baoshan steel mill.[76] Japanese firms have been working with Chinese industrial leaders and factory managers to improve plant layouts and scheduling, upgrade manufacturing techniques, replace obsolete machinery, and rectify quality control problems. Japan's approach, which is similar in many respects to its strategy in Southeast Asia, Taiwan, and South Korea, has been to establish a broad network of ties at the local level to accustom Chinese industry wherever possible to the use of Japanese raw materials, components, and other items.

As noted, however, in spite of Japan's increasingly active participation in China's modernization program, the Chinese have numerous complaints about Japan's failure to transfer know-how.[77] As in the case of Japan's commercial activities in other parts of Asia, PRC critics speak about Japan's willingness to provide "show-how" but not key design information and core technologies. Yet, even though these criticisms have appeared, the fact remains that Japan's role in China's modernization has become extremely significant. Although transfers of advanced technology have not been flowing as rapidly as the Chinese would like, Japan has developed into a major supplier of production lines for consumer and industrial electronics,

for technology in offshore petroleum development, and for the overall development of transportation, communications, and energy in China.

In essence, Japan is willing to provide certain limited technologies to China in return for access to its large array of natural resources and energy supplies. Without foreign assistance, it is clear that China would not be able to exploit these resources at any time in the near future, and this appears to be the quid pro quo on which China's relations with the Japanese are being built. This is not meant to imply that there are not other Japanese commercial interests. For example, Japan is quite interested in pushing forward on the sale of nuclear energy technologies to China.[78] Japan, however, is concerned about China's commitment to nonproliferation and appears ready to follow the U.S. lead within reason. Currently, the Japanese are ready and anxious to move ahead, particularly in view of a series of Chinese agreements with France, West Germany, Italy, and the United States, respectively.

Japan's technology relations with China form another critical component of the impressive array of S&T contacts that Beijing has developed with the industrialized world. Taken alone, Sino-Japanese S&T relations are important; they take on added significance when complemented by China's technology relations with the United States and Western Europe. As was true in the case of Western Europe, the Japanese also are more sanguine than the United States about Chinese military objectives. Accordingly, they also tend to be *relatively* less concerned about the military implications of technology transfers to China. It appears likely that the Japanese will continue to take advantage of their geographic proximity to China by being more aggressive in their approach to the China market, leaving U.S. business and government in the position of having to act in a more concerted fashion if American companies are to remain competitive.[79]

Sino-Soviet Technology Relations

China's growing technology relations with Eastern Europe have been referred to earlier in this section. A few additional comments, however, concerning China's S&T relations with the Soviet Union are in order. Since 1983 there have been exchanges of trade and scientific delegations in such fields as metallurgy, coal, automobiles, electric power, agriculture, and textiles. Trade between the two

countries also has started to climb, with China purchasing steel, timber, chemicals, and machinery in return for Soviet imports of Chinese canned and frozen meats, vegetable oil, tea, and silk. In December 1984, during the visit of Soviet Prime Minister Arkhipov, the two countries signed a 5-year trade agreement worth an estimated US$20 billion.[80] And in March 1986 in Beijing, during the first session of the Sino-Soviet Commission for Economic, Trade, Scientific, and Technical Cooperation, the two countries agreed to expand their industrial cooperation further to include the rehabilitation of 17 existing factories and the construction of 7 new ones.[81]

The Soviet Union sees S&T cooperation with China as a means to bring about a gradual normalization of political relations between the two countries. In particular, Moscow remains concerned about the closeness of relations between Washington and Beijing. Accordingly, the Soviet Union is on record as encouraging the expansion of educational exchanges, and some Japanese sources maintain that the USSR has even made some overtures toward Beijing about providing nuclear energy technology to the PRC.

The Chinese see several possible advantages in pursuing expanded cooperation, the most important being an opportunity to keep abreast of Soviet science and industrial developments and to gain deeper insights into the evolution of the Soviet system. Based on several conversations with Chinese scientists and industrial managers, it is clear that China sees only modest substantive benefit from expanded cooperation with the Soviets, although some Chinese have remarked that they would not oppose receiving Soviet assistance in their efforts to modernize their production facilities—many of which have large quantities of Soviet equipment.[82] This viewpoint seems to underlie Beijing's decision to accept Soviet assistance to modernize a limited number of the 156 industrial plants brought by the USSR in the 1950s. For the most part, however, such examples are still of minor importance since many of these facilities are not in the forefront of Chinese industry. The Chinese are, to a large extent (although not completely), moving away from the Soviet model of economic and research organization. Thus, it is highly unlikely that China will turn toward the Soviet Union in the S&T area—unless Beijing perceives the West and Japan to be intransigent with respect to technology and equipment sales.[83]

Taking these considerations into account, it appears that aside from modestly expanding educational exchanges, some limited joint research projects in minor scientific areas, and cooperation in plant

rehabilitation, Sino-Soviet S&T relations will probably expand but not rapidly.[84] As indicated earlier, this modest growth stands in sharp contrast to the sustained expansion of China's S&T relations with Eastern Europe.[85] The Chinese and Soviets, however, will encounter one another increasingly in international scientific forums. For example, there is indirect cooperation between China and the Soviet Union through an ongoing high-energy physics research project at CERN in Geneva. And Soviet and Chinese scientists regularly attend international conferences in each other's country.

KEY FOREIGN TECHNOLOGY TARGETS: THE CASE OF ELECTRONICS

Given the importance that the current leadership has attached to the modernization of computers and advanced electronics, it is not surprising to find that these priorities are strongly reflected in China's foreign technology acquisition activities.[86] The Chinese approach to the development of enhanced capabilities in computers and electronics is premised on a two-pronged strategy that combines direct support for technical advance through larger investments in R&D and plant renovation with a well-targeted foreign acquisition effort.[87] This foreign acquisition effort is multifaceted, with activities stretching across a large number of Chinese ministerial-level organizations.[88] A good reflection of Chinese intentions is the August 1984 agreement between Hewlett-Packard and the China Electronics Import/Export Corporation. The agreement, which is said to be valued at US$10 million, is part of a joint venture between the two parties for the manufacture and development of assorted electronics components in China.[89]

The Chinese have targeted large-scale integrated circuit technology as their major electronics priority. According to statements by Jiang Zemin, former minister of the electronics industry, advances in integrated circuit technology are necessary to support military needs and computer development. The PRC already has purchased several integrated circuit production lines from the United States and Japan and is engaged in negotiations with several other major U.S., European, and Japanese firms to purchase additional proven production lines for the manufacture of these critical components.[90] China also has acquired electronics components, microcomputers, and related items from South Korea and Taiwan, in quantities that have begun to grow over the last 2 years. According to the Planning Bureau of

the Ministry of Electronics Industry, 550 types of advanced electronic equipment were imported during the Sixth Five-Year Plan for use in telecommunications, aerial surveillance and control, offshore oil and gas exploration, fiber optics, and large-scale integrated circuits.[91]

Chinese efforts, however, are not merely focused on foreign acquisitions; there are large, ongoing R&D programs under way throughout China's electronics industry, leading universities, and the Chinese Academy of Sciences (CAS) to upgrade domestic capabilities. Chinese leaders do not want to become overly dependent on foreign suppliers for integrated circuits as well as consumer electronics products.[92] One good example of Chinese progress in this regard was the development of a multipurpose pattern generator in June 1983 by a Ministry of Electronics Industry-sponsored R&D team composed of the Jianchang Machinery Plant (Hubei), the Institute of Automation (CAS), the Semiconductor Institute (CAS), and the Changchun Institute of Precision Optics (CAS).[93] Beijing acknowledges that foreign firms, for both commercial and security reasons, may not provide China with state-of-the-art items in these areas. Thus, China's leadership recognizes that all foreign acquisition efforts must be complemented by a strong indigenous program.

This is particularly true in the field of computer development. For example, in 1982 the Jiannan Machinery Plant in Changsha imported a magnetic disk production line from France, which has the capacity to produce 500 Type A disks and 3,000 Type B disks per year.[94] This purchase was part of the ongoing effort to establish the country's first, full-fledged computer peripheral equipment manufacturing line, matching foreign technology with the technical capabilities of Hunan.

China also is expanding its efforts in software development. In March 1984 computer software experts throughout China met to develop a 5-year program for software R&D. In addition, the China Association for Software Industry was formed in September 1984 to better coordinate software development efforts and encourage interaction among software experts.[95] The Japanese have been among the most active in working with the Chinese on software development, which has been a perennial weakness in China's attempts to expand the use of computers. A high priority in this regard has been the development of Chinese character information-processing systems and software. Several Japanese firms (e.g., Fujitsu), as well as Wang Labs and IBM of the United States, have been working with the Chinese in this area.

Even though the main aim of electronics and computer development activities appears to be for manufacturing and national defense, China also is actively engaged in an effort to establish a national information industry to support its overall modernization. According to officials at the Institute of Scientific and Technical Information in Beijing, an information center is to be established in Beijing linking 10 key cities: Beijing, Shanghai, Tianjin, Hangzhou, Nanjing, Guangzhou, Wuhan, Shenyang, Chongqing, and Xian.[96] The establishment of this center will facilitate diffusion of the large quantity of technical information that is flowing into China through foreign journals, magazines, and newspapers.[97] Since 1980, 16 research institutes have received data recorded on computer tapes by foreign corporations, linking China directly to technical data bases in Europe and North America.

Another area that has received increased attention involves the development of scientific instrumentation, testing equipment, and industrial control equipment. Foreign technology has played an important role in the enhancement of existing capabilities. The Beijing Instrument Industry Corporation has been one of the most active organizations in terms of acquiring foreign technology and assistance.[98] Its range of products includes optical, analytic, and electrical instruments. At a national conference on instrumentation in October 1983, Chinese specialists mapped out their plans for improving the manufacture of components for instrument production. The key items included silicon semiconductors, compound semiconductors, galium arsenide integrated circuits, materials for optoelectric devices and lasers, materials for microwave devices (GaAs, InP, and InGaAs), materials for sensors, amorphous magnetic materials, magnetic recording and bubble devices, and magnetic fluid.[99] In each of these areas, China is seeking to approximate closely the state of the art in Japan and the United States.[100]

An important aspect of China's plans to advance domestic electronics and computer capabilities has been the decision to create four Silicon Valley-like R&D and production bases for electronics and computers in Shanghai, Jiangsu province (Wuxi), Beijing, and Guangzhou.[101] In fact, in January 1984, Shanghai announced that electronics would be its number one priority.[102] The Jiangnan Semiconductor Plant in Wuxi, for example, is slated to become China's premier integrated circuit fabrication facility as a result of technology and equipment imported from Japan, the United States, and abroad. In early 1986 Sofrecom of France announced its intention to

set up an advanced integrated circuit R&D facility in Wuxi, thereby further enhancing that city's technological base.[103] China's intent is to create a "technology hothouse" environment for electronics in each of these four areas through a combination of technology imports and indigenous R&D. Foreign investment and coproduction by multinational firms increasingly are viewed as an effective means to secure desired technologies. Relatedly, the Ministry of Electronics Industry has taken on the role of special adviser to the newly opened "fourteen cities" in their respective efforts to secure foreign investments and technology to support electronics development.[104]

PRIMARY FOREIGN ACQUISITION MECHANISMS

Key Organizations

The last several years have witnessed a proliferation of organizations in China concerned with the acquisition of foreign technology. The general decentralization of the foreign trade structure, in spite of some periodic tightening, has further contributed to the emergence of additional Chinese organizations doing business overseas. Each of the production ministries has its own import-export arm (see Table 6). In addition, various provinces and municipalities also have set up specialized bodies to attract foreign technology. A good example is the Shenzhen Scientific Equipment Export Service Company, whose purpose is to provide China with information and materials on the most advanced international science and technology of the 1980s.[105] The opening of the country to increased foreign investment has made these local-level bodies even more important as vehicles for the acquisition of key items.[106]

Although the proliferation of local organizations involved in foreign technology acquisition continues to move ahead, there has been an effort to tighten up the process by which foreign technology is imported. The Ministry of Foreign Economic Relations and Trade, which had lost some of its clout during the initial period of trade decentralization, is now directly involved in reviewing and signing off on most large technology import contracts. In addition, the China Technology Development Corporation has been created to help coordinate the importation of foreign technology and the development of domestic technology.[107] The new company has links with both the military and civilian sectors.

TABLE 6 Leading Chinese Ministerial Trade Corporations

Ministry	Corporation
Ministry of Electronics Industry	China Electronics Import-Export Corp.
Ministry of Aeronautics Industry	China Aero-Technology Import-Export Corp.
China Shipbuilding Corporation	China Shipbuilding Trading Company
Ministry of Nuclear Industry	China Nuclear Energy Industry Corporation
Ministry of Ordnance Industry	China Northern Industries Corporation
Ministry of Space Industry	Great Wall Corporation
Ministry of National Defense (People's Liberation Army)	Xinshidai Corporation
	Yanshan Corporation
Chinese Academy of Sciences	Oriental Scientific Instruments Corporation
Ministry of Foreign Economic Relations and Trade	China Instruments Import & Export Corporation
	China National Technical Import Corporation

SOURCE: Assorted Chinese periodicals and the China Business Review, 1982-1984.

Chinese economic and technical delegations have become regular visitors to leading U.S. universities, major corporations, and government laboratories and offices. The sophistication of these delegations has steadily improved as the participants tend to have stronger technical backgrounds and experience. The Chinese also have begun to increase their direct business activities in the United States and several other countries. A large number of PRC-funded or PRC-sponsored trading companies have emerged as active technology and equipment procurement organizations. These companies contract with Chinese enterprises to act as purchasing agents for designated items. In other cases, China has actually made equity investments in a personal computer company (Santec) in New Hampshire, a meat packing plant in Iowa, and a computerized tool company (Autonumerics) in New York.

The Chinese see these investments as a means to acquire technology and management skills. In particular, they provide effective training sites for PRC nationals. And they complement PRC activities in Hong Kong, which are also designed to increase access to

technology and expand training sites. In this regard, a November 1984 report in the *China Daily* indicated that the Hong Kong-based Everbright Corporation, which has already helped China import technology and equipment worth US$300 million for 15 ministries and 13 provinces, has agreed to assist with further acquisition of technology and purchases of second-hand equipment.

Level of Performance

Chinese organizations have been extremely successful in rapidly increasing the flow of foreign technology into China. Through a combination of shrewd negotiating techniques, their growing proficiency, and improved understanding of the global market for technology, China has taken great advantage of its open door policy to attract technology transfers.[108] And in spite of continued complaints about remaining export restrictions and CoCom, it is clear from China's own declarations that the emphasis on securing know-how rather than whole plants has yielded positive results from an acquisition standpoint. The Chinese see foreign technology as having six primary benefits: (1) contributing to greater national technological self-reliance; (2) helping to accelerate technical transformation of enterprises; (3) assisting in the expansion of exports; (4) shortening the time, cost, and risk of domestic research programs; (5) providing opportunities for gaining project management experience; and (6) serving as a context for training technical workers.[109]

One of the keys to the current level of success is the closer linkage between the acquisition mechanisms and the end-users of technology. This is particularly true in Shanghai and Tianjin, which have been given expanded decision-making power in importing foreign technology for revamping Chinese industrial plants and equipment. In addition, as indicated earlier, more of China's enterprises are contacting Chinese trading companies abroad directly, indicating their needs and appropriate specifications. Another factor, as noted, is the growing presence of more technically competent individuals among the members of Chinese buying and negotiating teams.

The Chinese also are on record as indicating that Western firms providing expanded amounts of technology will be given preferential treatment in the development of commercial relations.[110] According to one Chinese official, "While some countries may export equipment a little more cheaply to China and withhold advanced technological know-how, others may meanwhile sell equipment at a somewhat

higher price but include advanced technology also. To be frank, we would prefer the latter, [although] of course cheaper equipment plus transfer of technology would be more welcome." Zhang Jingfu, former head of the State Economic Commission, stated in May 1984 that such firms would be provided increased access to the Chinese market, particularly if the technology was not already available in China.[111] Zhang was particularly interested in electronics technology. As was the case with the Sixth Five-Year Plan (1981–1985), the Seventh Five-Year Plan (1986–1990) contains a list of 3,000 key items targeted for foreign acquisition during the first 3 years of the plan.[112] This list contains the following categories of items: light industry, textiles, food processing, packaging, machinery and electronics, chemicals, medicine, construction technology, coal, iron and steel, nonferrous metals, timber processing, petroleum, electric power, energy conservation, transportation, and agriculture and forestry. Detailed information provided for the Sixth Five-Year Plan list indicates that under the machinery and electronics category, the first batch of equipment and technologies included high-voltage appliances, hermetic sealing devices, hydraulic press devices, bearing technology, electronic instrumentation, low-voltage electrical appliances, and electrical equipment for machine tools.[113]

One factor that facilitated Chinese acquisition efforts during the 1983–1985 period was the growing availability of foreign exchange funds, which reached approximately US$16 billion in late 1984. Moreover, various factories, through the processing of imported raw materials or increased domestic sales of consumer products, were using their profits for acquisition of new equipment and know-how. As of mid-1985, however, new constraints on the spending of foreign exchange funds began to emerge as foreign reserves steadily decreased perhaps to below the US$10 billion level. It is clear, therefore, that the Chinese will remain cautious in their spending practices.[114] In the short term, except for some designated high-priority projects, these financial constraints remain an impediment to foreign technology acquisitions. Moreover, as evidenced by the serious problems encountered in the AMC joint venture in China, they could seriously affect the viability of foreign operations in the PRC.[115]

Impact of Foreign-Acquired Technology

Although this paper has been concerned primarily with the question of technology acquisition, it is clear that the issues of acquisition

and assimilation cannot easily be separated. As argued earlier, improved Chinese S&T capabilities have led to greater selectivity as far as recent acquisition efforts are concerned and vice versa. And as the capabilities of the end-user have become better matched with the available technology, China's ability to absorb imported items has improved steadily over the last several years.[116] The Chinese, for example, have cited their progress in assimilating many of the 3,000 items imported during the 1983–1985 period as evidence of their improved capabilities.[117] A primary factor contributing to this improvement has been the new economic reforms introduced into the industrial and R&D sectors since 1981.[118] These reforms have forced factory and research managers to pay attention to the more effective use and expanded application of imported technologies and equipment.[119] Without such reforms to complement stepped-up technology imports, it is likely that the present level of progress would have been unattainable.

While acknowledging the appreciable progress that has been made, it goes without saying that some absorption problems remain. Studies of previous cases such as the Spey engine project and the Wuhan steel mill, to name only two, indicate that many of these problems have a long history. Yet, care should be taken not to underestimate the difficulty that any society, advanced or less developed, would have in handling some of these complex technical efforts. The manufacture of aero-engines, for example, is a difficult task even here in the United States. In addition, as China concentrates its efforts on the acquisition of know-how, it is hard, at least in the short term, to determine whether or not "assimilation" has in fact been successfully achieved.

Still, one must distinguish between case-specific problems and those that derive from more generic causes. At a symposium held on technology imports in Guangdong in August 1984, three main problems concerning technology import activities were cited: (1) lack of an overall plan, resulting in excessive duplication; (2) excessive emphasis on hardware while neglecting imports of "software"; and (3) poor preparation, leading to inadequate results and unfulfilled expectations.[120] These same problems had been identified in March 1984 in a State Economic Commission circular that admonished organizations to do a better job of coordinating their activities and sharing information.[121] As in the past, computer imports have once again been singled out as representative of these larger problems. For example, there is a tendency to buy machines based on their

advanced state rather than on actual needs, and purchases often are made without considering software availability. In certain cases, organizations could share computers but instead individually make purchases of machines that are consistently underutilized.[122]

These examples of shortcomings in planning and approach are compounded by what one author has called "the three excesses and two shortages": excessive importation of consumer goods production lines, excessive production for the domestic market, and excessive duplication of imports, coupled with a shortage of technology and knowledge-intensive projects as well as a shortage of export-oriented projects.[123] These problems reflect a series of other, broader limitations that fall into three categories: financial, managerial, and technical and equipment related. First, even when foreign exchange is available for technology imports, in many cases the domestic investment capital is still lacking. Thus, firms do not have the funding to provide auxiliary inputs on the domestic end to support the introduction of foreign technology. This is especially true regarding investment in infrastructure to support new projects.[124] Relatedly, most importers of technology or equipment are looking for projects that can bring them a quick return—thus the emphasis on consumer projects. Second, a dearth of qualified managers continues to plague Chinese industry. Although efforts to rectify the situation through testing and additional training are under way, it will take a long time before there exists a cadre of qualified managers to handle the complex task of putting foreign technology and equipment to work within Chinese industry.[125]

Finally, because of the financial constraints noted above as well as China's own technical backwardness, much of the machinery, testing equipment, and special instrumentation needed to employ imported technologies efficiently is still absent. The Chinese may focus on quality in their negotiations, but they ultimately base their decisions on price as a main selection criterion. In addition, insufficient attention is paid to the problems of maintenance and spare parts. Even in such advanced industrial areas as Shanghai, plants and equipment are old, and the machinery tends to be from a variety of sources and of widely varying vintages. This is especially true in light industry in which investment has been severely lacking. The key exceptions appear to be in the electronics and computer industry, where it is clear that large quantities of technical, financial, and personnel resources are being made available to enhance China's capabilities. In fact, because of the priority attached to this area, electronics is supposed

to attain the 1970s and 1980s levels of the West by 1990—which is 10 years sooner than China's other industries.[126]

What is suggested by this combination of recent progress and continued problems is that it is likely we will witness the emergence of a limited number of so-called "pockets of excellence" in the Chinese economy over the next several years—created through a combination of foreign technology and indigenous efforts. As one Chinese source has suggested, "Let us change as soon as possible the formula of the first machine being imported, the second machine being imported, and the third machine also being imported into one of the first machine being imported, the second machine being made by China, and the third machine being exported."[127] From an overall national perspective, it appears that the most likely candidates will be those that are now being given a substantial dose of support and nurturing by the central government. In this regard, electronics and textiles seem to stand out.[128] Of course, certain specific enterprises will develop at a rapid and sustained pace due to managerial competence and a variety of firm-specific or location-specific advantages. This does not undermine the above hypothesis but merely confirms that, in contrast to the pre-1978 period, substantial opportunities now exist for enterprises that are capable of overcoming organizational and managerial inefficiencies.

FOREIGN TECHNOLOGY AND DEFENSE MODERNIZATION

Defense modernization remains a critical Chinese priority and according to People's Liberation Army Chief of Staff Yang Dezhi "is an integral part of China's modernization program."[129] One merely has to examine the high-level attention being given to the increased role of R&D and education in the military to recognize the continued importance that China's leaders attach to the defense sector.[130] A good example was the approbation given to the Institute of Computer Research under the University of Defense Science and Technology for its development of the "Galaxie" computer, a Cray-1-like machine that apparently can perform more than 100 million operations per second. The institute, which was cited by the Central Military Commission of China, was commended for, among other things, its effective use of foreign technology.[131]

An article in China's *Jingji Ribao* (Economic Daily), May 7, 1983, best captures the prevailing attitude of the top leadership

toward military modernization and its relationship to the civilian economy:

> If the defense industry is separated from the development possibilities of the national economy in a quest for instant success, we will only end up with results contrary to our expectations, or it will be a case of more haste, less speed. On the other hand, too little investment in the defense industry will hinder the progress of the modernisation of our weapons and equipment. This will not only hamper the improvement of the fighting power of the PLA units, but also concerns the safety of the state. . . . It is entirely necessary to develop military industries. We must have factories devoted to the production of products for military use. But military industries cannot be developed in isolation and must be built on the basis of powerful civilian industries. This is an important guiding idea we must observe. (p. 3)

Seen from this perspective, it is clear that gradually there is emerging a close working relationship between the civilian and military sectors. Chinese leaders view the defense sector and such projects as the U.S. space program, led by the National Aeronautics and Space Administration, as the driving force behind American industrial and technological advance. Thus, the newly emerging civilian-defense relationship in China more closely approximates the "military-industrial" complex structure in the United States than the highly compartmentalized structure of defense industry in the Soviet Union.[132] One of the major beneficiaries of this close relationship has been the PRC navy, which has good working relations with various components of the Chinese shipbuilding industry.[133]

Chinese expressions of interest in a variety of weapons systems and technology have been well publicized over the last several years. They have indicated possible purchases of items ranging from the TOW missile to the French Mirage fighter. High-level consultations have been held with the military establishments of a number of countries. In the U.S. case, these began as early as 1979, culminating in the visit to China of General John Vessey, chairman of the Joint Chiefs of Staff, in January 1985 *and* the return visit of Yang Dezhi to the United States in April 1986.[134] China's main priority continues to be the acquisition of critical know-how rather than the purchase of large quantities of foreign-made equipment.[135] This is not to suggest that China will not purchase military items from abroad. As indicated by the recent US$550 million agreement with the United States to purchase avionics equipment for modernizing their air force, the Chinese will procure selected items in areas of great need.[136]

Nonetheless, as negotiations on a number of other items indicate, the main Chinese focus is on gaining access to technology.

Discussions regarding military items have not been limited to the United States, Western Europe, or Japan. Recent information indicates that the Chinese have obtained technology and design know-how from the Brazilians (for armored personnel carriers) and possibly the Israelis (tank armor and weaponry).[137] According to a report in the December 1984 issue of *Janes Weapons*, the Chinese allegedly have signed a broad agreement with Israel for additional defense-related technical assistance.[138] In addition, there are reports that China has obtained defense technologies and weapons through Pakistan and several other Third World countries.

The big push for foreign technology appears in large part to be coming from China's National Defense Science, Technology, and Industries Commission (NDSTIC). The role of NDSTIC seems to have expanded with the appointment of Zhang Aiping, its former director, to head the Ministry of National Defense. Although a strong believer in greater national self-reliance, Zhang has encouraged the defense industry to rely on foreign technology wherever appropriate, implying that China's open door represents a window of opportunity. The defense industry and R&D structure have three advantages over the civilian sector: (1) better and larger numbers of qualified personnel, (2) more advanced equipment, and (3) a larger budget.[139] Generally speaking, the presence of these capabilities and assets makes it more likely that the defense sector can make more effective use of imported technologies than its civilian counterparts.[140] In addition, defense sector usage of such technology will become even more effective as current programs to expand technical training and education for the military yield anticipated results.[141]

Strategic weapons development has been designated as China's leading defense priority,[142] and, indeed, Chinese leaders look fondly on their past successes in their strategic weapons program. The emphasis on such programs seems to reflect internal assessments of optimum deterrence as well as an evaluation of the primary threats facing the country. Work in this area has been complemented and supported by China's efforts to establish a series of satellite-based communication and broadcasting systems. China has put 18 earth satellites into space over the last 26 years, the two most recent being a 900-kilogram telecommunications satellite sent up in April 1984[143] and a second similar telecommunications satellite that was put into geostationary orbit in February 1986.[144] In both cases the launching

vehicle was a three-stage carrier rocket that was designed and manufactured within China.[145] Relatedly, the launch was supported by recent advances in radar technology by the Nanjing Technical Research Institute of Electronics.[146] These achievements suggest that China's defense forces are well on their way toward acquiring "the eyes and ears" needed for a radically improved intelligence collection system. They also have helped move China into the market as a competitor with Western Europe and the United States for the commercial launching of satellites for other countries.[147] Developments toward this goal also have been complemented by recent advances in remote sensing capabilities, with a large portion of that technology coming from Canada, the United States, West Germany, and Japan.[148]

For the most part, it appears likely that the military will be a beneficiary of the technologies flowing into the civilian sector.[149] It will become increasingly difficult to discern final technology end-users, particularly as the channels for internal diffusion of technology become more efficient. Most defense-related foreign acquisitions will be designed to enhance indigenous capabilities and to avoid dependence on any specific foreign supplier. It can be expected that the military will continue to push hard for acquisition of advanced technologies in areas such as microelectronics and materials to support ongoing domestic R&D programs. Many of these same technologies also have relevance for China's conventional force modernization, an area in which there is a major need for improving existing command, control, communication, and intelligence-related devices such as radars, electronic countermeasures, and electronic surveillance capabilities.

China's strategy for modernizing the military reflects its reading of the current international situation, which apparently suggests to the leadership that aside from Vietnam there are no direct and immediate threats to its territorial integrity. The relaxation of tensions with the USSR has contributed to this sense of ease in Beijing and represents almost an about-face from China's view of the world during the 1970s. In effect, the Chinese believe that their present nuclear and intercontinental ballistic missile (ICBM) capabilities, combined with their effective use of diplomatic tools, are relatively sufficient to deter or handle any of their current national security problems. Military modernization, therefore, is viewed as a long-term objective; Chinese leaders seek to avoid a widening of the technology gap at a minimum. Accordingly, China's posture in the Asia-Pacific region of

necessity will be a defensive one—barring any major military-related changes in the area. Nonetheless, historical experience has taught China not to be complacent; current experience has taught PRC leaders to be sensitive to the role of technological change and its interplay with military strategy. As a result, PRC leaders will remain committed to ensuring that China's borders are secure and that the country possesses a reasonable strategic deterrent to offset potential changes in its relations with either of the superpowers.

IMPLICATIONS FOR OVERALL U.S. POLICY

From a policy perspective, the most important conclusion is that acquisition of foreign technology will continue to be a major Chinese priority. As such, it appears that the technology issue has not ebbed as far as Sino-U.S. relations are concerned. China's penchant for wanting larger quantities of more advanced technology will continue to be an important factor in the political relationship between the two countries. This is true despite the fact that China's fear of falling behind may lead it to seek technologies that are inappropriate from the perspective of its existing economic base and technical capabilities. It is likely that China will try to play off the United States, Western Europe, and Japan against one another in its efforts to gain greater access to technology and equipment and to obtain a "better deal" once specific negotiations are under way.

China remains committed to the principle of achieving greater technological self-reliance. As such, any effort to understand the role and contribution of foreign technology must be made within the context of assessing ongoing indigenous programs designed to enhance domestic capabilities. The Chinese will continue to rely heavily on foreign technology to support current priority programs, especially in electronics and computers. Nonetheless, they will not retreat in their commitment to enhance their own R&D and manufacturing productivity with the eventual objective of reducing over the long term, as much as possible, the need to rely on external sources for technology. The Chinese clearly feel uneasy about the necessity of having to seek technology from abroad because it represents the main form of leverage other countries have over Beijing. The priority given to strategic weapons programs is not likely to diminish in the near future. And, as the modernization of the economy gets well under way, it is likely that the military will push for a greater share of the available resources. For the moment, it appears that military R&D

programs have not suffered even though budgetary limitations have forced inefficient and obsolete production lines to be closed down. As a result, it is likely that a portion of the technology flowing into China will be drawn, albeit gradually, into the military sector. In this regard, it will become even more difficult to track and evaluate end-user applications of advanced technologies. U.S. policymakers will have to determine whether these increased risks are offset by the value of the Sino-U.S. political relationship. The uncertainty surrounding the answers to the question of acceptable risk is compounded by such outstanding issues as the post-Deng succession and the extent to which problems in the modernization program could produce a more traditionally minded, less-internationalist, conservative leadership in Beijing.

Given China's top priority of promoting a more-sustained pattern of economic growth, it will continue to seek a range of vehicles for acquisition of technology and assistance. Foreign investment promises to become increasingly important, although foreign corporate concerns about potential competition and China's business environment—rather than government controls—are likely to be the major inhibitors to the transfer of advanced technology. In all likelihood, China will maintain its focus on the following key technologies: electronics, computers, special materials, nuclear energy, petroleum, energy conservation, biotechnology, special alloys, aero-engine technology, avionics, communications, and transportation. The Chinese will still follow their policy of diversification, choosing not to rely too heavily on the United States or any other country for meeting their technology import requirements. Informal links with universities and members of the Chinese-American scientific community will become increasingly critical to China as will PRC links through commercial contacts in Hong Kong.

From a political perspective, China's inward focus on its modernization problems have not led it to retreat from its involvement in global affairs. In fact, China's efforts to become a more-active participant in both regional and global political affairs promises to have important implications for the international system in the coming decades. The consequences of this increased participation in the global community may be quite mixed—raising complex foreign and domestic policy issues for the United States in a number of critical areas. More specifically, because China's emergence will increasingly affect global industrial, employment, and trade patterns as well as

investment and lending practices, it is likely to create new conflicts and pressures as well as opportunities for expanded cooperation.

On the positive side, the gradual integration of the Chinese economy with the world's market economies—fostered in large part through expanded technology-related interactions—could serve to make China more interdependent with important segments of the global economy. The evolution of Sino-Japanese and Sino-American relations could take on added significance in this regard, especially given the possibility that the nature of U.S.-Japanese competition could be affected significantly by their respective relationships with China. Moreover, as suggested, the steadily growing links between China and the rest of the world will make Chinese leaders, both current and future, more aware of the benefits to be derived from behaving in a responsible and pragmatic fashion in various global issue areas. The attractiveness of these benefits should somewhat moderate (although not completely inhibit) Chinese behavior with respect to such potential U.S. concerns as unauthorized third-country diversions of technology (e.g., the sale of U.S. technology to North Korea). It may also eventually provide opportunities for U.S. firms to plug into the more technologically dynamic sectors of the PRC economy.[150]

In the commercial area, although it is likely that the promise of the so-called Chinese market will remain unfulfilled and major sales will be slow to develop and difficult to finalize, China will still offer opportunities for the licensing of technology, coproduction agreements, joint ventures, and assorted training programs. And as China expands its reliance on Western standards, measurements, designs, spare parts, and managerial procedures, it will become increasingly difficult and costly for the Chinese to extricate themselves easily from the web of relationships they have developed with the United States and other industrialized nations—although it must be acknowledged that no real guarantees exist to prevent China from bearing such economic costs in order to promote what it considers to be more imperative political considerations.

At the same time, and perhaps more importantly, Chinese progress in certain facets of its modernization program could prove both politically and economically problematic to the West and to the regional economies of East and Southeast Asia. According to Beijing's current development strategy, exports are to provide the revenue for additional technology and equipment imports. Although petroleum exports may become a major source of earnings over the

long term, the recent decline in the world price of oil plus delays in the "blossoming" of China's offshore petroleum development program seem to suggest that exports will have to be fueled by other sources.As such, Beijing's immediate intention is to rely on consumer goods, light industrial products, and selected capital goods. And, as China's industrial base improves and its products become more desirable (achievements that will be made more likely and that will occur more rapidly as a result of foreign assistance), the PRC economy could prove to be an important source of competition to various sectors in the developing nations and even the so-called newly industrializing countries, particularly if this latter group is unable to complete their respective programs for moving into more knowledge-intensive, higher value-added product segments in these same industries.

In such areas as textiles and light industrial goods, the Chinese already have begun to make progress. The controversy between the United States and China in the area of textiles quotas is indicative of what could happen in several other areas. Similarly, China's continued support for Third World positions on a number of complex global economic issues conceivably could bring it into growing conflict with the United States in such forums as the United Nations. This should not be taken to portend an inevitable clash between China's modernization program and the economic prosperity of East Asia or the United States; it does suggest, however, that these issues should be examined in a more comprehensive fashion to diffuse any misconceptions about how, when, and where China can expect to exert its greatest political and economic influence.

In the final analysis the Chinese will be faced with the increasingly difficult task of trying to balance the trade-offs necessary to maintain their "independence" of action, reap the benefits that come from economic integration with the nations of the world, and try to make credible their claim to represent Third World interests in dealing with the superpowers. Based on a plethora of statements by Chinese military and political leaders, it is clear that China will attempt to maintain its independent stance in foreign policy and military affairs, avoiding any public movement that would bring it too close to one superpower or make it dependent on any one nation. Consequently, U.S. expectations about Chinese willingness to be more forthcoming in terms of cooperation on a host of global and regional problems may be more a reflection of interesting coincidence than a long-term commonality of interests. Rather, such a

commonality needs to be built and nurtured by leaders on both sides to withstand whatever political strains might affect the relationship. Although clearly worth pursuing, currently it remains to be seen whether expanded technology transfers can create a real sense of interdependence of national interests in Beijing in terms of its relations with the United States. More time needs to pass before any fundamental change is made regarding China's status under prevailing export controls and CoCom. Therefore, we should not be under any illusions about the results of our actions regarding previous CoCom and export control relaxation. Here again, although conflict in the future certainly is not inevitable, neither can one offer guarantees in the other direction at this point in time.

NOTES

1. Another underlying assumption of U.S. policy is that support for economic and technological modernisation through technology transfers will help consolidate the current and future position of the present pragmatic leadership.
2. See Madelyn Ross, "China and the United States' Export Control System," *Columbia Journal of World Business* (Spring 1986).
3. "More Funds for Scientific Research in 7th Plan," *Xinhua*, March 17, 1986; translation, *Foreign Broadcast Information Service* (FBIS)/ Daily Report: China, April 3, 1986, p. K8.
4. "Central Committee Decision on the Reform of the Science and Technology Management System," *Xinhua*, March 19, 1985; translation, *FBIS/Daily Report: China*, March 21, 1985, pp. K1–K9.
5. See *Yinge Xinde Jishu Geming: Xin Jishu Geming Zhishi Jiangzuo* (Welcome the New Technological Revolution: A Series of Informative Lectures), vols. 1 and 2 (Changsha, Hunan: Hunan Science and Technology Publishing Company, 1984); and Shen Huasong and Wang Huaining, "The Economics of the Third Wave," *Shijie Jingji* (World Economics), September 10, 1984; translation, Joint Publications Research Service (JPRS)-China Economic Affairs (CEA)-84-105, December 21, 1984, pp. 41–52.
6. The first apparent public mention of the "third wave" came in a speech by Zhao Ziyang in October 1983. See *FBIS/Daily Report: China*, November 7, 1983, p. W1.
7. Huan Xiang, "Try Hard to Catch Up Rather Than Trailing Behind," *Jingji Ribao* (Economic Daily), February 18, 1984; translation, *FBIS/Daily Report: China*, February 29, 1984, pp. K9–K14.
8. An excellent example of Chinese thinking about the new technological revolution can be found in "Upsurge in Worldwide Technological Revolution," *Beijing Review*, April 23, 1984, pp. 27–29.
9. "Text of Zhao's Government Work Report to NPC," *FBIS/Daily Report: China*, June 1, 1984, pp. K1–K20.
10. Soviet assistance also was provided to modernise Chinese military capabilities and its defense industry.

11. According to reports, out of the 50 kits they allegedly received, the Chinese produced only 4 to 6 Spey engines, 2 of which were tested successfully at the Rolls Royce facility in the United Kingdom. Existing evidence suggests that the Chinese were unable to master the metallurgical and alloy manufacturing technologies necessary to produce the Spey. More importantly, they also were apparently unable to develop an airframe to house the Spey.
12. One source suggests that 22 "unnecessary" sets of equipment were purchased. In addition, for these projects to have come on stream would have required an outlay of 55,000 million yuan in domestic investment at a time when the entire national annual total appropriation for capital construction was only about 30,000 million yuan. See "China Switches Emphasis from Equipment Imports to Technology," *China Daily*, September 11, 1982, p. 4.
13. According to one Chinese author, "[We] have a deplorable record of converting imported technical hardware into technology in its knowledge form and back into hardware again." See "The Challenge and Opportunity of the New Technological Revolution," *Guoji Maoyi*, June 27, 1985, pp. 10–12; translation, *JPRS/China Science and Technology* (CST)-85-032, September 19, 1985, pp. 5–9.
14. Interviews conducted by the author in Beijing, January 1985.
15. Li Boxi et al., *Zhongguo Jishu Gaizao Wenti Yanjiu* (Research on the Problems of Technical Transformation in China) (Shanxi: Shanxi People's Publishing House, 1985). See also the special issue on technical transformation in *Intertrade* (October 1985) entitled "Technical Renovation is the Catchword."
16. Lu Dong, "Updating Equipment and Skills," *China Daily*, December 8, 1984, p. 4. For an analysis of some of the associated problems, see Xu Fangming, "Several Problems Concerning Technical Transformation of Enterprises," *Caizheng* (Finance), July 8, 1984; translation, JPRS-CEA-85-003, January 8, 1985, pp. 39–49.
17. This basically continues the trend that was started after the retrenchment of 1978–1979 when a large number of whole plant purchases were either cancelled or postponed.
18. Zhang Aiping, "Strengthen Leadership and Do a Good Job in Importing Technology," *Hongqi* (Red Flag), December 16, 1985, pp. 4–9.
19. Lin Guang, "Several Issues on Improving the Economic Results of Technology Transfer," *Jingji Lilun Yu Jingji Guanli* (Economic Theory and Business Management), October 25, 1983; translation, JPRS-CEA-84-017, March 1, 1984, pp. 1–12.
20. Lai Wanxian et al., "Import of Foreign Technology and Economic Effectiveness," *Caijing Wenti Yanjiu* (The Study of Finance and Economic Problems), July 1982; translation, JPRS 82364, December 2, 1982, pp. 57–69.
21. Li Yuansheng, "New Developments in Technology Imports," *Guoji Maoyi*, April 27, 1985, pp. 45–46; translation, JPRS-CEA-85-066, July 25, 1985, pp. 64–68.
22. "Regulations of the PRC on Administration of Technology Acquisition Contracts," *China Daily*, June 19, 1985, p. 2.
23. See Howard Perlmutter and Tagi Sagafi-nejad, *International Technology Transfer: Guidelines, Codes, and a Muffled Quadrilogue* (New York: Pergamon Press, 1981).
24. Yi Hui, "Some Thoughts on Suitably Advanced Technology," *Guoji Maoyi*

Wenti (International Trade Journal) 6(1985):5–10; translation, JPRS-CST-86-012, April 8, 1986, pp. 25–35.

25. Zhang Aiping, "Strengthen Leadership and Do a Good Job in Importing Technology," *Hongqi* (Red Flag), December 16, 1985, pp. 4–9.
26. According to one source, about 70 percent of the technology imported by China is from the United States, Japan, the Federal Republic of Germany (FRG), the United Kingdom, and France. About 90 percent of the "software" or know-how comes from these same countries. In both cases, the United States ranks first as a supplier of technology. See Liu Hu, "Technology Import Reaches New High," *Beijing Review*, March 10, 1986, pp. 22–24.
27. William Fischer, "Chinese Industrial Management: Outlook for the Eighties," in U.S. Congress, Joint Economic Committee, *The Chinese Economy in the Eighties* (Washington, D.C., 1986).
28. Lin Guang, "Several Issues on Improving the Economic Results of Technology Transfer."
29. "Key Role for Student Exchanges," *China Daily*, September 25, 1984.
30. "Renmin Ribao Reports on Chinese Studying Abroad," *FBIS/Daily Report: China*, November 28, 1984, p. K23.
31. Interviews with visiting Chinese scientific and education officials, Fall 1984. See also "Returned Students Feeling Stifled," *China Daily*, August 31, 1984.
32. Leo Orleans, "Chinese Students and Technology Transfer," *Journal of Northeast Asian Studies* (Winter 1985):3-25.
33. See "Reform Starts in Electronics Sector," *China Daily*, August 1, 1985, p. 2. As of mid-1986, all 172 factories under the Ministry of Electronics Industry had been removed from its direct control. The divestment program, however, has served to diminish rather than totally remove ministerial control. For example, the ministry will still retain the authority to control funds for technology imports, technical renovation, personnel training, some distribution, and some R&D.
34. Wei Liqun, "Enterprise Reforms Require Reform of Planning," *Jingji Yanjiu* (Economic Research), September 20, 1984; translation, JPRS-CEA-84-100, December 7, 1984, pp. 46–59.
35. For a discussion of the most recent reform, which stresses the separation of government administration from enterprise management, see "Ministry Discusses Foreign Trade System Reform," *FBIS/Daily Report: China*, June 20, 1984, pp. K8–K9.
36. "Zhao Ziyang to Head New Scientific Work Group," *FBIS/Daily Report: China*, January 31, 1983, p. K8.
37. Bai Junde and Zhu Mingjin, "Scientific Research on Military Technology Should Also Undergo System Reforms," *Kexuexue Yu Kexuejishu Guanli* (Scientology and the Management of Science and Technology), May 12, 1985, pp. 11–12; translation, JPRS-CST-85-033, September 30, 1985, pp. 12–14.
38. The nuclear industry has been tasked by the PRC leadership with meeting civilian needs. See "Nuclear Industry Shifting to Power Production," *Zhongguo Xinwen She*, March 18, 1986; translation, *FBIS/Daily Report: China*, March 20, 1986, p. K6.
39. See, for example, "Hu Yaobang and Others Speak to Nuclear Specialists," *Xinhua*, January 21, 1986; translation, *FBIS/Daily Report: China*, January 23, 1986, pp. K9–K10.

40. "S&T Leading Group Formally Established," *Hubei Ribao* (Hubei Daily), July 17, 1984; translation, JPRS-CST-84-034, October 29, 1984, p. 2.
41. A good example of such rapid progress has been the municipality of Tianjin, which between January 1983 and July 1985 imported technology under 547 agreements valued at US$510 million. As a result of these imported technologies and equipment, 800 new products were introduced and a series of new technical trades have developed. The electronics industry imported 26 production lines and has become the top producer in the city. See *China Daily*, October 21, 1985, p. 2.
42. The Chinese government has allowed the United States to specify physical inhibitors (e.g., locks on doors) as part of the export license requirements to prevent unauthorized use of computational equipment and related devices.
43. "U.S. Assured Over Technology Secrets," *China Daily*, November 13, 1984.
44. See U.S. Congress, Office of Technology Assessment, *Energy Technology Transfer to China*, OTA-TM-ISC-30 (Washington, D.C., September 1985).
45. "U.S.-China Nuclear Agreement Runs into Roadblock in Congress," *Asian Wall Street Journal*, July 2, 1984.
46. "U.S. Criticised for Delay on Signed Nuke Accord," *China Daily*, June 21, 1984.
47. "China's Import of Technology Produced Positive Results Last Year," *Jishu Shichang Bao* (Technology Market), January 28, 1986, p. 1.
48. "Scientific and Technological Exchanges with Foreign Countries," *Beijing Review*, March 29, 1982, pp. 21–28.
49. "Trade Pacts with 5 East European Nations," *Beijing Review*, June 4, 1984.
50. Huang Yichen, "French Experience Provides Model for Nuclear Power Development," *Dongli Gongcheng* (Power Engineering), December 15, 1983; translation, JPRS-CEA-84-026, April 9, 1984, pp. 87–89.
51. *Asian Wall Street Journal Weekly*, December 31, 1984, p. 1.
52. According to China's current development priorities, electronics and information industries will be the major target industries; they will be provided with special funding and given preferential treatment and protection when appropriate. See "Lu Dong on Importation of Advanced Technology," *Xinhua*, January 16, 1986; translation, JPRS-CST-86-008, March 1, 1986, p. 10. See also *FBIS/Daily Report: China*, January 15, 1985, pp. K25–K26.
53. "Western Red Tape Mires U.S. Sales of High-Tech to China," *Asian Wall Street Journal Weekly* (December 31, 1984), pp. 1, 18.
54. According to the Seventh Five-Year Plan, traditional industries will continue to account for a large proportion of the country's economic output and therefore must be the target of technological upgrading. See "New 5-Year Plan Accents Technology," *China Daily*, October 22, 1985, p. 4.
55. "Concern Rises Over COCOM," *China Trade Report* (September 1984).
56. For example, in July 1984 Huan Xiang indicated in an article in the *World Economic Herald* that "in transferring really important technologies, the U.S. has not made any concessions. . . ." *FBIS/Daily Report: China*, July 26, 1984, pp. K9–K12.
57. As of December 15, 1985, 27 different product categories were designated for liberalized treatment and are exempted from CoCom review. These changes were reflected in the U.S. export control guidelines as explained in the December 27, 1985, issue of the *Federal Register* (vol. 50, no. 249), pp. 52900–52912. According to the new guidelines, China's Ministry of Foreign Economic Relations and Trade is responsible for certifying that all items

falling in these 27 categories (which are identified with the letter "A" on the U.S. Control List) "are for use in the PRC and will not be reexported to a third country." In essence, this takes a large part of the burden for rapid processing of licenses and places it in the hands of the Chinese side. Interested parties are anxious to find out whether the notoriously cumbersome Chinese bureaucracy will be able to process the requests for certification at a smooth and rapid pace.

58. PRC firms also are being encouraged to cooperate with the Hong Kong electronics industry to raise existing technical and production capabilities. See Chen Jiwen, "Prospects for Cooperation Between the Hong Kong Electronics Industry and China," *Gang Ao Jingji* (Hong Kong and Macao Economic Digest) 3–4 (1984); translation, JPRS-85-002, January 4, 1985, pp. 112–121.
59. "High Technology Parts Exporter Pleads Guilty," *Daily Yomiuri* (Tokyo), June 14, 1986, p. 4.
60. A good example is Chongqing, which has set up a permanent office in Hong Kong to facilitate trade and technology transfer. See the *China Daily*, May 25, 1984.
61. One popular mechanism has been to use Hong Kong facilities involved with advanced electronics technologies as sites for training PRC nationals on equipment that otherwise might not be permitted for export to China. See *South China Morning Post*, April 14, 1985, p. 33.
62. The number of requests for export licenses for sales to the PRC jumped from 4,300 in 1983 to over 10,000 in 1985.
63. In regard to policy support, there appears to be very little activity in terms of an assessment of the cumulative impact of ever-increasing numbers of technology transfers to the PRC.
64. Four major military mission areas have emerged as the focal point of U.S.-PRC military technology and equipment sales: anti-tank, artillery, air defense, and surface-ship antisubmarine warfare. The most significant agreement heretofore involves a US$500 million avionics package sale to the PRC that will be used to modernize 50 of its F-8 aircraft. The package includes airborne radar, navigation equipment, a heads-up display, a mission computer, an air data computer, and a data bus. See Edward Ross, "U.S.-China Military Relations" (paper presented to the Seminar on U.S.-China Relations, Heritage Foundation, Washington, D.C., January 28, 1986).
65. "China's Door Opens Wider Than Ever to Europe–Zhao," *China Daily*, June 6, 1984.
66. In point of fact, China has had to press to ensure that relations in the S&T area would continue to grow. See *China Daily*, October 29, 1985, p. 1.
67. "Western Europe Emerges as Vital Partner in Technology," *China Daily*, September 5, 1986.
68. See "Economic and Technological Cooperation Between China and the EEC Develops," *Guangming Ribao*, November 19, 1985, p. 1. A good example has been the two agreements concluded between China and ESAB of Sweden for transfer of welding technology and equipment. See JPRS-CEA-84-087, October 24, 1984, p. 83.
69. A good example is the West German-Chinese cooperation in laser research, which involves the Max Planck Institute for Optics in West Germany and the Anhui Institute of Optical and Precision Machinery in China. Each

side has exchanged six to eight researchers since the project was begun in December 1980. See *FBIS/Daily Report: China*, June 30, 1983, p. G2.

70. France, West Germany, Italy, Denmark, and Belgium have all provided China with government credits or favorable loans for a host of industrial projects.
71. See "U.S. Blocks Deal for High Tech by France to China," *Boston Globe*, August 18, 1985, p. A103.
72. The issue of cooperation among CoCom members is merely one dimension of the problem because China has been able to turn to a number of non-CoCom sources for needed items. For example, during a visit to China in July 1985, it became apparent that large numbers of electronics components and a smaller number of microcomputers had been acquired through South Korea and Taiwan. Although the Chinese admitted that there are often reliability problems with some of the components, they also noted that these alternative sites were easily accessible.
73. Fang Zhiji, "Economic and Technical Cooperation Between China and Japan Is Developing in Depth," *Shijie Jingji Daobao* (World Economic Herald), March 26, 1984; translation, *FBIS-Daily Report: China*, April 20, 1984, pp. D6–D8.
74. "Sino-Japanese Ties 'Weak on Science' Says Minister," *China Daily*, May 3, 1984. See also "Fang Yi Hopes for More Cooperation with Japan," *FBIS-Daily Report: China*, April 12, 1984, p. D1.
75. The visit of Hu Yaobang to Japan in November 1983 appeared to be the catalyst in stimulating the rapid expansion of Sino-Japanese economic and technical cooperation; see *FBIS/Daily Report: China*, November 23, 1983, pp. D1–D8. The subsequent visit of Prime Minister Nakasone to China in March 1984 further advanced Sino-Japanese relations, especially since during the visit an additional US$2.1 billion loan pledge was announced by the Japanese delegation (*New York Times*, March 23, 1984).
76. For an analysis of Japanese involvement in China's industrial modernisation program, see "Tipping the Balance," *China Trade Report* (February 1985). See also Ma Yi, "Further Expand Transfer of Technology and Economic and Technical Cooperation Between China and Japan," *Guoji Maoyi*, September 27, 1984, pp. 12–13; translation, JPRS-CEA-85-016, February 13, 1985, pp. 159–161.
77. Tian Liwei, "An Important Problem Demanding Prompt Solution in Chinese Technological Trade," *Jingji Daobao* (Economic Reporter), December 2, 1985, pp. 48–49; translation, JPRS-CEA-86-013, February 6, 1986, pp. 91–95.
78. See "MITI Stopgap Clears Way for N-Power Equipment Export to China," *Japan Economic Journal*, October 18, 1983. See also "Japan and China Forging Links in Atomic Energy Industry," *Asian Wall Street Journal Weekly* (March 26, 1984), p. 8.
79. Chae-Jin Lee, *China and Japan: New Economic Diplomacy* (Stanford, Calif.: Hoover Institution Press, 1984).
80. In 1984 PRC-USSR trade totaled about US$1.1 billion.
81. "Liaowang Article on PRC-USSR Commission Work," *FBIS/Daily Report: China*, April 8, 1986, pp. C1–C2.
82. From interviews conducted by the author in Cambridge, Massachusetts (1983–1984), and in Beijing (May 1984 and January 1985).
83. Another major factor producing greater Chinese interest in expanded

economic dealings with the USSR has to do with foreign exchange considerations. Much trade can be conducted between the two countries on the basis of barter, thereby reducing the need for China to spend its foreign exchange to get goods and equipment that it needs—as it must with the West.

84. At the same time the Chinese leadership appears willing to relax its demands for progress on the so-called three obstacles to better relations (i.e., Soviet withdrawal from Afghanistan, an end to Soviet support of Vietnam in Kampuchea, and a diminution of the Soviet presence on the Chinese border) in return for Soviet assistance in selected areas.
85. "Chen Muhua on Trade with Eastern Europe," *Beijing Review*, September 3, 1984, pp. 16–17.
86. Within the Sixth Five-Year Plan, 60 imported electronics projects were identified. See "Plans for Electronics Imports," *Summary of World Broadcasts-Far East*, SWB/FE/W1227/A/21, March 16, 1983.
87. Currently, there are more than 2,600 enterprises in the electronics industry and 120 research/design units employing 1.4 million workers and staff members. See *FBIS/Daily Report: China*, September 11, 1984, pp. K15–K16.
88. Of the 3,000 items listed in the Sixth Five-Year Plan for technology acquisition abroad, 300 involve electronics. See *China Daily*, October 6, 1984.
89. "Electronics Joint Venture Signed with U.S. Company," *FBIS/Daily Report: China*, August 13, 1984, p. B5. This agreement is one of 17 foreign electronics joint ventures signed by China in 1984. See *China Trade Report*, January 1985, pp. 8–9.
90. A good example is the recent agreement with Fairchild Semiconductor Corporation to sell the silicon crystal growing and fabrication equipment from one of its "mothballed" wafer plants in California to a Hong Kong trading firm with the express understanding that the equipment will be resold to the PRC. See *Electronics News*, March 24, 1986, p. 39.
91. "Switched On and Raring to Go," *China Trade Report* (January 1985), pp. 8–10.
92. A potentially serious problem regarding protectionism may be developing as China seeks to allow domestic capabilities to emerge. Recent pronouncements by Vice-Premier Li Peng concerning the need to impose strict import limits on microcomputers and integrated circuits could serve to create additional uneasiness about access into the Chinese market. See *China Daily*, February 4, 1986, p. 4.
93. "Jianchang Machinery Plant," *JPRS* 84110, August 12, 1983, p. 14.
94. "Zhao Ziyang Visits Machinery Plant in Hunan," *Xinhua*, May 13, 1984.
95. "Software Industry Association Established," *FBIS/Daily Report: China*, September 11, 1984, p. K18–K19.
96. "Information Center Construction Starts," *China Daily*, September 24, 1984.
97. "Nationwide Information Network Planned," *China Daily*, January 24, 1984.
98. Since the beginning of 1984, the Beijing Instruments Factory spent US$12 million on 14 projects to import advanced technology and equipment, which equals 150 percent more than its total expenditures on technology imports between 1979–1983. See *China Daily*, November 14, 1984, p. 2.
99. Kang Changhe et al., "Prospects for Instrument Materials in China by

the Year 2000," *Yiqi Cailiao* (Journal of Instrument Materials) 1(1984); translation, JPRS-CST-84-034, October 29, 1984, pp. 22–32.

100. Japan has become a major source of measuring instrumentation for China, providing both equipment and technology. Yamatake Honeywell, for example, has developed a technical cooperation relationship with the Guangdong Instruments and Meters Plant for production of manufacturing-related instrumentation. Yokogawa-Hokushin will be working with the Shanghai Number 9 Automatic Instruments Plant to manufacture turbulence measuring instruments. See *Nihon Keizai Shimbum* (Japan Economic Journal), February 16, 1984), p. 10.
101. See *Renmin Ribao*, July 18, 1986. See also "Haidian Becomes Electronics Center," *China Daily*, September 18, 1984.
102. "Shanghai Puts Electronics First," *China Daily*, January 5, 1984.
103. *Business China*, January 27, 1986, p. 14.
104. "Commentary Hails Ministry's Advisory Function," *FBIS-Daily Report: China*, October 30, 1984, p. K18. By early 1986 the idea of having 14 open cities as targets for development had undergone substantial revision. Nonetheless, the Ministry of Electronics Industry has taken an active role in providing assistance to areas that seek to enter into electronics production.
105. "S&T Center Opens in Shenzhen," JPRS-CEA-84-107, December 26, 1984, p. 87.
106. According to Zhu Rongji, deputy minister-in-charge of the State Economic Commission, the flexibility that will come from decentralising technology import activities will greatly outweigh in value the potential costs in terms of possible duplication and waste. See *FBIS-Daily Report: China*, October 16, 1984, pp. K11–K12.
107. "New Firm to Aid Import and Development of Technology," *China Daily*, February 1, 1985, p. 2.
108. Samuel Ho and Ralph Huenemann, *China's Open Door Policy: The Quest for Foreign Technology and Capital* (Vancouver: University of British Columbia Press, 1984).
109. Chen Lianshen "A Breakthrough Is Necessary in Importing Advanced Technology," *Fujian Ribao* (Fujian Daily), January 23, 1983; translation, JPRS 83440, May 10, 1983, pp. 76–79.
110. "PRC to Reward Countries that Transfer Technology," *FBIS-Daily Report: China*, September 13, 1983, p. A5.
111. "Zhang Jingfu on Technology Cooperation with U.S.," *FBIS-Daily Report: China*, September 18, 1984, p. B1.
112. "More Technology Imports Planned for 1986–88," *Jiefang Ribao*, November 27, 1985, p. 1.
113. Apparently, the specific items to be acquired from abroad are noted in a document entitled "Trial Regulations Concerning the Transformation of Technology in the Machinery Industry," which was issued by the State Council at the time the Sixth Five-Year Plan was announced.
114. According to one report out of Hong Kong, Chinese leaders intend to keep their foreign exchange reserves close to the US$12 billion mark for 1986. See *South China Morning Post* (Business Section), March 2, 1986, p. 1.
115. "AMC to Suspend Chinese Venture's Jeep Production," *Asian Wall Street Journal Weekly*, May 5, 1986, p. 11.
116. Song Jiwen, "Digestion and Absorption of Imported Technology Is a Shortcut to Technological Progress," *Jingji Guanli* (Economic Management),

September 3, 1985, pp. 4–8; translation, *FBIS-Daily Report: China*, November 4, 1985, pp. 20–27.

117. Jin Jin, "The Great Might of 3,000 Imported Technologies," *Ban Yue Tan* (Semimonthly Talks), January 25, 1986, pp. 30–31.
118. "Technology Imports Yield Results," *Renmin Ribao* (People's Daily), January 14, 1986, p. 2.
119. A good example of Chinese progress is the case of the Shanghai Electric Welding Plant, which received imported technology and equipment as part of the 3,000 imported items during the Sixth Five-Year Plan. It was able to raise the standards of its products from the 1950s to the 1970s using imported items. See Jin Jin, "The Great Might of the 3,000 Imported Technologies," *Ban Yue Tan* (Semimonthly Talks), January 25, 1986, pp. 30–31; translation, JPRS-CEA-86-037, April 8, 1986, pp. 51–53.
120. "Technology Import Symposium Held in Guangdong," *FBIS-Daily Report: China*, August 2, 1984, p. P2.
121. "Circular Urges Improved Technology Import Work," *FBIS-Daily Report: China*, 28, 1984, pp. K10–K11.
122. Wu Weixiong, "On the Information and New Technological Revolution," *Shuliang Jingji Jishu Jingji Yanjiu* (Quantitative and Technical Economics), August 5, 1984; translation, JPRS-CEA-84-105, December 12, 1984, pp. 34–40.
123. Meng Jixin, "Views and Recommendations About Continuing Problems with Imports," *Guoji Maoyi Wenti* (International Trade Journal) (September-October 1985):58–60; translation, JPRS-CEA-86-031, March 24, 1986, pp. 64–68.
124. For a sense of shortfalls in the transportation sector and the strategy for overcoming them, see Xiao Haitao and Tian Dashan, "Transportation Development Strategy and Aviation," *Ziran Bianzhengfa Tongzun* (Dialectics of Nature), October 10, 1984; translation, JPRS-CEA-85-005, January 18, 1985, pp. 100–113.
125. See Cao Jiarui, "The Present Condition of and Problems in China's Technological Imports," parts 1–3, *Liaowang*, May 5, 1986, pp. 14–15; May 12, 1986, pp. 18–19; and May 19, 1986, pp. 12–13.
126. According to Li Deguang, general manager of China Electronics Import and Export Corporation, if [China's] industrial and agricultural output is to quadruple by the year 2000, then electronics industrial output has to be raised eight times. See *China Daily*, October 6, 1984.
127. "Guangming Ribao Discusses Overreliance on Imported Technology," *Zhongguo Xinwen She*, July 4, 1985; translation, JPRS-CEA-85-072, August 9, 1985, p. 9.
128. In the textiles area, for example, Chinese exports earned a total of US$17.2 billion. Much of this growth as well as future expansion derives from indigenous technological advances in the quality of textiles machinery and related equipment. See "More Than 600 New Types of Textiles Machinery Produced in 5 Years," *Jingji Ribao*, January 23, 1986, p. 2.
129. "National Defense Requires All-Around Economic Growth," *China Daily*, April 28, 1986, p. 1.
130. See Zhang Aiping, "Speeding Up Reforms of the Economic Structure of the Defense Industry," *Jingji Ribao* (Economic Daily), November 5, 1984; translation, *FBIS-Daily Report: China*, November 13, 1984, pp. K12–K14.

131. "Central Military Commission Honors Research Institute," *FBIS-Daily Report: China*, June 27, 1984, p. K8.
132. A good example is the experience of Tianjin, which has been selected by the central government as a specific site for developing close coordination and cooperation. See "Tianjin and Defense Industry Cooperate in Development," *FBIS-Daily Report: China*, August 10, 1984, p. R1.
133. See "Shipbuilding Industry Contributes to Defense," *Zhongguo Xinwen She* (China News Agency), July 25, 1984; translation, *FBIS-Daily Report: China*, July 26, 1984, p. K5. See also "Navy's Development Over 35 Years Chronicled," *FBIS-Daily Report: China*, September 26, 1984, pp. K12–K13.
134. For the Vessey visit, see *New York Times*, January 20, 1985, p. 3. For the Yang visit, see *China Daily*, April 28, 1986, p. 1.
135. Even the Chinese navy has paid close attention to the "new technological revolution." See Liu Huaqing, "The Ocean, the Navy, and the New Technological Revolution," *FBIS-Daily Report: China*, September 21, 1984, pp. K14–K17.
136. "U.S. Sale of Avionics to China's Air Force Draws Fire from Taiwan's Supporters," *Asian Wall Street Journal Weekly*, May 12, 1986, p. 2.
137. This information is based on the observations of several foreign journalists who viewed the military equipment displayed at the October 1st celebration in Beijing in 1984.
138. "Israel Beats U.K. to PRC Weapons Deal," *The Sunday Times* (London), October 14, 1984, p. 23.
139. Ye Zitong, "On the Shifting of Science and Technology from Military to Civilian Use," *Jingji Yanjiu* (Economic Research), November 20, 1982, pp. 44–47.
140. This is one of the main reasons why the defense sector has been tasked with assisting civilian organisations to overcome their production and technology-related problems. In Shanghai, for example, over the next 3 years, the military will provide scientific and technical assistance for 97 special projects, with special focus on four areas: robots, infrared technology, solar cells, and optical fibers. See "Shanghai Military Transfers Work to Civilians," *FBIS-Daily Report: China*, November 19, 1984, p. O7.
141. See Yu Qiuli's comments on the importance of training in "PLA Air Force Development Over the Past 35 Years," *FBIS-Daily Report: China*, October 3, 1984, pp. K12–K15. See also Yang Shangkun, "Building Chinese-Style Modernised Armed Forces," *Red Flag*, August 1, 1984; translation, JPRS-CRF-84-018, October 3, 1984, pp. 1–13.
142. Zhang Aiping, "Several Questions Concerning Modernisation of National Defense," *Red Flag*, March 1, 1983; translation, JPRS 83318, April 22, 1983, pp. 33–39.
143. "Nation Said to Rank High with 15 Satellites," JPRS-CST-84-030, October 10, 1984, p. 27.
144. *China Daily*, February 21, 1986, p. 1.
145. For an overall analysis of China's capabilities in this area, see Tong B. Tang, "The Chinese Aviation and Space Industries: An Overview," *Xiandai Junshi* (Conmilit), December 1, 1983, pp. 4–11.
146. "Nanjing Institute Commended for Radar Devices," *FBIS-Daily Report: China*, September 11, 1984, pp. O2–O3.
147. For example, China and Sweden have apparently signed an agreement for the Chinese to launch a Swedish satellite. See *China Daily*, March 29, 1986.

148. "Remote Sensing Center Set Up," *China Daily*, January 25, 1983. See also "Applications of Remote Sensing Technology in China," *Dianzi Shijie* (Electronics World) 5 (1983); translation, JPRS-CST-84-026, September 18, 1984, pp. 1–6.
149. Through this type of cooperation, the military may not only gain additional revenue by putting idle capacity to work but can also sharpen production capabilities further, perfect more flexible manufacturing techniques, and gain valuable engineering and technical experience. For a description of the variety of tasks performed by the military, see "Defense Sector Fulfills Civilian Goods Plan," *FBIS-Daily Report: China*, November 20, 1984, p. K17.
150. For example, U.S. firms could join forces with China's S&T system, combining their expertise with Chinese R&D capabilities, as one means of challenging Japanese firms.

A Study of Foreign Export Control Systems

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INTRODUCTION

This study provides an overview and comparison of the national security technology transfer controls of seven countries: Canada, the United Kingdom, France, the Federal Republic of Germany (West Germany), Japan, Austria, and the Republic of Korea. The following are addressed for each country: (1) authority, (2) objectives, (3) organization, (4) coverage, (5) licensing, (6) assurances against reexport, (7) enforcement, and (8) reaction to U.S. extraterritorial controls. This information is followed by comparisons of key elements.

Material for this paper was drawn from laws and regulations of the particular countries, interviews with government officials and business executives, and research previously conducted by others.* The study concludes with a comparison of key elements of the systems and suggestions concerning the implications they hold for security export control policy.

*Some of the information used may not be as current as might be wished because available time and financial resources severely limited in-country research. Efforts have been made to ensure the accuracy of statements in this document. The authors caution the reader, however, that only the respective governments can provide authoritative information concerning the export controls they administer.

COUNTRY SUMMARIES

Canada

AUTHORITY

Canada controls exports under the Export and Import Permits Act (1954). Under this act, licenses are required for a wide range of strategic goods and technologies as defined in the Export Control List.

OBJECTIVES

Canada is a member of the Coordinating Committee on Multilateral Export Controls (CoCom) and cooperates with U.S. controls. It wants to continue the open border and head off the possibility that the United States might impose license requirements on exports to Canada.

Canadian export controls grew out of World War II measures to conserve raw materials in short supply in the domestic market. After the war, controls were continued for short-supply and also for security reasons.[1]

Canada entered the war before the United States. At Canadian initiative, President Roosevelt and Prime Minister Mackenzie King declared at Hyde Park on April 20, 1941:

> [The parties] discussed measures by which prompt and effective utilization might be made of the productive facilities of North America for the purposes both of local and hemisphere defense and of the assistance which in addition to their own programs both Canada and the United States are rendering to Great Britain and other democracies. It was agreed as a general principle that, in utilising the resources of this continent, each country should provide the other with the defense articles which it is best able to produce.[2]

The Hyde Park Declaration was followed by a May 7, 1945, Exchange of Notes in which the United States agreed that "[t]he application of priorities powers towards Canadian requirements should be as closely parallel to the application of the same powers toward domestic requirements as is practicable."

Neither the 1941 Declaration nor the 1945 Exchange of Notes included any specific mention of export restrictions. The result of this collaboration, however, has been to exempt most exports to Canada from application of U.S. export restrictions. Given the Canadian short-supply situation that motivated these agreements, Canada was

under no obligation to reciprocate and did not do so at that time.[3] But for many years, Canada has in fact exempted most exports to the United States from Canadian export restrictions. Currently, only a few nuclear, communications countermeasures, and short-supply items require licenses for export in either direction.

ORGANIZATION

The Department of External Affairs administers Canadian export controls. Occasionally, the Department of National Defense is consulted. Other agencies that may become involved in export control issues include the Atomic Energy Control Board, the Department of Regional Industrial Expansion, and the Department of Communication.

COVERAGE

The Canadian commodity control list is substantially the same as the CoCom International List, even though Canada believes the list is too long. Chemicals are the only area in which Canada administers unilateral controls for other than short-supply reasons. Canada does not publish all the details of the CoCom International List and is slow to make changes based on CoCom list reviews.[4]

Canada controls technical data only in material form,[5] although it also uses its control over visas for foreign attendees of technical symposia as a means to restrict the transfer of technical data.

LICENSING PROCEDURES

Administration of the export permit system is the responsibility of the Office of Special Trade Relations, Export Controls Division, Office of External Affairs. The Department of National Defense (DND) can be asked to review any application, but this is generally done only on technically complex or questionable applications. DND can make recommendations, but the ultimate decision rests in the Department of External Affairs. There is an interdepartmental committee on military and strategic export controls that discusses relevant policy issues and resolves interagency conflicts on particular cases.

Canada requires a license for Canadian-origin controlled items to all destinations except the United States.[6] Additionally, Canada applies U.S. export administration regulations in controlling reexports

of U.S.-origin items.[7] Canada cooperates with the United States, even to the point of restricting reexports of U.S.-origin items pursuant to U.S. foreign policies not shared by Canada.

Canadian and U.S. views on which items are of U.S. origin differ, however. Canada maintains that an item originating in the United States loses its U.S. identity if it is materially changed in Canada—for example, if it has less than 80 percent U.S. components. U.S. regulations generally do not concede that a U.S.-origin item ever loses its U.S. identity. For those cases in which the United States now uses or is considering using a percentage test to exempt a product from U.S. reexport license requirements, the proposed figure is less than 20 percent U.S. components (i.e., much less than the Canadian 80 percent rule).

Canada does not require "extraterritorial" licenses—that is, for reexports from third countries or for exports from third countries of foreign-made products using Canadian technology or by persons in third countries considered to be subject to Canadian jurisdiction. (Some Canadian companies, however, include prohibitions on further transfer in their commercial agreements.) Licenses are issued to a "resident of Canada"—either an individual ordinarily residing in Canada or a corporation with its head office in Canada or operating a branch office in Canada.[8]

Canada issues a single license for multiple transactions (multiple consignee permits) that is similar to the U.S. distribution license. These licenses may not be used for Eastern destinations or for some munitions items. For the remainder of the munitions list and for some dual use items including computers, the license can cover exports only to one country. For the remainder of the control list, the license can cover exports to more than one country.[9]

Canada exempts shipments valued at under $50 from export license requirements, except to the Eastern bloc.[10]

Delays in issuing licenses to Western Europe and Japan are minimal if applications are supported by an end-use certificate or an international import certificate (IIC). Other cases might take 6 to 8 weeks plus an additional 3 months if CoCom review is required.[11]

ASSURANCES AGAINST REEXPORTS

As a general policy, Canada requires an IIC or similar end-use certificate to support export license applications as follows:

1. For exports to other CoCom countries (but to the United

States only for those few items noted above requiring a license for export) plus Austria, Finland, Hong Kong, Switzerland, and Yugoslavia of all CoCom-controlled items except:

a. goods qualifying for "administrative exception" (i.e., those that can be shipped at national discretion under CoCom rules);
b. shipments valued at less than $6,000 Canadian, except for eight electronic and nuclear items;
c. specified small quantities of ammunition or small arms;
d. exports to government agencies, relief agencies, accredited institutions of higher learning, or exhibitions;
e. replacements; and
f. spare parts to repair non-U.S.-origin goods other than munitions or atomic energy items; and

2. For exports to all other countries of specified munitions items except for shipments qualifying for one of the exceptions noted above.[12]

Canada may require an IIC or end-use certificate for the export of any controlled item to any destination. Canada notes that, in addition to the countries listed in (1) above, Israel, Macao, Malaysia, Nigeria, the Republic of South Africa, Singapore, Spain, and Sweden administer the import certificate system; Ireland administers an end-use certificate system; and all other countries generally issue end-use certificates in support of imported goods.[13]

The rules are silent as to whether Canada requires import certificates for single licenses for multiple shipments (i.e., licenses similar to the U.S. distribution license for which the U.S. government has exempted import certificate requirements) [Export Administration Regulations (EAR) Section 375.3(d)(7)].

Requiring import certificates for spare parts to repair U.S.-origin goods (see 1[f] above) no doubt stems from Canadian efforts to support U.S. controls.

ENFORCEMENT

Canadian customs officers are responsible for the investigation of suspected violations and the enforcement of the Export and Import Permits Act.

Canada is seeking legislative authority to conduct prelicense and postshipment checks. It does not maintain a blacklist of unreliable

firms but does use the U.S. published list of firms subject to denial orders.

Statutory penalties for export control violations are up to $25,000 Canadian and 5 years' imprisonment.[14] Three cases for export control violations were prosecuted from 1981 to early 1984.[15]

In 1984 newspaper accounts charged that Canada was a conduit for illegal transfers of technology from the United States to the East. Shortly thereafter, Canada initiated bilateral talks with the United States, resulting in Canadian agreement to selective customs checks, more resources for intelligence and enforcement, and more sharing of information with the United States. Canada also embarked on a campaign to educate exporters concerning license requirements. Following this campaign, the volume of export license applications increased.

REACTIONS TO U.S. EXTRATERRITORIAL CONTROLS

Canada objects to U.S. extraterritorial measures. The Foreign Extraterritorial Act of 1984 blocks the application of foreign laws on Canadian territory if the Canadian government finds such applications not to be in Canada's interest. In the export control area, this legislation permits Canada to block U.S. end-user checks, postshipment checks, reexport license requirements, and penalties.

SUMMARY

Canada cooperates with U.S. export controls and recognizes the importance to the Canadian economy of the U.S. waiver of license requirements for exports to Canada; but Canada objects to U.S. extraterritorial export control actions. Nevertheless, Canadian enforcement of export controls is more extensive than that of other Allied countries because Canada enforces U.S. foreign policy and security export controls; uses the U.S. published list of unreliable firms subject to U.S. temporary denial orders; educates exporters on export control requirements; and actually prosecutes violations.

United Kingdom

AUTHORITY

British export control authority is derived from the Import, Export, and Customs Powers (Defence) Act of 1939, enacted well

before the creation of CoCom and the nuclear developments that justify current controls. The Export of Goods (Control) Order of 1985, as amended, is the current instrument of British export controls. Also applicable is the Customs and Excise Management Act of 1979, as amended. Section 68 of this act deals specifically with offenses relating to export controls.

OBJECTIVES

The United Kingdom is supportive of the security goals behind CoCom and is one of its founding members; it is also a founder of the London Supplier's Group, which is concerned with nuclear nonproliferation export controls. In the 1950s the United Kingdom took unilateral action that forced CoCom to abandon the China differential (more restrictive controls to China than to the Soviet Union) and occasionally has made proposals to tighten controls. However, the British also have been concerned that CoCom coverage is too broad.

The United Kingdom values its special relationship to the United States and hopes that export control cooperation with the United States will lead to increased technology sharing—for example, in Strategic Defense Initiative (SDI) research.

ORGANIZATION

The Department of Trade and Industry (DTI) administers export licensing controls. DTI considers advice from the Ministry of Defence on strategic implications, from the Department of Energy and the Foreign and Commonwealth Office (FCO) on multilaterally agreed-upon nuclear nonproliferation controls, and from FCO on foreign policy implications of all controls. H.M. Customs and Excise enforces the export licensing controls at ports and airports throughout the United Kingdom on behalf of DTI.

COVERAGE

The British control list, the Schedule to the Order, is substantially the same as the CoCom list. The schedule omits much of the technical detail of the CoCom list, but the government publishes almost the complete CoCom International List for information purposes.[16]

U.K. unilateral controls include paramilitary items, nuclear-related equipment, aluminum and maraging steel alloys, and some dangerous chemicals. Technical data controls are limited to "documents" (i.e., they exclude intangible transfers).[17] No license is required for the export of technical data to other Western countries, but it is always necessary to consider any possible breach of the Official Secrets Act.

Occasionally, the United Kingdom proposes tightening CoCom controls, and the British actually are stricter than the Americans in controlling microprocessor development systems.

LICENSING PROCEDURES

Except for a few "open general licences" for specified items to specified destinations, controlled commodities require a license for export to all destinations. Controlled technical data require a license for export only to CoCom-proscribed destinations.[18]

License applications must be accompanied by an international import certificate (IIC) or an end-user notification that describes the end-use of the item. The sufficiency of the end-user data is determined on a case-by-case basis. Such supporting documentation may be waived for some exports to CoCom countries that are valued at less than 10,000 pounds sterling.

An applicant may request a single license for multiple shipments.

The United Kingdom does not require extraterritorial licenses.

There are no statutory deadlines for processing cases. A straightforward case would take about 15 days. The average processing time for a case to another Western country for a nonsensitive item is 5 working days.

The United Kingdom processes about 90,000 license applications per year of which about 50,000 are to other CoCom countries and about 5,000 are to CoCom-proscribed destinations.

ASSURANCES AGAINST REEXPORTS

IICs are required in principle on all exports to other CoCom countries but in practice are not requested for low-value, low-status cases. About 16,000 certificates are requested annually. Exporters in other countries may wish to obtain proof from U.K. importers that strategic goods have in fact been delivered to the United Kingdom. H.M. Customs and Excise issues delivery verification certificates for this purpose.

ENFORCEMENT

Under the provisions of the 1985 order, statutory penalties for violation are up to 1,000 pounds sterling and 2 years' imprisonment. The United Kingdom authorities take a firm stance in enforcing the legislation.

Where an offense under Section 68(1) of the Customs and Excise Management Act (1979) is committed, an exporter's goods shall be liable to forfeiture and any parties involved liable to a penalty of 400 pounds sterling or of three times the value of the goods, whichever is greater. Where an exporter has deliberately evaded the controls (Section 68[2]), the maximum is up to 2 years' imprisonment or a penalty of any amount, or both.

REACTIONS TO U.S. EXTRATERRITORIAL CONTROLS

The United Kingdom objects in principle on legal, political, and commercial grounds to the U.S. requirement that U.K. importers submit to conditions against reexports or, in certain cases, resales within the United Kindgom. The British are concerned about damage to U.S.-U.K. relations and potentially adverse effects on the free flow of technology between the United States and its Western partners. In their view, unilateral controls tend to undermine the consensus needed to make multilateral controls effective. Although maintaining these objections, U.K. authorities recognize that U.S. authorities may penalize U.K. companies that do not comply with U.S. reexport requirements by denying them access to U.S. products and technology in the future.

The United Kingdom objects to U.S. extraterritorial measures generally. Under the Protection of Trading Interests Act of 1980,[19] the British government may require a U.K. individual to give notice of a foreign requirement and may give a U.K. individual directions to prohibit compliance with a foreign order (e.g., to produce to an overseas court a commercial document not within the territorial jurisdiction of that country if it infringes on U.K. jurisdiction or is prejudicial to U.K. sovereignty or to U.K. security or is made for other than civil or criminal proceedings). In addition, a firm could seek compensating action in a U.K. court if it is the victim of an American multiple damage award.

In response to U.S. controls on equipment for a Soviet natural gas pipeline, an order was issued on July 1, 1982, which stated that this act shall apply to U.S. export administration regulations that affect

reexport or export of goods from the United Kingdom. Subsequently, directions were issued prohibiting particular U.K. companies from complying with the U.S. measures. A few months later, the U.S. controls that had prompted the U.K. order and directions were lifted.

The United Kingdom made demarches to the U.S. Congress and to the executive branch in 1983 urging statutory restraints on U.S. extraterritorial export controls.[20] A number of U.K. firms have informed the U.K. government that, because of difficulties with U.S. extraterritorial export controls, as a matter of policy, they are designing future projects to exclude U.S. technology and generally are seeking comparable non-U.S. sources of supply.

SUMMARY

The United Kingdom supports controls by occasionally taking the initiative to tighten restrictions and by wide use of international import certificates. The United Kingdom also cooperates with the United States in CoCom and recognizes the importance of a close information-sharing and technological relationship with the United States in support of the North Atlantic Treaty Organization (NATO). However, the United Kingdom is critical of the breadth of coverage of CoCom controls and resists U.S. extraterritorial export control actions.

France

AUTHORITY

French export controls are based on wartime authority (an April 18, 1939, decree-law concerning munitions and a November 30, 1944, decree listing other prohibited goods), supplemented by later regulations (e.g., December 8, 1948; January 12, 1955; January 30, 1967; and December 5, 1985) on import certificates and the special treatment of goods subject to final destination controls.

OBJECTIVES

France is a member of CoCom and tightly administers a hard-core control list. It holds strong views that CoCom controls should be drastically reduced to such a hard core. Moreover, France has approved significant cases without CoCom review (e.g., telephone

circuit-switching equipment). The number of cases France submits to CoCom is relatively small compared to other major trading nations.

France occasionally appears to be using controls to further commercial objectives. In the 1970s, it was suspected that France was seeking to help French computer companies get domestic business away from American competitors by delaying the submittal to the United States of assurances against nuclear use. The United States eventually stopped asking for the assurances in order to prevent such possibilities. In other celebrated cases, France took advantage of U.S. export controls to take business away from Armco and Nippon Steel for a steel mill at Novolipetsk, from Sperry for a computer at TASS, and from other U.S. companies for oil and gas equipment to the USSR.

On the other hand, the French are very sensitive if they perceive that the United States is using access to U.S. technology as leverage to obtain French cooperation on export controls.

ORGANIZATION

France has an active interministerial committee on export controls composed of representatives of the Ministries of Industry, Commerce, Defense, and Foreign Affairs.

The French Ministry of Defense played a role in crucial French support for a U.S. proposal to establish a military committee to advise CoCom. CoCom had opposed this idea for several years; but such a committee, although not organizationally a part of CoCom, eventually was established in October 1985.[21]

The French statist approach toward society is evident in its policies on export controls. For example, French control authorities assist license applicants to revise their cases so as to facilitate license issuance, in contrast to the more adversarial relationship between U.S. applicants and U.S. government officials.

COVERAGE

The French control list published in the *Journal Officiel* is substantially the same as the CoCom list although it omits some technical details included by CoCom.[22] License requirements, however, are founded on an unpublished microfiche list based on tariff classification numbers that do not correspond exactly to CoCom item descriptions. Moreover, there are separate overlapping lists in published notices for military and nuclear items for which licenses are

required (military—April 2, 1971, and May 11, 1981; nuclear, January 21, 1986).

France controls technical data only in documentary form[23] and is skeptical that even such tangible technical data can be controlled unless associated with a specific product.

Licensing Procedures

The French publish few rules. They prefer to rely on a case-by-case approach to licensing and work closely with industry experts in making assessments. France does not require licenses for reexports from third countries.

On January 13, 1986, France established a procedure for a single license for multiple transactions (war materials are ineligible) that is similar to the U.S. distribution license.[24] The French license is valid for 24 months. It could apply to a parent-subsidiary or exclusive distributor relationship; it could apply to other regular clients only if they were final end-users. The exporter must obtain written assurance concerning the following:

- verification of the nature of the delivered goods;
- a list of responsible company individuals overseeing export controls;
- an internal audit process;
- a procedure to identify clients that are not likely to respect destination controls;
- training for persons dealing with orders; and
- file maintenance.

Assurances Against Reexports

France uses the international import certificate/delivery verification (IIC/DV) system for exports to other CoCom countries; it uses other similar certificates for exports to Austria, Finland, Hong Kong, Sweden, Switzerland, and Yugoslavia. For all other countries, proof of intended consumption in the importing country may be required but not in any particular form.[25] If a diversion takes place, the government may refuse to approve future licenses involving the diverter.

ENFORCEMENT

Customs agreements of 1924 and 1953 permit bilateral discussions but do not authorize U.S. enforcement work in France. A 1986 agreement allows French customs officers to conduct investigations at the request of the United States.

France does not have a blacklist. Moreover, sales to a French firm willing to pay the full list price in cash may not be refused.[26]

Civil fines may be levied at from one to three times the value of the goods (articles 400 and 413 of the Customs Code, February 1, 1986, edition). Charges for the one known prosecution involving export controls were based on false documentation rather than on violation of export control regulations.

REACTIONS TO U.S. EXTRATERRITORIAL CONTROLS

A French blocking statute of July 1980 prohibits firms or individuals from providing information that may be detrimental to French business to a foreign government unless the provision of such information is permitted by prior agreements (e.g., the French Customs Agreement of 1924). In addition, France supported a European Community demarche to the U.S. Congress in 1983 urging statutory restraints on U.S. extraterritorial export controls.

SUMMARY

France controls some exports tightly and at the same time is aggressive in taking advantage of inconsistencies and ambiguities in the international control system to further national commercial competitive objectives.

Germany

AUTHORITY

Controls on exports from the Federal Republic of Germany to the German Democratic Republic are still based on a 1949 Military Government Statute (no. 53), which prohibits foreign commerce unless licensed.

Controls on exports from the Federal Republic of Germany to other destinations are based on 1961 legislation that switched the

emphasis from control to trade.[27] Regulation is authorized in specific ways, under specific circumstances, and for specific purposes: namely, to counter a threat to national security, international peace, foreign policy, or the national economy. The basic principle of the Foreign Economic Law is the freedom to engage in foreign commerce as an individual right. Moreover, the government's power is restricted by the German parliament's right to lift regulations within 4 months after their promulgation. An individual has a right to a license provided the public interest would not be substantially endangered. Revocation of a license is allowed only under certain conditions and may result in compensation claims.

Judicial review of administrative decisions is guaranteed. Courts acknowledge the judiciary's limited role with respect to political and economic judgments but still look for legal rationalization, such as whether the executive has interpreted the law in accordance with the legislative intent, presented facts in support of its conclusion that national security is threatened, and reasonably balanced the public with the private interest.

OBJECTIVES

Germany is a member of CoCom and shares U.S. concerns about exports to the Eastern bloc. German industry is anxious to share U.S. technology and participate in SDI research projects, and it is critical of U.S. controls on bilateral transfers.[28]

ORGANIZATION

The Ministries of Foreign Affairs, Economics, and Defense review arms exports. The Ministry of Defense (MOD) plays a major role in the review of military items.[29]

For dual use items, the Ministry of Economics administers controls with only minimal participation by other ministries. The Ministry of Finance has an enforcement role, acting through the German customs organization.

COVERAGE

The German control list is substantially the same as the CoCom list. Although Germany consistently has been a helpful ally in CoCom in supporting U.S. proposals to tighten specific controls, the Germans believe the CoCom control list is, overall, too long.

Controlled commodities require a license to all destinations. Germany controls a few munitions and atomic energy items unilaterally.[30]

Arms are not authorized for sale to the East, are not restricted to NATO countries unless there are exceptional circumstances, and are restricted to other destinations unless there are exceptional circumstances.[31] Germany requires a license for tangible transfers of technical data to all destinations and for intangible transfers to CoCom-proscribed destinations.[32]

Licensing Procedures

Germany has no legal authority to require a license for an extraterritorial transaction. Exports subject to control are from a "resident," defined as any "natural" person in Germany or any "juristic" person with a place of management in Germany. However, German end-use certificate documents state that reexports, except to CoCom countries, require government permission.[33] This permission is granted by letter rather than by issuance of a license.

A bulk license for multiple transactions may be issued for most exports to Western destinations except for munitions and atomic energy items. To qualify for a bulk license, a firm must have been exporting for at least 2 years and in the last 12 months must have received at least 200 export permissions.[34] About 800 such licenses have been issued. A firm may also obtain permission to ship a specified list of goods to one end-user up to a specified value for 1 year.

Licenses can be withdrawn but cannot be suspended. If a license is withdrawn for other reasons than for a violation of its terms, the government must compensate for lost sales.[35] From 1975 to 1986, the license-processing case load increased from 35,000 to 80,000. A substantial number of licenses are issued under a 1-day procedure.

Assurances Against Reexport

An international import certificate (IIC) is issued whenever it is requested, whether or not Germany considers items to be embargoed. Germany requests IICs for exports to other CoCom members for transactions exceeding DM 20,000 for dual use items or DM 10,000 for munitions or atomic energy items.[36] Delivery verification certificates are requested for higher value shipments. Comparable import certificates are required for exports to Switzerland, Austria,

and Yugoslavia.[37] End-use certificates are required for all arms exports.

ENFORCEMENT

German complaints about prelicense checks and postshipment investigations being conducted by U.S. officials in Germany led to a U.S. decision to suspend such activity in Germany in 1983–1984. Germany does not object to U.S. embassy and consulate personnel carrying out those prelicense check activities that Germany construes to be within the scope of normal diplomatic activities pursuant to the Vienna Convention. German customs officials now conduct investigations of firms in Germany following a U.S. request.

Germany has no published list of firms to be denied export licenses because of past violations of controls. However, judgments concerning several firms have been published.

REACTIONS TO U.S. EXTRATERRITORIAL CONTROLS

Germany opposes U.S. extraterritorial export controls and supported the European Community demarche to the Congress in 1983 that sought U.S. statutory restraints on such controls. However, Germany has not enacted a blocking statute comparable to those of Canada, the United Kingdom, and France.

SUMMARY

Germany is more trade oriented and less control oriented than the United States. On the other hand, Germany is supportive of U.S. negotiating positions in CoCom and is anxious to cooperate with the United States in the development of militarily significant technology.

Japan

AUTHORITY

Japanese 1949 legislation authorizing controls is based on the principle of export freedom. The legislation makes no mention of control for military or political reasons.[38]

OBJECTIVES

Japan is a CoCom member; but like other member countries Japan has reservations about the length of the control list. The Office of Technology Assessment (OTA) of the U.S. Congress estimates that Japan is a relatively insignificant source of strategically sensitive high technology for the USSR and notes that there is no evidence that the Japanese Defense Agency sees Japanese technology exports to the USSR as a threat to Japanese security.[39]

On the other hand, a Japanese Ministry of Foreign Affairs official stated publicly in 1983: "The amount of military outlay required to overcome intensified military strength attained by the USSR through procurement of Western technology was far greater than the profit which was made by the West through lawful export of the equipment and technology to the Soviet Union."[40]

Japan has been a strong supporter of U.S. sanctions against the Soviet Union. In 1980 Japan joined the United States in stopping a contract for an Armco-Nippon Steel sale to the USSR of a steel mill for Novolipetsk. Subsequently, however, France sold a steel mill for Novolipetsk (and Germany sold an aluminum smelter for Sayansk after the United States had stopped Alcoa from doing so).

Japan's objective in cooperating with controls is in part to receive U.S. technology. The Ministry of Foreign Affairs official's 1983 public statement included the following: "When there is no fear of reexport to communist countries, we may be able relatively easily to receive high technology from free nations."[41]

Nihon Keizai (the Japanese equivalent of the *Wall Street Journal*) reported on February 8, 1984, three instances in which delays in the issuance of distribution licenses were hampering imports of technology from the United States; these included low-illumination image augmentation tubes from ITT to the Avie Trading Company; AC power supply to inspect aircraft navigation instruments from California Instruments to the Seki Trading Company; and ring laser gyros from Lear Siegler to Nozaki.

Japan supports about half of its exports to the USSR with export credits.[42] But Japan does not wish efforts to maintain the small Soviet share (2 percent) of the Japanese export market to affect adversely its access to U.S. technology.

ORGANIZATION

The Ministry of International Trade and Industry (MITI) administers export controls. Participation by the Japanese Defense Agency is minimal, which in large part is due to the American postwar policy to demilitarize Japan.

COVERAGE

The Japanese control list is substantially the same as the CoCom list. However, Japan simplifies the CoCom list to such an extent that the perceived coverage could be considerably less. For example, until 1985 the Japanese control list entry for computers was simply "electronic computer (excluding those for office business)."[43] The CoCom agreement, on the other hand, included many conditions for excluding office computers. The 1985 amendment to the Japanese list included more detail but still omitted much of the revised CoCom texts.[44]

Japan is believed to assert controls on both tangible and intangible technology (i.e., technical data) but to apply them only when the technical data are related to a specific existing product.

Japanese law requires notification prior to importing technology.[45] The period during which the import of technology may be prohibited may be extended up to 4 months for cases that might imperil national security or adversely affect similar business.[46] The apparent intent of the law is to avoid uneconomic or duplicate purchases of technology.

LICENSING PROCEDURES

Little specific information has been gathered regarding the licensing process in Japan. OTA, however, noted the Japanese preference to proceed on the basis of a consensus between business and government and the lack of recognition in Japanese law for the concept of extraterritorial controls.

ASSSURANCES AGAINST REEXPORTS

Japan requests international import certificates (IICs) from 15 countries including Singapore and Malaysia as well as CoCom members; it requests end-use certificates from 9 others (including Switzerland, Sweden, and Hong Kong).

ENFORCEMENT

The Japanese government stated in 1983 that Japan was unaware of any violation and in 1984 maintained that there was no case of identified diversion. In case of violations, however, 1 year is the maximum period for denial of export privileges; fines of up to 1 million yen and imprisonment are also authorized.[47]

REACTIONS TO U.S. EXTRATERRITORIAL CONTROLS

Japan regards extraterritorial export controls as contrary to the international legal system and as an infringement on its sovereignty.

SUMMARY

Japan cooperates in controlling exports partly to maintain its bilateral economic and political ties to the United States and partly for continued access to U.S. technology. It has been supportive of U.S. export control sanctions against the USSR.

Austria

AUTHORITY

The Austrian constitution provides that an administrative authority may act only if expressly provided by law. The Austrian law authorizing export controls (the Foreign Trade Act of 1968) specifies that there are no limits in the absence of specific restrictions. The law does not provide for control of goods that are in transit (i.e., in bonded warehouses), but it does require permission to export non-Austrian-origin goods.

A law of December 12, 1984, specifies that an import certificate, which is comparable to the CoCom-agreed international import certificate, is to be provided, even if the import is not on the list of goods requiring certification, if an import certificate must be furnished in order for the export license to be obtained. Munitions are controlled pursuant to a 1977 law.

OBJECTIVES

As a neutral country, Austria approaches export controls with a perspective different from that of the CoCom countries in that it

desires to maintain good commercial relations with the West without violating its neutrality. Austrian-origin goods are restricted only to prevent shortages or price fluctuations. The United States used access to its technology in a case regarding exports to Austria in 1983 as leverage to obtain Austrian cooperation to control exports of U.S.-origin items.

ORGANIZATION

The Ministry of Trade, Commerce, and Industry administers export controls. The Ministry of Defense plays no role in licensing dual use items.

COVERAGE

The only overlap between the Austrian control list and the Co-Com International List for dual use items is electronic-grade silicon, test equipment, and automatic data processing equipment. These items are not technically defined and are not subject to control for security reasons.[48]

There are no controls on indigenous Austrian technical data, whether tangible or intangible.

Austria will issue an import certificate for any import on request. However, no request has been received for a certificate for an import limited to technical data.

Austria doubts whether exports of some embargoed items (e.g., compact computers) are truly controllable.

LICENSING PROCEDURES

Licenses are required for exports of items imported with import certificates.[49] Austrian customs officials at the border, however, can issue export permits for goods imported under distribution licenses without import certificates. Austria has no authority to control reexports from third countries.

ASSURANCES AGAINST REEXPORTS

In February 1983 the United States and Austria exchanged letters in which Austria undertook to "reinforce an autonomous system to protect the import, export, and reexport of imported goods and technology and products under foreign license and sensitive foreign

technology and products based thereon." This system includes the following elements:

- It is based on voluntary agreements between Austrian firms and an Austrian government agency.
- Supervision is based on import certificates and the affirmation by the firm that it will abide by the conditions in the export license or reexport license.
- In considering applications for export authorization from Austria of goods and technologies covered by voluntary agreements, Austrian authorities will seek to ensure the fulfillment of conditions accepted by Austrian firms.
- In the case of license production agreements, the supervision of internal security must be requested by the firm or be based on the licensing agreement.
- Austrian firms may communicate the existence and content of voluntary agreements to authorities of the exporting government.

ENFORCEMENT

In June 1983 Austrian customs officials informed the U.S. Customs Service that, in connection with the 1976 bilateral Customs Services Mutual Assistance Agreement, Austrian customs officials are not competent to enforce high-technology export restrictions except by controlling import and export licenses at the clearance of goods. Because no Austrian law authorizes Austrian customs officials to comply with U.S. requests for assistance, customs personnel will transmit requests to the Ministry of Trade and Industry, which is the appropriate authority for import and export regulations. A court could require the government to indemnify persons if information was given to U.S. authorities illegally.

U.S. authorities may conduct prelicense or postshipment checks, either in the company of Austrian officials or alone (if the firm agrees). Such checks may be made on goods entering with import certificates or under distribution licenses. The United States conducted 11 prelicense and 10 postshipment checks from January through April 1984.

Austria applies the customs fraud law more than the export control law. There have been no known prosecutions for violations of export controls although two firms have been blacklisted for diversions. Austria can deny an import certificate to a misbehaving firm.

It has been reported that Hungarians can buy desktop computers easily in Austria and take them back to Hungary.

REACTIONS TO U.S. EXTRATERRITORIAL CONTROLS

Austria finds it unusual that the United States asks Austrian distributors for lists of all their end-users as required by U.S. distribution license regulations. Under the Austrian Data Protection Act, prior approval of the end-user and authority of the Austrian Data Processing Commission is required before such data can be transferred outside Austria. In general, Austria does not recognize the validity of requirements for U.S. reexport licenses.

SUMMARY

Austria cooperates with U.S. controls on reexports to the extent consistent with Austria's neutral status.

Republic of Korea

AUTHORITY

Dual use exports are controlled pursuant to a Foreign Trade Transactions Act. Under Korean law, an item is free (not subject to controls) unless it is on a control list.[50] Munitions are controlled separately.[51]

OBJECTIVES

Because of hostility toward North Korea, the Republic of Korea engages in no direct trade with CoCom-proscribed destinations, which are presumed to be conduits to North Korea. Otherwise, Korea controls the export of no dual use items for security purposes, and its technology policy is geared toward making Korea competitive in the export market.

ORGANIZATION

The Ministry of Commerce and Industry (MCI) administers controls on dual use items (such as textiles).[52] The administration of

munitions export controls moved from MCI to the Ministry of National Defense (MND) in 1981 and from MND to the Korean Defense Industries Association (a civilian agency) in 1983.

Coverage and License Procedures

Except for munitions (and the virtually total embargo to Warsaw Pact countries), Korean export control lists include no items on the CoCom International List.[53]

Assurances Against Reexports, Enforcement, and Reactions to U.S. Extraterritorial Controls

Korean firms generally honor U.S. export license conditions against direct reexports of U.S.-origin products, but the government conducts no end-user investigations. In addition, Korean firms respect joint-venture contract restrictions on reexports to ensure continuing access to U.S. technology. Otherwise, no attempt is made to control U.S.-origin technology or components in Korean-manufactured products.

U.S. government approval is required for the reexport of U.S.-origin military equipment.[54] Only 8 percent of reexport requests were approved in 1983 because purchasing governments were reluctant to sign end-use certificates.

Summary

Korea has tighter controls on direct exports to the USSR than does any CoCom country including the United States. However, the lack of Korean controls on exports to other Western destinations of dual use strategic items could become a source of diversion to the East as Korea proceeds with its rapid technological development.

COMPARISONS AND CONCLUSIONS

Need for Harmonization

There is substantial agreement among Western countries that cooperate on security export controls. But there are many differences in administration that weaken the international system. These differences cannot be removed by U.S. unilateral controls because our allies and other affected countries resist extraterritorial measures.

The alternative to divisive U.S. extraterritorial controls is coordinated action with other CoCom countries and other non-CoCom countries that are willing to cooperate. Such coordination can be strengthened by improving our knowledge of the national export control systems of those countries. Once this knowledge is in hand, it will bring to light differences, some of which could be harmonized, cooperatively, thereby improving the effectiveness of controls.

Harmonization directly strengthens controls; it also increases the credibility of controls in the business community by reducing their potential for constituting an advantage for companies in one country over competitors in another country.

Points of commonality consist of areas in which effective harmonization has already been accomplished through cooperation and areas in which all the countries analyzed differ from the United States. Differences between the seven and the United States, as well as differences among the seven, serve either as an agenda for problems to be resolved or, if the differences are intractable, as a recognized constraint on what can be accomplished by means of export controls. Some points of commonality and difference are listed below along with comments regarding implications for U.S. policy. Appendixes A, B, and C are a detailed comparison of procedures and policies.

Commonality

1. Each country studied here administers export controls that further Western security. Four of the seven countries are members of NATO (Canada, the United Kingdom, France, and Germany); these four plus Japan also are members of CoCom. The Republic of Korea refuses to trade directly with the Soviet bloc. Austria, although protecting its neutrality, maintains controls on the reexport of Western goods and technology.

2. All seven countries indicated that they believe the CoCom list is "too long" to be effectively administered and that they would prefer focusing on a more select list of sophisticated, state-of-the-art technology. Canada, the United Kingdom, France, Germany, and Japan have for years actively advocated major reductions in the coverage of CoCom controls and still do. There is feeling among these countries that the United States is the principal obstacle to removing from the list items that are so widely available that their export cannot in fact be prevented.

3. Canada, the United Kingdom, France, Germany, Japan, and

Austria issue, on request, import certificates. Under this system, the government of the Western country importing controlled items from another Western country assumes the responsibility for preventing diversionary reexports to the East. Canada, the United Kingdom, France, Germany, and Japan also request import certificates but for varying types of transactions and for varying countries of destination.

4. None of the seven administers extraterritorial controls. They consider as questionable under international law U.S. extraterritorial controls over the reexport of U.S.-origin items, the export of foreign-made products based on U.S.-origin technology, and the export of non-U.S.-origin items by U.S. subsidiaries located overseas.

5. Most countries have cooperative relationships among their exporters and government agencies. All of the countries studied accord a higher priority to exporting in economic policymaking than does the United States. Most countries will work with exporters to help them export—for example, by suggesting ways to downgrade equipment so that it will fall under national discretion guidelines. This contrasts with an underlying adversarial relationship between U.S. government agencies and U.S. exporters of high-technology items.

Differences

1. There is little similarity among these seven countries with respect to technical data controls. Some restrict the export of intangible technical data while others limit controls to tangible technical data.

2. Types of assurance against reexport from "third countries" (non-CoCom, nonembargoed) vary among CoCom members, as do the countries of destination and types of transactions subject to such assurances.

3. The degree to which defense ministries participate in the control process varies among the countries studied:

- There is virtually no defense role in the export control systems of Japan, Austria, and Korea.
- There is occasional defense participation in Germany and Canada.
- The French Ministry of Defense has a determining role on munitions controls and an institutional advisory role in other areas.
- The United Kingdom Ministry of Defence is active on an extensive and continuing basis, reviewing all cases for the East,

determining which products are subject to munitions list controls, and participating in CoCom list review negotiations.

4. The countries vary in the vigor and methods used to enforce controls.

5. Although the CoCom International List is the basis of controls in all the CoCom countries, the details of coverage vary from country to country.

Implications for National Security Export Control Policy

The controls of the seven countries studied here are responsive to the objectives of multilateral security export controls. U.S. policy is consistently recognized as the dominant philosophy; but these countries are not fully in agreement with U.S. policy. They share the objective of controlling strategic trade; they also perceive economic and political advantages to cooperation with the United States. But they believe that the CoCom list is too extensive to be effectively enforced, that foreign policy controls generally are unjustified, and that extraterritorial U.S. controls are an unacceptable infringement on their sovereignty.

The credibility of strategic controls is strained by perceptions such as the following:

- liberal interpretations of texts agreed upon by European and Japanese governments permit unlicensed exports from these countries of items for which the United States requires a license;
- collusion between the U.S. government and U.S. firms permits a U.S. competitive advantage when the United States agrees to liberalize controls;
- controls cannot be enforced on widely available items; and
- little is being done to enforce controls on many items.

The multilateral system would be made more credible by the identification and removal of widely available items for which effective enforcement of controls is generally believed to be impossible, whether the export is from the United States or from some other country. In addition, the case for strict enforcement of controls on the remaining list items would be enhanced by removal from the list of widely available items.

Stricter control enforcement by cooperating countries would reduce the need for U.S. controls affecting transactions in those countries. Given the resistance to the extraterritorial reach of U.S. controls and the apparent lack of effective cross-border enforcement

capabilities, U.S. reexport regulations have become particularly controversial as a policy issue. Reexport regulations have in effect been the U.S. government's unilateral means of seeking to maintain a transnational enforcement capability, but there is an increasing trend in other countries of blocking their effectiveness. Thus, the reduction of such controls would remove the politically damaging appearance of allied disunity in an area with strategic relevance. Moreover, other countries often strengthen their enforcement measures when the United States relaxes its extraterritorial controls.

The harmonization of export control policies that would result from decontrol of widely available items and reduction of U.S. extraterritorial controls in cooperating countries would permit a major caseload reduction. Limited U.S. export control staffing resources could then be concentrated on important cases.

The resultant closer trading relationship between the United States and cooperating countries would strengthen the overall control system. Controls are largely a function of voluntary action by exporters. Increased activity of responsible U.S. firms in cooperating countries would, therefore, improve the consistency and effectiveness of controls on exports to the East.

This study provides only a preliminary comparison and analysis of the seven countries reviewed. A more complete understanding of the international control framework is needed. The important goal of harmonization of national rules and regulations can proceed only if it is based on solid knowledge of the rules, regulations, and differences as they now exist; likewise, effective enforcement can take place only if the nuances of national laws and procedures are understood. Exporters can be ensured a "level playing field" only if the competitive implications of national export control policies are known.

NOTES

1. Department of Industry, Trade, and Commerce, *Export and Import Permits Handbook*, p. 102.00.1.
2. U.S. Department of State bulletin, April 26, 1941, p. 494.
3. Memorandum of Explanation Relating to Hyde Park Agreement.
4. For example, administrative exception notes are not published at all. In addition, publication of the results of the 1984 list review was delayed.
5. *Export and Import Permits Handbook*, pp. 303.00.1 and 303.00.53–303.00.55.
6. *Export and Import Permits Handbook*, p. 303.00.1.
7. This is made possible by a separate entry (i.e., 9001) on the control list for U.S.-origin items. See *Export and Import Permits Handbook*, p. 303.00.55.
8. *Export and Import Permits Handbook*, p. 201.00.1.

9. Department of External Affairs, *Notice to Exporters*, Serial No. 21 (July 18, 1984; amended March 1, 1985), paragraphs 26–30, pp. 12–13.
10. *Export and Import Permits Handbook*, p. 306.01.1.
11. *Notice to Exporters*, paragraphs 31 and 32, pp. 13–14.
12. *Notice to Exporters*, paragraphs 19-25 and Appendix B, pp. 10–12 and 18–21.
13. Ibid., paragraph 23 and Appendix A, pp. 11, 16, and 17.
14. *Export and Import Permits Handbook*, p. 201.00.5.
15. See the *Wall Street Journal*, March 19, 1984.
16. See the official list in *Export of Goods (Control) Order 1985*, Customs and Excise 1985 No. 849; and FYI list in *Security Export Control*, British Business Supplement (June 14, 1985).
17. *Export of Goods (Control) Order 1985*, article 2(viii), p. 3; and group 4 of Part II, Schedule 1, pp. 160–165.
18. *Export of Goods (Control) Order 1985*, article 2(i) and 2(viii).
19. This law was cited as a model in a resolution placed before the European Parliament on February 21, 1986. The resolution calls for respect for the CoCom agreement and objects to extraterritorial elements of U.S. export control policy and U.S. reexport control regulations.
20. See Department of Trade Press Notice 470, October 21, 1982; Press Briefing, March 22, 1983; Press Notice 290, August 2, 1983; Press Notice 431, October 27, 1983; remarks by W. M. Knighton, U.K. Department of Trade, the Association of the Bar of the City of New York meeting on November 4, 1982; an article by A. V. Lowe in *International and Comparative Law Quarterly* (July 1984), p. 515; and the European Community Aide Memoire to the U.S. Administration, 1983.
21. *International Herald Tribune*, October 12–13, 1985.
22. *Journal Officiel de la République Française: Lois et Décrets*, Annexe au No. 282 (December 5, 1985).
23. Ibid., article 1, section A2, p. 3.
24. Decree modifying and completing the decree of January 30, 1967, on import and export procedures.
25. *Journal Officiel*, Annexe, articles 2 through 6, pp. 3–5.
26. Ordinance 45-1483, June 30, 1945; Ordinance 58-545, June 24, 1958; Law 73-1193, December 27, 1973.
27. See the Foreign Economic Law (*Aussenwirtschaftsgesetz*). Also see Werner Hein, "Economic Embargoes and Individual Rights under German Law," *Law and Policy in International Business* 15, no. 2 (1983). There is also a German law concerning weapons: *Gesetz ueber die Kontrolle von Kriegswaffen*.
28. Elmer Rauch, "Some Problems of U.S.-German Transatlantic Cooperation," *Oberammergau* (September 10, 1985).
29. Annex to *Wehrdienst* no. 847/82, May 10, 1982, German Arms Exports, point I.6.
30. For example, rockets, item 1470, Stand: Bundesanzeiger, *Ausfuhrliste* (November 1984), p. 21.
31. *Wehrdienst*, May 10, 1982.
32. *Zentralverband der Elektrotechnischen Industrie e.V., Exportkontrollen--Ein Uberblick fur die Electronindustrie* (November 1985), p. 12.
33. Ibid., *Anlage* 5(d).
34. Ibid., p. 14.
35. Hein, "Economic Embargoes and Individual Rights."
36. *Uberblick*, p. 15.

37. Ibid., p. 16.
38. See the Foreign Exchange and Foreign Trade Control Law (no. 228) (December 1, 1949).
39. Office of Technology Assessment, "East-West Trade Policies of America's CoCom Allies: Japan," in *Technology and East-West Trade.*
40. Iritani, "Policy to Prevent Outflow of U.S. High Technology," *Finance* (November 1983).
41. Ibid.
42. Office of Technology Assessment, "East-West Trade Policies."
43. *Export Trade Control Order* (Cabinet Order No. 378) (December 1, 1949, as amended), p. C-61.
44. MITI Notification No. 28 (January 25, 1985).
45. Foreign Exchange and Foreign Trade Control Law (no. 228), article 25.
46. Ibid., articles 29 and 30.
47. Foreign Exchange and Foreign Trade Law (no. 228), as amended, article 53.
48. See the December 12, 1984, law regarding automatic data processing equipment.
49. Foreign Trade Act of 1968 (*Bundesgesetzblatt*), Section 1 (August 9, 1968), p. 1175.
50. Ministry of Commerce and Industry (MCI) Public Note 83-22 (May 30, 1983).
51. Weapons and Firearms Control Act and Ministry of National Defense Directive 175, approved in 1983.
52. MCI Public Note 83-22.
53. Ibid.
54. See the Ministry of National Defense Memorandum of Understanding with the United States.

APPENDIX A: COMPARISON OF EXPORT CONTROL COUNTRIES

Authority and Objectives	Organization	Mechanisms: Coverage	Tech Data	Licensing Procedures	Assurances	Enforcement
CANADA						
Legal Authority Export and Import Permits Act (1954) Objectives Controls began for short supply reasons during WWII; later also based on national security	Administering Agency Office of Special Trade Relations, Export Controls Division, Department of External Affairs Other Agencies Involved Department of National Defense, Atomic Energy Control Board, Department of Regional Industrial Expansion, Department of Communication Special Organizations Interdepartmental Committee on Military and Strategic Export Controls consisting of representatives from Departments of External Affairs, National Defense, and Regional Industrial Expansion; chaired by Office of Special Trade Relations; duties: review policy, resolve interagency conflicts	Export Control List (ECL) substantially the same as COCOM list a. Munitions Group 7 of Export Control List b. Nuclear Group 8 of Export Control List c. Dual Use Groups 3-6 of ECL and Unilateral Controls on some chemicals	Control technical data in material form relating to controlled commodities a. Constitutional or Free Speech Considerations Canada uses control over visas to restrict entrants to technical symposia b. Intangible No control c. Tangible Controls tech data only in material form	a. Application Requirements - Description of goods - Identification of end consignee - Evaluation of goods against Export Control List entry or International List entry - Performance Evaluation Sheet for computers if export is to Warsaw pact, PRC or Albania, Mongolia, North Korea, Vietnam - Case precedents - Port of export - U.S. content - Quantity - Dollar value--no license required if under $50.00 except in the East b. Processing Times - Minimal to western Europe and Japan - 6 to 8 weeks for others - 3 months for COCOM review	a. Import Certificates Canada requires an IIC to support license application for exports to COCOM countries; also requires similar import certificates for exports to Austria, Finland, Hong Kong, Switzerland, and Yugoslavia b. Other Governmental Assurances Canada notes Israel, Macau, Malaysia, Nigeria, South Africa, Singapore, Spain, and Switzerland administer end-use certificate systems c. Consignee Assurances End-use certificate for munitions exports Importers from other countries generally issue import certificates	a. Government Audits Selective customs checks Audits N/A Intelligence Resources Customs officers are responsible for the investigation of suspected violations and the enforcement of the Export and Import Permits Act d. Prosections Three cases for export control violations were prosecuted from 1981 to 1984 e. Imposition of Penalties Statutory penalties for export control violations are up to $25,000 and 5 years imprisonment

Authority and Objectives	Organization	Mechanisms: Coverage	Tech Data	Licensing Procedures	Assurances	Enforcement
				c. Volume 64 cases for COCOM review, 1983-1984		
				d. Differentiation Among Country Groups No license required for most exports to the U.S.		
				e. Use of Bulk Licenses Multiple Consignee Permits available		
				f. Reexport Licenses Does not require licenses for Canadian product after it is exported from Canada; does issue licenses for U.S.-origin product exported from Canada		
				g. License for Foreign-made Products of Canadian Technology None		
				h. Licenses for Exports of Persons Subject to National Jurisdiction Application can only be made by resident of Canada, or corporation having head or branch office in Canada		

UNITED KINGDOM

Legal Authority

Import, Export, and Customs Powers (Defence) Act 1939; 1985 Order contains current regulations

Objectives

U.K. wants to retain special relationship with U.S. and share technology and information

Administering Agency

Department of Trade and Industry

Other Agencies Involved

Ministry of Defence advice on strategic implications; Department of Energy advice on nuclear cases; Foreign Office advice on foreign policy implications; H.M. Customs and Excise enforcement of controls at U.K. ports and airports

a. Munitions

Group 1

b. Nuclear

Group 2

c. Dual Use

Group 3 includes several unilaterally controlled paramilitary nuclear, metal, and chemical items

a. Constitutional or Free Speech Considerations

No license required to Western destinations

b. Intangible

No controls to any destination

c. Tangible

Group 4 controls limited to documents to CoCom-proscribed destinations

a. Application Requirements

Description goods, technical specs, end-use name/importer, and ultimate consignee computer questionnaire

b. Processing Time

Average for nonsensitive items for Western destinations, 5 working days

c. Volume

100,000 licenses per year; 5,000 per year to proscribed destinations; 578 cases for COCOM review, 1983-1984

d. Differentiation by Country

a. Import Certificates

IICs are required for high value for exports to COCOM countries

b. Other Governmental Assurances

End-user notification

c. Consignee Assurances

A published form for a consignee undertaking not to reexport

a. Government Audits

N/A

b. Internal Industry Audits

N/A

c. Intelligence Resources

N/A

d. Prosecutions

N/A

e. Imposition of Penalties

Fines and/or up to 2 years' imprisonment

APPENDIX A (continued)

Authority and Objectives	Organization	Mechanisms: Coverage	Tech Data	Licensing Procedures	Assurances	Enforcement
				None for most commodities; tech data licensing requirements apply only to exports to Albania, Bulgaria, China, Czechoslovakia, E. Germany, Hungary, Mongolia, North Korea, Poland, Romania, USSR, and Vietnam		
				e. Use of Bulk License Yes		
				f. Reexport Licenses None		
				g. License for Foreign-made Products of U.K. Technology None		
				h. Licenses for Exports of Persons Subject to National Jurisdiction None if nonresident		

FRANCE

Legal Authority

Nov. 30, 1944, decree. For other items, April 18, 1939, decree/law for munitions

Objectives

Desires tight control of hard core (much less than COCOM list)

Administering Agency

Customs administers controls

Interministerial Committe on Export Controls composed of Ministries of Industry, Commerce, Defense, and Foreign Affairs

a. **Munitions**

Arrete April 2, 1971, amended May 11, 1981, includes some dual use items

b. **Nuclear**

Notice to exporters Jan. 21, 1986; some differences from COCOM Atomic Energy list

c. **Dual Use**

Notice to exporters Dec. 5, 1985, plus unpublished microfiche, which requires licenses for some products except from COCOM list

d. **Other**

Unpublished restrictions on ''hard core'' and related equipment

a. **Constitutional or Free Speech Considerations**

N/A

b. **Intangible**

No controls

c. **Tangible**

Controlled in documentary form

a. **Application Requirements**

Tariff number (rather than COCOM item number)

- Information on end-use
- French government will help firms change or downgrade products to get sale approved

For multiple license need written assurances from consignees

b. **Processing Times**

To West about 2 weeks; to East about 3 weeks plus COCOM; for overcoverage because of use of tariff numbers, immediate issuance

c. **Volume**

83 cases for COCOM review, 1983-1984

a. **Import Certificates**

Use IIC for export to COCOM countries

b. **Other Governmental Assurances**

Require end-use certificates for exports to Austria, Finland, Hong Kong, Sweden, Switzerland, and Yugoslavia

c. **Consignee Assurances**

''May'' require assurance ''in no particular form'' of consumption in other importing countries

Under multiple license, exporter would need to obtain assurances from consignee including: c. delivery verification, responsible individuals in the firm, internal audit, diversion risk screen, training program, and record-keeping

a. **Government Audits**

French do check end-use and maintenance procedures if they find that products are diverted; they may not furnish another license to that destination again; per 1983 agreement, French customs will conduct investigations at U.S. request

b. **Internal Industry Audits**

See ''Consignee assurances''

Intelligence Resources

N/A

d. **Prosecutions**

Only known case was prosecuted false documentation rather than export control violation

APPENDIX A (continued)

Authority and Objectives	Organization	Mechanisms: Coverage	Tech Data	Licensing Procedures	Assurances	Enforcement
				d. Differentiation by Country None e. Use of Bulk License Jan. 13, 1986, established single license for multiple transactions; importer must be a subsidiary, an exclusive distributor, or a final end-user f. Reexport Licenses None g. License for Foreign-made Products of French Technology None h. Licenses for Exports of Persons Subject to National Jurisdiction N/A	e. Imposition of Penalties Fines from one to three times the value of goods per articles 400 and 413 of Feb. 1, 1986, edition of the Customs Code; imprisonment in criminal cases

GERMANY

Legal Authority

Aussenwirtschaftsgesetz of April 28, 1961

Objectives

Right to export in absence of specific restriction; wants to share technology with U.S.

Administering Agency

Ministry of Economics; Federal Office of Business Economics, administers items; Ministry of Defense administers weapons

Foreign Affairs Ministry leads international negotiations

Customs enforces controls

a. Munitions

Some unilateral controls

b. Nuclear

Some unilateral controls

c. Dual Use

Substantially same as COCOM list

a. Constitutional or Free Speech Considerations

See "b" below

b. Intangible

Subject to control

c. Tangible

Subject to control

a. Application Requirements

N/A

b. Processing Time

One day if adequately documented

c. Volume

80,000 per year; substantial number issued in 1 day; 442 cases submitted for COCOM review, 1983-1984

d. Differentiation by Country

Controlled commodities require license to all destinations; intangible technical data only controlled to CoCom-proscribed destinations

e. Use of Bulk License

a. Import Certificates

IICs are required for exports to COCOM countries of dual use items over DM 20,000 and of munitions or atomic energy items over DM 10,000

b. Other Governmental Assurances

Import certificates are required for exports to Switzerland Austria, and Yugoslavia

c. Consignee Assurances

End-use certificates for all arms exports

a. Government Audits

German customs investigates at U.S. request

b. Internal Industry Audits

N/A

c. Intelligence Resources

No published denial list

d. Prosecutions

Several

e. Imposition of Penalties

Up to 3 years' imprisonment or fine

APPENDIX A (continued)

Authority and Objectives	Organization	Mechanisms: Coverage	Tech Data	Licensing Procedures	Assurances	Enforcement
				License for multiple transactions may be issued for exports to Western destinations; firm must have been exporting for 2 years and have received at least 200 export licenses in preceding year		
				f. Reexport License Letters of permission rather than reexport licenses are used		
				g. License for Foreign-made Products of German Technology N/A		
				h. Licenses for Exports of Persons Subject to National Jurisdiction Must be resident		

JAPAN

Legal Authority

Foreign Exchange and Foreign Trade Control Law (1949)

Objectives

Law makes no mention of control for military or political reasons

Desires access to U.S. technology

Administering Agency

Ministry of International Trade and Industry; minimal participation by Japan Defense Agency; Ministry of Foreign Affairs establishes policy and conducts COCOM negotiations

a. **Munitions**

Control to: (1) communist Bloc; (2) countries subject to arms export embargo under U.N. resolution [embargo]

b. **Nuclear**

N/A

c. **Dual Use**

List is substantially the same as COCOM list but with less detail

a. **Constitutional or Free Speech Considerations**

N/A

b. **Intangible**

Controls on intangible tech data exist if related to specific existing product

c. **Controls Limited to Commodities**

Also controls tangible tech data related to specific existing product

a. **Application Requirements**

Copy of contract

b. **Processing Time**

N/A

c. **Volume**

330 cases for COCOM review, 1983-1984

d. **Differentiation by Country**

Licenses for dual use items not required for Latin American countries, S. Korea, and Iceland

Area "A"--free and communist countries

Area "B"--countries where there is an embargo, e.g., Rhodesia, Iran, Iraq, or countries where Japan has negative balance of payments, e.g., Nigeria

a. **Import Certificates**

Japan requests import certificates from 15 countries, including Singapore and Malaysia as well as COCOM members

b. **Other Governmental Assurances**

Japan requires end-use certificates from nine other countries, including Switzerland, Sweden, and Hong Kong

c. **Consignee Assurances**

N/A

a. **Government Audits**

MITI officials may make spot checks on end-users

b. **Internal Industry Audits**

N/A

c. **Intelligence Resources**

N/A

d. **Prosecutions**

The Japanese government has denied export privileges to companies

e. **Imposition of Penalties**

Fines up to 1 million yen; imprisonment up to 3 years; denial of export privileges up to 1 year

APPENDIX A (continued)

Authority and Objectives	Organization	Mechanisms: Coverage	Tech Data	Licensing Procedures	Assurances	Enforcement
				e. Use of Bulk License N/A f. Reexport License No reexport controls exist g. License for Foreign-made Products of Japanese Technology N/A h. Licenses for Exports of Persons Subject to National Jurisdiction N/A		

AUSTRIA

Legal Authority

Foreign Trade Act 1968 as amended Dec. 12, 1984

Munitions controled pursuant to 1977 law

Objectives

Prevent shortages and price fluctuations; good commercial relations with West without violating neutrality

Administering Agency

Ministry of Trade Commerce and Industry

a. Munitions

N/A

b. Nuclear

N/A

c. Dual Use

Only overlap with COCOM list is silicon, test equipment, and computers, which are not restricted on security grounds

a. Constitutional or Free Speech Considerations

N/A

b. Intangible

No controls

c. Controls Limited to Commodities

No controls

a. Application Requirements

N/A

b. Differentiation by Country

None

c. Use of Bulk License

N/A

d. Reexport License

No license required for reexport from another country of Austrian-origin items

e. License for Foreign-made Products of Austrian Technology

See preceding entry

f. Licenses for Exports of Persons Subject to National Jurisdiction

Must be legitimate company that has been operating for at least 3 months

a. Import Certificates

Austria requires an export license for all commodities that enter with an import certificate

b. Other Governmental Assurances

N/A

c. Consignee Assurances

U.S. distribution license requirements for distributors to list end-users conflicts with Austrian Data Protection Act; prior approval of end-user and of Austrian Data Processing Commission is required to transfer such data outside of Austria

a. Government Audits

Austria authorities may inspect any facility before or after issuance of an import certificate

b. Internal Industry Audits

Austrian companies must establish a record-keeping procedure to keep track of commodities in question

c. Intelligence Resources

N/A

d. Prosecutions

Two companies have been blacklisted for diversions

e. Imposition of Penalties

N/A

APPENDIX A (continued)

Authority and Objectives	Organization	Mechanisms: Coverage	Tech Data	Licensing Procedures	Assurances	Enforcement
KOREA						
Legal Authority Foreign Trade Transaction Act, Article 2, Restrictions on Export and Import Weapons and Firearms Control Act and Ministry of National Defense Directive 175, approved 1983 Objectives Deny assistance to North Korea	Administering Agency Ministry of Commerce and Industry (dual use) Korean Defense Industries Association (munitions) Actual export license issued by the Foreign Exchange Bank	Coverage All exports prohibited to COCOM-proscribed destinations a. Munitions Three categories: lethal, non-lethal, general b. Nuclear N/A c. Dual Use Not controlled to Western destinations	a. Constitutional or Free Speech Considerations Not controlled b. Intangible Not controlled c. Tangible Not controlled	a. Application Requirements N/A b. Differentiation by Country Will not trade with "unfriendly c. nations" including COCOM-proscribed destinations c. Use of Bulk License N/A d. Reexport Licenses None e. Licenses for Foreign-made Products of Korean Technology None f. Licenses for Export by Persons Subject to National Jurisdiction N/A	a. Import Certificates None b. Other Governmental Assurances None Consignee Assurances Firms generally respect U.S. conditions against reexport e. Imposition of Penalties N/A	a. Government Audits None b. Internal Industry Audits None c. Intelligence Resources None d. Prosecutions None

APPENDIX B: SUMMARY COMPARATIVE ANALYSIS

	Canada	United Kingdom	France	German	Japan	Austria	South Korea	United States
Wartime authority	Yes	Yes	Yes	No	No	No	No	No
Technology import concern	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes, at least from Japan
Defense role	Occasional consultation	Advice taken	Committee member	Review arms	Minimal	None	Minimal	Active
National controls list substantially the same as COCOM list	Yes	Yes	Yes	Yes	Yes	4 items	No	Yes
Unilateral security controls	Few	Few	Few	Few	No	No	No	Substantial
Technology controls:								
Tangible	Yes	Yes	Yes	Yes	Yes[a]	No[b]	No	Yes
Intangible	No	No	No	Yes	Yes[a]	No[b]	No	Yes
License requirements on security goods for:								
Indigenous exports								
commodities to East	Yes	Yes	Yes	Yes	Yes	No	Embargo	Yes
commodities to West	Except U.S.	Yes	Yes	Yes	?	No	No	Except G-COM
tech data to East	Yes	Yes	Yes	Yes	Yes	No	No	Yes
tech data to West	yes	No	Yes	No	Yes	No	No	Mostly No
Foreign-origin exports	Yes	Yes	Yes	Yes	Yes	Yes	?	Yes
Exports from third countries	No	No	No	No	No	No	No	Yes
Single license for multiple shipments to West	Yes	Yes	Yes	Yes	?	No	No	Yes
Import Certificates								
Issues on request	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Request that others issue	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Blocking statute against extraterritorial controls	Yes	Yes	Yes	No	No	Yes	No	EAA Section 8
Number of COCOM exception cases, 83/84	16/48	213/365	17/66	212/230	122/210	--	--	1590/1428
Number of firms on U.S. denial list	2	15	19	18-20	1	23-31	0	65-72

[a] Only if related to specific existing product.
[b] Will issue IC for technology.

APPENDIX C: INTERNATIONAL IMPORT CERTIFICATE (IIC)

	Canada	United Kingdom	France	Germany	Japan	United States
Elements on IICs						
Will not divert	X			X	X	
Will not divert, transship, or reexport		X	X			X
Will obtain prior authorization if not imported into France						
Notify authorities if changes	No	On application	No	No	No	Yes
Reminder about delivery verifications	Most report arrived	On application	No	No	No	Yes
Failure to abide violation of law	No	No	No	NO	NO	Yes
False statements punishable	No	On application	No	No	No	Yes
IICs for Exports						
To government organizations	No, where clearly identified	No	Not sure of criteria	No	No	No
Between lead offices and subsidiary or between subsidiaries	Yes	Can be waived unless for resale		ICs but not DVs unless high-value usually bulk license with end-use certificate and not IC	No exemptions	No exemptions except for Distribution License