Chapter 2

Implications and Issues for Congress

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International collaboration in defense technology is an extraordinarily complex business at best, and is becoming increasingly messy as the old assumptions of the post-WWII order give way to new forms of technical, industrial, political, and alliance organization around the globe. We have entered a period where dramatic restructuring of Eastern European governments and East-West relations has been superimposed on a process of gradual, but significant change in the balance of economic, technological, and military power in the international state system. The context for U.S. arms cooperation with other nations has shifted, not only with regard to dramatic events in Eastern Europe, but also with respect to the lowering of trade barriers and the consolidation of the defense industries in the European Community. U.S. policy on arms cooperation remains wedded to an older, simpler era. It has also failed to adapt to the rise of economic nationalism in the Western Pacific and the development of rival defense industrial bases, both in Asia and in Europe.

WHY COLLABORATE?

Not many years ago, the United States collaborated with its NATO Allies to achieve objectives that were easy to understand but difficult to implement. As the undisputed leader of the Free World, the United States sold military technology to the Allies for the purpose of building up their defense and civil industrial bases that had been devastated in World War II. In the context of the Cold War, the United States sought to enhance the overall military capacities of the NATO Alliance; to achieve economies of scale, interoperability, and standardization of military equipment; and to maintain a coordinated conventional deterrent to a Warsaw Pact invasion of Western Europe. But the period of U.S. dominance of defense technology and markets is over, and the goal of setting and meeting common defense equipment requirements through transatlantic cooperation has not been realized—although efforts to do so are continuing.

Different nations collaborate in defense technology for different reasons. These include the nature of the military threat, the structure of regional security alliances, defense and political ambitions, economic vitality, and the level of technological and industrial development. Israel, for example, collaborates with the United States, and a large number of other countries, because its survival depends on the capability of its armed forces, which was tested in 1948, 1956, 1967, and 1973. It has also benefited through aggressive export of weapons made in Israel. The Republic of Korea (ROK) faces a significant and sustained military threat from North Korea. It has collaborated primarily with the United States because of the strength of the U.S.-ROK security relationship since the Korean War. As the United States contemplates reduction of its troops in Korea, Korean interest in collaboration has increased as a means of building an indigenous defense technology and industrial base. The Koreans are beginning to look beyond the traditional U.S. relationship for new partners, both in Asia and in Europe.

Their close neighbors, the Japanese, have pursued a very different strategy. Japan does not enter into regional security agreements, and has cooperated in defense technology almost exclusively with the United States. Japanese leaders are politically wary of investing in defense technology, and this has freed them to concentrate their assets on technology and manufacturing for consumer markets. Although the Japanese generally prohibit the export of defense technology, they have made an exception in the case of the United States. On the other hand, they have adopted a narrow definition of defense materiel, and impose few prohibitions on exporting dual-use items, even when they ultimately end up in the arsenals of other nations.

In Europe, the situation is somewhat more complex, and it has evolved over time. Today, smaller countries, such as Holland and Belgium, collaborate largely because they do not have the financial resources or industrial infrastructure needed to build state-of-the-art weapons systems that require the development of a full spectrum of advanced technology products. At the other end of the spectrum, the major European powers, Britain, France, West Germany, and Italy, are certainly able to build modern defense systems, but they have chosen to collaborate, often with other European nations, to decrease costs, to achieve economies of scale, to build their technology bases, and because they do not fear the loss of business to foreign suppliers.

U.S. policymakers have tended to view international armaments cooperation as symbolic of NATO Alliance cohesion and the strength of political relations in the West. The U.S. position as a military and economic superpower meant that it could underwrite the security of the West, with little regard to the cost of modern weapons, while its allies viewed cooperation in defense technology in very different terms.

The Europeans saw collaboration as a means of acquiring foreign technology, employing local populations, building up industrial infrastructure, and enhancing overall economic vitality. They have been willing consistently to pay a substantial premium, either in terms of increased costs or decreased military performance, in order to produce weapons systems in Europe. A clear progression in the structure of transatlantic cooperation in military technology has coincided with these largely Eurocentric and national objectives.

Initially, the European powers bought U.S. military equipment through government-to-government foreign military sales programs. But while different nations pursued different strategies, and the details varied significantly from one collaboration to the next, a clear pattern emerged. The next step was to engage in licensed production or coproduction of a limited number of military items, usually because the European ally could not afford to produce the system independently. Soon, however, the acquiring nation demanded a piece of the action, sometimes in the form of a direct offset agreement to produce a component of all future copies of the system in question. The next step was to engage in cooperative codevelopment of the next generation of an existing weapons system. Finally, the acquiring nation or group of nations undertook production of an indigenous fighter, tank, radar, or other system. For most of our NATO Allies, the answer to the question ''why collaborate?' is simple enough: to share costs and to further the drive toward national or regional self-sufficiency in the development and production of military technology and systems.

This process, which might be called ''indigenization, " is somewhat oversimplified above, but it has not been limited to NATO. Our allies in the Western Pacific have also increased their military power by tapping into U.S. defense technology. Japan has long depended on the United States to provide technology needed to produce its military aircraft. Of the 36 types of aircraft flown by the Japanese Self Defense Forces, 9 were purchased directly from the United States, 16 were coproduced, and several are copies of low-technology U.S. aircraft.[1] Part of the controversy over the FSX fighter deal with Japan stemmed from concern in Congress that the Japanese had indeed progressed to the phase of codevelopment of a next generation fighter to follow the F-16. The irony was that the Japanese initially planned for indigenous development of the FSX, and were dissuaded by the efforts of the U.S. Department of Defense (DoD).[2]

The military aspect of international trade in defense technology takes on added dimensions in East Asia, where nations, such as Japan and South Korea view defense collaboration as part of an overall industrial and technology strategy. This can be seen in the way that they have organized their industrial bases to include defense production.[3] The United States appears to be alone among advanced industrial nations in its rigid institutional and legal separation of the production of military and civilian technologies. DoD regulations make it extremely difficult for a large company to organize itself to produce military materiel and consumer products under one administrative roof.[4]

Many European defense executives have commented that Europe does not have a defense industrial base. Instead, major companies that produce weapons also make consumer products and so are part of one integrated industrial infrastructure.[5] In Japan, military and civilian technology are pursued

[1]Richard J. Samuels et al., "Defense Production and Industrial Development: The Case of Japanese Aircraft," MIT Japan Science and Technology Program, 1988, p. i4.

[2]Some observers believe that Japan originally planned to buy a new fighter off-the-shelf from a U.S. defense company. See Clyde V. Prestowitz, Jr., *Trading Places (New* York, NY: Basic Books, Inc., 1988), pp. 10-11.

[3]This aspect will be taken Up in greater detail in the final report of this assessment.

[4]The barriers that exist between the *civilian* and *military* sectors of the economy are examined at length in U.S. Congress, Office of Technology Assessment, *Holding the Edge: Maintaining the Defense Technology Base,* OTA-ISC-420 (Washington DC: U.S. Government Printing Office, April 1989), see ch. 9 and passim.

[5]From a Workshop on Transatlantic Cooperation in Defense Technology—European Perspectives, held at the office of Technology Assessment On Sept. 11, 1989.

under a single industrial structure, where military production typically accounts for less than 15 percent of a company's sales. Because their defense industries are less insulated from civilian economic activity, many Asian and European companies are better positioned to take advantage of the dual-use aspects of technology, to apply advances in consumer electronics, for example, to military systems. Similarly, new military innovations, whether produced at home or acquired through international collaboration, can more easily be engineered into civilian products. Nations and companies collaborate to gain new technology, technology that can be moved from military to civilian applications within the divisions of a single company or group of companies.

Some military analysts believe that the United States must maintain a separate defense technology and manufacturing base if it is to retain its role as a military superpower in international affairs. To be a superpower, it is necessary to produce leading-edge military technologies in many different fields. They distinguish rigorously between dual-use manufactured items, such as advanced semiconductors, that are increasingly incorporated into U.S. weapons systems, and state-of-the-art military technologies needed to build an Advanced Tactical Fighter (ATF), a National Aerospace Plane (NASP), or Strategic Defense Initiative (SDI) systems. Japan excels in the former but is not in the same league with the United States in the latter. Accordingly, the ATF, NASP, and SDI systems would not be built if the Nation relied on the civil industrial base alone, because business would not make the necessary investment in R&D with no civilian market to justify it.

But the argument can be taken a step farther. If the military depends too heavily on dual-use technology, it will lose its leadership position because dual-use technologies are more widely available, and most modern militaries have them. The only reason that the United States leads Europe and Japan in next-generation defense systems is that the United States has made the investment in military-specific technologies that may not have civilian applications for many years, if at all. In this view, the United States will have to retain the kind of defense industrial structure that it has today, including a largely separate manufacturing infrastructure for weapons systems, if it is to retain its superpower status. These analysts argue, accordingly, that a decision to reduce the defense budget drastically in response to the end of the Cold War would also be a decision to abandon leadership as a military power. From a military perspective, these factors tend to militate against international collaboration. As one high-ranking officer put it: "If we want to stay a superpower, we will invest to be ahead of the world in next generation systems . . . Otherwise, we are co-developing and therefore not leading. We lose the superpower label. '

The reasons why the United States collaborates with its allies in military technology are no longer as clearly defined or as universally accepted as they once were. Indeed, the center of gravity in international collaboration has shifted away from government-to-government agreements, which were largely driven by foreign policy objectives and Alliance military strategy. Most collaboration is now initiated on an industry-to-industry basis, where U.S. defense companies enter into licensing agreements, joint ventures, codevelopment arrangements, and business alliances with foreign companies.

The dilemma for policymakers is that the interests of the U.S. defense companies may not coincide with the future national interests of the United States. This divergence will increase to the degree that present negotiations for the reduction of troop levels and conventional forces in Europe are successful. For example, if future arms control agreements ban or obviate the need for planned follow-on forces attack systems, it would no longer be in the interests of the United States to build them, even though revenues for U.S. defense companies would be substantially reduced.[6] Beyond this obvious impasse, there are other, more subtle points of divergence.

Many large U.S. defense companies, for example, seek to increase their international business as part of a strategy to survive large program cancellations and budget reductions in the future. They hope to use international collaboration to enter foreign markets, where demand for their products is still high and profits are not regulated. The motivation behind their international operations is to make money, and properly so, from a business perspective. These

[6]FOFA stands for Follow-on Forces Attack. For a complete assessment of FOFA, see U.S. Congress, Office of Technology Assessment, *New Technologies for NATO: Implementing Follow-on Forces Attack,* OTA-ISC-309 (Washington, DC: U.S. Government Printing Office, June 1987).

companies argue that cooperation allows the United States to exploit foreign technology, to obtain the best defense products at the lowest price, to sell to a much larger market, and to ensure the future viability of the U.S. defense industry.

But from a national perspective, international collaboration can increase U.S. dependence on potentially unreliable foreign sources to unacceptable levels, erode the middle tiers of the U.S. defense industrial base, take business away from U.S. companies and jobs from U.S. workers, and transfer valuable technology to competitors that may later be used to penetrate civilian markets in the United States.

Perhaps most important, industry-to-industry collaboration reduces government control over the distribution of advanced defense technology. In this respect, governments have always controlled the output of the defense companies, because the allocation of sophisticated weapons can change the balance of power among nations in the international state system. Stated more simply, we don't want to sell them something that might ultimately be shot back at us. The privatization of international defense cooperation raises vexing issues for U.S. policy on international collaboration. These are discussed in greater detail in the final section of this chapter.

THE DEFENSE TECHNOLOGY ENVIRONMENT HAS CHANGED

Changes in the balance of both economic and technological power between the United States and its allies in Europe and Asia have reshaped the environment in which cooperation in military technology takes place. But relevant U.S. policies have remained largely the same. Changes in the environment of defense technology, alone, would require different policies and a different approach to cooperation with our allies in the development and production of future defense equipment. Unfortunately, Congress will have to face an already difficult policy environment that has been made more complex by a sea change in relations between the United States and the Soviet Union, and the political restructuring of some half dozen nations in Eastern Europe.

Trends in Defense Technology

Perhaps the greatest change in the past decade is that technology leadership in defense has dispersed around the world. Today, the ability to produce advanced technology with military applications is widespread, and the United States is no longer the leader in some technologies that are vital to military systems. The United States still produces state-of-the-art and next generation defense systems and equipment, and the sheer size of its market and industry creates the illusion that it is far out in front of the European powers, the Japanese, and others.[7] But advances in military and dual-use R&D, technology and manufacturing capacity in Europe and Asia have created rough equality on three continents for many different technologies used in building defense systems. This can be seen in the successful efforts of European defense firms to penetrate niche markets in the United States by forming alliances with U.S. prime contractors. One incentive for the U.S. partner is to gain access to first rate foreign technology; another is to gain reciprocal access to foreign markets.

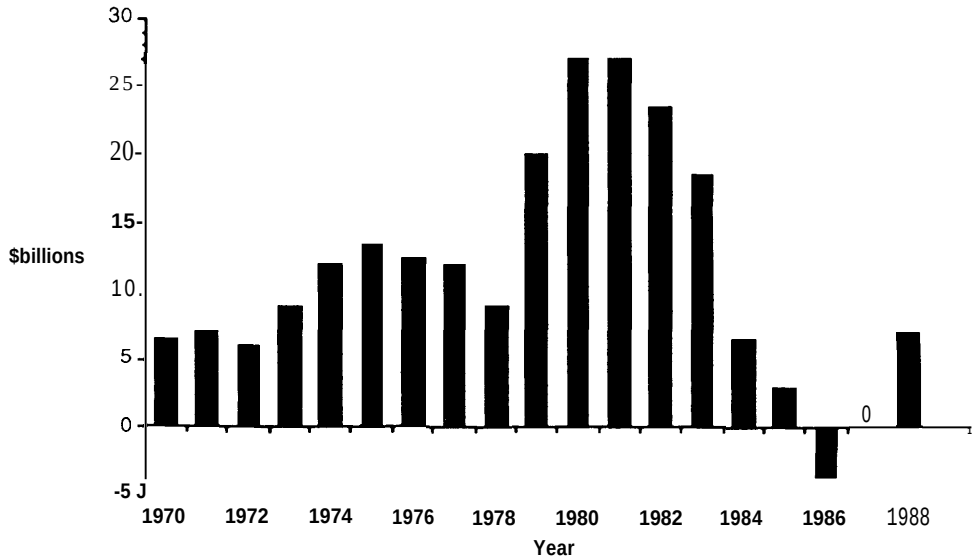
But proliferation of increasingly capable centers of defense technology has also created global overcapacity in many defense industries.[8] By building up the military and industrial capability of its friends and allies, the United States has also helped to create formidable competition for shrinking defense markets. Even before the relaxation of military tensions between NATO and the Warsaw Pact, the defense industries of the West and of the Far East were characterized by growing overcapacity. In South Korea, for example, the defense industry is presently running at 60 percent of capacity. In the United States, Congress and the Department of Defense have funded acquisition and procurement of military systems to support many more production lines than can be justified on both national security and economic efficiency grounds.

The problems associated with technological leveling in the military sphere are linked closely to the fate of U.S. technology and industrial leadership in

[7] Indeed, the United States is a leader in many military fields, such as those related to signature control and nuclear directed energy weapons, that are so expensive or so military-specific in application that other nations have not pursued them.

[8] In the period from 1982 to 1987, world arms imports and exports decreased by 4.6 percent. At the same time, world military expenditures increased by 1.8 percent, indicating that there are fewer foreign outlets for increasing defense capacity. Data taken from tables 1,2, and 4 in U.S. Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers 1988,* June 1989, pp. 2, 4, and 7.

Figure 2-l—Balance of High-Tech Trade, 1970-88



SOURCES: U.S. Department of Commerce and National Science Foundation, 1989.

general. A generation ago, U.S. technology led the world, and military technology in particular was unrivaled. Two trends have changed this picture substantially. The first is that military procurement no longer drives innovation in the United States; much leading-edge technology is now pulled forward by markets for consumer goods. Second, U.S. manufacturing and sales have taken a back seat to foreign competition in one product line after another. Today, there are large areas in consumer electronics where the United States is not a significant player, and emerging technologies, such as high-definition TV, where the United States may never get into the game.

This is a significant problem because the distinctions between military and non-military technology, industry, and markets are breaking down. If the United States cannot compete in international consumer markets, it will ultimately come to depend on foreign dual-use technology in the production of the next generation of weapons. In this context, the U.S. negative balance of trade in high-technology goods with both the European Community member nations and Japan takes on greater weight. (See figure 2-l.) There is substantial evidence that Japanese and European firms produce critical parts and components for U.S. defense systems.[9] Of the 20 technologies listed by DoD in its 1990 "Critical Technologies Plan" at least 15 are dual-use.[10] These include microelectronic circuits, software, robotics, photonics, composite materials, superconductivity, and biotechnology, among others. (See table 2-l.) Japan is a leader in many of these technologies, and exports them to the United States and other countries both for civilian and for military use.

Substantial interdependence already exists between the United States and its allies, from innovation through production, in technologies used in military systems, and it is likely to increase in the future. Dependence is incurred directly by many different types of international collaboration, including joint ventures, strategic alliances, codevelopment, and direct offsets. But it is also built into the structure of global competition and trade in dual-use technology among the advanced industrial, market-oriented countries. It is difficult to imagine a future in which some degree of collaboration in military technology is not economically and technically necessary. These changes in the environment of defense technology necessitate a rethinking of the meaning of national security and its relationship to overall economic competitiveness.

[9]See Martin C. Libicki, Jack Nunn, and William Taylor, ***U.S. Industrial Base Dependence/Vulnerability: Phase II-Analysis*** (Washington, *DC:* National Defense University, November 1987), ch. 3 and passim.

[10]U.S. Department of Defense, *Critical Technologies Plan*, prepared for the Committees on Armed Services, U.S. Congress, Mar. 15, 1990, p. ES-1.

Table 2-1-Summary of Foreign Technological Capabilities

Critical technologies	Dual-use	U.S.S.R.	NATO allies	Japan		Others
1. Semiconductor materials and microelectronic circuits	√	★	☆☆	☆☆☆☆	☆☆	Israel
2. Software producibility	√	★	☆☆	☆☆	☆☆	Various countries
3. Parallel computer architectures	√	★	☆☆	☆☆	☆☆	Switzerland, Israel, Hungary
4. Machine intelligence and robotics	√	★	☆☆☆	☆☆☆☆	☆☆	Finland, Israel, Sweden
5. Simulation and modeling	√	★	☆☆☆	☆☆☆		
6. Photonics	√	★★	☆☆	☆☆☆☆	☆	Various countries
7. Sensitive radars	√	★	☆☆	☆☆	☆☆	Sweden
8. Passive sensors		★★	☆☆	☆☆		
9. Signal processing	√	★★	☆☆	☆☆	☆☆	Sweden, Israel
10. Signature control		★★	☆☆	☆☆		
11. Weapon system environment	√	★★★	☆☆☆	☆☆	☆	Various countries
12. Data fusion	√	★★	☆☆	☆☆	☆☆	Israel
13. Computational fluid dynamics	√	★	☆☆	☆☆	☆☆	Sweden, Israel
					☆	India, China, Australia
14. Air-breathing propulsion	√	★★	☆☆☆	☆☆		
15. Pulsed power		★★★★	☆☆	☆☆	☆	Various countries
16. Hypervelocity projectiles		★★★	☆☆	☆☆		
17. High-energy density materials		★★★	☆☆☆	☆☆☆		
18. Composite materials	√	★★	☆☆☆	☆☆☆	☆☆☆	Israel
19. Superconductivity	√	★★	☆☆	☆☆☆☆	☆☆☆	Switzerland
20. Biotechnology materials and processes	√	★★	☆☆☆	☆☆☆☆	☆☆	Various countries

LEGEND:
Position of U.S.S.R. relative to the United States.
★★★★ Significant leads in some niches of technology
★★★ Generally on a par with the United States
★★ Generally lagging except in some areas
★ Lagging in all important aspects

Capability of others to contribute to the technology.
☆☆☆☆ Significantly ahead in some niches of technology
☆☆☆ Capable of making major contributions
☆☆ Capable of making some contributions
☆ Unlikely to make any immediate contribution

SOURCE: Adapted from U.S. Department of Defense, 1990.

The Future of Collaboration

Deepening detente with the Soviet Union has created vast uncertainties for U.S. defense strategy and policy. It has also introduced a measure of uncertainly into the economic and political future of the European Community. While it is difficult to remove the clouds from the crystal ball as yet, there are some constants. First, the trends in defense technology, identified above, are unlikely to be reversed by these political events. Instead, they will probably be aggravated by dramatic movement associated with the end of the Cold War. For example, the Bush Administration has already suggested reducing the barriers to technology transfer to Eastern European nations. In time, high-technology centers may evolve in countries that are now members of the Warsaw Treaty Organization, especially if German reunification proceeds quickly or if the European Community is expanded to include one or more of the Eastern European states.

Of more immediate concern, problems of overcapacity in the defense industries will be compounded as defense budgets fall, both in the United States and in Europe. This has profound implications for the structure of the defense industries and the kinds of international collaboration that will be undertaken. Fundamentally, future defense collaboration is tied to the future of the defense industries. As defense business declines, is not clear whether international collaboration will be used to create new efficiencies in defense production, or whether regional and national policies will be instituted to bolster indigenous defense industries.

The motivations that led the United States to collaborate with its allies in Europe have been weakened, if not altogether removed, by changes in the balance of transatlantic economic and technological power, and by the rush of recent events in Eastern Europe. The United States collaborated to build up Allied defense capacity, and as a symbolic enterprise to enhance the stability and cohesiveness of NATO. But as the U.S. lead in defense technology declines, and as the economic and technological strength of Europe expands, U.S. policy is becoming increasingly anachronistic. Similarly, as the threat of Soviet aggression recedes, and U.S. influence in NATO diminishes, enhanced European collabora-

tion in defense technology may become a vehicle for political consolidation of NATO Europe, replacing former U.S. efforts.

But the future of transatlantic collaboration, as well as cooperation with allies in the Western Pacific, does not depend on government policy alone. Industry-to-industry collaboration, the dominant form of defense cooperation, requires only an official nod, and is motivated by factors more tangible than alliance relations. It depends as much on the ability of large defense companies to engage in and make profits from defense markets around the world. Changes in U.S. Government policy, recent political changes in Europe, and changes in the environment of technology will all influence the structure of the defense industries in the near term, both in the United States and around the world. The remainder of this chapter discusses the structure of the U.S. defense industries, U.S. defense industrial policies, and the issues that are likely to require congressional consideration in the 101st and 102nd Congresses.

CHANGE IN THE DEFENSE INDUSTRIES

Over the past decade important sectors of the U.S. defense industry have internationalized their operations to respond to global changes in the environment of defense technology. In discussions with OTA staff, several of the largest defense contractors indicated that they conduct 15 percent or more of their defense business on an international basis. Because international operations are not as closely regulated by the U.S. Government, this 15 percent often translates into more than 25 percent of profits, adding pressure for increased penetration of foreign markets.[11]

These companies would like to follow the lead of their civilian sector counterparts or parent companies, and conduct operations on a global scale, exporting production and even R&D when it makes business sense. They have not been able to do this because U.S. defense policies have combined to make global operations less attractive or to prohibit them altogether. As one top defense executive put it:

> We are exporters. We are not a global company because we have retained most of the capability for production in the United States. But we are international in our operations, in buying and selling, in joint ventures, strategic alliances, and in codevelopment and production arrangements. The best thing government could do for our international business would be to get out of the way.

The industries that supply defense equipment and conduct defense R&D in the United States can be divided into three broad groups. They are and will be affected differently both by U.S. policy on international collaboration and by projected reductions in defense budgets. The first group is comprised of some 50 of the largest defense contractors through which approximately 60 percent of the acquisition budget flows.[12] (Figure 2-2 displays the 20 largest defense contractors and their total contract awards in fiscal year 1989.) These companies, among others, have the capacity to enter into sophisticated international ventures. They are pursuing a number of strategies to cope with anticipated program cancellations and budget reductions.[13]

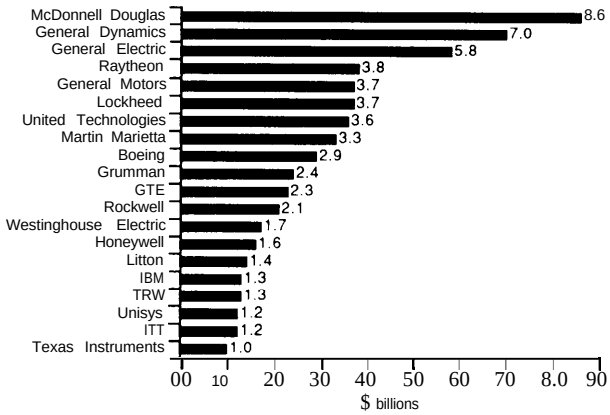
First, they are seeking additional international business and access to new foreign markets where profits are greater because they are not subject to regulation by the Department of Defense. Second, they are tightening their belts by dropping unprofitable operations and reducing their work forces. One of the largest companies is now in the process of laying off approximately 15,000 workers. Finally, they are working more closely with a smaller number of suppliers, and moving attractive production opportunities in-house as a way to increase revenues in a declining domestic market. By making these changes, these large companies hope to improve their chances of remaining in business during the coming defense downturn. There is a good chance that some will not.

[11] Some analysts believe that foreign business is more profitable because fixed costs are amortized over U.S. production only, leaving a larger profit margin for foreign sales at the same unit price. However, defense company executives argue that foreign sales reduce costs to the U.S. Government because they increase production runs, thus introducing economies of scale.

[12] Figures calculated from "The Top 200 Defense Contractors," *Military Forum*, vol. 6, No. 1, August 1989, pp. 15-16.

[13] Many of these companies borrowed a great deal of money to invest in the development of new weapons systems during the Reagan Administration defense build-up, systems that may never be produced. Defense companies have written off about $2 billion over the past 2 years, including Lockheed Corp. ($500 million), Northrop Corp. ($337 million), Honeywell Inc. ($200 million), Unisys Corp. ($150 million), General Dynamics ($125.8 million), McDonnell Douglas Co. ($124 million), and United Technologies ($1 14 million). *Defense News*, vol. 5, No. 3, Jan. 15, 1990, p. 25.

Figure 2-2—U.S. Defense Contractors by Prime Contract Award, Fiscal Year 1989



SOURCE: Data from U.S. Department of Defense, 1990.

Not all sectors of the defense industries are able to pursue these strategies. A second group of companies, sometimes referred to as the defense subtiers, depend on a chain of subcontracting arrangements descending from the first group of companies, the large system integrators, for most or all of their business.[14] They are largely U.S.-owned, and most do not possess the financing or the know-how to enter into international business arrangements. They include large electronics houses as well as small, specialized machine shop operations. In recent years a small percentage of them have been bought by large foreign companies that seek an American presence as part of a long-term strategy of penetrating the U.S. defense market. In the past these subtier companies have been protected from the forces of international competition by a variety of defense policies. But the increasing internationalization of defense business poses a competitive threat to them. In the context of a defense downturn, they tend to view international defense business as a less-than-zero sum game. They have benefited from participation in the largest and possibly most protected defense market in the world. They will likely sustain heavy casualties in the context of shrinking defense budgets, opening defense markets, and global overcapacity in defense production.

A final group of companies that supply parts and components for defense resides at the lower tiers in the chain of subcontractors. These are companies that do most of their business in the nondefense sector of the economy. Many operate globally and produce high-technology products; some do not maintain manufacturing operations in the United States. Because they do not depend on defense for any substantial part of their sales, most will be only marginally affected by changes in U.S. defense policies and by declines in domestic defense production. These companies are also largely exempt from the defense regulations that influence firms higher up the subcontracting chain because DoD specifications, regulations, and auditing procedures usually cannot reach them.[15]

These companies produce many of the dual-use technologies that were listed in the DoD "Critical Technologies Plan" and that are used in U.S. defense systems. Because there are often many levels of subcontractors between the dual-use suppliers and the initial prime contractor, DoD has few records that describe them as a group.[16] Most of them would probably be unwilling to tolerate the government scrutiny that is typical in defense contracting at the middle and upper tiers of the defense industries. This group is important to defense, however, because they develop much of the innovative and leading-edge technologies needed for next generation weapons systems. But their involvement in defense is a double-edged sword; the technologies and products these companies supply also introduce a large measure of dependence on foreign industry and sources.

DEFENSE INDUSTRIAL POLICY: WHAT HASN'T CHANGED

In considering any future policy framework for international defense cooperation, Congress may wish to take into account the strengths and vulnera-

[14]The large companies in the first group often perform subcontractor work for other large companies (and occasionally for smaller ones). Companies in this second group can be prime contractors, but usually are not. Some provide finished products that are sold di.met.ly to the government (e.g., radios, boots, pistols, etc.), but most produce parts that are integrated into larger systems (e.g., signal processors, sensors, fuel tanks, motors, etc.).

[15]For purposes of contract compliance, a prime contractor relies on its second-tier contractor to confirm that all subcontracted goods are produced to specification. There are some auditing and compliance procedures at this level. But the second-tier subcontractor relies in turn on the assurances of the third-tier subcontractor, and soon down the line. At some point, the auditing trail ends, and the government is unable to determine who the actual supplier is, and whether the part or other item in question was foreign-soured.

[16]As one influential member of the Defense Manufacturing Board put it, "Once you get down below the level of the primes, DoD doesn't know what in the hell is going on."

bilities of the different industrial sectors that supply defense. To a great extent, U.S. Government policy already shapes and controls the structure of the defense industries, the international arrangements they may engage in, and their access both to domestic and foreign defense markets. European and other foreign observers have long insisted that in matters of defense industry and technology, the United States does have an industrial policy. They have been quick to add that it is an awkward and inefficient one. Nevertheless, the U.S. defense market is highly protected; DoD routinely picks winners and losers, especially in the winner-take-all sweepstakes for major weapons systems; DoD supports excess capacity, most notably in the aerospace industry; and DoD regulations result in separate defense and nondefense industry operations.

How does U.S. policy ensure a largely protected marketplace for domestic defense companies? Compliance with the Defense Federal Acquisition Regulations alone is so complex that few foreign firms can manage it without a significant U.S. presence. In addition, the security classification system serves as a major nontariff barrier to foreign entry into the market. When a U.S. defense company is acquired by a foreign-owned corporation, its security clearances can be withdrawn, and it may be required to shut its doors to further work until the clearances are restored. Depending on the nature of the defense work and the ownership of the company, this can be a long, drawn-out procedure, and reinstatement of clearances can be denied for a variety of reasons that are difficult to challenge. Accordingly, many foreign firms that seek to penetrate the U.S. market form alliances with or become subcontractors to established U.S. prime contractors, and avoid equity investments in U.S. defense companies.

In addition, scores of major U.S. defense programs are 'black' or special access programs. This means that they are so highly classified that information about the program is compartmented, so that even the contemplated scope of work is unavailable to foreign fins. Projects on the scale of the B-2 bomber have been classified as entirely special access programs. By making a program 'black, ' the DoD has, in effect—if not by intention-protected participating U.S. industry from unwanted foreign competition. During the Reagan Administration spend-up, an unprecedented number of programs, and a large percentage of the acquisition budget, was dedicated to special access activities.

Beyond this, dozens of U.S. laws contain "buy American' provisions that are applicable to defense procurement.[17] Although some buy American legislation can be waived on the authority of the Secretary of Defense, as is routinely done in country-specific, reciprocal memoranda of understanding, these provisions set a tone and preference that is adhered to by many DoD officials. Finally, there is a strong bias against foreign technology that stretches the length of the chain from the Services, though the Office of the Secretary of Defense up to Congress and back. In addition, many DoD officials hold the view that foreign defense technology is inferior to that produced in the United States. The overall effect is that most U.S. defense work is done by companies owned and operated in the United States, and that the various mechanisms for international collaboration form an exception to the rule.

Finally, under mobilization base rules, DoD may restrict a procurement to the North American industrial base if it finds that the product or component in question is necessary to sustaining critical U.S. production capabilities in times of crisis or conflict. In practical terms, foreign companies have *come* **to believe that they** must locate facilities in North America in order to sell to DoD, although a mix of off-shore and on-shore production is often sought as **a** compromise.

A variety of U.S. laws and regulations create de facto separation of the defense and civil industrial and technology bases in the United States. In general, companies in the upper and middle tiers of the defense industries do most of their business with defense customers, domestic and foreign. This situation did not arise because executives made a decision to be in defense work and to reject nondefense opportunities. It occurs because U.S. laws, DoD regulations, and auditing procedures virtually require that a company organize itself to do nothing but defense work, and do it in ways that are not cost-effective in the civilian sector.

The fact that many U.S. defense companies depend on defense contracts for most or all of their business makes them more vulnerable to defense downturns than the competition in Europe and

[17]See U.S. Department of Defense, "The Impact of Buy American Restrictions Affecting Defense Procurement," July 1989.

Japan, where defense and nondefense work is more often and more easily integrated into a single corporate structure. Suppose, for example, that defense production is reduced by 50 percent, both in the United States and in Japan. A U.S. company that conducts 85 percent of its business in defense might be forced to close its doors. Its Japanese counterpart, that depends on defense work for only 10 percent of its business, would be able to absorb the cuts far more easily. In addition, because it combines civilian and defense operations under a single administrative roof, the Japanese company may be better positioned to convert its defense manufacturing to production for civilian purposes. As Congress grapples with the question of converting the defense industries to nondefense operation, it may be necessary to begin by eliminating the legal and administrative impediments to conversion.

POLICY ISSUES FOR THE 1990s

If Congress can make defense industrial policies, Congress can also change them. If the policies that created the structure of the defense industries and control international collaboration in defense technology are inadequate or irrelevant to today's circumstances, Congress can revise them. Congress faces an unprecedented situation and a unique opportunity in trying to ensure the future national security of the United States. Many aspects of today's defense policies, particularly those that affect international collaboration, are inadequate or counterproductive. Consequently, Congress will have to address a number of difficult policy choices, if it is to be a major player in the adjustment and restructuring of the defense industries.

In this, as in so many areas, Congress finds itself between a rock and a hard place. Many analysts will urge caution because so much uncertainty exists as to the nature of future military threats, the successor failure of *perestroika*, and the affect of German reunification on East-West relations and the economic integration of Europe. They would stay the hand of Congress until more is known.

Alternatively, if Congress fails to act, the defense companies will move to restructure their domestic and international operations in response to economic forces. Many large defense companies are now for sale, but as yet there are few takers. As budgets fall, companies that are able to get out of the defense business may do just that, leaving behind the less capable that have few options. Accordingly, the United States may end up with a defense industrial structure unable to meet the future defense needs of the Nation.

Revamping the Defense Industrial Base

The frost two issues relate to basic structural flaws in the organization and operations of the U.S. defense industrial sector. In a time of plenty, when U.S. defense technology was preeminent throughout the world, large scale inefficiencies, such as the separation of defense and nondefense manufacturing infrastructure, and the protection of defense industry, could be sustained. This is much less true today, and will soon present an acute problem to Congress, as demand for defense equipment dwindles, and competition among the defense industrial and technological centers of the world drives many firms out of the defense business.

Issue 1: Protecting the Defense Industries

U.S. policy has been to protect the defense sector from most forms of international competition. So long as the defense industries were strong in the United States, and there was little competition from abroad, the degree of protection was not a significant issue, except to our Allies who complained that the "two-way street" in NATO armaments cooperation was a superhighway to Europe with a dirt road back. In recent years, however, direct cooperation between U.S. and foreign companies has increased international exchange and commerce in defense technology. Moreover, the environment of defense technology has changed so significantly in the past decade, and promises to change even more radically over the next few years, that the fate of the defense industries, both here and abroad, is uncertain.

In the context of diminishing defense dollars and worldwide overcapacity, demands that Congress do something to assist the domestic defense industry are certain to mount, particularly as congressional districts register the impact of increased international competition and decreased production, and most directly when plants close and jobs evaporate.

These demands will be difficult to resist, and will emanate from different sectors of the defense industry. They are likely to defy panacean remedies, and will probably create conflicting initiatives within the executive branch. The large companies will lobby for increased internationalization of the

defense industry, so that they can have freedom and flexibility to enter into deals that make money, irrespective of the impact on the domestic industrial base. Thus, they will ask for relaxation of technology security controls, and for policies that promote greater access to foreign markets.

On the other hand, many of the smaller, middle-tier subcontractors would likely view increased internationalization and openness in the U.S. defense market as a disaster. Many believe they will lose subcontracts to large foreign firms, who will work with their own supplier bases, and there will be far less business in the United States. Foreign governments and defense firms would of course demand reciprocal penetration of the U.S. market, and the ability to sell U.S.-origin technology and components to third country arms markets.

As Congress moves toward reauthorization of the Defense Production Act, and proposes related legislation to support the U.S. defense industrial capacity, it will have to balance the need to retain a strong defense industry at home against the increasingly internationalized character of large U.S. companies, defense technology, and defense markets. There is concern in many quarters that the defense industrial base in the United States is eroding quickly, although the data that supports this thesis is weak, and there is a movement in Congress to do something about it. One prominent approach is to define what a U.S. company is, and then to create preferential treatment for U.S. companies through a variety of mechanisms.

It is extremely difficult, however, to define what a U.S. company is in a way that supports domestic R&D and production of defense materiel without: 1) excluding a great many capable firms (both defense and civilian) already producing in the United States, and 2) damaging the international business and profitability of the largest U.S. defense companies that are committed to international business relationships with foreign companies. In would be ironic, indeed, if policy frees aimed at strengthening the defense industrial sector led to the collapse of the international business of large U.S. defense companies.

The policy dilemma here is that the interests of different sectors of the defense industries can easily be pitted one against the other. A prudent strategy would encourage a strong domestic defense industrial structure and, at the same time, recognize that international business cooperation in defense has become a very important element in the overall picture. Beyond a doubt, the actions that Congress takes in this area will become increasingly important as the defense industries restructure their operations in response to anticipated budget declines. Ultimately, a sound policy will assist in managing the transition of the defense industrial base to a lower level of defense activity and into productive civilian enterprises.

Autarkic policy fixes are likely to exacerbate the problem. Rigorous enforcement of buy-American legislation, a surcharge on foreign-produced defense materiel, or a blanket requirement to tighten protection over a 5-year period would likely hold undesirable consequences for the U.S. defense community and for international relations. First, it would decrease U.S. access to advanced foreign defense technology. Second, it would weaken the incentive for some U.S. defense companies to stay at the leading edge (and might increase costs) because companies would have a guaranteed market. Moreover, with reduced competition, there would be even less incentive to modernize plants. And finally, increased domestic protection would engender reciprocal protectionism abroad, with the result of sharply decreased profits for the largest U.S. defense aerospace and electronics industries.

On the other hand, a policy that opened the U.S. defense market, relaxed technology security controls, and encouraged international collaboration would create stiffer competition for the smaller and middle-tier defense companies. In addition, in the context of a general reduction in Western defense budgets, opening markets might also create vulnerabilities for some of the largest U.S. defense companies, particularly those that have recently posted poor earnings, are now for sale, or teetering on the verge of bankruptcy. In the increased competition that would result from such a policy, structural overcapacity in many vital sectors of the U.S. defense industries might lead to the closing of major divisions or companies, probably starting in the aerospace sector, where competition for limited business is already intense.

Clearly, expected contraction of the defense industries places Congress in a delicate position, where conflicting demands of powerful interests must be balanced against the national security. Accordingly, when Congress debates new measures

to support the defense industries, or to convert defense production to civilian purposes, a first order issue will be the need to develop a strategy that defines an acceptable level of defense R&D and industrial capacity, that must be maintained in the United States. Cost will bean increasingly important factor. Part of this analysis would focus on how to achieve a more integrated approach to civil and defense manufacturing, with the recognition that a great deal of technology for future defense systems will be designed, developed and even produced in the commercial, nondefense sector.

Issue 2: Integrating Defense and Civil Manufacturing

A large number of studies and high-level reports have called for reform of the acquisition system that DoD uses to procure defense goods and weapons. They have cited continuous cost overruns, spare parts horror stories, a lack of open competition, interservice rivalries and duplication of weapons systems. Such reports and attempts at reform have caused confusion and consternation within the defense industrial sector, but have generally failed to make defense procurement either more efficient or less expensive. There continues to be the perception that the more Congress tries to fix the system, the worse it seems to get.

As OTA previously reported, many of the rules and regulations that make defense industry inefficient and cumbersome were motivated by conscientious lawmakers and officials who sought to protect the public interest, and to eradicate fraud and abuse in matters relating to public funds. But the cumulative effect of regulatory controls is that the vast bureaucratic overhead of government has been extended into and replicated within the defense industry itself. These rules and regulations have created substantial barriers between the defense and civilian industrial sectors.[18]

One result is that much potentially useful R&D and productive capacity in the civil sector has been decoupled from defense, probably to the detriment of both sectors. Among advanced industrial nations, the United States is the most extreme in the separation of defense R&D and manufacturing infrastructure from the larger civilian economy. Both in Europe and in Japan, companies that build defense systems have large scale civilian operations as well. For this reason, they are better positioned to take advantage of dual-use technology than are the more highly defense-oriented companies in the United States.

In the United States, several of the largest defense prime contractors are wholly owned subsidiaries of civilian companies. In discussions with these firms, OTA staff were told that defense and civil divisions do not share accounting, financial, personnel, or other management systems, and in most cases, they cannot even share technology. In one corporation, the company makes satellites both for the military and for civilian customers. Even where the mission of the satellites is similar, the two divisions do not share data, technology, personnel, R&D or manufacturing facilities.

Defense companies tend to focus on meeting government requirements and have had little incentive to stay at the leading edge of manufacturing technology. They have been able to do so only because they are supported by government. If a civilian industry falls behind in technology innovation or in manufacturing technology, it will soon be supplanted by foreign competition. On the other hand, most civilian companies do not know how to meet all the requirements in the defense world. To qualify and conduct business with DoD or its prime contractors, civilian firms would be forced to reorganize all phases of operations to meet government regulations and specifications. The result is that legal and administrative requirements have built rigid barriers between the civil and military sectors of the economy, forcing DoD to maintain separate corporate and manufacturing infrastructures dedicated to defense.

This way of doing business runs counter to world trends in R&D and manufacturing, where technology is increasingly viewed as generic or dual-use, and then is applied to military or civilian purposes. In many Japanese and European companies, technology developed for consumer markets is modified and then applied to military systems. In order to implement this kind of technology path in the United States, it would frost be necessary to change the way the defense business is conducted in fundamental ways.

[18] *Holding the Edge*, op. cit., footnote 4. See ch. 9 and passim.

Congress faces a situation where radical action may be necessary because most of the quick frees (and some hard solutions) have been tried and have failed. But recent and ongoing changes in world politics and in the global environment of defense technology now offer opportunities that may not have been available in the past. This Congress and the next will have to choose between managing the down-sizing of the defense industrial sector or letting it be dismantled piecemeal in corporate board rooms by managers seeking to cut their losses and get out of the defense business.[19] Clearly this is an uncomfortable debate involving political risks to members on one hand and risk to the security of the Nation on the other.

But it is precisely this environment that creates the opportunity and the forum in which to question seriously the necessity for maintaining a separate and highly inefficient R&D and manufacturing infrastructure dedicated to defense.

The Role of Government in Defense Industrial Cooperation

A second set of issues is closely related to the first. It focuses on the appropriate conduct of government as regards the international activities of the largest defense corporations and the middle-tier companies that support them. The present policy framework is inconsistent because, at one and the same time, it promotes internationalization of U.S. industry, hinders its operations and opportunities, and attempts to protect the domestic market from significant or unwanted foreign competition.

Issue 3: Globalization of the Defense Industries

The largest defense companies are not global in the sense that the largest commercial multinational corporations are. Governments, by tradition and of necessity, exert far stronger controls over the business decisions and prospects of the defense companies. This is true even when a large defense firm is wholly owned by a commercial conglomerate. Most large defense companies have only recently learned to go beyond foreign military sales, and to collaborate on an international scale. They have retained the major portion of their R&D and manufacturing facilities within the continental United States. While the largest defense companies increasingly enter into codevelopment, coproduction, joint ventures, and strategic alliances with foreign firms, most are U.S.-owned and operated, and they are subject to extensive regulation by the U.S. Government.

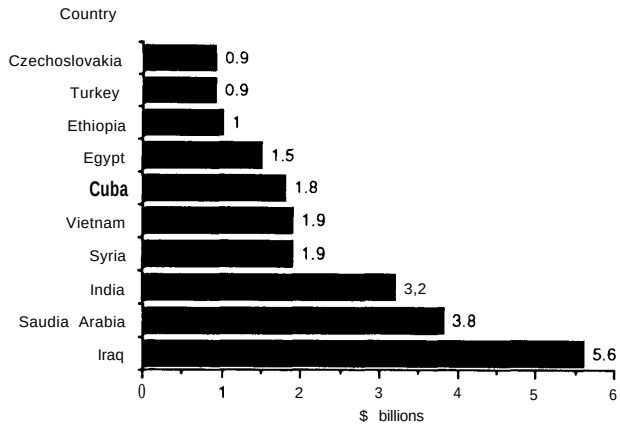
Nevertheless, the distinction between an international company and a global one is largely a matter of degree. The policy problem centers on how to regulate sales abroad of U.S.-made weapons in the presence of an international or global arms industry. For example, intense lobbying pressure will be focused on Congress to relax foreign policy controls on sales of weapons to Third World countries. These controls are used to limit both the kind of technology that can be exported or transferred, and to designate countries that may or may not receive U.S.-origin defense materiel.

During the 1990s, as Western Europe and Japan become better able to satisfy their own defense needs, sales of military equipment and related technology transfer to Third World nations will be an increasingly important issue. As Third World conflicts go high-tech, U.S. defense contractors (and the European competition) will seek to expand foreign sales as a means of balancing reduced sales at home. (See figures 2-3 and 2-4 on arms imports and exports.) The risks associated with these sales and transfers are greater because these countries are more independent and less aligned to U.S. interests than the countries that were the recipients of U.S. equipment and technology transfer in the 1970s. Clearly, the task of deciding which militarily relevant technologies may be sold to which countries is an inherently governmental function. A policy that permitted the sale of defense technology to the highest bidder, without regard to nonproliferation, arms control, or to other foreign policy considerations, would increase sales for the defense industries. Indeed, many defense executives believe that they have lost sales to foreign competitors due to overly restrictive, unilateral U.S. controls.

As the US. defense giants become increasingly international in scope and operations, Congress will have to decide what controls can and should be maintained and/or imposed on them. This will require a delicate balance, particularly with regard to the European powers that are now consolidating and concentrating their arms industries, partly to obtain economies of scale and partly in response to the overall economic integration of Europe pursuant to the Single European Act. It is unlikely that U.S. defense assets should be considered closely in this regard.

[19] The recent decision of the Ford Motor Co. to divest itself of

Figure 2-3-Leading Arms Importers, 1987



SOURCE: Data from Arms Control and Disarmament Agency, 1988.

allies, who have always paid more attention to the economic aspects of armaments cooperation, will be anxious to increase controls over the sales of their national or regional arms industries as world demand for defense commodities diminishes.

Issue 4: The Appropriate Level of Defense Technology

The Cold War engendered apolitical and military stability in the West unknown throughout the first half of the 20th century. Even if many in Congress felt that the arms race was a dangerous and extravagant proposition, they could not deny that the stand-off between NATO and the Warsaw Pact had brought peace to all of Europe for more than 40 years and prosperity to the West. At this writing, with the nations of the Warsaw Treaty Organization in political disarray, and tens of thousands of protesters demanding democracy in the streets of Moscow, much is uncertain. At a minimum, the consensus on the Soviet threat that supported high levels of defense spending, as well as collaboration in defense technology between the United States and its allies in Europe, has begun to unravel.

Congress and the Administration face a new political environment and new economic challenges as they begin to address the amount and kinds of defense technology and systems that are necessary to ensure the future military security of the United States and its allies. In the Cold War era, a principal **strategy** of the U.S. armed forces was to counter superior numbers of men and equipment with superior technology. This meant that military planners generally sought to use state-of-the-art technology, and even to push the leading edge farther out by incorporating anticipated innovations into future weapons systems. The amount of effort needed and the bottom line became secondary considerations. One result was a never-ending competition in the development and production of armaments between the United States and the Soviet Union. Another was a constant upward pressure on the defense budget as the costs of high-performance, high-technology systems escalated.[20]

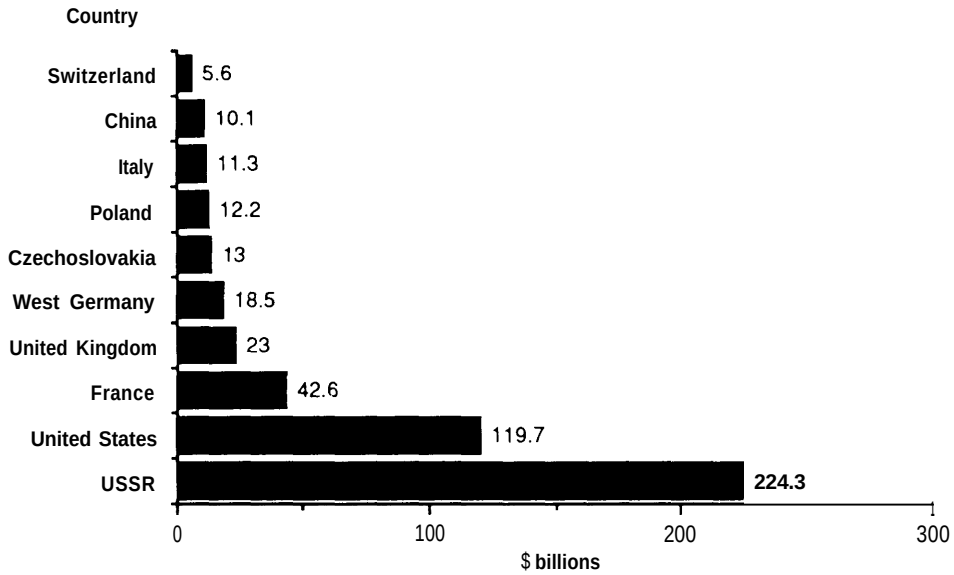
An agreement, in principle, to reduce and limit U.S. and Soviet troop levels in Europe has recently been reached,[21] and subsequent agreements to reach parity in conventional armaments are now being negotiated in Vienna. It is now at least conceivable that the nature and extent of the preparations to meet the Soviet threat will be determined in the future not by an arms race, but by arms control and verification regimes that designate the numbers and kinds of systems to be built and deployed by the United States, the Soviet Union, and their respective allies. This would, of course, exert a profound influence on international collaboration in defense technology, because it would create a new set of governmentally imposed constraints on the defense industries.

As Congress considers the nature of the military capability that will be necessary in the future, the issue of the technical sophistication of forces, units, weapons systems, and equipment, and the associated costs, will become increasingly important. Congress may wish to reconsider the underlying strategy that calls for designing next generation and even notional technologies into weapons systems. As noted earlier, these tend to be military-specific in character, with few or no civilian applications. It is possible that large scale substitution of dual-use for military-specific technologies might ultimately undermine the position of the United States as a military superpower—because dual-use technologies would be available to many nations. In time, the U.S. military position might degenerate to the status of first among equals.

[20] Some analysts argue that technological complexity is also a factor both in rising costs and in the lengthening time it takes to get new weapons into the field.

[21] The Soviet Union and the United States have agreed to limit troop strength in central Europe to 195,000 on each side, with the United States permitted to maintain an additionat 30,000 troops in other parts of Europe. *New York Times,* Feb. 14, 1990, p. A-1.

Figure 2-4-Arms Exports, Cumulative Sales, 1977-87



SOURCE: Data from Arm Control and **Disarmament** Agency, 1988.

Nevertheless, Congress will likely experience unrelenting pressure to get on with the business of peace, to collect the "peace dividend," and to reorient defense spending to reduce budget deficits and to meet pressing social service, environmental, and other domestic needs that have been neglected over the past decade.

Issue 5: Military Dependence on Foreign Technology

In the long run international collaboration in defense technology generates dependence. This is obviously the case in direct offset agreements, where a foreign coproducer of a weapons system may demand and receive the right to supply a particular part or component for all future copies of a given system. The original developer of the system would have little reason to retain such a capacity when rights to produce it have been given to a foreign supplier. For many years, DoD has avoided involvement in offsets, but to little effect, because offsets have become just one more trading chit that may be necessary for a U.S. firm to clinch an international deal. Beyond offsets, most forms of international collaboration contribute to the dispersion of technical capacity, and ultimately to dependence, if for no other reason than the U.S. company draws on the technical expertise of its foreign partners to build the part, component, or system in question.

A second kind of dependence arises in the context of dual-use technology, and the global structure of the civilian industries whose technology ultimately ends up defense systems. As discussed previously, these are the companies about which the U.S. Government knows the least, but through which much dependence has been introduced into defense systems. OTA made substantial efforts to obtain quantitative data regarding the amount of foreign content in U.S. weapons systems. The government does not maintain such data, because there is no audit trail that penetrates much below the level of the second tier contractors. OTA also approached several large prime contractors and was told that they do not provide data on foreign content in specific systems because they have no mechanism to capture it. Several stated that it would a very costly and difficult task, and that it would not be possible to track the country of origin for many parts and components.

The debate over military dependence on foreign technology is often stated in terms of its potentially detrimental impact on the ability to mobilize for a prolonged war. But like many other defense issues, foreign dependence must be cast in new terms, given changes in the environment of defense technology, and recent dramatic movement in political and military relations between East and West. Logically,

it makes sense to worry about military dependence on foreign technology when such dependence poses a military threat, and when a nation is in a position to do something about it. For decades, the European powers depended on U.S. defense technology in a way that is unacceptable and unthinkable to most Americans. Rather than posing a threat to the Europeans, military dependence on the United States both enhanced European security in the near term, and became a means of acquiring technology that could be used to rebuild their industrial bases. Over time, the Europeans have been able to decrease their dependence on the United States substantially. Using U.S. technology as a base, they learned to build systems at home, systems that usually cost more and were somewhat less capable than systems available through U.S. foreign military sales programs.

The European experience teaches that there may be some kinds of foreign dependence that can be tolerated more easily than others. This distinction underlies the present effort in Congress and elsewhere to identity technologies that are critical to the military. It is closely associated with the argument that a nation must retain R&D and industrial capacity in certain essential technologies in order to maintain its international trade position, and ultimately the standard of living of its population. The military and civilian threads of this argument are, of course, joined in the notion of dual-use technologies, which in many cases, turn out to be critical technologies both in defending the territorial integrity of a nation and in maintaining its economic vitality.

This is also the point where the relationship between economic well-being and national security becomes transparent. In the long term, it is unlikely that the United States will be able to ensure its future military security if it cannot compete in civilian markets, markets that produce both the wealth necessary to fired the common defense and, increasingly, the wealth necessary to conduct the R&D and manufacture of future critical dual-use technologies.

If Congress decides to address the question of military dependence on foreign technology, it will first be necessary to collect data or to establish some measures of the extent and exact nature of the phenomenon in question. It will then be appropriate to decide how much and what kinds of dependence can be tolerated. The other way to approach the problem is, as suggested above, to define critical technological and industrial sectors that must be maintained in the United States, both for economic and for military reasons, and to take steps to ensure that they are supported.

Issue 6: Technology Transfer and Security Restrictions

Throughout the 1980s, DoD pursued a conservative policy regarding transfer of militarily relevant technologies to foreign governments and companies.[22] It was based on the assumption that the Soviet Union and its Warsaw Pact allies seek to acquire Western technology to aid them in developing modern weapons and systems, from every possible source, using all available means. This assumption appears less well-grounded today in light of the political dissolution of the Warsaw Pact, and political and economic changes sweeping the Soviet Union.[23]

At this writing the Bush Administration is contemplating major policy changes in the administration of export controls, both for militarily critical and dual-use technologies. The President has ordered a national security review, to be carried out by the Joint Chiefs of Staff and by the intelligence community. There is strong pressure from the U.S. business community and from the Coordinating Committee (COCOM)[24] nations to relax controls on technology to Eastern Europe. The U.S. strategy appears to be to reach agreement on a small number of technologies that must be controlled, and then rigorously enforce that regime. Some DoD officials have expressed concern over this plan because they believe that the intelligence services of the Eastern European nations are still intact and in full communication with their Soviet counterparts.

[22] Both DoD and the Department of Commerce implemental initiatives to convince the NATO Allies to tighten export restrictions On technology. They pressed for stronger administrative controls, and for expansion of the powers of the Paris-based Coordinating Committee (COCOM). The policy objective was to stem what some DoD officials described as a hemorrhage of Western technology flowing to the East.

[23] Technology security policy has been the subject of considerable debate since 1987, when a National Academy of Sciences panel on national security export controls, chaired by former U.S. Air Force Chief of Staff Lew Allen, issued a report sharply critical of U.S. export administration policy and practices and recommended sweeping changes in the export control process. ***Balancing the National Interest: U.S. National Security Export Controls and Global Economic Competition*** (Washington, DC: National Academy Press, 1987).

[24] COCOM is a voluntary body which oversees East-West trade to ensure that Soviet and Warsaw Pact military power is not aided by this trade.

Congress will soon address the next reauthorization of the Export Administration Act (EAA), part of the current legislative authority for U.S. export controls. The EAA, which has twice been amended since its passage in 1979, is set to expire on September 30, 1990. As Congress considers this legislation, it will be necessary to determine whether the statute remains adequate in the face of recent developments and can therefore be retained or amended without fundamental changes; or whether substantially new policies are required to meet changing technological, political, and economic circumstances.

As written and administered today, export controls over technology constitute a de facto and unintended policy to regulate the kinds and amount of international collaboration that U.S. defense companies may engage in. They have also inhibited the international business prospects of U.S. civilian companies because U.S. unilateral restrictions and interpretations of COCOM rules are more strict than those of other COCOM nations. Congress may decide to limit the international activities of U.S. defense companies, but if it does, it should do so purposefully, and not as a side effect of other policy goals.

Obtaining an export license for an item covered by the Arms Export Control Act, which controls militarily critical technologies, is a lengthy process. All license applications must be submitted to the Office of Munitions Control at the State Department. In DoD, the Defense Technology Security Administration (DTSA) coordinates applications with the Armed Services and defense agencies. While DTSA tries to move applications rapidly through the system, the sheer number, and multiple levels of review, inevitably cause delays. Most large U.S. defense contractors argue that DoD's technology transfer policies are biased toward protection, rather than sharing, and taken together, constitute a major impediment to successful industry-to-industry cooperation.

The issue of third country re-export restrictions is particularly sensitive. When the U.S. Government grants a license to a U.S. firm to export defense or dual-use products, the receiving government or company must agree to request permission from the United States before it re-exports that product (in any form) to a third country. This restriction is applicable under the Arms Export Control Act and under some provisions of the Export Administration Act. Third-country restrictions have been a source of irritation to allied governments and foreign companies that were forced to accept them when no other source offered the product or the underlying technology. Many large U.S. defense contractors report, however, that foreign governments and their industries increasingly seek non-U.S. sources for weapon systems which have export potential in order to circumvent restrictive U.S. Government policies.

In recent years, the defense industries, the Defense Science Board, the National Academy of Sciences, and the Defense Policy Advisory Committee on Trade, among others, have raised technology transfer policy as a primary issue, and have called for a relaxation in the policy as a means to assist international sales of defense companies, and to make civilian, high-technology companies more competitive. In addition to the ongoing executive review of export controls, the National Academy of Sciences in conducting a follow-on study to its influential 1987 report, *Balancing the National Interest.*

A new policy on export controls will have to balance the economic concerns of U.S. companies against U.S. foreign policy goals such as arms control and nonproliferation of weapons of mass destruction. In this regard, it may be necessary to tighten controls on some strictly military technologies, and at the same time, establish a mechanism to remove controls that damage the competitiveness of U.S. industry. Such a policy will clearly have to be sensitive to the differences among various allies, as well as differences between Eastern and Western Europe, and between Eastern Europe and the Soviet Union.