
Meeting the International Challenge

[The following two-part article is extracted from the March/April 1992 edition of *Defense*, 92, pp. 33-39, and is based on Chapter 4, "The International Environment," of the *Report to the Congress on the Defense Industrial Base*, dated November 15, 1991.]

The consequences of DoD budget reductions will be one of the most important issues facing defense contractors in the 1990s. Also important is the fact that the defense industrial base needs to be built on a strong domestic industry that is competitive in the international market.

Defense contractors conduct their business in an environment that is increasingly international and interdependent, and their ability to compete effectively in world markets will be pivotal to their future. The globalization of defense-related business has been recognized by DoD and is an essential element of its international programs and acquisition policies. Foreign military sales, offshore sourcing, foreign direct investment, international teaming arrangements, international cooperative programs, foreign technology developments, and offsets have changed the business climate for both defense contractors and DoD.

Foreign [military sales] and direct commercial sales, for example, are crucial parts of U.S. industry's involvement in the international marketplace, but also represent complex policy issues for the U.S. government. Foreign military sales and direct sales not only contribute to industry's total sales and profits, but enhance its production capability by keeping defense facilities operating longer and at higher production rates than otherwise possible.

MORE SALES LESS MONEY

For the future, many firms are looking toward increased foreign sales to sustain operations while DoD budgets are lower. Unfortunately, foreign defense firms are under many of the same pressures as domestic ones, [and are] reacting to their own nations' defense budget reductions and production over-capacity; the international arms market is more competitive than ever.

It will not be easy for U.S. defense contractors to offset reduced U.S. government sales with increased foreign sales. With defense budgets expected to decline in most allied and friendly countries, foreign governments may choose to forgo indigenous development of weapon systems and instead seek cooperative development with, or licensed production from, other countries. This could present opportunities for U.S. prime contractors to increase their global market penetration, but these cooperative endeavors must be carefully considered.

On the other hand, protectionist sentiments and policies in foreign countries may inhibit sales abroad by U.S. firms. Similarly, the U.S. Buy America Act prevents foreign suppliers from participating in certain aspects of U.S. defense contracts.

Offsets are another form of international strategy for U.S. defense contractors. Commercial defense export sales must take local production offset requirements into account as a "way of doing business." Recognizing the common practice of these commercial arrangements in the free market, the U.S. government permits U.S. industry to negotiate offset arrangements with overseas buyers of U.S. produced goods and services. Although the U.S. government is not a party to these arrangements, it retains the right to review offsets as part of its review and approval of proposed international defense cooperative programs.

INCREASED GLOBAL TIES

The international environment is evolving rapidly, and industry-to-industry agreements and other forms of direct cooperation between U.S. and foreign defense firms have been increasing. This cooperation includes data exchanges, personnel exchanges, direct foreign sourcing (as distinct from U.S. government purchases of foreign-produced items), subcontracting, mergers, joint ventures, research consortia, and strategic partnerships. This cooperation has taken place largely at the level of prime contractors, who seek to increase their share in overseas markets, obtain technical advantage, enhance efficiency, and improve their profitability. Such cooperation, however, may impact second- and third-tier U.S. defense contractors since many of the components previously provided by these smaller companies will now be provided by foreign partners of U.S. prime contractors.

ROUTINE FOREIGN CONTRACTING

Within this environment, contracts between U.S. and foreign defense firms are now a routine practice. Rather than the national origins of specific products, services, or technologies, the key DoD issues include the following: to produce and maintain existing systems, DoD must be assured of the timely delivery of affordable components and materials regardless of their national origin; and DoD also must be assured of sufficient access to worldwide state-of-the-art technology to develop next-generation systems and to improve the U.S. domestic technology base. It is important for DoD to understand international trends that impact these needs and to assure access to the production and technical resources of the international marketplace.

FOREIGN PURCHASES

DoD purchases thousands of materials, parts, components, and finished goods either directly or indirectly from foreign manufacturers, just as other governments purchase such items from the United States. Since these purchases involve numerous weapon systems, thousands of contractors and subcontractors, and millions of parts and components, comprehensive information on foreign-sourced items is not routinely available to DoD.

As an example, many DoD electronics components, such as semiconductors, are initially developed for the commercial market in a friendly or allied country such as Japan or Germany and produced by a subtier manufacturer within the global industrial base. By the time the product is embedded in a DoD weapon system, it has become very cumbersome and costly to monitor all original sources of the technology and product.

Overseas sources are a vital asset to our national defense and help to strengthen the national security; however, there may be occasions when excessive reliance on a single overseas source potentially could lead to unacceptable risks to the continuity of supply. If such excessive reliance occurs, steps must be taken to address it.

Three terms are used to describe defense-related purchases from overseas suppliers and the degree of vulnerability that might result. "Foreign sourcing" is the purchase of goods, services or technologies from sources outside the United States or Canada. Foreign sourcing is a fact of life for DoD, and these purchases often offer cost, availability, or quality advantages over U.S.-manufactured products. Overseas sourcing can contribute to national security by increasing commonality of equipment with allies, by providing access to products that cannot be competitively obtained domestically, and by ensuring that U.S. weapon systems incorporate the very best *products and technologies* available.

"Foreign dependence" occurs when goods, services, or technologies are purchased from offshore because they are not available at all from U.S. or Canadian sources. These dependencies, which might arise for several reasons, raise understandable concerns about potential disruptions in the supply of products and materials essential to defense. Determining whether a foreign dependence can be tolerated depends on such factors as the criticality of the item, the likelihood of a supply disruption, the availability of alternative sources both within the United States and throughout the world, or the time and cost to develop alternatives.

"Foreign vulnerabilities" are those cases of foreign dependence where loss of access to a single foreign source supplier would impair the nation's capability to field a critical weapon system or otherwise endanger national security. These situations could impact the nation's security by producing an excessive reliance on a foreign sole-source supplier.

STUDYING THE PROBLEM

DoD and other government agencies have conducted a number of case studies on the potential impact of foreign sourcing and on necessary solutions. These studies have examined many weapon systems and industrial sectors, including semiconductors and machine tools, and have been conducted by a variety of government agencies and private organizations. Findings to date indicate that although foreign vulnerabilities are potentially of great concern to DoD, they represent an exceedingly small proportion of the items that are foreign-sourced today. Furthermore, the Department of Commerce has undertaken an ambitious study of foreign sourcing and vulnerability in three Navy systems, including a communications system, a torpedo, and a missile system, with data collection extending to third- and fourth-tier suppliers. When made available, this study will provide further insight into DoD's foreign sourcing and possible dependence on foreign-made components.

VULNERABLE SYSTEMS

Foreign sourcing and potential vulnerability issues are also being addressed directly by DoD major weapon systems programs. One important initiative is DoD's recent mandate that all Defense Acquisition Board programs address industrial base concerns, including foreign dependence and vulnerability issues, at each milestone review leading up to the production decision. In addition, individual program offices and defense contractors identify critical parts and components in major weapon systems and take actions within the acquisition system to plan for reliable sources of supply.

CREATING DOMESTIC SOURCES

For example, second sources can be created where [it is] practical and cost-effective to eliminate single- and sole-source dependencies. The Defense Production Act Title III program has contributed in this area by creating domestic capacity for materials that had previously been available only from offshore, including polysilicon, quartz fiber, silicon-on-sapphire wafers, and AC/DQ steel plate. Projects in the planning stage will reduce current and potential vulnerabilities in the areas of single crystal silicon, silicon carbide/carbonitride yarn, garnet epitaxial wafers, and gallium arsenide.

Foreign direct investment in U.S. defense firms can provide defense-related companies with an infusion of needed capital, encourage plant and equipment modernization, and promote the transfer of advanced product and process technologies to the United States.

Foreign investment is monitored to ensure that it does not jeopardize national security. The Committee on Foreign Investment in the United States reviews acquisitions that have a potential

impact on national security. Filings with the committee by parties to an acquisition are voluntary, but the group can investigate on its own initiative the acquisition of any U.S. firm by a foreign interest that may potentially affect national security. If there is credible evidence that the foreign investor might take action detrimental to our nation's security interests, the president may prohibit or suspend the acquisition.

Foreign direct investment takes place through a variety of mechanisms: acquisitions of domestic firms, mergers between overseas and domestic companies, and construction of foreign-owned facilities in the United States. The level of investment grew significantly over the 1980s, particularly in key sectors such as electronics. In 1989, the value of foreign direct investments in the United States totaled over \$390 billion, although the rate of investment has declined dramatically in recent years. The United Kingdom is the leading investor in U.S. companies, followed by Japan, the Netherlands, and Canada. About 37 percent of all foreign direct investment is in the manufacturing sector.

REVIEWING THE SITUATION

During the course of an investigation, the committee reviews a number of factors, including a foreign investor's plans for locating research, development, and production facilities, the criticality of the technology, and [the] net technological impact of the investment, such as the question of licensing technology to U.S. firms; and the classified and unclassified contracts with DoD and other government agencies. None of these factors has yet been cited as a basis for blocking a foreign takeover, but overseas firms have provided assurances or representations to the U.S. government, or have modified or dropped takeover plans as a result of the committee's review or investigation.

Of the more than 600 filings that have been made since 1988, the Committee on Foreign Investment in the United States has found cause to perform a detailed investigation on 13 cases. Of these, the President exercised his statutory authority only once to prohibit a transaction—forcing an aerospace machine tool firm owned by the People's Republic of China to divest itself of U.S. holdings. In the remaining cases, the committee determined that no clear threat to the national security existed.

Independent of the committee's process, DoD has broad authority under Defense Investigative Service regulations to review any acquisition of interest by a foreign person in a foreign firm which does classified defense contract work. DoD may impose measures to protect sensitive information—for example, voting trust and other arrangements that insulate foreign owners from access. In this connection, DoD balances concerns about the possible compromise of information with the estimated benefits to DoD of foreign capital and technology.

OBJECTIVES FOR COOPERATION

To deal more effectively with the highly complex international environment, DoD has developed formal objectives that are embodied in its international defense cooperation program. The objectives are:

- To foster the collective security of the United States, its allies and other friendly countries by encouraging participating countries to make adequate investment in modern conventional defense equipment and in the technical and other capabilities required to support that equipment, making the most efficient use of the total scientific, technical, and industrial resources available to participating countries;

-
- To encourage participating countries to adopt standardized or interoperable equipment, uniform or compatible logistic support arrangements, and common strategic and operational concepts, and,
 - To foster defense industrial capabilities in the United States and in other participating countries that meet the military requirements of all participating countries.

SECURITY COMES FIRST

There are strong benefits to the trend toward internationalization and interdependence. In taking advantage of these benefits, it must be remembered that the national security of the United States always comes first. This national security includes economic security and requires that DoD have an assured and reliable source of supply of defense materiel in peacetime, crisis, and war, in an era of declining budgets and increasing globalization of defense markets. Thus the potential for increased access to global technologies and products is balanced with continued DoD support of innovation in the U.S. industrial base and continued concern for its global competitiveness.

PRESERVING THE TECHNOLOGY AND PRODUCTION BASE

Although production is the most visible industrial operation, technology development is an equally important function of the industrial base.

Desert Storm vividly illustrates the importance of advanced technology to military capabilities and also shows the payoffs of a patient and long-term commitment to research and development. Many military technologies developed during the 1970s and 1980s, such as stealth aircraft, electronic warfare systems, and "smart" munitions, were key to the victory of coalition forces while minimizing the loss of life.

Access to and development of advanced technologies will continue to be central to the ability of the United States to counter a diversity of threats, and are likely to be a critical factor in deterring or prevailing in future contingencies.

The benefits of DoD technology investments are generally realized over the very long term—decades rather than years. Equally important are the research and development dollars supplied by defense contractors, who continually invest a portion of their profits in long-term, defense-related investments. The time horizon for an advanced technology may extend to half a century or more, from initial research to application and through the long service life of a weapon system.

Decisions to invest in new technologies are often difficult, since these investments are long-term, inherently expensive, and frequently involve significant risk and uncertainty. Nevertheless, the necessity of advanced technology development is well recognized by the government to ensure long-term U.S. national security and competitiveness. In the words of President George Bush:

The defense industrial base must be strong and include manufacturers that are highly flexible and technologically advanced. This will require that both the Defense Department and industry maintain active research programs in vital technologies. The department must also create incentives (and eliminate disincentives) to invest in new facilities and equipment as well as in research and development. This will be especially important in an era when overall procurements are likely to decline.

The size and structure of DoD's research, development, test, and evaluation budget has a major influence on military capabilities as well as on the financial health of defense firms. RDT&E

spending will remain relatively stable. This account is projected to grow significantly in fiscal 1992 and level off to a small real decline through fiscal 1994. The planned funding level will sustain research and development activities and allow DoD to maintain its technological edge to help deal with future threats.

In spite of a smaller force structure, the decline in major new program starts will result in heightened emphasis on modularity in weapon system platform design to increase flexibility and mission capability, enhance longevity, and facilitate technology upgrades. In addition, the uncertainty about the nature of future world crises increases the importance of maintaining a capability to rapidly introduce technologies into fielded systems. Thus, DoD will place greater emphasis on incremental subsystem upgrades—for instance, avionics, propulsion, weapons, communications, and countermeasures, as well as accelerated development and use of advanced manufacturing technologies.

DoD is taking a number of steps to improve the structure of its long-term technology investments. The department's most recent critical technologies plan names its most important technology areas and identifies development milestones, projected funding levels, and challenges. The first objective is to generate innovative, highly leveraged breakthrough technologies and insert them efficiently into military equipment. The second is to pursue technology "trump cards," which may be played every five to 10 years and which will allow the United States to sustain its long-term dominance in the technological arms race.

Regardless of their technical potential, advanced technologies will not result in improved military capabilities unless they are capable of being rapidly and efficiently incorporated into new and fielded systems. The addition of flexible manufacturing to the list of defense critical technologies underscores the importance of innovative processes in reversing trends toward increasing unit costs, lengthening lead times, and delays in transitioning technologies to operational use. Flexible manufacturing and other technologies are beginning to allow producers to emphasize rapid product design and introduction, reduce inventories, smooth process flows, and shorten turnaround times between production runs. Because of defense budget reductions and an emphasis on subsystem upgrades, flexible manufacturing will become increasingly important to DoD and defense manufacturers.

DEVELOPING A TECHNOLOGY PLAN

To further the development of manufacturing technologies by DoD, the National Defense Manufacturing Technology Plan is being developed jointly by the Office of the Secretary of Defense, the services, and defense agencies. The plan represents a change in emphasis for DoD's manufacturing technology programs and will contribute directly to DoD's technology development goals.

For the first time, senior manufacturing officials from a broad community are engaging in joint strategic planning and are establishing a framework for manufacturing investments. The DoD program supports projects related to the development of critical technology production capabilities, including flexible manufacturing, next-generation machine tool controller architectures, manufacturing processes for advanced composites, and electronics packaging.

DoD will increasingly rely on the capabilities of the entire industrial base as defense budgets diminish. This integration must take place at many levels, including the development of dual-use technologies, an increased reliance on commercial products and processes, and title sharing of civil and defense-related production resources where sufficient similarities exist.

There is a significant opportunity to move forward quickly with dual-use applications. DoD's critical technologies plan and other recent reports have shown the extent to which military power is dependent on the same technologies that are critical from a national economic perspective.

For example, 15 of the 21 critical technologies have important commercial applications as well as contributing to vital DoD missions. Many DoD critical technologies also appear among the emerging technologies identified by the Department of Commerce and the national critical technologies identified by a White House-appointed panel. The technology goals of defense and the civil sector are fundamentally the same. Nevertheless, defense and commercial research has often taken place along parallel paths, without taking full advantage of synergy. The use of commercial technologies can contribute to national security in important ways. As defense budgets decline, access to a broad and healthy commercial sector will allow DoD to maintain the pace of innovation, leverage commercial technology investments, and improve the performance and affordability of its weapon systems. The civilian economy can also benefit from dual-use, not only through increased funding from a larger customer base, but through commercial spinoffs from DoD-sponsored research and development. For example, DoD investment is the primary force behind U.S. efforts to develop future-generation aircraft, gas turbine engines, advanced composites, and parallel computer architectures—all areas of domestic industry leadership.

Despite these advantages, dual use must be pursued carefully to achieve its full benefits. There are many areas where defense requirements are unique and where DoD will continue to rely on defense-specific capabilities. Some items based on commercial technologies must be adapted by DoD to meet its stringent performance requirements or to tolerate high stress operating environments. While dual-use cannot be looked upon as a complete solution to the problems of a shrinking industrial base, a greater reliance on dual-use technologies can provide increased opportunities to benefit from the strengths of the entire nation's research and production base.

MORE COMMERCIAL BUYING

In addition to making better use of civil sector research and development, DoD will benefit from its increased emphasis on commercial buying practices, which in turn encourage industry to integrate military and commercial research and development and manufacturing operations.

A 1989 Defense Science Board report, *Use of Commercial Components in Military Equipment*, concluded that DoD could realize such benefits from commercial practices as higher quality, reduced acquisition and life-cycle costs, improved access to advanced technology, and access to a broader and more diversified industrial base. If the goals of civil-military integration are achieved, a defense-unique industrial base would be necessary only in those areas where specialized defense capabilities are required.

For example, many semiconductors used in military equipment have generic functions that could be satisfied by commercially available circuits. However, DoD specifications and certification requirements have resulted in an overwhelming dependence on devices that have been designed and manufactured solely for military use. DoD's requirements have also persuaded several world-class U.S. semiconductor firms to get out of the defense market or to isolate their defense businesses from the talent and technologies of their commercial operations. As a result, microcircuits acquired by DoD are expensive, have long leadtimes, and increasingly lag the commercial sector in incorporating innovations that enhance performance and reliability.

DoD is therefore pursuing a multifaceted program to enhance the department's ability to buy and use commercial microcircuits where appropriate. In addition to cost savings, the expanded market could improve the overall competitiveness of the U.S. semiconductor industry.

After a series of studies focusing on how DoD can expand its supplier base to include more commercial firms, the department undertook a number of initiatives to promote civil-military integration across a broad spectrum of defense acquisition. DoD revised its acquisition guidance to place greater emphasis on the importance of purchasing commercial products that satisfy military requirements. It recently issued new guidance to reflect a clear, unambiguous preference for commercial products in appropriate circumstances.

The new DoD Directive 5000.1, *Defense Acquisition*, requires DoD components to make "maximum practical use of off-the-shelf commercial products." The new DoD Instruction 5000.2, *Defense Acquisition Management Policies and Procedures*, states that "materiel requirements shall be satisfied to the maximum practicable extent through the use of non-developmental items when such products will meet the user's need and are cost effective over the entire life cycle." This guidance will give impetus to the modification of other procurement regulations and will result in the adoption of procedures that are more consistent with commercial practice.

Highly technical military specifications are one of the most significant hurdles in promoting commercial contracting. These specifications not only establish performance standards, but frequently provide specific instructions on how an item is to be manufactured. Often, the DoD requirements are considered obsolete from industry's perspective and cannot be met with existing plant and equipment. Detailed military specifications often require defense-specific designs, even for items that are in general use. By expanding its purchasing to a wider array of products and firms, DoD can capitalize on the quality and reliability of many commercial goods.

ADOPT COMMERCIAL STANDARDS

DoD has therefore undertaken a major effort to reduce its reliance on military specifications. When the system is fully implemented, specifications will be employed only for militarily unique items. An important set of changes proposed by DoD would eliminate specifications in favor of non-government standards and commercial item descriptions for commercial-type products and processes. DoD reviewed the 55,000 documents contained in the *DoD Index of Specifications and Standards* for possible conversion into non-government standards or commercial item descriptions. At the beginning of this February, more than half of the 3,500 specifications identified had been converted, thereby laying the groundwork for increased purchases of commercially available products.

Another important component of encouraging more commercial firms to do business with DoD is to reduce the unnecessary paperwork associated with government contracting. DoD has developed a standard uniform contract that will eliminate unnecessary provisions and provide simplified standard clauses that will apply to commercial item purchases. *Defense Federal Acquisition Regulation Supplement* changes in this area became effective in May 1991.

DoD is also easing its requirements for cost and pricing data. It has proposed regulations that would allow more producers to waive this requirement and also streamline exemption procedures. The modification of requirements for certified cost and pricing data is expected to encourage more suppliers to offer commercial products. The proposed regulation is expected to go into effect in late 1992.