

---

## SUMMARY

---

In fiscal year 2001, the U.S. Air Force tasked RAND with providing an analysis to help it respond to the potential new opportunities—and problems—arising from an increasingly globalized and consolidated aerospace industrial base. Between 1990 and 1998, a horizontal and vertical integration took place across all segments of the U.S. aerospace industry. The number of credible U.S. prime contractors for integrating fighters and bombers fell from seven to two; the number of U.S. missile manufacturers from fourteen to four; and the number of space launch vehicle producers from six to two. By the end of the 1990s, the European defense aerospace industry had also begun to experience a dramatic cross-border consolidation and restructuring. This growing consolidation of defense prime integrators and subsystem suppliers has resulted in increased numbers of strategic and product-specific alliances, international teaming and joint ventures, and cross-border mergers and acquisitions (M&As) among defense firms, together with heightened interest in foreign exports and foreign lower-tier suppliers.

Because the globalization of the aerospace defense industry is a relatively recent phenomenon, its effects are not yet well understood. The Air Force therefore asked RAND to help assess the benefits and risks associated with these new cross-border business agreements and procurements, as well as proposed laws and regulations affecting the defense industrial base. The resulting project has been shaped in large part by three major Air Force objectives relevant to the issue of globalization:

- The need to equip aerospace forces with affordable yet highly capable weapon systems, both today and in the future (the economic and technological dimension);
- The need to prepare the United States, its allies, and other friends to fight future wars as coalitions (the political-military dimension); and
- The need to protect U.S. national security (the national security dimension, mainly related to technology security and industrial base viability).

RAND's objective for our overall program of research on this project is to help determine how and to what extent globalization can be managed to best promote the achievement of both economic and political-military objectives while minimizing potential risks from the perspective of the U.S. Air Force. The findings will be reported in two parts: the current report and a follow-up study to be completed in FY 2002.

This report focuses on four key questions:

- How far has the globalization of the U.S. defense aerospace industry already progressed?
- What are the potential economic, political-military, and national security implications of U.S. defense aerospace industry globalization?
- What laws, regulations, and policies constrain, guide, and inform Air Force management of the globalization process and industry structuring of cross-border relationships?
- Which partnerships now being formed by U.S. and foreign companies are most likely to promote the three fundamental Air Force interests tied to greater globalization?

## CHAPTER SUMMARIES

### Indicators of Aerospace Industry Globalization

In broad terms, the most visible manifestation of globalization lies in the growing number and value of cross-border purchases and sales

of goods, services, and financial assets. Our assessment of statistical data suggests that the U.S. aerospace industry is an active but heavily export-oriented participant in the global economy. The United States is by far the world's leading arms exporter, accounting for about half of all shipments. There is less evidence of aerospace imports, however, and data suggest that military aerospace producers are less internationally active than are nonmilitary producers. The growth and geographic pattern of investment by U.S. defense firms have been somewhat slower and have an even stronger bias toward the United Kingdom than that exhibited by firms in other industries.

To better understand recent globalization trends, we developed a typology of cross-border business relationships and activities prevalent in the defense aerospace industry. The joint or cooperative activities on which we focus herein include cross-border shipments of finished platforms, systems, or major subsystems; licensed coproduction; Foreign Military Sales (FMS) coproduction; "partnership" coproduction; and codevelopment. The last three of these activities generally involve a relatively greater level of collaboration among participating firms. All these international activities can be supported by several types of cross-border business relationships, the most common forms of which are prime/subcontractor, marketing agreement, team, joint venture, and parent/subsidiary. Broadly speaking, prime/subcontractor relationships represent traditional types of arrangements, while the others represent the new, more highly integrated face of defense aerospace industry globalization.

A review of the recent historical record suggests that U.S. defense-related industries, including military aerospace producers, are not yet as fully integrated as their counterparts in nondefense industries. Nevertheless, deeper industry-led cross-border relationships such as teams and joint ventures are growing in importance relative to simpler export and cross-border licensed production arrangements.

### **Implications of U.S. Defense Aerospace Industry Globalization**

We examined the potential implications of U.S. defense aerospace industry globalization in light of the Air Force's economic-technical, political-military, and national security objectives. In each case, we

found both benefits and risks to be inherent in increased globalization.

The many potential economic and technical benefits of globalization include lower costs, higher productivity, better quality, and increased innovation. Exports help lower the costs of new equipment through economies of scale and help reduce the costs of legacy equipment by keeping open production lines for replacement parts and components. Imports provide access to state-of-the-art foreign technologies and industrial capabilities while exposing U.S. industry to international competition, which can help spur innovation and efficiency. At the same time, globalization can also present economic challenges. Both unemployment and unprofitable and underused plants and equipment could potentially present a national security risk for the United States to the extent that they indicate a longer-term loss of industrial capability. Moreover, if international marketing agreements, teams, joint ventures, or subsidiaries serve to leverage rather than dilute U.S. domestic firms' market power, a loss of competition could result.

The net effects of globalization are similarly ambiguous with respect to the Air Force's political-military objectives. Globalization can help achieve technical interoperability through common platforms for U.S. and allied weapon systems and equipment as well as compatibility in areas such as command, control, communications, intelligence, surveillance, and reconnaissance (C<sup>3</sup>ISR) systems and munitions. Such technical advances would likely help narrow the technology gap between the United States and European members of the North Atlantic Treaty Organization (NATO). Mergers, acquisitions, and other forms of collaborative business relationships between U.S. and NATO European defense firms also have the potential to encourage some degree of system-level interoperability because, for purely economic reasons, these types of arrangements tend to feature the sharing of design concepts, technology standards, and inputs.

On the other hand, increased collaboration among U.S., European, and non-European foreign firms—combined with the consolidation of the European defense aerospace industry—may make European and other foreign alternatives to U.S.-designed platforms and systems more capable and hence more competitive. This is likely to en-

courage NATO Europe and other important allies to adopt home-grown alternatives, thereby reducing the interoperability of their forces with those of the United States. Moreover, it can be argued that closer integration of the U.S. and foreign defense industrial bases is unlikely to affect interoperability in either direction if U.S. allies do not increase their procurement budgets significantly.

In terms of national security, globalization also poses significant risks as well as rewards. With respect to rewards, globalization provides the Air Force with more “bang for the buck” as global competition forces costs down and quality up. It also strengthens overall U.S. military capabilities both by providing greater access to foreign technologies and by improving the financial health of U.S. defense firms. However, the risks are potentially significant. Globalization’s most potent threat lies in its potential to equip hostile nations and groups with advanced weapons and technologies designed by the United States and paid for by the U.S. government. Technology transfers become harder to control with globalization because they are a desired feature of many cross-border business relationships. Other risks stemming from globalization include worldwide weapon proliferation; the loss of certain domestic defense capabilities and technologies, coupled with an associated dependence on foreign sources of supply; and foreign control over U.S. industry.

### **The Regulatory Framework for Aerospace Industry Globalization**

Air Force management of the globalization process is informed by an extremely complex network of laws, regulations, executive orders, policies, directives, and procedures. This regulatory environment greatly affects the types of cross-border relationships established by industry. The primary instrument for controlling unclassified defense-related trade and technology transfers currently lies in the International Traffic in Arms Regulations (ITAR), which govern all military Security Assistance and International Armaments Cooperation programs. Contained within the ITAR is the U.S. Munitions List (USML), which includes all goods, services, and technologies designated as defense-related. All exports of USML items or technologies must be licensed by the Office of Defense Trade Controls (DTC), a division of the State Department’s Bureau of Political and

Military Affairs. The Export Administration Act of 1979 (EAA 1979) controls the transfer of technologies that have both commercial and military (dual-use) applications. There are two key policy tools for regulating foreign ownership, control, and influence (FOCI) of the U.S. industrial base. The Committee on Foreign Investment in the United States (CFIUS) oversees proposed foreign mergers with and acquisitions of U.S. businesses. The National Industrial Security Program (NISP) governs U.S. classified information released during any phase of a U.S. government contract, license, certificate, or grant.

These laws, regulations, and policies affect the ability of the Air Force to achieve its objectives relating to globalization. With regard to competition, laws and regulations require and encourage acquisition personnel to allow international sources to compete, and more general policies promoting competition have the potential to encourage greater competition from abroad. However, foreign industry has thus far not been viewed as an essential part of competition-based strategies, although this view may be changing: The shrinking number of U.S.-owned and -located defense contractors has raised the specter of collusion and thereby triggered support for competition-enhancing linkages between U.S. and foreign firms.

Current laws and regulations provide varying degrees of support for the Air Force's political-military and national security objectives. In order to prepare for coalition operations, the Department of Defense (DoD) has stated its strong support for International Armaments Cooperation programs and promotes Security Assistance programs to encourage allies and other friendly states to procure U.S.-designed equipment. At the same time, regulations and policies place major limitations on exports by virtue of concerns about defense-related trade and technology transfers and FOCI over key sectors of the U.S. industrial base.

Our reading of the literature indicates that both the Office of the Secretary of Defense (OSD) and the Air Force now believe that certain aspects of the U.S. export control regime have become ineffective and even counterproductive. Many perceive the ITAR as an impediment both to the leveling up of NATO and other allied forces and to greater interoperability of such forces with those of the United States. EAA 1979 is believed to encumber international defense co-

operation and to impede efficient DoD use of U.S. commercial industry by restricting firms' ability to participate in international exchanges of technology.

In response to such concerns, DoD has undertaken a wide-ranging reform effort. A key component of these reforms is the Defense Trade Security Initiative (DTSI), which is a joint effort by DoD and the Department of State to reform the ITAR and related export practices. The full implementation of DTSI could eliminate the need for authorized U.S. companies to acquire individual licenses for unclassified equipment exports or technology transfers when part of a major program or project involves a NATO government, Japan, Australia, or Sweden.

Other reforms are also being discussed. Bilateral negotiations are under way with the UK, Australia, and other close allies to establish congruence and reciprocity in several major areas, including export control processes and industrial security policies and procedures. Various congressional amendments have also been proposed to EAA 1979, including the removal of controls on items widely available from foreign suppliers and the establishment of an interagency dispute resolution process for license applications. At this point, it is not yet clear how far such reforms have proceeded.

### **The New Cross-Border Business Relationships: Case Studies**

A key objective of this report is to help identify the types of cross-border business relationships that are now emerging; to assess which are most likely to achieve the Air Force's economic and political-military objectives while minimizing potential risks; and to examine to what extent these relationships are positively or negatively affected by the regulatory environment. To increase our understanding, we conducted a survey of 38 cross-border business relationships and programs.<sup>1</sup>

An initial review of the cases reveals that the types of programs that show the most promise for promoting the potential military-political

---

<sup>1</sup>Some programs are counted twice as they evolve from one type of business relationship to another.

and economic benefits of globalization possess some or all of the following characteristics:

- They are voluntarily structured and often initiated by defense firms rather than by governments on the basis of internal business calculations of market conditions and best business practices.
- They are painstakingly structured to satisfy the existing U.S. arms export and technology security regulatory regime and CFIUS.
- They often focus on promoting existing products or modifications thereof, or on specific product market sectors.
- They frequently focus on subsystems, munitions, or discrete components or areas rather than on large, complex programs for the development of entire weapon system platforms.
- They are designed to gain and expand active reciprocal market access through new programs.
- They are often motivated by a desire to add to a company's product portfolio a highly competitive product in a market sector dominated by another firm or firms.
- They are characterized by mutual perception of balanced and complementary bilateral market access opportunities and technology transfer.
- The most aggressive and innovative among these relationships depend on continued reform of the U.S. export control regime in order to achieve their full potential.

For further research, we suggest an examination of case studies for in-depth analysis to better illustrate the issues and problems involved with greater globalization as well as the menus of policy options the Air Force has to manage them. Two proposed case studies are shown in Table S.1.

Proposed follow-up research into these case studies will focus on two central questions. First, what forms of the new industry-initiated cross-border business relationships and cross-border activities are most likely to promote key Air Force objectives regarding globalization? Second and most important, what key "lessons learned" can

**Table S.1**  
**Case Studies of Cross-Border Strategic Market Sector Collaboration**

Program	Business Structure	Activity	Competition <sup>a</sup>	Globalization Issues
Surveillance radar, command and control	U.S. French market sector joint venture	Codevelopment, coproduction	Variable	Tech transfer, tech security, work share, NATO RSI, <sup>c</sup> competition
NATO alliance ground surveillance	To be decided	Codevelopment, coproduction	Euro Hawk, ASTOR, SOSTAR, Eagle+, NATAR <sup>b</sup>	NATO RSI, tech transfer, tech security, interoperability

<sup>a</sup>The “Competition” column indicates separate programs that are clearly in competition. See the main text for a detailed discussion of specific programs.

<sup>b</sup>ASTOR = Airborne Standoff Radar; SOSTAR = Standoff Surveillance and Target Acquisition Radar; NATAR = NATO Transatlantic Advanced Radar.

<sup>c</sup>RSI = rationalization, standardization, and interoperability.

these cases provide to guide the Air Force on how and to what extent it can play a more proactive role in effectively managing globalization?

## CONCLUSIONS

### The Response of U.S. Industry to Globalization

- **Numerous innovative cross-border strategic market sector agreements initiated by U.S. and foreign companies are emerging.** Leading U.S. aerospace prime contractors and subcontractors are aggressively seeking creative new forms of cross-border linkages in efforts to gain or maintain foreign market access. The most innovative of these linkages appear to be long-term strategic teaming or joint venture agreements aimed at entire market sectors rather than the more traditional approach focusing on specific projects or systems.
- **U.S. aerospace firms are not significantly increasing their acquisition of wholly owned subsidiaries of foreign defense aerospace firms.** There are few indications that U.S. defense

aerospace firms have dramatically increased their interest in acquiring wholly owned foreign subsidiaries, although there seems to be some increase in U.S. M&A activity overseas in the defense industry as a whole. As noted above, the preferred industry-initiated cross-border business relationships appear to take the form of teams and joint ventures.

- **Teaming and joint ventures with non-UK and non-European-based firms are increasing.** Over the past several years, there has been an apparent increase in M&As, teaming, and joint ventures with non-UK-headquartered European companies as well as with non-European companies. This represents a shift from traditional U.S. practice, in which most direct investments and U.S.-initiated cross-border investments involved UK firms.

### **Implications of European Consolidation and Increased Aerospace Globalization**

- **U.S. industry collaboration with one country's firm increasingly means collaboration with many countries' firms.** The consolidation that is taking place both with the European defense aerospace industry and with that of other important foreign industrial bases has made it increasingly problematic for U.S. government policymakers and industry leaders to think in terms of bilateral collaborative relationships between the United States and specific European or other foreign countries. As a result, the traditional U.S. government and U.S. industry approach of negotiating bilateral, country-specific agreements may have to be modified or adjusted.
- **Consolidated European and other foreign firms mean potentially more equal partners as well as stronger competitors.** The consolidation of the European defense aerospace industry is producing pan-European companies of roughly the same size and sales turnover as the leading U.S. firms in many product sectors. These new, consolidated pan-European firms are eager to offer European solutions for European and third-country weapon system requirements that are fully competitive with U.S. products. Similar consolidation trends are visible in other countries.

- **European and other foreign firms seek U.S. market access but resent barriers.** With an overall smaller market and smaller R&D funding base, the newly emerging pan-European firms and other foreign companies strongly desire greater access both to the U.S. market and to U.S. technology. However, European and other foreign firms are insisting with increasing aggressiveness on more equal business relationships with U.S. firms as well as on less restrictive U.S. policies regarding access to the U.S. market, technology transfer, and third-party sales of technology and products.
- **European and other foreign firms view the acquisition of U.S. firms as the most effective means of penetrating the U.S. market.** The most successful recent penetrations of the U.S. market by European firms have been through acquisition of existing U.S. firms rather than through joint ventures or programs. To date, however, newly acquired foreign subsidiaries primarily service DoD and are often restricted with regard to technology flow back to Europe. Thus, such market penetration does not necessarily promote equipment standardization or interoperability or help close the capability gap with Europe.
- **Non-European foreign firms are forming strategic relationships with European and U.S. firms, potentially enhancing competition but complicating standardization and interoperability objectives.** The defense industries of some other important non-NATO allies have been aggressively seeking U.S. and European market access through the forging of new business relationships based on strategic alliances. Israeli industry has been particularly active in this area. In many cases, these alliances have clearly increased competition in key niche product sectors within both the U.S. and European markets in a manner that would appear to be beneficial to the Air Force. In some cases, however, these relationships seem to have undermined U.S. attempts to promote equipment standardization if not interoperability.
- **The findings above suggest that European and other foreign industry consolidation present U.S. government and industry with unprecedented opportunities as well as risks.** If new, mutually beneficial cross-border collaborative business relationships take hold, the consolidation of European and other foreign

industries greatly increases the prospects for allied procurement of standardized or interoperable systems while potentially reducing system costs. On the other hand, the persistence of frictions over technology transfer and security issues as well as foreign direct investment, combined with the increased capabilities and competitiveness of European and other multinational defense industries, means that the Europeans and other allies may be tempted to move increasingly toward indigenous solutions and more widespread global competition with U.S. firms.

### **Directions for Future Research**

The findings of this initial study point to the need for greater understanding of the opportunities and problems associated with an increasingly globalized and consolidated aerospace industrial base. Three issues in particular stand out for future research.

First, to what extent are greater competition and allied equipment standardization possible given the need for the United States to safeguard its defense technology in the interests of national security?

Second, what is the effect of the regulatory reforms undertaken beginning in the late 1990s in enhancing globalization while also protecting U.S. national security objectives such as technology security and maintaining critical national capabilities?

Third, to what extent and in what specific ways will the changes taking place in Europe affect the prospects for global reform and greater transatlantic collaboration? In addition, how will political and military factors in Europe affect the prospects for the expansion of the U.S. defense industry into overseas markets?

Further analysis of these broad questions in the follow-up study, together with additional in-depth case study analysis, will help fill the gaps in our understanding and provide guidance to the Air Force in developing new strategies and policies regarding the globalization of the industrial base.