Chapter 5

Commercial Implications of International Collaboration

CONTENTS

Figure

Table

Chapter 5

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INTRODUCTION

This chapter provides an in-depth discussion of the question of how and to what extent transfer of military technology assists the recipient nation in increasing its technological sophistication, and in building an industry that can become competitive with the United States in nonmilitary markets. But the question of building civilian industrial capacity is only one major implication of international collaboration in military technology.

International collaboration also has direct implications for U.S. defense companies and affects various sectors of the industry differently. It promotes the short term interests of the largest defense contractors that have experience in international business and who can make the necessary investments needed to penetrate foreign markets. Conversely it dilutes the business prospects of many smaller companies that cannot establish international strategic alliances with foreign fins. Accordingly this chapter considers the different sectors of U.S. defense industry separately. Three questions are addressed:

- Does international collaboration in defense technology make it easier for foreign industries to penetrate U.S. civilian markets?
- What are the implications of increasing international collaboration for the large U.S. defense companies, the system integrators?
- What is the effect of increasing international collaboration on other sectors of the U.S. defense industry-the second- and lower-tier subcontractors and the suppliers of components for the defense market?

TRANSFER OF MILITARY TECHNOLOGY TO THE CIVIL SECTOR

Does international collaboration in defense technology make it easier for foreign industries to penetrate U.S. civilian markets?

Civilian industries are indirectly affected by international collaboration in defense technology. In general, activity that builds up a nation's technological capability in defense will also benefit closely related technological activities in the civilian sector. How much technology "spinoff" from defense R&D actually takes place and benefits civil industry (or is developed for "dual-use" under the stimulus of a military development) is a complex question. It is complex because nation states have varying industrial policies, possess different rules that guide the defense business, are at different stages of technological sophistication, and have different levels of civil-military industrial integration (ranging from Japan, which is highly integrated, to the United States, which is largely separate).

Some technology is transferred in almost every collaborative venture. How much or how easily that process proceeds depends largely on the organizational structure of the joint project and the industrial environment in which the participants operate. Tightly controlled and highly segregated cooperative projects, such as classified military programs, tend to minimize diffusion of technology to other programs. On the other hand, technology can be transferred relatively easily within and between large vertically integrated companies with long-standing cooperative arrangements.

The United States has promoted a wide variety of collaborative efforts from information exchanges, both formal and informal, to very complex coproduction programs negotiated among several countries and their companies.[1]

Technology can be transferred when two or more individuals discuss technical issues during an information or data exchange. The Department of Defense (DoD) has always encouraged and even formalized this type of exchange. On a fundamental level, data exchange can be a very effective process that leads both to personal relationships and actual knowledge transfer. In licensing, technology transfer occurs as a result of the transfer of data packages that impart to the recipient complete instructions on how to produce a certain part or component. In coproduction, personnel from two or more organizations work together to be sure that the resulting equipment meets all the requirements of the system in question. Consequently a higher level of collaboration is involved, and the possibility of technology

[1] See app. B for examples.

transfer is greater. However, coproduction rarely involves state-of-the-art technology and therefore transfer of leading-edge technology is still limited.

The highest level of technological cooperation, and consequently the most susceptible to leading-edge technology transfer, is codevelopment, where the two partners work together to solve mutual problems. At this level, the opportunity for a true two-way street in the transfer process is greatest. In general, the closer technical personnel work together, the more easily the transfer process works. Consequently, the process of codevelopment, where large teams of engineering and management personnel must work together to solve mutual problems, is a fertile ground for technology to transfer in both directions, with new technology being generated and available to all parties in the agreement.

Extensive foreign military sales, licensing, and coproduction programs that the United States has conducted with its allies over the past several decades have been critical to building competitive defense industrial complexes in Europe and Japan. Starting in the 1950s and 1960s, military hardware licensing brought these countries embryonic defense engineering and production capabilities. Over the years these efforts grew toward coproduction of progressively more sophisticated and complex systems, with each new step adding to the technological capability of the foreign participants. In making policy choices about which coproduction programs to participate in, these countries made political and financial commitments that dramatically added to their total industrial capabilities. They often paid premium prices to create and maintain advanced technological capabilities domestically, through coproduction programs with the United States.[2] Codevelopment of military technologies that can be used in civil applications has been an openly stated goal of European governments for years. Further, through intra-European cooperation, the major European powers have developed extensive indigenous capabilities in defense technology, and have, with few exceptions, become increasingly independent of the United States.

In Japan a similar process has developed with one important difference; for many years Japan's explicit industrial policy has emphasized the acquisition of technology from abroad, mostly from the U. S., and primarily for civilian production purposes. Further, legal restrictions and post-World War II cultural inhibitions have mandated defense technology to a relatively minor fraction of that country's industrial output. Operating under a set of coordinated industrial policies, Japan has participated in extensive coproduction programs in the aerospace and defense electronics fields. In doing so, it has significantly enhanced its industrial capabilities and has attained world leadership in important areas.

Diffusion of military technology to the civil sector is likely when it is transferred to a country that has an explicit policy to emphasize development of its civilian industries and/or to integrate its civil and military industries. This phenomenon is most apparent in Japan and Germany, where approximately 1 percent of the defense budget is allocated to defense-oriented R&D. Both countries benefit significantly through collaboration with the United States. They gain access to defense technology developed here, and they are able to concentrate on civilian-oriented technology research.

In addition, the existing close association between military and civilian manufacturing promotes the spread of military technology to the civil field. When airplane wings for both civil and military systems, or military and consumer electronics, are made side-by-side in the same factories, the possibility of technology transfer is greatly enhanced. Integrated companies that do a small amount of defense work are positioned to exploit defense technologies for civil purposes, especially in the absence of government policies, both implicit and explicit, that separate civil and defense developments. Some observers argue that U.S. companies tend to favor esoteric defense-specific technologies, while their foreign partners concentrate on dual-use technologies that can later be marketed in civil applications.

Technological development moves in many directions simultaneously, in companies, industries, and internationally. When a technology transfers from the military to the civilian sector it called "spinoff." The term "spin-on" has been coined to describe transfers in the opposite direction, from the civilian sector to the military. Both terms can be misleading. When there is a general increase in the state of knowledge in a given area, and that knowledge is applied to another application, the term technology diffusion is, perhaps, more appropriate. In addition, it is possible to develop technolo-

[2]The history of this process is discussed inch. 3.

gy with the objective of applying it both to military systems and to consumer products.

Historically, defense technologies have exerted significant influence on civilian commercial developments. This has been particularly true in the United States, where DoD has sponsored a major fraction of the country's R&Din aerospace. Modern jet transport and the computer provide examples of the critical role that Pentagon R&D investment have played in the growth of important industries.[3] There is abundant historical evidence that defense technology can provide strong leverage for commercial industrial developments.

Spinoff of technology from defense to the commercial sector has been primarily an American phenomenon. Whether this is so because the United States spends so much more on defense R&D than do other nations, or because of the high priority given to advanced technology in U.S. defense R&D programs, or both, is not clear. However, it is difficult to identify major spinoff successes in foreign programs. In Europe, programs like the Airbus were developed as wholly civilian operations. In Japan, major efforts, such the dramatic rise of the semiconductor industry over the last 10 years, have been directed at strictly commercial developments.

There is evidence that spinoff no longer works well in the United States. The greatest potential for transfer occurs in the early stages of R&D, when advances are generic and not product-specific. As the technology matures, commercial and military applications tend to diverge in performance and cost requirements, and the technical interchanges decrease. There are fewer person-to-person contacts, fewer technical meetings, less open journal publication, and decreased interaction on the management level. In addition, the trend in the United States toward greater regulation of defense businesses has created additional barriers between civil and military technologies and industries.

The trend in the DoD R&D budget has been toward greater emphasis on advanced systems prototype engineering and testing, rather than on the type of applied research and exploratory development that fosters technology transfer.[4] For example, the Strategic Defense Initiative (SDI) program has not produced significant technology transfer to the civilian sector considering the size of its operations and budgets.[5] It would appear that defense technology spinoff is not a very active path at this time, despite legislative efforts to stimulate this type of activity.[6]

DoD has the resources and the need to invest in long-term technological developments that may have a high payoff, but also involve substantial risks and may have no obvious commercial use. DoD does this to underwrite its basic defense posture, which is to stay a generation ahead of our adversaries in technological capability. Despite the fact that these sorts of military technologies have on occasion started entire new industries, such as jet transportation and computers, civilian companies appear far less willing to invest in such high risk ventures than in the past.

The structure of most European and Japanese companies is well-suited to the sharing of technologies between civilian and military applications. In many cases, the military and civilian sectors cannot be distinguished. Military work is not a very important aspect of the total business, frost because the Europeans and Japanese do less defense business than American firms since their market is much smaller, and second, because they and their *governments* place a much stronger emphasis on *commercial* business. In Japan, the country's largest military

[3]Both the development of the modern jet engine, originally by Whipple in Great Britain, and the modern swept-wing transport aircraft were direct derivatives from military developments. The Advanced Research Programs Agency (ARPA, now called DARPA) bought all computer technology, even that developed for civilian purposes, in the belief that priming this critical industry would accelerate the development of computer technology as a whole that would in the end benefit DoD. See Kenneth Flamm, *Targeting the Computer: Government Support and international Competition* (Washington DC: The Brookings Institution 1987); and J. Stowsky, "Beating Our Plowshares Into Double Edged Swords; The Impact of Pentagon Policies on the Commercialization of Advanced Technologies,' The Berkeley Roundtable on the International Economy (BRIE), April 1986.

[4]Ashton Carter, ''Analyzing the Dual Use Technology Question,'' Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University, Cambridge, MA, November 1989.

[5]See Rosemary *Nimroody,* William Hartung, and Paul Grenier, *Star Wars Spin-Offs: Blueprint for a High-Tech America? (New York, NY:* Council on Economic Priorities, 1988). Despite the fact that technology transfer to the civilian sector is not strong for SDI, the European Community, and especially France, has been concerned about the potential for civilian spin-off of the SDI program. They specifically initiated the EUREKA program in response to SDI. However, EUREKA is oriented toward civilian and dual-use applications.

[6]For instance, one of five stated purposes of the Stevenson-Wydler Technology Innovation Act of 1980 was to ''stimulate improved utilization Of federally funded technology development by State and local government and the private sector."

contractor, Mitsubishi Heavy Industries (MHI), conducts only 15 percent of its total business in the area of defense, and defense production accounts for only 0.5 percent of Japan's total industrial output. Consequently many companies operate their defense efforts alongside their commercial work, often using the same technical and management teams. At the subcontractor level, this line is blurred further because much of their technology is dual-use and supplies both sectors.[7]

The case of the FSX fighter codevelopment project, where technology transfer in both directions was a key issue in the debate, provides an excellent example in the differences in corporate philosophy. At MHI, new technology acquired in the codevelopment process will become available to other MHI projects, including commercial ones. MHI has done this before, when it carried out F-15 coproduction efforts in parallel with its commercial subcontract work for Boeing, while concurrently developing an indigenous private corporate jet in its Nagoya Works.[8] Conversely, technology transferred to General Dynamics under this agreement is unlikely to be shared with other U.S. companies, and certainly not with the U.S. commercial aviation industry.

In the United States, defense and commercial business organizations typically are highly segregated, even when they reside within the same corporation. Companies separate into government and commercial products divisions when they have major activities in both sectors, even in cases where the products are similar. This separation is not as unreasonable as it sounds, given that the defense and civil divisions must apply different technical approaches, different cost and performance considerations, different administrative and management systems, different types of regulation, and different customer relationship and marketing operations—adding up to profound differences in corporate culture. The coordination of the activities of such companies usually occurs primarily in the board room, which is not the best environment for the transfer of specific technological knowledge. Some of the **differences between military and civilian** projects are **listed in table 5-1.**

In its effort to speed the development of greater capacity and faster micro-chips, DoD initiated the Very High Speed Integrated Circuit (VHSIC) program. Because of the defense-first acquisition approach used by DoD, the companies that dominated VHSIC were defense contractors, not the commercial semiconductor industry. The program generated special purpose, high capacity chips oriented to specific military projects, with little or no application to the U.S. commercial semiconductor industry.[9] In Japan, MITI organized an industry-wide development program for high-capacity commercial micro-chips that now dominates world markets, and supplies advanced chips for U.S. defense systems. Without the separation of defense and civilian industries, the Japanese were able to channel their efforts directly to the companies that could lead them to market dominance. Figure 5-1 displays the dramatic rise of Japanese micro-chip products from 1972 to 1987, and the attendant decline in U.S. capability.

Because the military and civil aspects of European and Japanese industry are more closely coordinated and are dominated by nondefense interests, foreign companies appear better able to exploit U.S. defense technology, transferred in collaborative efforts, for civilian purposes, than their counterparts in the United States. To understand this phenomenon, it is necessary to explore the underlying causes of these differences.

The separation of U.S. defense industry from the commercial sector is a major factor. To a great extent, this artificial separation is created and enforced by U.S. laws and DoD regulations.[10] Only in the United States and possibly in the Soviet Union, have defense markets been large enough to support very large companies on defense business exclusively. Twenty U.S. companies had more than $1.0 billion of defense business in 1988.[11] In Japan, only Mitsubishi had sales in excess of $1.0 billion in defense business, and that amounted 26 percent of

[7]A further discussion of these statistics is given in app. C.

'See ch. 4.

[9]Some observers argue that because the VHSIC program was classified, the technology could nOt be transferred to the civilian sector. In this view, the technology was dual-use, but the chips that were built were not.

[10]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), ch. 9.

[11]*Military Forum*, vo1. 6, No. 1, August 1989, pp. 15-16.

Table 5-I-Differences Between Military and Civilian Projects

Military	Commercial
• Cost not as important as performance of weapons systems	Highly rest-sensitive
• Large ratio of technical to nontechnical personnel	Fewer technical personnel; less development, redesign, and emphasis on state of the art
• Most products custom-designed; tendency toward overdesign	Standardized, mass-produced products
• Focus on state-of-the-art technology or leading edge not yet state-of-the-art	More emphasis on use of off-the-shelf items to keep costs low
• Relatively few customers, the U.S. Government and its military services, which designate how a product is designed. Products sold as a block, vendors compete once for contract.	Different customers with differing needs. Products sold few at a time, vendors compete for every sale.
• Marketing and sales staff more dominated by engineers	Concerns of marketing and sales personnel often override those of technical staff
• Large, long-term contracts	Many customers, many orders
• Much time spent on proposals and in developing documentation (operating and maintenance manuals)	Emphasis on specification sheets, instruction manuals, and warranties
• During design and manufacture, a need to define a variety of missions; harsh, uncertain operating environment	Predictable product life is important
• The customer, DoD, supplies the threat and mission requirements, while the contractor furnishes the technology; parties work together to define final work statement	Manufacturer of equipment supplies specifications
• Documentation done concurrently, while job is under way	Documentation sometimes supplied after project completion
• Administrative and accounting systems prescribed by the Federal Acquisition Regulations (FAR) for maximum audit scrutiny	Administrative and accounting done to standard commercial practice
• Government regulatory environment covers all aspects of operation.	Regulations cover only specific aspects of operation such as Occupational Safety and Health Administration, Food and Drug Administration, export licenses, etc.

SOURCE: Adapted from *IEEE Spectrum,* vol. *26, No.* 11, November 1989, p. 4.

the total Japanese defense expenditure.[12] General Dynamics is 85 percent defense-dependent and Lockheed is over 90 percent. For others the defense business is large enough so that a conglomerate like General Electric can split off a defense products division as a business unit that does over $5.0 billion per year. This part of General Electric is a government and defense-committed operation.

In recent years, the Department of Defense has contracted for approximately 150 billion dollars' worth of goods and services annually presenting major business opportunities for many companies in the United States and abroad. In order to conduct such a large business, the government has its own set of procurement rules, the Federal Acquisition Regulations, or FARs. Defense firms organize themselves structurally, and especially administratively, to conform to these regulations, which often increases costs compared with commercial projects. Compliance with the FAR is one of the factors that splits U.S. industry into two sectors. Some argue that it keeps commercial high-technology companies, including innovative ones, on the sidelines with respect to DoD, while keeping defense contractors isolated. Major reform of government procurement and contract administration has been recommended by many committees and knowledgeable individuals,[13] by Congress, and by the Pentagon,[14] but little remedial action has taken place.

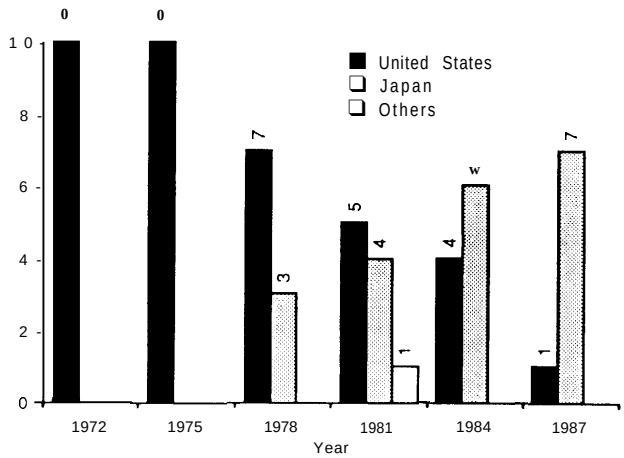
The ease with which technology appears to transfer from military coproduction programs to commercial ventures in Japan, and in the EC, is primarily due to the way their industries are structured, the dominance of the civil market in their overall economic policy, and the close working relationships that exist between the workers in the two sectors. There is little evidence of direct application of specific military hardware or systems

[12] See app. C for detailed data on the Japanese defense industry.

[13] For instance, see The President's Blue Ribbon Commission on Defense Management, "A Quest for Excellence," June 1986.

ids, the Defense Science Board Summer 1988 Study on the Defense Industrial and Technology Base, Office of the Under Secretary of Defense for Acquisition, Washington DC, October 1988.

Figure 5-l—The Top Ten Micro-chip Producers, 1972-87



"Only eight ccmpanies in existence.

SOURCE: "Survey: Japanese Technology," The Economist, vol. 313, No. 7631, Dee. 2, 1989, supplement, p. 8.

to the commercial sector, but there is little doubt that the technological knowledge and experience are invaluable to the civilian sector, when the environment is right for the transfer to occur.

Conversely, when the environment is not right, the process will just not happen. It is not the availability of military technology that causes the disparity in technology transfer capacity between the United States on the one hand and the EC and Japan on the other, but rather the vast differences in the management structure and regulatory constraints of the companies.

Where American corporations have attempted to maximize technology transfer, they have gone to great lengths to create an environment for innovation and entrepreneurship.[15] Loosely organized technical teams, a maximum opportunity for interdisciplinary interaction, informal organization and, above all, a free hand to innovative technologists have all been found to work well. All of these attributes are in direct opposition to the highly organized, project-specific, mission-oriented DoD approach.

Defense companies that have no commercial interests also have little incentive to keep technology with commercial potential out of foreign hands. For example, because General Dynamics has little or no business in the civil aviation field, it would not be damaged financially if the transfer of F-16 technology to MHI aided that company in increasing market share in world transport aviation markets. Rather, General Dynamics is concerned about future direct competition in the area of military systems, and consequently, has protected several sensitive pieces of flight control software, which are critical to advanced fighter aircraft, but have little to no commercial value.

During the FSX debate in Congress, there was concern that transfer of the F- 16 technology to Japan would assist the Japanese in building up an aircraft industry that would eventually compete for market share with U.S. industry. Boeing executives did not share this concern.[16] In fact, Boeing has pursued a course that will materially and directly transfer technological capability to the Japanese civilian aerospace industry. Boeing's commercial airplane operations dominate commercial aircraft manufacturing with over 60 percent of the world market and a Production backlog of over 4 years.[17] It is challenged by Airbus Industries, a European consortium, which during the past 10 years has made considerable inroads into the market, forcing Boeing to make progressively greater financial commitments to maintain its position and eroding some of its profitability. Boeing should be the company most concerned about the entry of yet another strong competitor, in the form of a revitalized aircraft industry in Japan.

Instead, Boeing is actively pursuing collaborative ventures with Japanese firms. It has subcontracted major components and subassemblies of its commercial airplanes to Japanese companies since the early 1970s. In 1986, Boeing and the Japan Aircraft Development Corp., a government-affiliated consortium, agreed to codevelop a new 150-seat passenger airplane, the 7J7. Under this agreement, Japan was to design and manufacture 25 percent of the new airplane in return for 25 percent of the financing. The project was dropped in 1988 due to a downturn in the market for small airplanes. The collapse of this

[15] See Thomas J. Peters, *In Search of Excellence (New York, NY: Harper & Row, 1982)*.

[16] Testimony by Phillip Conditt, Executive Vice President of the Boeing Commercial Airplane Co. before the Committee on Science, Space, and Technology, U.S. House of Representatives, May 11, 1989.

[17] See Artemis March, "The Aircraft Industry Goes Global," *Technology Review*, vol. 93, No. 1, January 1990, pp. 26-36.

venture represented another setback in Japan's ambition to develop a world class aircraft industry .18

In November 1989 Boeing announced new talks with Japan aimed at a partnership to codevelop a new airplane, the 767J, a model designed to compete with the McDonnell Douglas MD- 11 and the Airbus 340.[19] Boeing has apparently made a business decision that potential for new sales represented by these agreements outweighs the threat of future competition from Japan.[20]

The FSX codevelopment project may provide some indirect assistance to Japan in its efforts to establish a world-class aviation industry. But it is unlikely to approach the level of assistance or direct technology transfer that has resulted and will continue to result from subcontractor and joint venture relationships between Boeing and the Japanese aircraft industry. In many respects, Boeing's commercial actions make irrelevant much of congressional debate over the FSX.

THE POSITION OF THE LARGE U.S. DEFENSE INDUSTRIES

What are the implications of changes in the environment of defense technology and increasing international collaboration on the large U.S. defense companies?

Major U.S. defense companies, the prime contractors and large systems integrators, strongly support international collaboration. They have participated in the internationalization of advanced technologies and are now painfully aware of the loss of competitiveness of U.S. industries, the escalating costs of new weapons, and the declining U.S. defense market. They are concerned about political developments in the Eastern bloc countries, and the resulting instability of defense budgets throughout the world.

The largest U.S. defense companies have taken stock of their capabilities and believe that they are still superior to the competition in development of large-scale, complex weapons systems that integrate technologies from diverse fields. Most seem to believe that they can weather the storm by rationalizing their operations and by gaining access to foreign markets, but the survival of even the largest prime contractors is by no means assured.

The market for their services is, however, declining and is likely to do so more rapidly in view of recent international political developments. The Bush administration has announced its willingness to reduce defense spending by as much as $190 billion between 1991 and 1995,[21] and Congress may do so even more rapidly. Confronted by what now seems inevitable, the large U.S. defense contractors have intensified their efforts to make foreign sales. Recognizing the difficulty of selling directly, they attempt to allay fears about employment and industrial development by cooperating with foreign defense firms through joint venture arrangements and other collaborative programs.

However, the outlook for sales to foreign governments is also grim. In Europe, as in the United States, the perception of a decreased Warsaw Pact threat is making it difficult for countries to sustain heavy defense spending. West Germany, for instance, has more than matched the U.S. proposal of a 2 percent troop reduction in the near term with a proposal for a 20 percent reduction in the Bundeswehr. The situation is developing rapidly and unpredictably, but it is likely that Europe will cut military expenses as much, if not more, than the United States. If present trends continue, the weapons development that occurs in Europe will be accomplished indigenously.

In the search for foreign sales, the alternative to working with foreign governments is to form alliances with foreign companies. Such activity has increased markedly in the last few years .22 U.S. defense industry is searching for opportunities where its special strengths produce a good fit with European and Pacific Rim defense-oriented companies or teams. These alliances can take the form of teams, joint ventures, subcontracting, suppliers of subsystems or other business arrangements. Just as

[18] For a detailed discussion of the Japanese aircraft industry see, Richard J, Samuels and Benjamin C. Whipple, "The FSX and Japan's Aircraf t Strategy for Aerospace," *Technology Review,* vol. 92, No. 7, October 1989.

[19] See Louis Uchitelle, "A Japanese Strategy for Boeing," New *York Times, Nov. 3, 1989,* p. D-1.

[20] Some analysts believe that the U.S. aircraft industry is following the path of many other U.S. industries and will lose out in the world market due to the lack of modernization of the industry. See March, op. cit., footnote 17.

[21] Richard Cheney, Secretary of Defense, quoted in Stephen Engelberg, "AirForceOffers To Close 15 Bases and Scrap Missile, ' *The New York Times,* Nov. 19, 1989, sec. 1, p. 1.

[22] See Sandra Sugawara, "Defense Firms Take a Global Offensive,' *Washington Post,* Oct. 22, 1989, p. H-1.

foreign companies search for niche opportunities in the U.S. defense market, American companies are searching abroad for opportunities to obtain a foothold.

When companies work closely in international collaboration it is inevitable that technology is transferred. The technology which the U.S. companies import into U.S. contracts is often very advanced and can be superior to that available in the United States. Frequently, international collaboration also introduces U.S. companies to foreign dual-use products, which are sold throughout the world with few export control restrictions. These products are often cheaper than their U.S. counterparts, and thus help the prime contractors reduce and control costs. Technology exchanges are definitely part of the process, and one of the incentives for teaming. For the large U.S. defense systems contractors, the alternative to overseas marketing and collaboration is a severe drop in business, which many of the participants might not survive.

IMPLICATIONS FOR DEFENSE SUBCONTRACTORS, SUPPLIERS

What is the effect of increasing international collaboration on other sectors of the U.S. defense industry, the second- and lower-tier subcontractors and suppliers of components to the defense market?

The **increasing** internationalization of defense business and markets creates a significant cost for smaller and medium-sized defense companies in the United States that depend on the prime contractors for subcontract business. When the prime contractors create teams and make deals with foreign companies, they agree to use foreign technology in subsystems and components, and even to license or coproduce them in offsets arrangements, all as part of the bargaining process. Consequently, the middle- and lower-tier U.S. defense contractors and suppliers, the makers of radars, flight control systems, guns, landing gears, electronic components, sensors, and even smaller subsystems and components, lose business to their foreign competitors.

Furthermore, the smaller defense firms, which perform a large fraction of the actual work on U.S. defense contracts, generally cannot afford to market overseas and are not well positioned with respect to foreign competition. Many deal in technologies that are widely available abroad. They face competition from industries supported by foreign governments in the area of dual-use technology, and they have problems in obtaining support for their R&D to sustain leading-edge technologies and innovative programs. In general, DoD does not deal directly with this group, but only indirectly through the prime contractors. As foreign companies penetrate the U.S. defense market, as subcontractors to U.S. primes, as competitors through direct bids, or through the acquisition of smaller U.S. defense firms, U.S. second- and lower-tier companies face stiffer competition.

Many smaller defense contractors see national policies that favor and support the large internationally oriented companies as a threat to their existence. They feel competitive pressures acutely as the large prime contractors eliminate marginal domestic suppliers, turn to foreign firms, or rationalize operations in response to anticipated budget reductions. Consequently, as an industry they have appealed to the Federal Government to protect them from international competition.[23] Some **claim that the** policy of waiving "buy-American" restrictions in international collaboration with our allies results in direct losses to them. They believe that this tilts the playing field against them, because foreign bidders are not directly bound by costly DoD procurement regulations. In addition they assert that U.S. export controls, as well as foreign protectionist practices, keep U.S. lower-tier firms from bidding successfully for foreign subcontracts. In this view, the U.S. Government provides little support for small defense exporters, and U.S. export restrictions represent a significant barrier to their business.[24]

One industry association has brought suit against DoD to force compliance with the Buy American Act of 1933, as amended by 41 U.S.C. 10(a-d).[25] Under bilateral Memoranda of Understanding the

[23] There have been a number of cases where Congress has enacted laws that specifically protect small segments of the defense industry, usually as the result of strong lobbying efforts. A number of these cases have been reported and analyzed. See "TheImpact of Buy American Restrictions Affecting Defense Procurement," report to the U.S. Congress by the Secretary of Defense, July 1989.

[24] The hearings of the U.S. House of Representatives Committee on Banking, Finance and Urban Affairs, Subcommittee on Economic Stabilization@ Apr. 18, 1989, held to hear comments on the FSX joint development agreement with Japan, brought out many of these arguments.

[25] The National Council for Industrial Defense, Inc., *Plaintiff* v. *United States Department of Defense and Dick Cheney, Secretary of Defense,* Defendants. Civ. No. 88-0949 NHJ, Executed Sept. 26, 1988.

Secretary of Defense has granted blanket waivers from the Act for all foreign military purchases under the MOUs. The plaintiff alleges that these waivers are illegal, and its brief gives numerous examples of U.S. contractors that have lost business to foreign competitors due to actions under these waivers.

The subtier defense companies also assert that they are damaged by offset agreements between the prime contractors and their foreign collaborators. Offsets allow a purchasing nation (or company) to reduce or eliminate a balance of payments deficit arising from a particular sale of defense equipment. In general, the seller agrees to buy goods or services to 'offset' a negotiated percentage of the cost of the equipment in question. Offsets can be direct, in which case they involve work directly on the product covered by the purchase, i.e., a subcontract with the buyer to produce some portion of the system, or they can be indirect, in which they can be any unrelated purchase from that company or country, i.e., effectively a case of barter.

Offsets are specifically defined when companies, parties to an international sale, reach agreement to supply products or services. The large defense contractors use the promise of offsets to achieve a favorable bidding position when competing for foreign business. However, these arrangements create difficulties for the lower-tier contractors, which now have to bid into a situation to which the primes have already contractually agreed, i.e., they have agreed to return a certain fraction of the sales price to the buying country in the form of subcontracts. In addition, prime contractors frequently agree to purchase parts originally transferred to foreign companies under an offset agreement for later domestic production.

The middle-tier defense companies also assert that foreign firms have advantages over the U.S. companies in head-to-head competition. Defense-oriented U.S. companies bid under DoD procurement regulations, either because the prime contractor requires it, or because the company is operated under the U.S. Government audit system, The administrative overhead of complying with these government-directed practices can be very high, easily as much as 20 percent of the contract price. Foreign companies operating under different rules may have a significant price advantage in such a competition. On the other hand, prime contractors claim that foreign contracting practices must be approved by the Defense Contracts Administration Service (DCAS) and, therefore, must be equivalent to U.S. practices.

Further, subcontractors claim that they must operate under government mandated quality control requirements that are complex and frequently outdated, and that foreign bidders must satisfy less stringent rules. The prime contractors rejoin that all foreign components must be qualified in the same manner that domestic components are qualified. There is considerable uncertainty about the level of subcontract or component purchases to which U.S. quality control standards are enforced. Subcontractors have proposed that each foreign bid should be justified by an impact statement that assesses the intangible cost advantages of the foreign bid, and levies an appropriate surcharge against that bid.

U.S. high-technology companies assert that their business potential is restricted by U.S. export policies and, consequently, they are at a disadvantage with respect to their foreign counterparts. In particular, the dual-use product, and third country re-sale restrictions of U.S. export laws, create serious barriers for U.S. companies wishing to participate in the world market. Products that are readily available abroad and traded with few restrictions by other nations are often restricted by U.S. dual-use export controls. Further, many countries are not willing to guarantee that products will not be resold to restricted countries. For this reason, many avoid U.S. products. Many innovative small and mid-sized high-technology companies in the United States decline defense business because the added administrative problems would distract them *from their primary* mission. Consequently, these companies are not direct participants in the U.S. defense industrial base.

Despite these arguments, it is not a foregone conclusion that the smaller, subtier, defense subcontractors lose when international collaboration in defense technology is increased. Subcontractors depend for most of their business on the large systems' prime contractors. They do relatively little work directly for the Pentagon. Consequently, if internationalization brings the primes more business, or even if it lets them sustain their business in a period of falling budgets, the subcontractors may also profit. The limited data on this subject is ambiguous.