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This study ends an intensive 11-month senior service, college-level research program of three military Research Fellows. At the direction of the Under Secretary of Defense for Acquisition, the program has dual purposes: first, to provide professional military education for selected officers from the Army, Navy and Air Force; second, to conduct research in a subject of interest to the U.S. defense acquisition community. The program includes a 12-week resident Program for Management Development (PMD) course at the Harvard University Graduate School of Business.

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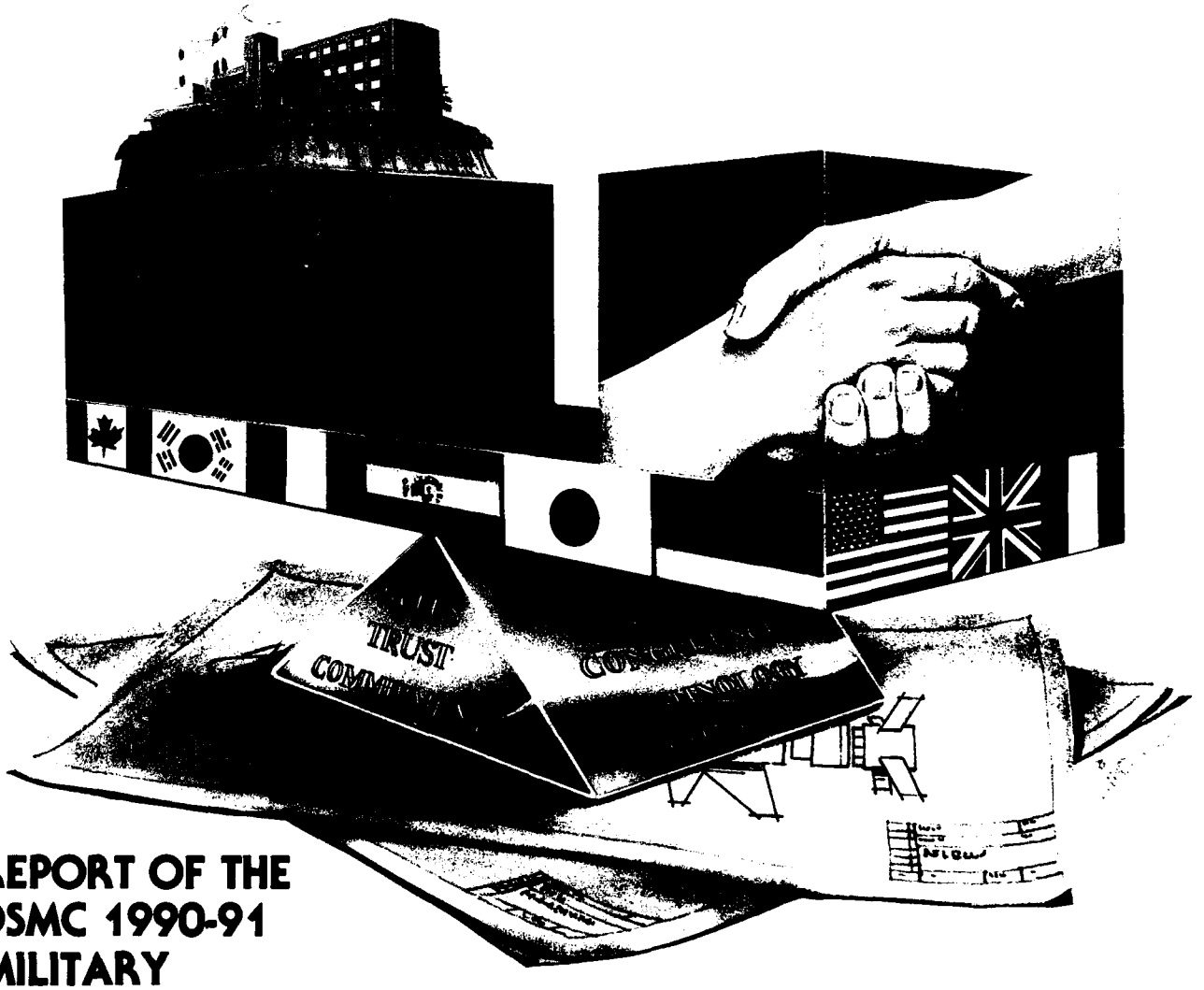
DEFENSE SYSTEMS
MANAGEMENT COLLEGE

# INTERNATIONAL COOPERATION

## THE NEXT GENERATION




## REPORT OF THE DSMC 1990-91 MILITARY RESEARCH FELLOWS

COL RICHARD W. JOHNSON, USA
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DEFENSE SYSTEMS
MANAGEMENT COLLEGE

# INTERNATIONAL COOPERATION— *THE NEXT GENERATION*

## Report of the DSMC 1990-1991 Military Research Fellows

Colonel Richard W. Johnson, USA
Lieutenant Colonel Richard A. Engel, USA
Lieutenant Colonel Delbert B. Atkinson, USAF

*September 1991*



For
*Aesun,*
*Nicky,*
*Prasertsi,*
and
for our mentor,
*Dr. Franz A.P. Frisch*

# PREFACE

This study ends an intensive 11-month, senior service, college-level research program of three military Research Fellows. At the direction of the Under Secretary of Defense for Acquisition, the program has dual purposes: first, to provide professional military education for selected officers from the Army, Navy and Air Force; second, to conduct research in a subject of interest to the U.S. defense acquisition community. In keeping with its role as the center for systems management education in the Department of Defense, the Defense Systems Management College (DSMC), in cooperation with the Harvard Business School, provided the means for conducting this study. The program includes a 12-week resident Program for Management Development (PMD) course at the Harvard University Graduate School of Business.

Defense acquisition has entered a new and exciting era. Just when peace began breaking out all over the world and "the wall" came down, the Persian Gulf crisis erupted. The need for international cooperation was never clearer than among the allied coalition in the Middle East. While historians dissect war reports to determine diplomatic and political ramifications, the militaries of the world will evaluate results for a clearer view of the threat environment likely to be faced as we approach the next century. The acquisition community is busy—analyzing the performance of the weapon systems in the Persian Gulf, and quantifying the "bang for the buck." The underlying theme emerging is that multinational operations are the future. International defense ministries will have to work together. Progressive business approaches to acquire future weapon systems present an excellent opportunity to harmonize international requirements, capitalize on global technology, and economize for an effective military capability.

Reviewing the composition of weapon systems contributing in the Gulf War, one quickly realizes that Foreign Military Sales (FMS) and direct sales of U.S. military products to allied countries were the primary forms of international cooperation. It was generally a "one-way street," the sale of U.S. products abroad. Program management of these cooperative efforts, though demanding and often frustrating, was not so unlike management of U.S.-only systems. But, the world also saw the results of cooperative ventures in defense weapon acquisition.

This study examines the international program initiation process with a view toward the future. National security is a function of military strength ***and*** economic strength. The research shows that U.S. economic strength has weakened in part because of issues arising from the military-industrial complex. The United States' short-term perspective of research and development, and the primary focus on defense-related technology, may not benefit the industrial base or the U.S. economy for the long-term. First, concentrating on advancing the technology without planning for efficient manufacturing loses competitiveness and builds foreign dependence. Second, the lack of trusting, positive relations between the

U.S. Government and U.S. industry, and between U.S. and foreign governments, has severely handicapped multinational collaboration. The "bureaucracy" and "protective"/"not invented here" mindset frustrates an already difficult process, often acting as a disincentive.

The Department of Defense (DOD) must explore national security implications of an increasingly competitive world economy. Economies everywhere depend on a stable global trading system, and maintaining it often requires major nations to take steps with short-term political "pain." This political perspective can be overwhelming. Drawing on extensive research and over 105 personal interviews, we identified and analyzed characteristics of cooperative efforts contributing to the success of co-development and co-production programs. Using empirical findings of the surveys, specific criteria emerged illustrating issues to be addressed in future consideration of potential multinational programs. In this study we address the effects of technology transfer, communication, culture, requirements harmonization, long-term commitment, and personal relationships on international collaboration. Programs must establish a healthy working relationship, converting nationalistic interests to mutual joint venture and program interests. Candidate programs permit greater integration among allies, and mutually beneficial economies of scale.

Finally, we extend the discussion of international programs to include the perspective of industry's foreign partners. Based on interviews with representatives of industry and government in Europe and Japan, this study concludes that the United States must deal with its biggest high-technology and economic competitors to boost the sagging U.S. defense industrial base. Patriotism is good for single events, as evidenced by the Persian Gulf situation, and Americans will not let the nation down. But, we can't use patriotism as an excuse for business loss. The infrastructure is crumbling, companies are begging for skilled workers, and the nation is developing a service-oriented economy. To support future defense industrial requirements, this study recommends principles for consolidating splintered management and countering the mounting pressures to cooperate internationally.

Readers pressed for time may want to go directly to the Executive Summary, Chapter 10, for pertinent points and recommendations. For others, Chapter 1 sets the stage with a discussion of today's changing environment and trends in international cooperation, the reasons for international programs, and the study's objectives and methodology. Chapters 2 through 8 contain results of the research and interviews. Successful cooperative ventures have similar characteristics. Partners achieve and maintain harmony of purpose toward an agreed objective. They commit themselves to the project. Management in the international arena is challenging but quite rewarding when conducted with an appreciation of the partners' cultural, political and military influences. Chapter 6 also extensively details problems created when technology is transferred among participants. At times the bureaucratic barriers can become almost insurmountable. We next discuss the relationships of government-to-government, industry-to-industry and government-to-industry as keys to successful implementation of a joint endeavor. Chapter 8 closes with a look at the education, research facilities and resources in the U.S. infrastructure required to participate in global projects. Chapter 9

summarizes findings and offers macrolevel recommendations.

We could not have undertaken a project of this size without the cooperation and contributions of many others. Throughout the writing of this document, we were genuinely thankful for their help. The faculty and staff at Harvard and DSMC were extremely helpful with their support and encouragement throughout the 11 months of this program. We appreciate efforts of the Library of Congress Federal Research Division which conducted much of the literature searches used as the basis for this study. Colin E. Smith of the American Embassy in London and Lieutenant Colonel Frank W. Lester, Jr., USAF, of the American Embassy in Tokyo were invaluable for reviewing the draft, and for the extra effort to secure interviews in Europe and Japan, respectively. Thanks to the government and industry experts listed in Appendix E without whose generous gifts of time and candid thoughts, our data gathering would have been more difficult. The DSMC librarians deserve special mention for timely responses for our unusual and hard-to-find information. The publications staff and graphics experts were phenomenal in converting our raw transcript into a professional product worthy of the DSMC logo. Captain Ralph W. Ortengren, Jr., USN, Dean of Research and Information at DSMC, and Lieutenant Colonel David Scibetta, USA, Director of Research at DSMC, deserve extra special credit for providing a supportive environment and the academic freedom necessary to produce a document of this type.

We dedicate this effort to the program managers, today and in the future, who will be instrumental in securing world peace through international cooperation. We sincerely hope that they may benefit from this work.

# Table of Contents

*I am not accepting collaboration because of governmental whims....I have to see the right business-orientated [sic] reasons before I will collaborate with anyone.*

*— Dr. Maurice Dixson, Chief Executive, Royal Ordnance*

# CHAPTER 1
# INTRODUCTION

We undertook this research project believing that future international cooperation will become increasingly important to the United States, in general, and to the Department of Defense, in particular. Our objective is to sensitize the acquisition community to the issues and barriers affecting international cooperative programs. Our goal is to provide a framework for the successful initiation and management of future cooperative programs.

Our interest in this subject derives from two studies, *Europe 1992 -- Catalyst For Change In Defense Acquisition,* written by previous Defense Systems Management College Research Fellows, and *The Management of International Cooperative Projects* by Lieutenant Colonel C. Michael Farr, USAF. Our interest in international armaments cooperation was further stimulated while attending the Harvard Business School Program for Management Development which comprised 139 middle managers from around the world, representing most forms of business; approximately 55 percent were from outside the United States, representing Europe, Africa, South America, Asia and the Soviet Union. Our convictions regarding the value of this project were confirmed as we interviewed more than 105 government and industry people involved in international programs.

## TREND TOWARD INTERNATIONAL COOPERATION

Europe 1992 is a plan for new laws and regulations that by 1992 will remove all barriers to the freer movement of goods, services, capital and people within participating countries.

### Europe 1992

The Europeans and the Japanese have made considerably more progress than the United States in restructuring their industries to operate in today's global marketplace. Unlike the United States, European domestic markets, military and commercial, have never been large enough to support their domestic industries; they have been forced to export their products. In 1957, the Treaty of Rome began the process of removing barriers to the freer movement of goods, services, capital and people among participating nations. Cooperative programs among European nations, and exporting resultant goods and services to third countries, have gradually become a way of life for European industry.

While there are many issues that must be resolved before achieving the sought-after Pan-European environment, progress has been made in removing barriers to global trade. Within Europe there is significant movement toward the strategic alliances,

mergers and joint ventures essential to a global market. Without repeating the extensive analysis presented in *Europe 1992* (Appendix A contains conclusions and recommendations of that study), Figure 1-1 shows recent involvement of six European countries in cooperative military aircraft programs. Also shown are major aircraft product lines of the individual corporations. Figure 1-2 compares results, in defense sales, of recent European mergers to those of two major U.S. defense contractors. Because the United States is expected to remain the single largest defense market, Europeans are investing in U.S. defense industry. They recognize the need and time required to develop necessary relationships to gain acceptance in the U.S. marketplace. Conversely, U.S. exports (including defense), as a percentage of the gross national product (GNP), are lower than other major industrial countries, and U.S. industrial investment in foreign industries is not commensurate with foreign investment in the United States.

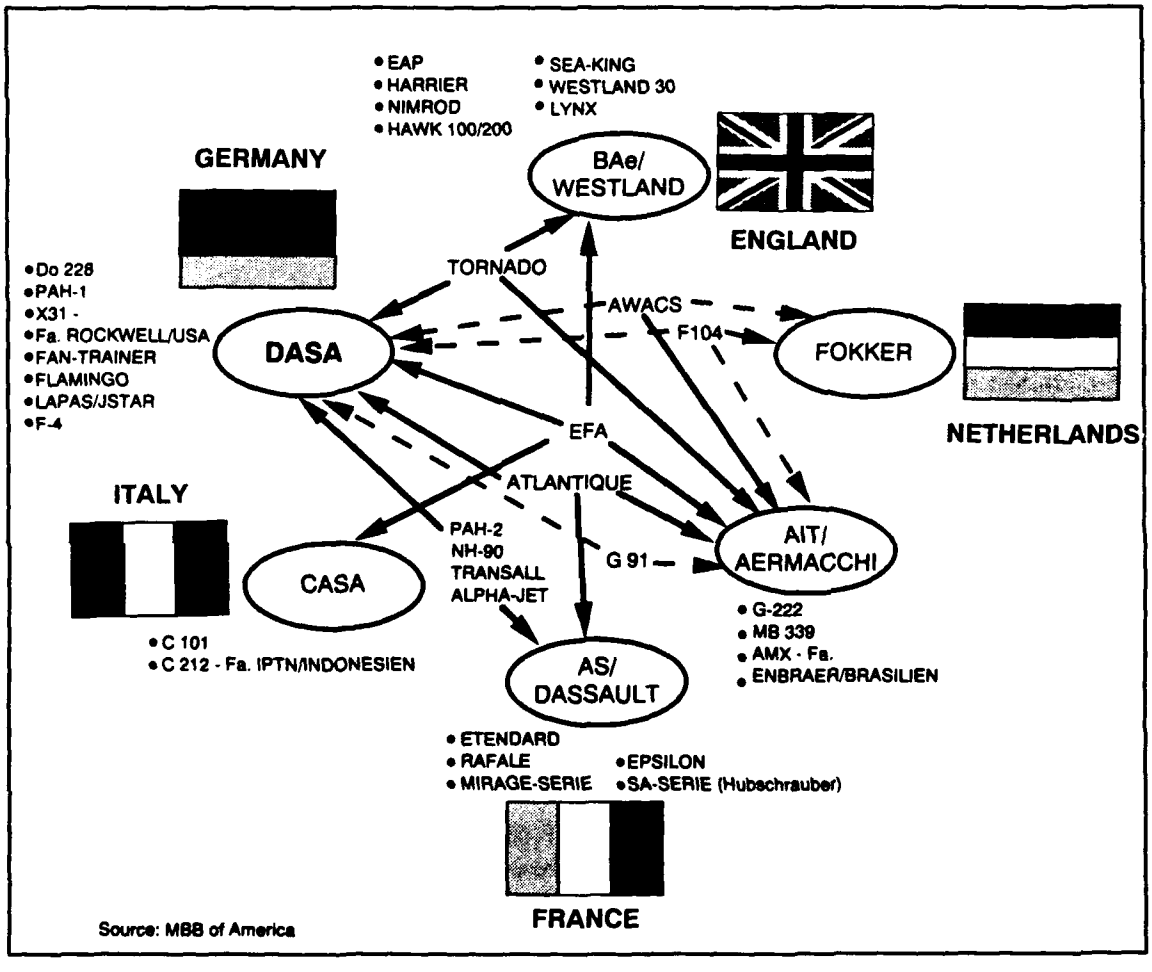



***Figure 1-1.*** **Cooperative European Military Aircraft Programs**

## 2 Introduction

Within the defense industry, the European NATO countries have taken steps to increase international cooperation on weapon development and production. Central to this are the Independent European Program Group (IEPG) and the NATO Conventional Armaments Planning System (CAPS); national composition is shown in Figure 1-3, page 4. The IEPG focus is on harmonizing national defense requirements and generating more cooperative programs to meet those requirements; the purpose is to reduce waste and inefficiencies associated with each nation pursuing its solution. The IEPG essentially begins its process with an Equipment Replacement Schedule (ERS) listing each nation's program for replacing current military equipment. The IEPG proceeds to look for a commonality of requirements and the opportunity for a cooperative program. The NATO Conventional Armaments Planning System, controlled by the Conference of the National Armaments Directors (CNAD), similarly seeks to harmonize national defense require-

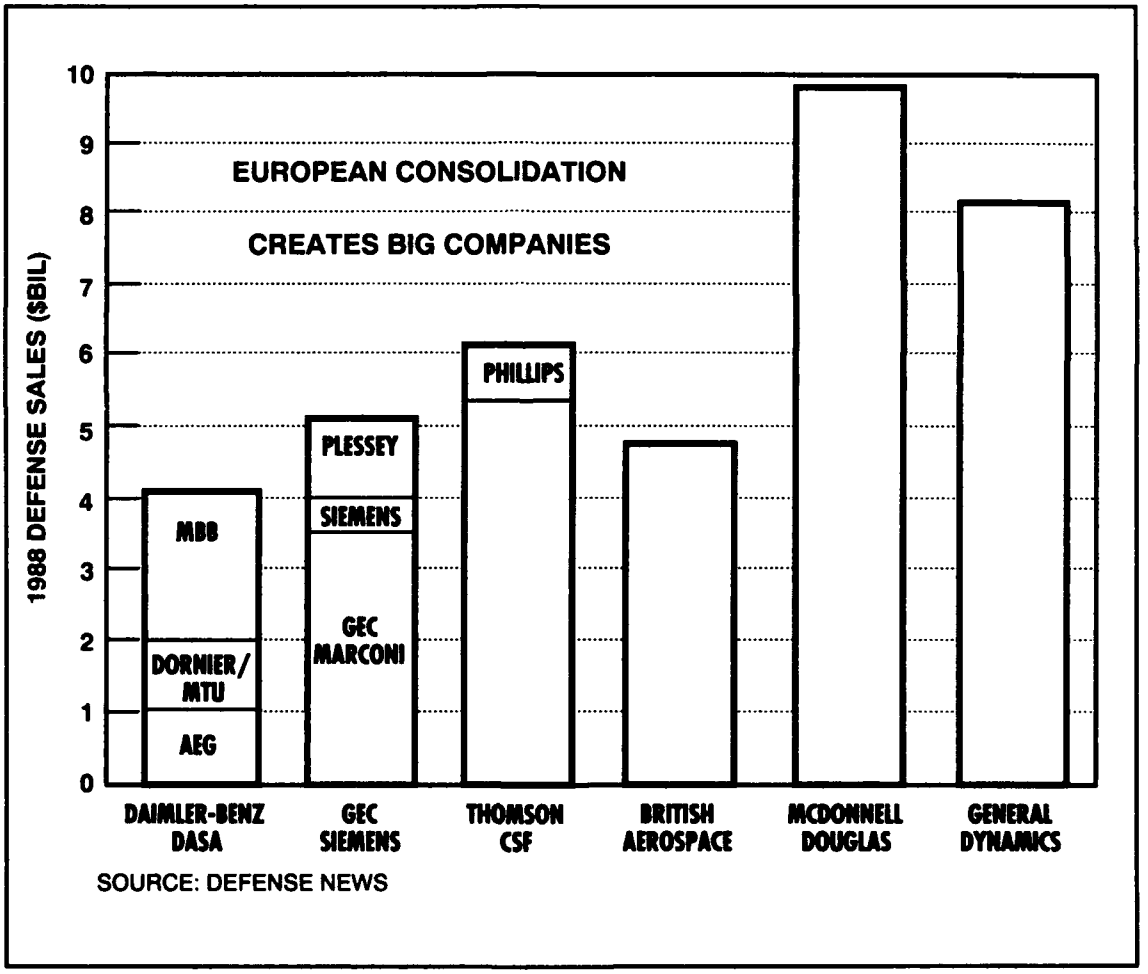



***Figure 1-2.*** **U.S. and European Aerospace Giants**

ments, in this case using a questionnaire to ascertain which long-range programs each participating nation is pursuing. These efforts demonstrate the European commitment to international cooperative efforts. Dominique Moisi, Associate Director of the French Institute for International Relations, expresses the European philosophy well: "While differing political interests may cause friction from time to time, [European] Community members increasingly see that their long-term national economic interests are best served by moving toward greater integration."

Japan's cash-rich economy is likely to stimulate growth in the Pacific Rim defense industries. Japanese progress on the next generation of super-conductivity computers has significant ramifications on defense, and their technology is ahead of the United States. They have been adept at improving upon ideas and processes developed elsewhere, often within the United States. The question for Western defense industry is: Can it compete with Asian firms or should it join with them?

The United States and Japan are mired in a competition associated with trade and technology issues. The distinction between economic affairs and the Japan-United States security relationship is blurred. Cooperative defense programs traditionally involved strategic motives for the United States, but received more economic emphasis by the Japanese. What began as a transfer of military-related technology, for defense cooperation, has become controversial because of economic disputes between the respective governments, as in the case of the FS-X program.

International armaments cooperative programs historically developed with U.S. attempts to strengthen the military capabilities of its allies; for mutual defense against the

| MEMBERS | NATO CAPS | IEPG |
|---|---|---|
| Belgium | X | X |
| Denmark | X | X |
| France | X | X |
| Germany | X | X |
| Greece | X | X |
| Iceland | X | |
| Italy | X | X |
| Luxembourg | X | X |
| Netherlands | X | X |
| Norway | X | X |
| Portugal | X | X |
| Spain | X | X |
| Turkey | X | X |
| United Kingdom | X | X |

*Figure 1-3.* **IEPG and NATO CAPS Participation**

Soviet Union and other communist powers. Meanwhile, the very underpinning of U.S. national defense security has been to maintain technological superiority in military weapons. Thus, the downside to assisting our allies in strengthening their military capabilities has been the erosion, through the inevitable sharing of technology, of U.S. leadership in technology. In other words, the price of strong alliances has been a rapid advance of state-of-the-art technology among U.S. allies, at the expense of U.S. leadership in technology.

The predominant, historical U.S. attitude toward international cooperation has been "We don't think anyone has anything to teach us" and "The U.S. builds and our allies buy." This attitude is slowly changing, primarily within industry, and U.S. policy must be adjusted to recognize the shift to, and encourage participation in, a global economy. The U.S. government has just begun to examine its

*modus operandi* to reconcile its policies, organization and resources to facilitate standardization and interoperability with our allies, while reducing industrial costs and enhancing the economic strength of the nation. However, driven by their historical needs to reach beyond small domestic markets, Europe and Japan have moved further ahead of the United States in developing a global business perspective. As markets and industries become more globalized, U.S. national security will become increasingly tied to its role within the global marketplace, both commercial and defense.

**WHY INTERNATIONAL PROGRAMS?**

In the last 2 years we have seen major changes in the world. We have gone from a Cold War with a visible threat, primarily the Soviet Union, to a situation characterized by the expression, "Peace is breaking out all over." The Eastern Block appears to be collapsing, and U.S. relations with the Soviet Union have improved significantly. The visible threat once facing the United States and its allies is changing. This has caused the United States and allies to rethink national security needs. In particular, the U.S. Congress and Department of Defense are scaling down the size of the armed forces.

The direct result of the new world situation is that defense force structures and defense budgets are being reduced in the 1990s. Figure 1-4 on page 6, shows the most recent projection of defense expenditures associated with the 1992 U.S. Department of Defense budget cycle. This trend is not unique to the United States. The declining defense budgets among the United States and its allies mean that, unless business arrangements change, the Free World defense industry will be characterized by a greater over-capacity regarding research, development, manufacturing, and support of the weapon systems of their armed forces. This over-capacity translates into inefficiencies regarding duplication of effort and underutilized manufacturing capacity.

No nation, including the United States, can afford to be totally self-sufficient in developing, producing and supporting the weapons required for its national defense. Noted defense analyst, Jacques S. Gansler, states that keeping its weapons systems at the technological forefront costs the United States about a 5-7 percent annual increase in the cost of each new generation of equipment. Figure 1-5, page 7, illustrates the increasing trend in procurement costs for succeeding generations of equipment. The result has been that, as weapons costs increase, the United States can only afford fewer of them. Norman Augustine said that if such a trend continues the United States will be able to afford only one fighter airplane per year by the year 2054.

As the U.S. force structure and defense budgets decline, domestic production requirements can be expected to decrease — causing the unit price per weapon system to be even higher (i.e., due to spreading overhead costs over fewer production units).[1] Furthermore, reduced requirements of our allies mean the export market will shrink, contributing to an additional increase in unit production costs. Appendix B presents a model for evaluating effects of changing foreign military sales upon the unit cost of a system. Also, the 6 percent decline, in real terms, of the FY91 Research, Development, Test and Evaluation (RDT&E) budget, following many FY89 program cancellations and extensions, has added to industry concerns for the future. By expanding production requirements to meet the needs of more than one country, the production economies-of-scale achieved should lower unit-production costs. Conversely, reducing production quantities has the negative effect of increasing the per-unit cost. The bottom line is that, given the trend toward reduced defense force structures and reduced defense

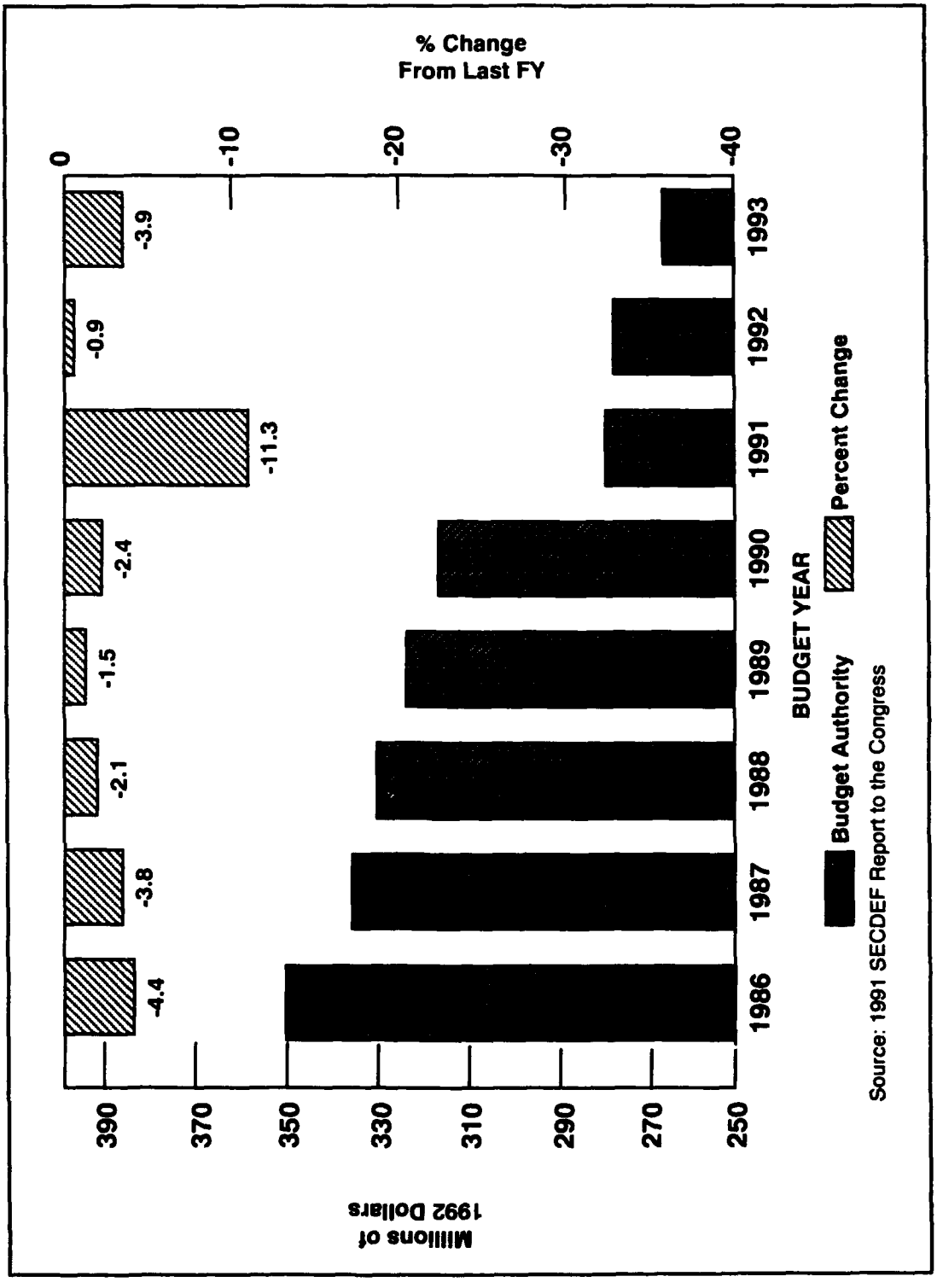
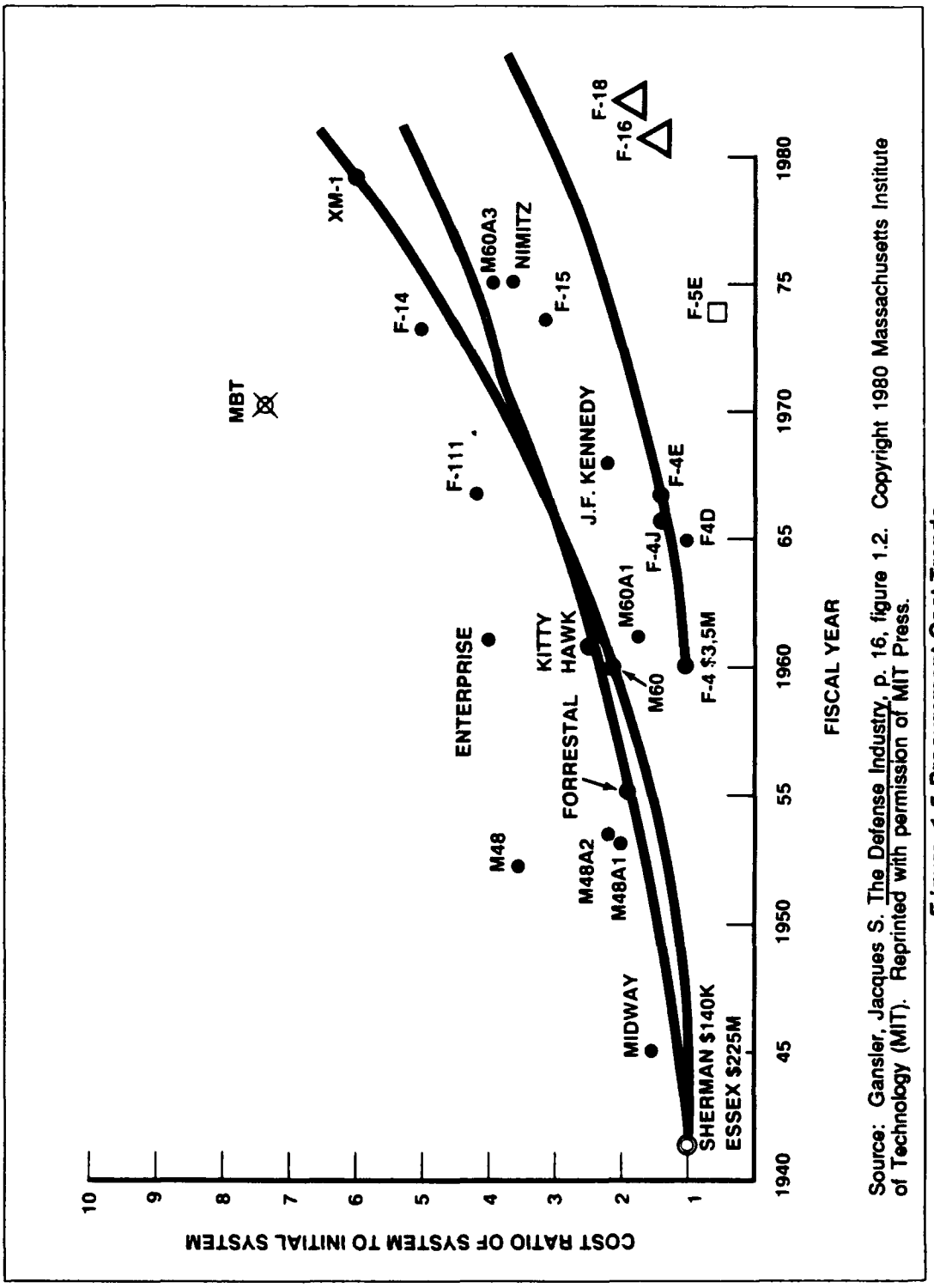



*Figure 1-4.* DOD Budget Trend




Source: Gansler, Jacques S. The Defense Industry, p. 16, figure 1.2. Copyright 1980 Massachusetts Institute of Technology (MIT). Reprinted with permission of MIT Press.

***Figure 1-5.*** **Procurement Cost Trends**

budgets, the United States and its allies no longer can afford to "go it alone."[2] As this trend continues, the defense industry must not only become more efficient, but it also must compete harder at home and overseas, and as partners, to survive.

**Economies of Scale**

It follows that one sound business reason for international armaments cooperation is to achieve economies-of-scale in development and production. Instead of three nations, for example, each developing its own, unique system to meet a common requirement, it would be more cost-effective to work together on developing and producing a single system. By cooperating, these nations avoid wasteful duplication of: research and development costs, capital expenditures, and variable costs associated with production. Instead of three individual nations' costs, there would be the single cost of a joint venture. Admittedly, that single joint-venture cost might be greater than the cost for a single-nation program, because of complexities involved in managing an international program. However, the cost to partner nations in the joint venture would certainly be less than if they pursued a national program on their own. The cost to each partner, however, is not simply the "single-nation-program-cost" divided by the number of partners. Rather, each nation's share, assuming an equal distribution of costs, is estimated to equal the "single-nation-program-cost" divided by the square root of the number of partners (see Appendix C).[3] With defense budgets declining in the future, nations will not be able to fund all of their programs on a go-it-alone basis. Cost sharing in a collaborative program presents an alternative means of acquiring a new weapon system — for some cents-on-the-dollar.

**Technological Synergy**

Another distinct advantage of collaborative programs is the resultant technology synergy. While Americans like to believe the best technology can always be found in the United States, that is no longer true. More than 65 percent of the people we interviewed strongly believe that European and Asian industries have significantly closed the technology leadership gap with the United States. In fact, it was the interviewees' consensus that, in some areas, they are ahead of the United States. These comments were further supported by recent publications. According to a recent analysis of 20[4] U.S.—designated critical technologies, shown in Figure 1-6, Japan leads in 5.[5] The March 15, 1990, Department of Defense Critical Technologies Plan asserts that of the same 20 critical technologies, NATO Europe is clearly ahead in three and capable of major contributions in another 13. A later section of our report will address technology issues in more detail. However, it is important to note here that good technology is available from outside the United States. International cooperation on research, development and production programs is one way to share in advanced technology. Combining the best minds to solve a technology challenge or enhance a manufacturing process can create synergistic effects that produce superior results. Also, such solutions might be generated quicker, with shared risk and at less cost, than if they were attempted by one national industry.

**Expanding Markets**

Foreign market access is another critical reason to pursue international programs. We mentioned the effects of exporting to achieve greater economies-of-scale in production. During this time of shrinking defense budgets, the United States and Europe have looked to each other as a safety valve in shoring up declining domestic sales. The prime U.S. export markets are Europe, the Middle East, and the Pacific Rim nations. Those potential customers of U.S. weapons systems no longer want to just buy American

| **The Twenty Most Critical Technologies** and Major Long Term Goals for the S&T Program<br>GOAL | Strategically relocatable targets | Force projection/rapid deployment | Defense against ballistic missiles | On-demand space asset deployments | Antisubmarine warfare | Worldwide, all-weather $C^3$/surveillance | Signature management | Close combat/air defense | Brilliant weapons | Reduced support requirements | Personnel reduction | Affordable/producible weapon systems |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **High-Priority, Most Pervasive Technologies** | | | | | | | | | | | | |
| Composite materials | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Computational fluid dynamics | | | | ■ | ■ | | | ■ | | | | ■ |
| Data Fusion | ■ | | ■ | ■ | ■ | ■ | | | | ■ | ■ | |
| Passive sensors | ■ | | ■ | | ■ | ■ | | ■ | ■ | | | |
| Photonics | | | | | | ■ | | | ■ | | | ■ |
| Semiconductor materials and | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| microelectronic circuits | ■ | | ■ | ■ | ■ | ■ | | | ■ | | ■ | |
| Signal processing | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Software producibility | | | | | | | | | | | | |
| **Enabling Technologies** | | | | | | | | | | | | |
| Air-breathing propulsion | | ■ | | ■ | | | ■ | ■ | | ■ | | ■ |
| Machine Intelligence and robotics | | | | ■ | | | | ■ | ■ | ■ | ■ | ■ |
| Parallel computer architecture | | | | ■ | | ■ | | | ■ | ■ | | |
| Sensitive radars | ■ | | ■ | | ■ | ■ | | ■ | ■ | | | |
| Signature control | ■ | | ■ | | ■ | | ■ | | | | | |
| simulation and modeling | | ■ | | | | ■ | | ■ | | ■ | ■ | ■ |
| Weapon system environment | ■ | ■ | ■ | | ■ | | | ■ | ■ | | | |
| **Emerging Technologies** | | | | | | | | | | | | |
| Biotechnology materials and processes | | | | | | | | | | ■ | ■ | ■ |
| High-energy-density materials | | | ■ | ■ | | | | ■ | | ■ | ■ | ■ |
| Hypervelocity projectiles | | | ■ | | | | | ■ | ■ | | | ■ |
| Pulsed power | | | ■ | | | | | ■ | | | | ■ |
| Superconductivity | | | ■ | | ■ | ■ | | | | ■ | | |

Source: The Department of Defense Critical Technologies Plan. 1990.

***Figure 1-6.*** **DOD's Critical Technologies**

products. They are becoming increasingly reluctant to even produce an American product under a license agreement. More than 60 percent of the people we interviewed said an important cost of doing business overseas is providing "industrial benefits." Foreign nations want to play significant roles in the development and production of systems they procure. They want to use the procurement process to enhance their industrial base and national economy. Having an indigenous capability to produce a weapon system means developing the capability to provide life-cycle support for the system; no umbilical cord ties them to the United States or any other supplier. Industrial benefits have become a customer demand, and countries that don't meet the demand risk not getting the business.

**Interoperability**

Greater interoperability among the United States and its allies is certainly a positive outcome of a successful international program, particularly with the trend towardan increased reliance on multinational forces and operations. If the United States and its allies can reduce the variety of weapons systems on a battlefield, imagine the benefits to logistical elements that must provide the fuel, ammunition, repair parts, and maintenance support to a multinational operation. Consider the effects on the command and control of a multinational force that has more commonality in equipment and operational capability. This is not a new subject; the topic of rationalization, standardization, and interoperability has been around for years. However, there has been little progress in standardizing equipment. For example, look at the proliferation of armored vehicles, artillery, helicopters, fighter aircraft, and support vehicles among the United States and its allies. International cooperation offers a renewed opportunity to address some of these issues.

We believe there are significant advantages for the United States to seek more involvement in international cooperation on defense system development and production. We do not, however, believe it is the panacea for all future DOD weapon system procurement — it should not become the latest fad in weapon system procurement. Managing an international program is a complex, often frustrating, process. Yet, where it "fits," it can present significant advantages to all participants.

## STUDY OBJECTIVES

When undertaking this study, we found two similar efforts had been conducted by Lieutenant Colonel Farr, of the Air Force Institute of Technology (AFIT) and sponsored by the Defense Systems Management College. Those focused primarily on government perspectives regarding criteria for managing successful international programs. A summary of findings is in Appendix D. The purpose of our study is to build upon that previous work and, with particular emphasis on industry's viewpoint, examine the barriers to entry into an international program and the criteria for successfully managing an international program. We want to provide a framework for success: what conditions must be present when nations decide to enter into an international cooperation, and what factors must be managed with particular attention during the execution of an international program. Having done so, the astute manager can turn the barriers into a competitive edge.

## STUDY METHODOLOGY

Data for this study came from two primary sources, a literature search by the U.S. Library of Congress and extensive personal interviews. The literature provided by the Library of Congress provided useful background data on the economies of the United States and other industrial nations, and the trends and

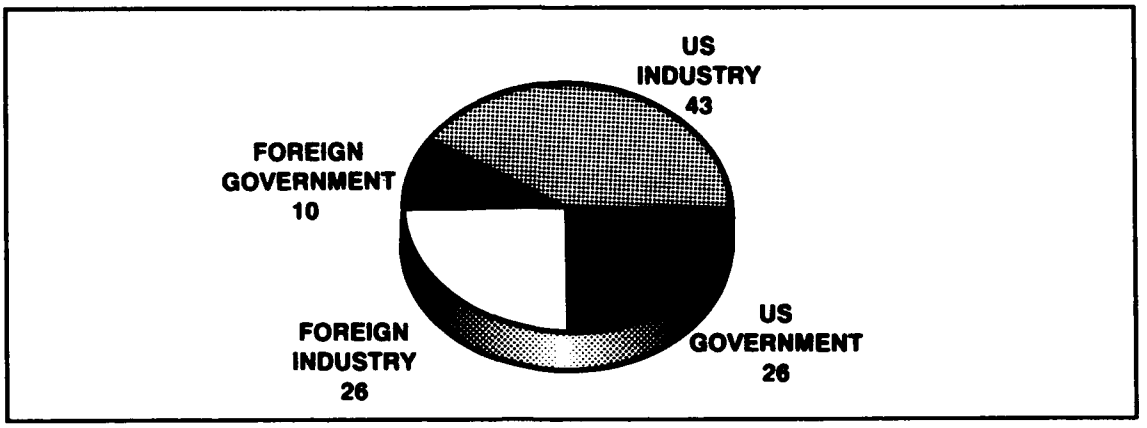



***Figure 1-7.*** **Distribution of Interviews and Personal Contacts**

movement toward a global economy. It corroborated information from our interviews.

Our intention was to get into the minds of industry and government officials involved in initiating and managing international programs. Given the studies by Lieutenant Colonel Farr, which focused largely on the government perspective, our major thrust was toward an industry view. It was not possible, however, to access all industry managers without first contacting the appropriate government program office. Therein we found another audience who were anxious to discuss experiences and to arrange meetings with industry counterparts. Figure 1-7 shows the distribution of interviews, industry and government, United States and foreign; a complete listing of interviews is at Appendix E. In all cases, we found industry and government representatives, United States and foreign, willing and eager to talk. The typical interview lasted one hour; some, three hours.

The interview format was similar to Lieutenant Colonel Farr's. We tailored his questionnaire to draw out an industry viewpoint. A copy of our interview guide is at Appendix F. The interview guide was provided as a read-ahead to all contacts, but it was not rigidly followed during the interviews. Given the time constraints of the executive being interviewed, and whether or not he/she had specific international program office experience, we used either the entire guide or only Part II. Regardless, a pattern of observations emerged. For example, a large percentage of executives discussed the U.S. system of export license controls and the need for long-term commitment to an international program. We tracked the frequency of comments, adding to and refining the list, as we progressed through our scheduled interviews. These key observations became the basis for further background research and the findings presented in this document.

# ENDNOTES

1. The additional per-unit cost is also a function of the manufacturing technologies employed in the production facility, as well as the production capacities, normal and surge, designed into the plant

2. The high cost of developing and producing defense systems is also impacting the Soviet Union. It is common knowledge that the Soviets are concerned about reducing their defense expenditures and converting their defense production plants into commercial industrial facilities. They, too, can no longer afford the large expense of developing and producing weapons for a large military force.

3. While there is no proven, scientific formula, there is a rule-of-thumb commonly used and understood by the industry and government officials we interviewed. Given the complexity of managing an international program, most officials felt the total program cost and schedule would increase by about the square root of the number of partner nations involved in the program. Some interviewees felt that estimate provided by this rule-of-thumb represented an upper limit, or maximum cost for a collaborative program; a well-managed program, with total partner commitment, could be expected to do better. Appendix C illustrates these effects upon total program cost and partner share.

4. The 1991 Department of Defense *Critical Technologies Plan* was published on 1 May 1991. It contains 21 critical technologies, having added flexible manufacturing to the list and renaming others. Due its recent publication, there has not yet been a published analysis of global leadership regarding the 1991 list of critical technologies.

5. Jane Poss, "After 40 Years, Is Defense Research Outdated?" *The Boston Globe*, October 7, 1990, p. A1.

You can see a lot by observing.
— *Yogi Berra*

# CHAPTER 2
# AN OVERVIEW

In reviewing the data, certain patterns quickly emerge regarding the central issues and/or barriers which affect the initiation of international programs. Figure 2-1 illustrates the frequency with which certain issues surfaced during our interviews. The comments provided by industry and government are shown side-by-side to show where

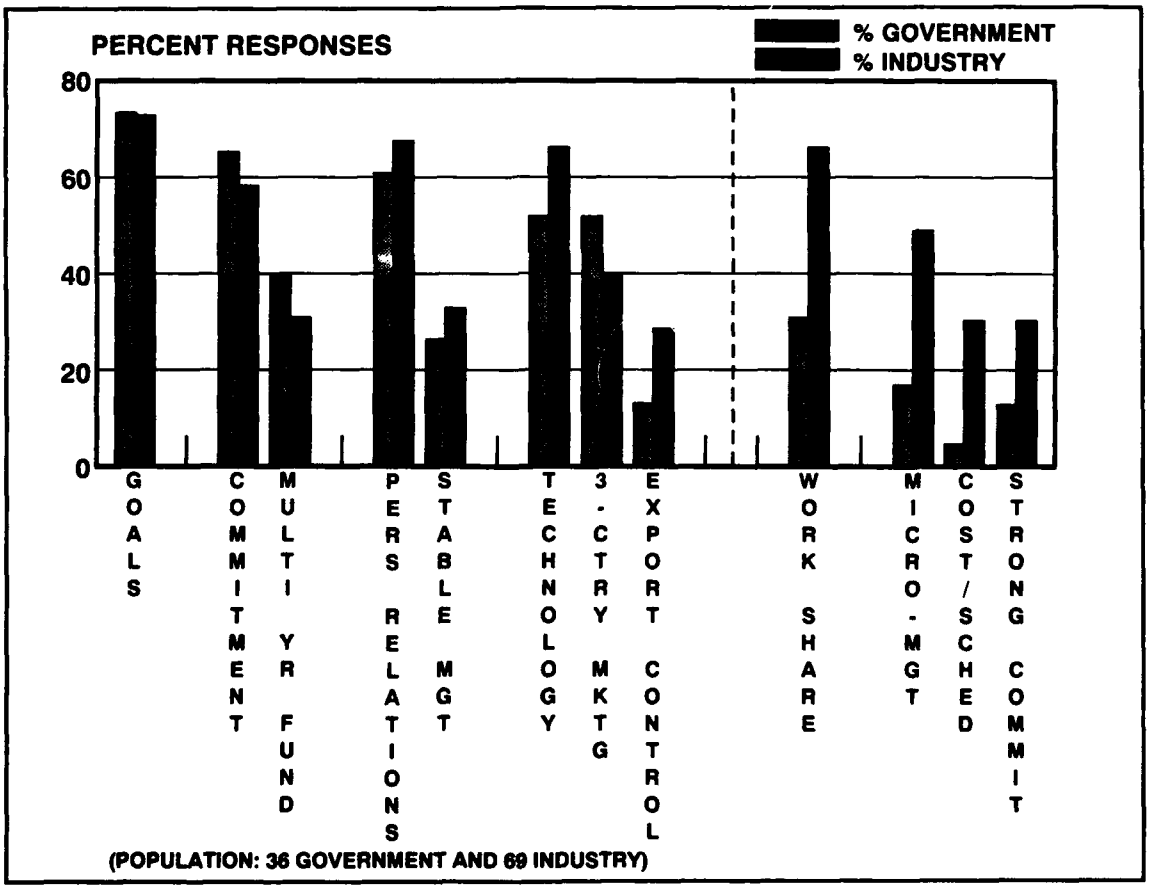



***Figure 2-1.*** **Barriers and Issues**

there was a commonality of perceptions; those categories to the left of the dashed, vertical line reflect relatively close agreement, while those to the right of that line indicate a difference of opinions. We've also clustered some of the data where the same point of issue was approached from different aspects. For example, the lack of a long-term commitment to an international program was generally discussed in terms of commitment and/or the lack of multiyear funding support for multinational programs. Another example centers on the need for better understanding and respect of cultural differences; this surfaced in comments about the importance of close personal relationships that must develop between key people — and how difficult that is when key management people have longevity of less than three or four years. While separate sections are devoted to each of the key issues, an overview will help set the stage.

## GOAL CONGRUENCE

Goal congruence is absolutely essential to program success, be it a national or a multinational program — but especially in a multinational program. That may sound like a blinding flash of the obvious, but harmonizing requirements was one of the most discussed issues. If the participating nations cannot agree on the technical and programmatic requirements, or if they try to change them in mid-stream, the international program is doomed to failure. It is also essential that time be devoted up front to planning and putting into place the terms and conditions for cooperation (i.e., Memorandum of Understanding, management organization, decision-making process, communications, roles/responsibilities) to maintain harmony among participants.

## INDUSTRIAL BENEFITS

It was interesting to note the difference between the government and industry perceptions on industrial benefits. Almost 70 percent of the industry representatives, versus only about 30 percent of the government representatives, considered the issue of industrial benefits to be significant enough to warrant discussions. The reality is that industrial benefits are extremely important to our foreign partners. They are no longer satisfied with just "buying American" or building an American product under U.S. license. They are looking for arrangements that will boost the economic conditions of the nations and industries. A case in point is the NATO AWACS Modernization Programme: it took only one year to reach agreement on the technical requirements, but it took two more years to reach agreement on the division of industrial benefits. Potential foreign partners are no longer content with being the U.S. "junior partner"; they want to be full and equal partners, and they demand a share of the benefits — proportional to their contribution.

## COMMITMENT

Once the participants agree on a program, the next major factor contributing to its success or failure is commitment to that program, as specified in the provisions of the Memorandum of Understanding. The consensus among the people we interviewed, which was also supported in our literature review, was that the United States lacks the long-term commitment exhibited by our allies. Unlike the U.S., our allies' defense budgets cannot support multiple, concurrent programs working to the same objective. It is not uncommon to have more than one U.S. Service working on similar efforts, or to have multiple programs within a Service, developing competing technologies of which only one will survive a down-select process. The Europeans cannot afford this kind of acquisition process. When they enter into a program, they tend to commit to the program, through development and into production. And they tend to fund, or set aside monies, to support

the program — in contrast to the U.S. annual program and budget reviews. The Europeans and PACRIM nations have a difficult time coping with the U.S. tendency to drop a program at any point in the acquisition cycle.

**Technology Control**

The United States needs to take a more realistic view of technology control. The current U.S. policy is based upon three conditions that existed in 1949:

(1) the United States is the leader in, and therefore controls the diffusion of, most advanced technology;

(2) exports don't matter much to the U.S. economy; and

(3) dual-use technologies represent a small and easily isolated category.

All of those conditions have changed, but U.S. policy regarding technology controls have not. The U.S. attitudes toward advanced technology, export licenses, and third-country sales represent a significant barrier to U.S. participation in the global marketplace, both commercial and defense.

## CULTURAL DIFFERENCES

Understanding and respecting cultural differences are also vital to a successful international program. It is important to recognize, and capitalize on, the unique expertise and approaches of the foreign partners — versus trying to impose your way as the only acceptable way of doing business. Blend the precision and organization of the Germans, with the creativity of the French, with the U.S. ability to organize and manage a major project. In doing so, personal relationships and trust are built that will see a program through the tough times and difficult decisions that lie ahead. Many of our contacts stressed the importance of close personal relationships, especially at the higher levels of the organizations. The United States has a particular weakness herein, in that U.S. executives and other key people usually have less longevity than their foreign counterparts. It takes time to establish trust and gain rapport with your counterparts, and all too often the U.S. member leaves the program just about the time that personal relationship begins to bear fruit.

## GOVERNMENT-INDUSTRY RELATIONSHIPS

The last area has to do with roles, and the differences in perception should not be a big surprise. Once again industry makes a case for a clearer division of roles and responsibilities between the government and industry. Industry perceives that the U.S. government micro-manages too much. They contend that the government's role should be focused on establishing the requirement, providing stable funding, and maintaining an oversight that ensures the requirement is being met. Industry asserts that managing the programmatic details according to the given technical, schedule and budget objectives is an industry responsibility.

Often cited during this study was the much closer relationship — read that as "trust" — which exists among foreign industries and their governments. This is in sharp contrast to the U.S. government's arms-length, "fraud-waste-and-abuse" mentality in dealing with contractors. Trust is critical for negotiating cooperative agreements to facilitate the flexibility needed for compromise.

## CRITERIA FOR SUCCESS

Following from the above issues flowed some specific criteria for success. Figure 2-2. on the following page, reflects the responses to our specific interview question: "What are the selection criteria for a successful international program?" We've divided the responses into

four groups: Goals, Trust, Process, and Limiting the Number of Partners.

The "goals" response re-emphasizes what was said earlier about the importance of harmonizing goals among the participating governments/industries. If there is not complete agreement, or if there are hidden agendas regarding technical objectives, work-shares, and expectations from the program, then the program will not succeed. This is the very foundation of a successful international program.

The second major concern is that of trust — among the partnering nations, among the partnering industries, and among the industries and their national governments. A solid trust-based relationship is essential to resolve issues regarding technology sharing, export licenses, third-country sales, and the roles and responsibilities of the partners. Trust is the foundation for a long-term commitment to the success of the program. Trusting partners will become dependent upon each other, and assist each other, to work successfully through the difficult technical and programmatic issues that will occur.

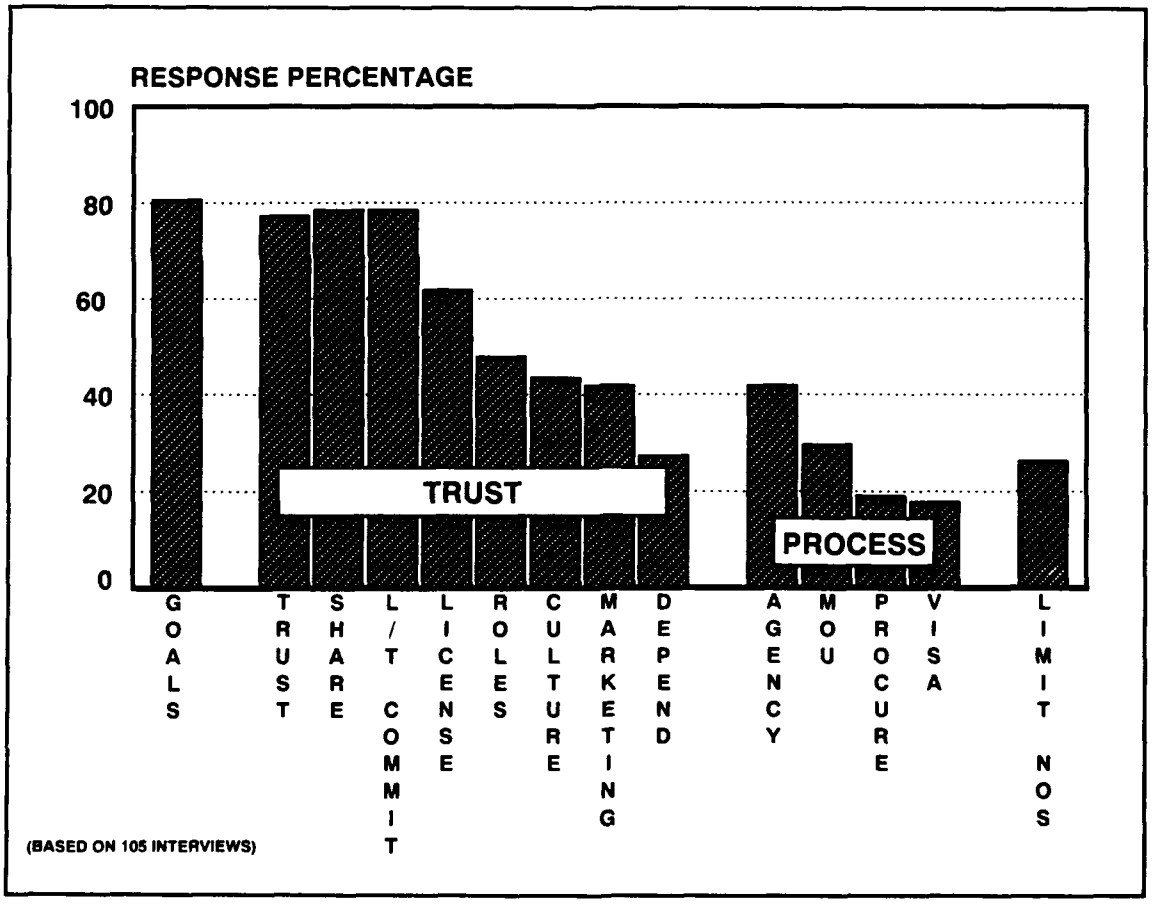



***Figure 2-2.*** **Criteria for Success**

The third criterion is process-related. Recommendations were made regarding the need for a single U.S. voice on international collaboration. Currently, the "policy house" is divided by the perspectives of the Departments of Defense, State, and Commerce and other departments or agencies. The process of negotiating the Memorandum of Understanding must be streamlined, in order to get international programs off-the-ground quicker. The procurement and the visa processes need to be revised to foster, not hinder, the already difficult job of managing international programs.

The last criteria is fairly obvious — limit the number of partners to that which is workable. Recognizing that each arrangement is unique, much depends on the nations and industries that are teamed together. However, the majority of executives we interviewed recommended limiting the number of partners to three or four. Beyond three or four full-and-equal international partners, the consensus is that the process becomes too complex to manage properly.

The remainder of this document will address the major issues in more detail, followed by our conclusions and recommendations.

...collaboration for the sake of collaboration,... is really rather costly.[1]

# CHAPTER 3
# FINDINGS: ACHIEVING AND MAINTAINING GOAL CONGRUENCE

Goal congruence (i.e., a clear understanding/agreement by all participants), is the single most important factor in achieving program success. There should be congruence at every level—government to government, industry to industry, and government to industry. It is especially important that the participating nations agree on the threat and/or system requirements to counter that threat, and that industry agree on the technical requirements/approach. It is the very foundation of an international program — if you can't harmonize requirements, international collaboration is a non-starter. All major issues must be addressed in a Memorandum of Understanding (MOU),[2] and there must be agreement on roles and responsibilities, as well as a management structure.

## OBTAIN A UNANIMOUS AGREEMENT ON THE REQUIREMENTS

A successful international program begins with a clear definition of the requirements. An agreement on the threat and a thorough requirements scrub (to include standardizing and consolidating) were identified by interviewees as the most important prerequisites to success. Obtaining a consensus often involves much negotiation, but is time well spent to establish the goals that focus participants on the path for a successful cooperative effort. It is critical that the process start early; as early as threat assessment. All too often, nations consider a cooperative approach only after a variety of national development projects are underway. Success then requires that one or more of the nations abandon their national programs — this may happen, but it is a difficult decision at best.

A common complaint among U.S. allies is the difficulty in getting a clear U.S. requirements definition; our interviews confirmed the familiar point that it is often difficult to know who speaks for the United States, because of conflicting signals from the Congress, DOD, and the Services. The United States was also characterized as prone to change its requirements (more than Europeans would tolerate in a European program). The United States might also have competing programs within and among the Services to satisfy similar requirements. The Europeans, who can afford only one system, generally have a single requirements definition that encompasses all Services. Europeans tend to define a general requirement with emphasis on performance; letting industry build the system as close to the requirements as possible and, if necessary, adapting the force structure and doctrine to capitalize on the resultant weapon system. In contrast, the United States develops detailed performance and cosmetic requirements, and

it is prepared to cancel the program if these "restrictive" requirements aren't met. To some, "U.S. requirements change by the hour," with the United States being afflicted with the "wait I can make it a little better" syndrome.

There are numerous examples of cooperative programs failing because the United States could not agree on requirements. For example, the Modular Stand-off Weapon (MSOW) cooperative program was canceled when the USAF "couldn't agree on requirements" in favor of a competing USAF program. Similarly, the United States pulled out of the JP233 (runway-cratering bombs) program after three years when the USAF changed to a stand-off requirement.

Until recently, the U.S. Services have not been under financial pressure to look for partners for their projects. Additionally, U.S. requirements are based on worldwide threats; therein lies a perception that requirements are not to be set by partners whose attentions are centered on Europe. For example, a primary reason for the MSOW program not being initiated was the difficulty in trying to agree on the range of the weapon. The Germans (due to constitutional constraints) had a shorter range requirement than either the United States or the United Kingdom. Such differing views lead to lengthy and difficult negotiations in establishing the requirements foundation for a cooperative program (especially co-development). Rationalization is difficult, as the initial specification is "all things to all people" and the specification must be worked down to the cardinal points to make the project cost-effective.

It is imperative that a timely exchange of information take place among the politicians, military officials and industry. Well established institutions, such as the NATO Independent European Program Group (IEPG), can make significant contributions to this effort. While it is difficult to reconcile different force structures and threats, NATO has a methodology to resolve this. The success of the Multiple Launch Rocket System (MLRS) program is largely the result of the weapon system fitting well into the force structures of the national Services. It was required by the Germans, French and British; need drove the commitment. For NATO, the need is to identify the common threat that binds NATO partners. In the 1980s, the F-16 became an international success because of the unanimous support in Europe for an advanced fighter aircraft to counter a common threat. In addition to agreeing on the threat, the participating countries agreed that producing the F-16 would benefit all. The nations selected to produce the F-16 actually supplemented the U.S. production capability, thus saving costs and production time to meet the increasing demand for the aircraft.

**SATISFY THE "WHAT'S IN IT FOR ME?"**

The principal motivation for entering a cooperative effort is that benefits are perceived to exceed contributions, with the participants constantly asking "what's in it for me?" It is, therefore, essential that critical needs are satisfied up-front and remain an incentive to continue participation. The key to harmony is that the work-sharing (i.e., contributions and benefits) must be acceptable. Unfortunately, the contributions/benefits balance is often difficult to define and it may be complicated by external interests (e.g., the Congress) and the number of participants.

The bottom line for industry is whether it is a good business deal (i.e., must be industrially and economically profitable to the companies —or market driven "goal congruence"). Governments may be interested in one or more of the following: decreasing dependency on foreign sources; fostering technological development; socio-economic benefits

(e.g., keeping existing facilities busy); and/or prestige. Economic interests require consideration of: direct participation in the program; orders to the manufacturing industry of the concerned countries; and balance of trade offsets.

These should be addressed in the MOU under work-sharing and third party sales, and industry to government agreements regarding industrial benefits. Since each participant may have different objectives that must be satisfied, accommodation requires that the objectives be made known and that there be open communication between industry and government. It is also critical that all participants are flexible in considering tradeoffs to ensure that everyone is at ease with the final package. There must be unanimous approval before program initiation. Additionally, as the program evolves, the agreements may have to be renegotiated to ensure they are tailored to each phase and satisfy the U.S. policy of equitability.[3]

The Multiple Launch Rocket System (MLRS) and NATO Airborne Warning and Control System (AWACS) programs have been very successful in accomplishing this difficult task. In the Terminal Guidance Warhead (TGW) submunitions development, the MLRS program had to accommodate the participants requirement for each to share in the development of the high technology seeker. After lengthy negotiations, the division of effort shown in Figure 3-1, page 22, was agreed to. While it would have been more efficient to have one company responsible for the entire seeker, the program could not continue as a cooperative effort unless the participants' desires for technology-sharing were satisfied.

The NATO AWACS is another program that has been very successful in managing/accommodating participant needs. The NATO AEW&C Programme Management Organization (NAPMO) has extensive experience in the industrial benefits (IB) field. The IB agreement for the NATO E-3A Modernisation Programme has implemented an IB agreement that returns the value of each nation's monetary contributions in the form of agreed-to-benefits for national industries over a nine-year period.

The trend is to provide increased freedom for industry to negotiate agreements for development and production work-shares. Most interviewees also favored letting industry work out the offsets as a part of work-share negotiations, but with government involvement and support. The U.S policy appears to support this view by placing the responsibility for negotiating and implementing offset arrangements with the companies involved.

However, most industry representatives felt the U.S. policy was too restrictive because it also prohibits: any direct U.S. government participation in the guarantees of offsets to any allied government or participating industry; and, the use of U.S. funds to finance offsets.[4] United States allies typically want to see some U.S. guarantee of economic and political return (i.e., offsets) to their own countries.

Additionally, they are increasingly interested in technology transfers, which may conflict with U.S technology transfer policies. Thus, co-production and co-development present far greater challenges to defense companies than direct sales. With no direct U.S. oversight, foreign governments negotiate directly with industries in their countries and with U.S. companies on terms and conditions of offsets. It is therefore possible that important, perhaps vital, cooperative weapons programs could be dictated by the ability of U.S. companies to come to terms with foreign governments on offsets.[5] If the offset arrangements aren't successful, important and costly R&D

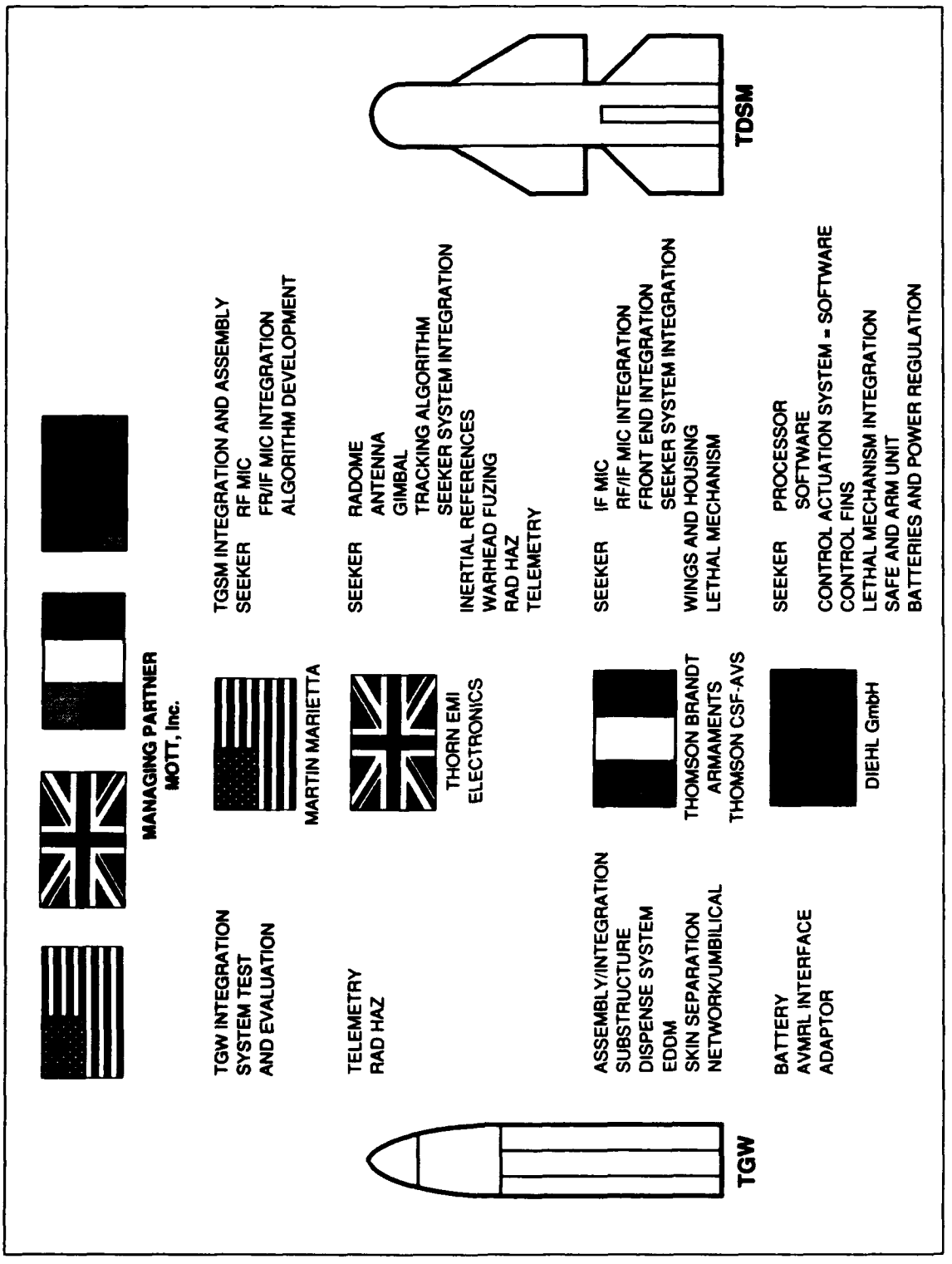



*Figure 3 -1.* **MLRS TGW Distribution of Work**

**KEYS TO MAINTAINING HARMONY**

1. **Let industry choose own partners**
2. **Get the politics right.**
3. **Establish policy and a management structure to facilitate maintaining consensus.**
   a. **Ensure the MOU addresses all critical issues.**
   b. **Define the process for rapid settlement of disputes.**
   c. **Clearly define roles and responsibilities.**
   d. **Provide an environment/mechanism to facilitate open/timely communication.**
   e. **Agree on contracting terms and conditions.**
   f. **Provide for industry involvement.**
   g. **Recognize and accommodate cultural and managerial differences.**
4. **Limit the number of equal partners**

*Figure 3-2*

may be scuttled (or the United States may have to bear the full cost) outside U.S. government control.

## MAINTAINING HARMONY

The key to maintaining harmony is planning the proper foundation. Figure 3-2 identifies what our interviewees considered as the keys to maintaining harmony.

### Let Industry Choose Their Own Partners

Defense programs are like marriage: choosing the right partner is critical to success. In this regard, there must be mutual respect and a feeling among partners that they need each other. The criteria industry considers essential to selecting partners is summarized in Figure 3-3. Every company stressed the importance of extensive contact to ensure the fit is right. These criteria point to "trust" and "mutual respect" as keys to success; these come only with experience of working together. Most companies we talked to had formed relationships on smaller projects that evolved into larger cooperative efforts only after there was a "good fit."

**INDUSTRY CRITERIA FOR SELECTING PARTNERS**

1. **Complimentary capabilities (based on the program requirements).**
2. **Compatible interests and strategic objectives.**
3. **Competence and past experience.**
4. **Similar size and resources**
5. **Political clout**

*Figure 3-3*

"Political clout" is especially important in selecting foreign partners as foreign companies have much closer relationships with their governments than U.S. companies have with the U.S. government. A company's clout is often more important than its resources or size. During our interviews, several U.S. companies indicated they were very successful in obtaining, via their foreign partner, information the U.S. government considered "acquisition sensitive" (i.e., request-for-proposal information shared between government partners).

These criteria can only be satisfied if government lets industry negotiate their own partnerships. Forced marriages generally do not work! The Advanced Short Range Air-To-Air Missile (ASRAAM) is an excellent example of a forced marriage that caused serious programmatic problems as Germany designated a partner to team with U.K.'s British Aerospace (BAe). The German partner was not BAe's preferred choice.

In this regard, a problem with some U.S. and European cooperative programs is the European perception that "they (U.S.) consider us junior partners, not equal partners."[6] It is best to have government designate the requirements and let industry assemble the teams and negotiate the work-shares.

Unfortunately, forced marriages are often a condition of doing business overseas. Unlike the United States, other nations do not have a large number of companies from which to choose. Therein the partner companies are often dictated by the participating governments. Such partnerships tend to cost more, and they require more up-front work to negotiate an acceptable working agreement, especially regarding work-shares.

To assure equality, the preference was to avoid prime/sub-contractor relationships. A partnership relationship (such as that resulting from a joint venture or associate contractor arrangement) was considered more effective in building teamwork and a sense of ownership. One of the keys to the MLRS program success has been the effectiveness of the MDTT, Inc., joint venture company[7] in managing the industrial effort. The commercial Airbus Industries has a similar organization.

**Get the Politics Right**

It is critical at the outset that the program be identified as high priority among all potential participating countries. A program, especially a cooperative one, has a much greater chance of succeeding if there are well-positioned advocates and clear, undivided support among internal constituents. Maintaining goal congruence through all governmental levels is vital. An imbalance in the perceived relative importance is a threat to program stability.

**Ensure the MOU Addresses All Critical Issues**

The Memorandum of Understanding (MOU) lays a critical foundation — it must be right! If an MOU contains vague language, particularly when addressing the tough issues, that ambiguity will later haunt the participants when each partner has a vastly different interpretation. It is also common to inappropriately defer issues for industry resolution. There are many agencies and departments (DOD, State, Commerce) involved in making an international cooperative program a success; issues must be resolved at the outset and not postponed until there is an immediate situation needing resolution.

Since industry must implement the MOU, it is desirable to involve them in the preparation of the MOU. Industry involvement is common practice overseas, but not in the United States due to the legal requirement for open competition. One way to involve industry early is to coordinate the draft MOU with in-

dustry by advertisement in the *Commerce Business Daily* with a follow-on conference to address issues and questions; this would be similar to a pre-draft solicitation review. The recommended approach by industry interviewees is to prepare a general MOU before program initiation, then update it for each phase.

Issues that appear to take the most time are intellectual property rights, third-country sales and work-share conditions — these must be addressed up front. The process can be streamlined by reducing serial coordination, but care must be exercised to ensure all critical issues are addressed/resolved before implementing a cooperative effort. Several interviewees stressed that "you must be prepared to say this program isn't going to work, if you can't agree to the MOU."

Several interviewees also stressed the need for the United States to assign negotiators experienced in international programs who are well versed on the program objectives and have the authority/freedom to negotiate. Interviewees credited the Europeans with having a more professional approach to MOU preparation than their U.S. counterparts; the Europeans tend to use experienced international negotiators while the United States has been accused of "sending in rookies." This subject will be discussed further in Chapter 5, Managing In The International Environment.

**Define the Process for Rapid Settlement of Disputes**

All successful programs have clearly identified decision authority or chain of command, and procedures for resolving issues/appeals. Steering committees, as well as technical and functional coordinating committees, play key roles in problem resolution by providing forums for communication at all levels. All participants must be represented with votes proportional to contribution.

Another excellent practice, followed by AIRBUS Industries, Euromissile and NATO AWACS is that steering committee decisions on critical issues (e.g., financial, work-share) must be unanimous; there is no unfinished business to trigger future "I told you so" controversies.

**Clearly Define Roles and Responsibilities**

The language and cultural differences that characterize international cooperative efforts mandate that partner (industry and government) roles/responsibilities/contributions are carefully specified and agreed to before program initiation. Most interviewees emphasized the importance of establishing a strong management structure with one program manager (PM) clearly designated as the lead. The United States still demands that they be in charge.

However, U.S. leadership in critical defense technology is eroding, and future programs may see other countries having the lead. It is also plausible that leadership may rotate during the acquisition life cycle; based on the capabilities of the participants. The U.S. superiority mindset will be difficult to change, but when partners can deal on a more equal basis, international cooperative programs can really be successful.

On a more macro-level, proper roles and responsibilities are: government sets the requirements and ambience for the program; industry sets the business deal and technical solutions (to include the evaluation of can do's, cannot's, and tradeoffs). Government should ensure the program stays focused on satisfying the requirements while not micromanaging the program.

**Provide an Environment and Mechanisms to Facilitate Open/Timely Communication**

Industry and government management must provide the right atmosphere. Open com-

munication and cooperation must be encouraged to preclude surprises and promote harmony. Co-location of technical and key management personnel as well as sharing key management and technical responsibilities/staffing facilitate cooperation.

Clearly, the increased convenience/speed of air travel, and advances in communications (e.g., fax, teleconferencing, improvements in data transmission provided by wide-band satellite communications, the ease of secure communications) have dramatically improved the possibilities for communication among distant partners. While English has become the international business language, managers must be alert to communication problems inherent in translations (i.e., use simple English, avoid jargon, slow down meetings to check the understanding of participants, provide English transcripts of meetings to ensure there is only one official record).

**Agree on Contracting Terms and Conditions**

Government partners must agree on contracting terms and conditions. However, it also must be recognized that an international program is a management challenge requiring innovative approaches to reduce the administrative burdens that can distract management from critical issues. Therefore, participants must be willing to reduce bureaucratic encumbrances. If U.S. contracting procedures are used, the United States must be willing to tailor Federal Acquisition Regulation (FAR) requirements.

**Provide for Industry Involvement**

All industry interviews emphasized the importance of early and open communication between government and industry. There is a wealth of knowledge in industry on the management of cooperative programs. Ideally, industry should be involved in early program planning (i.e., establishing a realistic technical/schedule/cost approach, assessing risks, resolution of issues encountered in MOU preparation); they can help mitigate issues.

Unfortunately, U.S. government procurement laws/regulations hampered communications as they led U.S. officials to adopt an arms-length approach that sometimes carried into program execution — long after the contract was awarded. This is a major problem in MOUs as there is no collaboration between the negotiators (U.S. Government) and the implementors (industry).

Contrast this with our allies who encourage industry to work closely with the military to ensure a good product. Often, the U.S. industry partner works through the foreign partners to contribute to early planning while the United States is maintaining an arms-length relationship. Government managers must ensure industry is a principal team member. Pre-bidders conferences as well as releases, for comment, of draft request for proposals (RFP), MOUs, and technical libraries offer possibilities for early involvement.

**Recognize and Accommodate Cultural and Managerial Differences**

All participants must understand and appreciate that cultural and managerial differences result in different approaches to doing business (e.g., developing a weapon system). Because of these differences, more management effort is required to maintain harmony.

**Limit the Number of Equal Partners**

Most interviewees cautioned that the goal congruence was extremely difficult to maintain when the number of partners exceeded four. In fact, most preferred a bilateral agreement, but said they could manage three or four.

As the partners increased above three, co-production is generally easier to manage than co-development (as agreements on intellectual property rights, and work-shares are often difficult to resolve as everyone has different views). The preferred solution for more than four was to establish four primary national prime contractors, with the others in a subordinate national prime role.

A well-thought-out MOU, clear roles and responsibilities, and a strong management structure (i.e., with executive and management steering committees, one PM as lead, and integrated staffing) become even more important in the successful management of programs with more than three partners. As the number of partners increase, any flaws in these areas are very difficult to overcome. Another recommendation is to have a lag (three to six months) between contract award and work start-up to allow team building, firming of relationships, and the "bugs to be worked out."

# ENDNOTES

1. Wolfgang Flume and David Swa, "British Aerospace—Leading Defence in Britain, *Military Technology,* XII, 3 (1988): p. 56.

2. Projects are defined in a written document called a Memorandum of Understanding (MOU), Memorandum of Agreement (MOA), a project agreement, or other similar name. The rights and obligations of each party are identified in the agreement. They define in broad terms the: objectives, scope and management of the program; the work to be performed by each participant; financing; the structure and content of the industrial collaboration; the intellectual property rights provisions; and other necessary elements regarding the administration and performance of the program. The greater the detail in these documents, the easier their implementation and the lower the probability of disputes over their interpretation.

3. Equitable sharing of the costs of the project by all participants is explicitly required for MOUs undertaken pursuant to Section 27 of the Arms Export Control Act and Nunn projects, and is implicitly required for MOUs undertaken pursuant to DOD Service or Agency statutory authorities. To the United States, equitable means "fair" not "equal." Equitable funding requires that each participant pay in the value of the benefits it receives from the program. The value of the benefits received by each participant may vary from phase to phase. The assessment of the equitability of the U.S. contribution to the total cost of the project phase is made before the United States enters the project phase, not during. For a further discussion of equitability, see the *Guidebook for Preparation and Negotiation of International Armaments Cooperation Memoranda of Understanding (Draft),* DSMC, dated1 April 1991.

4. The policy announced by President Bush on April 16, 1990, committed the U.S. Government not to encourage or commit to offsets and constrains the use of U.S. government funds in offset arrangements. The decision whether to engage in offsets as well as the responsibility for negotiating/implementing offset arrangements resides with the companies involved. "Presidential Policy on Offsets in Military Exports," The White House Office of the Press Secretary, 16 April 1990.

5. McCarroll, William, "The Future of Cooperative Programs," *The DISAM Journal,* Fall 1990, p. 83.

6. "MBB — Leader in Systems and Partner," *Military Technology,* Vol. 12, No. 9, 1988, p. 88.

7. MDTT INC. is wholly owned by Thompson Brandt Armaments, Diehl GMBH and Co., Thorn EMI Electronics LTD, and Martin Marietta Corp. The MDTT INC. is the managing partner providing program management for the member companies (which act as national prime contractors). It is internationally staffed to ensure European involvement.

**In foreign relations, as in all other relations, a policy has been formed only when commitments and power have been brought into balance.**
*— Walter Lippmann*

# CHAPTER 4
# FINDINGS: COMMITMENT

## SURVEY RESULTS

Our interviewees rated commitment as the second most critical factor to the success of an international program. Approximately 70 percent of them criticized the U.S. long-term commitment and indicated this factor required substantial emphasis if the United States is to be successful in international collaboration.

## THE UNITED STATES TRACK RECORD

The majority of the government and industry officials whom we interviewed believed that the United States was not serious about international programs. They pointed to the lack of stable funding and the programs which the United States dropped as evidence. Many of them went so far as to say they viewed U.S. participation as a program risk, and they were reluctant to involve the United States as a partner.

A commonly held view is that Nunn Amendment cooperative programs are low priority and have no DOD support beyond the Nunn Amendment seed money. This perception was not restricted to foreign partners and participants in Nunn programs that had been canceled. Some DOD representatives also indicated that Nunn programs generally came from below the Services' cut-lines; being low priority among other competing programs. The implication is that Nunn cooperative programs don't survive beyond the expenditure of Nunn funding.

While some Nunn cooperative programs have been canceled, the facts do not support the general contention that most of them don't survive. Figure 4-1, page 30, shows the funding track record for 30 major cooperative programs; Appendix G explains the acronyms. In most cases, Service or Agency funding has been provided subsequent to Nunn money. At this time the United States has canceled participation in only three of those programs: the Autonomous Precision Guided Munition (APGM), the Modular Stand-off Weapon (MSOW) and the Advanced Short Takeoff - Vertical Landing Aircraft (ASTOVL). That track record looks pretty good, unless, of course, you were a major player in one of those canceled programs.

The industry and government people associated with the Modular Stand-off Weapon program believed their program is illustrative of the U.S. *modus operandi* in international programs: "get in, get out, and return to their own parochial program." After investing millions of dollars in establishing an international joint venture company and bidding on the program which they believed would extend through at least the demonstration/validation

| | FY86 | FY87 | FY88 | FY89 | FY90 | FY91 | FY92 | REMARKS |
|---|---|---|---|---|---|---|---|---|
| ARMY: | | | | | | | | |
| AA B/C Detector | | | | | N/S | N | S | |
| APGM | N | N | N | | | | | US Canceled |
| ARDS | N | N | S | S | | | | Complete |
| Combat Veh C2 | | N | N | N | S | S | S | |
| EO C-Measures | | N | N | N | S | S | | Complete |
| HME | | N | N | N | N | S | | |
| Laser Standoff Chem | | N | N | N | N | S | | |
| Patriot MM Seeker | | | | | | N/S | N/S | |
| NAVY: | | | | | | | | |
| MIDS | N | N | | N | N/S | N/S | S | |
| MPA-90 | | | N | | S | S | S | |
| NATO AAWS | N | N | N | | | | | Note 1 |
| RIM-116A/RAM | | | N | N | N/S | S | S | |
| RPV/MOSP | | N | N | | | | | |
| Adv Sea Mine | N | N | | | | | | UK Canceled |
| NATO Frigate 90 | N | N | N | | | | | Canceled |
| AIR FORCE: | | | | | | | | |
| Adv Avionics Arch | | N | | | N/S | S | S | |
| Ducted Rocket | | | N | N | S | S | S | |
| F-16 Upgrade | | | N | | S | S | S | |
| J-STARS/SOSTAS | | N | N | | S | S | | |
| NIDS | N | N | | | S | | | |
| MSOW | N | N | | | | | | US Canceled |
| DOD AGENCIES: | | | | | | | | |
| Ada Prog Support | N | N | N | N | N | N | | |
| Armor/Anti-Armor | | | N | N | N | N/S | N/S | |
| ASTOVL | N | N | | | S | | | US, UK Canceled |
| EFM/X-31 | N | N | N | | S | S | S | |
| Non-Acoustic ASW | | | N | N | | | | |
| C3 Interoperability | | | | N | N | N/S | S | |
| Post-2000 Comm | | | N | | N/S | S | S | |
| BICES | | | N | | | | | Complete |
| International Map | | | N | | N/S | S | | |

Legend: **"N"** indicates Nunn Amendment funding
**"S"** indicates Service or DoD Agency funding

Note: (1) Application was the NATO Frigate 90; future in question.
Source: Office of the Under Secretary of Defense for Acquisition (OUSD(A) Cooperative Program Funding IP & T).

***Figure 4-1.*** **Cooperative Program Funding**

phase, the program was canceled. When the Secretary of Defense changed, and the program was challenged by the Congress, the U.S. Air Force Tactical Air Command did not support the program over one of its "black" programs. Rockwell International had spent considerable time and resources, nearly three years, convincing other major companies, like British Aerospace and Messerschmitt-Bolkow-Blohm Gmbh, that the United States was serious about the Modular Stand-off Weapon program, only to discover there was no strong support within the U.S. Air Force. One industry representative characterized the whole experience as the "United States playing the Nunn Amendment game." That bad experience has made the major participants very leery about entering any new international collaborations involving the United States.

The Autonomous Precision Guided Munition program is a similar experience, this time with a U.S. Army program. This program was considered a real "natural" for international collaboration; eight nations had reached agreement on a given threat and a need to develop a smart munition for the 155mm howitzer. The United States stood to gain substantial technology from the German and French industries for only 40 percent of the total program cost. However, when the Congress challenged the program as it was about to transition from a Nunn cooperative program to an Army-funded program, neither the Army nor the new Secretary of Defense vigorously opposed the Congress.

The Autonomous Precision Guided Munition industry participants later learned their program was number three of three on a priority list of competing technologies/programs. The U.S. cancellation of the Autonomous Precision Guided Munition program was viewed by the interviewees as a major embarrassment for the United States — only six months earlier the Secretary of Defense had reportedly pressured the German Minister of Defense to provide their funding share for the program.

Another international program, but not a Nunn program, that was recently threatened by U.S. cancellation for similar reasons, is the Terminal Guidance Warhead (TGW) phase of the Multiple Launch Rocket System. The MDTT, Inc., a joint-venture company comprised of Martin Marietta (United States), Diehl Gmbh (Germany), Thomson-CSF (France) and Thorn EMI Electronics, Ltd. (United Kingdom) is the development contractor. In early 1991, the government project office and MDTT, Inc., were advised that, due to budgetary constraints, a down-select among competing technologies would occur in March 1991, at least one year earlier than expected. They found themselves in a life-or-death situation against competing infrared-based technological solutions (the Terminal Guidance Warhead program is based upon millimeter wave technology) and an Army "black" program. While the Terminal Guidance Warhead development program received a reprieve until March 1992, it provides another example of the United States running multiple programs in parallel, with no firm commitment to the international program. In response to the question "What is your company doing to pursue additional cooperative ventures?" one senior official responded: "Nothing. Why should they pursue more international programs when this very successful, expensive effort — it's within cost and on schedule — is in danger of being killed?"

## WHAT DOES IT ALL MEAN?

The lesson in these canceled international programs is that the United States is perceived to have left their partners "holding the bag" without an affordable solution to meet a valid requirement. Repeatedly we were told that, unlike the United States, our allies cannot afford to run several programs, each designed to provide an alternate solution to a

requirement. Instead, they move very cautiously in establishing a requirement and forming a collaborative program that will fill the need. Once that collaborative program has been formed, our overseas partners are committed to that program's success—through development and into production. When a major player like the United States withdraws, the remaining nations find it difficult, if not impossible (e.g., the Autonomous Precision Guided Munition program), to restructure and redistribute the work-share costs to keep the program alive. One high-level interviewee intimated that such a chain of events could be a subtle means of enforcing a "Buy American" plan; that is, when the foreign governments can no longer afford to develop a system and are forced to buy something off-the-shelf in order to meet an urgent requirement.

Similar situations were uncovered regarding the JP233, a runway-cratering bomb program with the United Kingdom, and the Advanced Short Range Air to Air Missile (ASRAAM) program with France, Germany and the United Kingdom. In the JP233 program, the U.S. Air Force dropped their requirement for a low-level attack system in favor of one to develop a stand-off munition; this left the United Kingdom alone in the program.

Among the problems plaguing the ASRAAM program were the changing requirements (i.e., regarding launcher adapter configuration and cryogenic cooling for the engine) of the U.S. Air Force. The delays encountered trying to meet the changing requirements of the U.S. Air Force raised suspicions that the Air Force preferred to just buy Sidewinders from the U.S. Navy. The bottom line of these program stories is the perception that the United States lacks long-term commitment to international programs. Our allies are very suspicious about entering a program with major U.S. involvement — they don't want to get burned again.

The European and Japanese approach to collaborative programs is much different from the United States. They characterize it as carefully selecting the programs for collaboration, carefully choosing their partners, and then fully committing to the success of the program. They readily admitted that it takes time to agree on the requirements, the work-share arrangements, and the distribution of industrial benefits. For example, the very successful North Atlantic Treaty Organization (NATO) Airborne Warning and Control System (AWACS) program just recently completed 3 years of negotiation on their Modernisation Programme. NATO AWACS took 1 year to reach agreement on the technical requirements, and another 2 years to agree to the work-share and industrial benefit distribution. But once they reach agreement, they are committed to making the program a success. Yes, other countries besides the United States drop out of programs, but the Europeans perceive that they do not drop out as readily as the United States.

A sign of program commitment is stable funding. The U.S. annual budget cycle is viewed as ludicrous by our allies. The Congress' annual program/budget reviews add another element of uncertainty regarding the future of a program. Despite DOD and Service support for a program, the Congress has the power to reduce or zero the funding line. The Congress is viewed as ambivalent toward international cooperation: international cooperation is good for the nation as long as it does not adversely impact political interests. The Congress is seen as torn between the goodwill generated by international cooperation and the political advantages of a "Buy American" policy. Just one indicator of their ambivalence is the funding level for the Nunn cooperative programs. Even though the Nunn Amendment specified that "$200,000,000 shall be available, in equal amounts, to the Army, Navy, Air Force, and Defense Agencies for NATO cooperative research and development

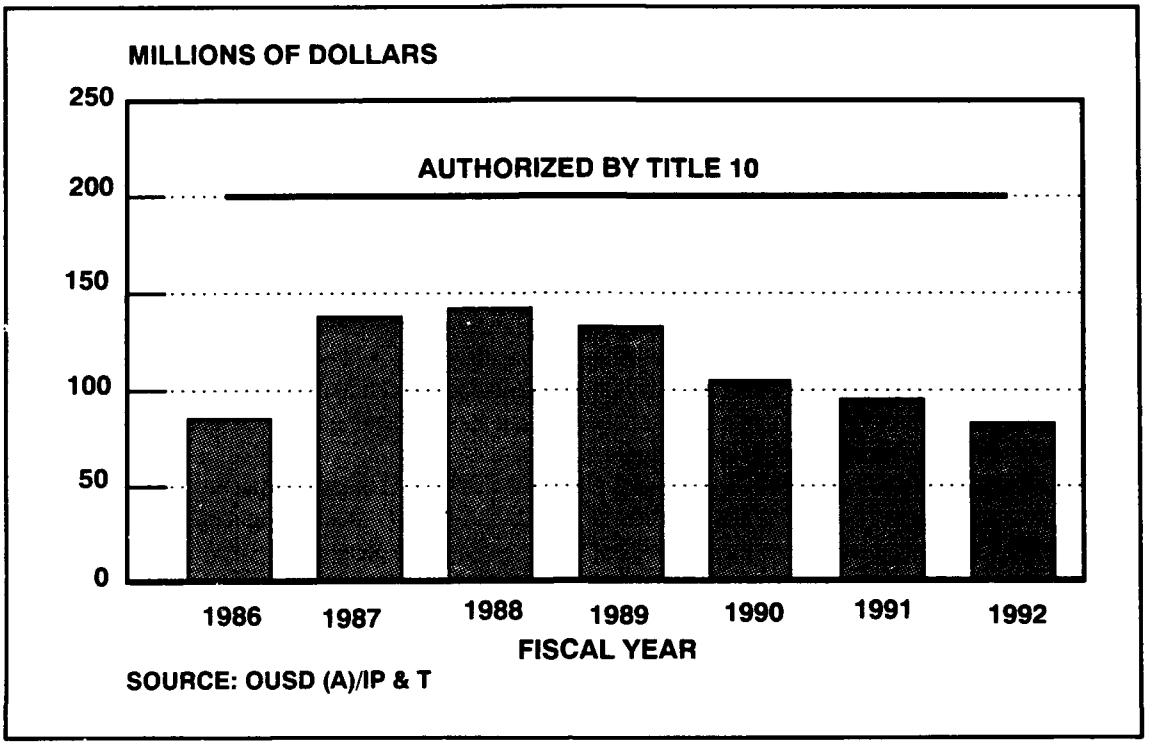



***Figure 4-2.*** **Nunn Amendment Funding Cooperative Amendment Programs**

projects," that level of funding has never been provided. See Figure 4-1, page 30.

While there is no program funding approach common to all European nations, their various methods are viewed as much more stable than that of the United States. Our interviewees indicated that, in general, the French tend to fund, up front, the full amount of a program, whereas the United Kingdom and Germany tend to allocate and fence funding by program phases. There is significantly less micro-management by those governments, as compared to the annual program/budget reviews of the U.S. Congress.

According to the program's general manager, one of the key elements to the success of the North Atlantic Treaty Organization (NATO) Airborne Warning and Control System (AWACS) program was the funding approach, a "fixed ceiling over several years." The above approaches instill program stability and permit program managers and industry to make sound, long-term business decisions. Conversely, the United States predominantly uses annual versus multi-year budgeting. Each year represents another cycle of program justification and defense before DOD and the Congress. Our allies frustratingly view the U.S. budget process as a series of never-ending "what-if drills" and "neck-down exercises" that make it impossible to nail down a budget that fosters long term commitment and long-range business planning.

**THE $R_x$:**

What actions are required to demonstrate a true U.S. commitment to international collaboration on defense programs? At the top of the list among our interviewees is multi-year or fenced funding (i.e., 5 years for major systems, 2-3 years for others). Stable funding

is absolutely essential. The United States is not a welcome partner if it will not demonstrate staying power in a program. Our allies do not want to be left holding the bag—without a tangible product after having spent considerable funds from their relatively small defense budgets — if the United States decides to reduce or zero the budget.

It follows then, that the United States must be very selective regarding the cooperative programs it enters. Demonstrating an interest in international cooperation is not a function of the quantity of programs in which you participate. The United States doesn't necessarily need to arrange more multinational programs. Rather, our allies would prefer that the United States become more selective in participating in meaningful programs — and then stick to them, committing to their success. And success is accomplishing whatever was agreed upon in the international Memorandum of Understanding: research goals, system development, production, or a combination thereof. The United States must carefully choose the programs and its partners —then demonstrate "stick-to-it-iveness."

Carefully selecting programs and demonstrating "stick-to-it-iveness" necessitates uniting the various elements of the U.S. government regarding international cooperation. The Congress, the DOD, and the Services and Agencies must agree on the programs and uniformly support them. There must be a single voice regarding the pursuit of an international program, and there should be a single U.S. point of contact to speak for the government. Our allies find it perplexing when they get differing opinions from the involved Service(s), the DOD and the Congress — who's in charge?

Last, but not least, the United States must establish an operating environment conducive to long-term multinational programs. The export license control system and the visa process are significant impediments. The export license control system, discussed in the technology transfer section of the report, severely restricts the free flow of technical information which is an essential ingredient to a cooperative program.

And the U.S. visa process adversely affects the collocation of foreign engineers, scientists, etc., in a joint venture company based in the United States. Work visas are generally restricted to 5 years, and spouse employment is virtually prohibited; similar restrictions exist for United States citizens employed overseas. These employment limitations effectively discourage many talented, experienced and ambitious people from participating in a multinational program that places them overseas.

However, most barriers to cross-border employment and work permits among the European nations have been removed as part of the Europe 1992 effort. Obviously, future international cooperation will require a similar removal of cross-border employment barriers on a more global scale.

These commitment-related concerns must be addressed if the United States is to be considered a serious partner in international programs.

## ENDNOTE

1. It was estimated that Rockwell International, British Aerospace, and Messerschmitt-Bolkow-BlohmGmbh each invested about '$3.5 — 4.0 million on the program before it was canceled.

**Excellence in defense management will not and cannot emerge by legislation or directive. Excellence requires the opposite — responsibility and authority placed firmly in the hands of those at the working level, who have knowledge and enthusiasm for the tasks at hand.**

***— Packard Commission, 1986***

# CHAPTER 5
# FINDINGS: MANAGING IN THE INTERNATIONAL ENVIRONMENT

This paper would not be complete without a discussion of the management principles deemed relevant by the interviews. Generally speaking, the careful art of managing international projects requires the same basic skills of communication, leadership and control that successful managers learn early in their careers. To manage in a global environment requires more of the same, with an extra dose of sensitivity toward the cultural differences. We inquired in the interviews what unique challenges were presented to management as a result of dealing with an international program. Not surprising, the most important criteria for successful management was effective communication. Managers expressed a need to understand as much as possible about the culture, history, sociology, government, economy and national goals of the partners. All participants must understand and appreciate that cultural and managerial differences result in different— not bad— approaches to doing business. The philosophy of Airbus Industries is helpful: Accept the differences in business and education; use them, learn from them, but don't try to equalize them. Differences when rationalized and accommodated can provide synergetic benefits to a program. For example, one participant may be creative and flexible, while another may add structure and organization.

Managers have relied on personal experience to become more comfortable dealing with the partners' differing management styles and technical skills. We did not find much in the way of formal training, and preparation for international program managers is still lacking.

## PRINCIPALLY MANAGEMENT

Once the requirements for a cooperative project are understood and the prospective partners begin negotiations, the challenge becomes one of accommodating the different management styles. The partners can learn from one another; management techniques as well as technology. We have included a brief discussion of how three contrasting management styles can be mutually beneficial.

The United States is viewed by Europeans as having pioneered the entrepreneurial spirit in business. The U.S. can-do philosophy questions limits and places a premium on action

and progress. It promotes the adage that "the customer is always right." The United States places heavy emphasis on professional education, particularly post-graduate management education, which is regarded as the finest in the world.[1]

In Germany, their long-term, global perspective is a key to their success. They clearly define the corporate strategy, based on consensus-oriented decision-making. Through their much envied job apprenticeship program, they produce senior managers who are trained on the job and are well-versed in the basics. International awareness extends even into small- and medium-sized companies.[2]

Japanese management systems have been known to turn failing business organizations around. Closely resembling an ideology, the organizational values and philosophies are clearly communicated throughout the organization. Employees are recruited on the basis of their commitment to the same fundamental values.

Often criticized for their slowness in decision-making, the Japanese achieve a level of consensus prior to the decision which greatly simplifies the implementation. They are methodical and process-minded, following a very long-term, coordinated plan. One of the reasons for their technical success is their active search for information around the world. Once they acquire the knowledge, they improve it and find new ways to employ it.

The lesson for managers in the global arena is to combine the positive traits of the management styles encountered and benefit from the synergy. Maintain a stable, long-term strategic perspective, while applying an entrepreneurial attitude to respond quickly and effectively to changing environmental factors. Develop a technically competent work force grown in the practical skills of manufacturing and sales, and educated in professional management to maintain state-of-the-art knowledge. Remember the customer's importance, and recognize that the customer base extends into international markets.

**NOTABLE EXAMPLES**

Through the interview process, we asked several international cooperative projects to assess how effective they felt they had been with these principles. No two organizations were alike, pointing out that there is no perfect model of an organization. Each had employed the principles discussed above to their own specific needs.

The NATO Airborne Early Warning & Control Programme Management Agency (NAPMA) manages the NATO AWACS projects. Twelve of the fourteen member nations are represented in the program office co-located in Europe. (See Figure 5-1.) The program agency is run like a corporation, independent, with all the authority necessary derived from the NATO Board of Directors. The Board also handles the funding contributions, providing the program office stable funding for effective long-term planning. The NAPMA can invest the funds until needed. The NAPMA has a clearly defined mandate, based on a well-defined military requirement.

Another interesting management arrangement is found in the U.S. Army's Multiple Launch Rocket System (MLRS) Terminal Guidance Weapon (TGW) program. The industry team consisting of four multinational firms formed a joint venture. (See Figure 5-2, page 38) The joint firm, entitled MDTT, Inc., wholly owned by the participants, is internationally staffed, and it directs the international project office, providing the program management for the members. By having a staff of personnel from the national primes, MDTT has flexibility and a spirit of cooperation

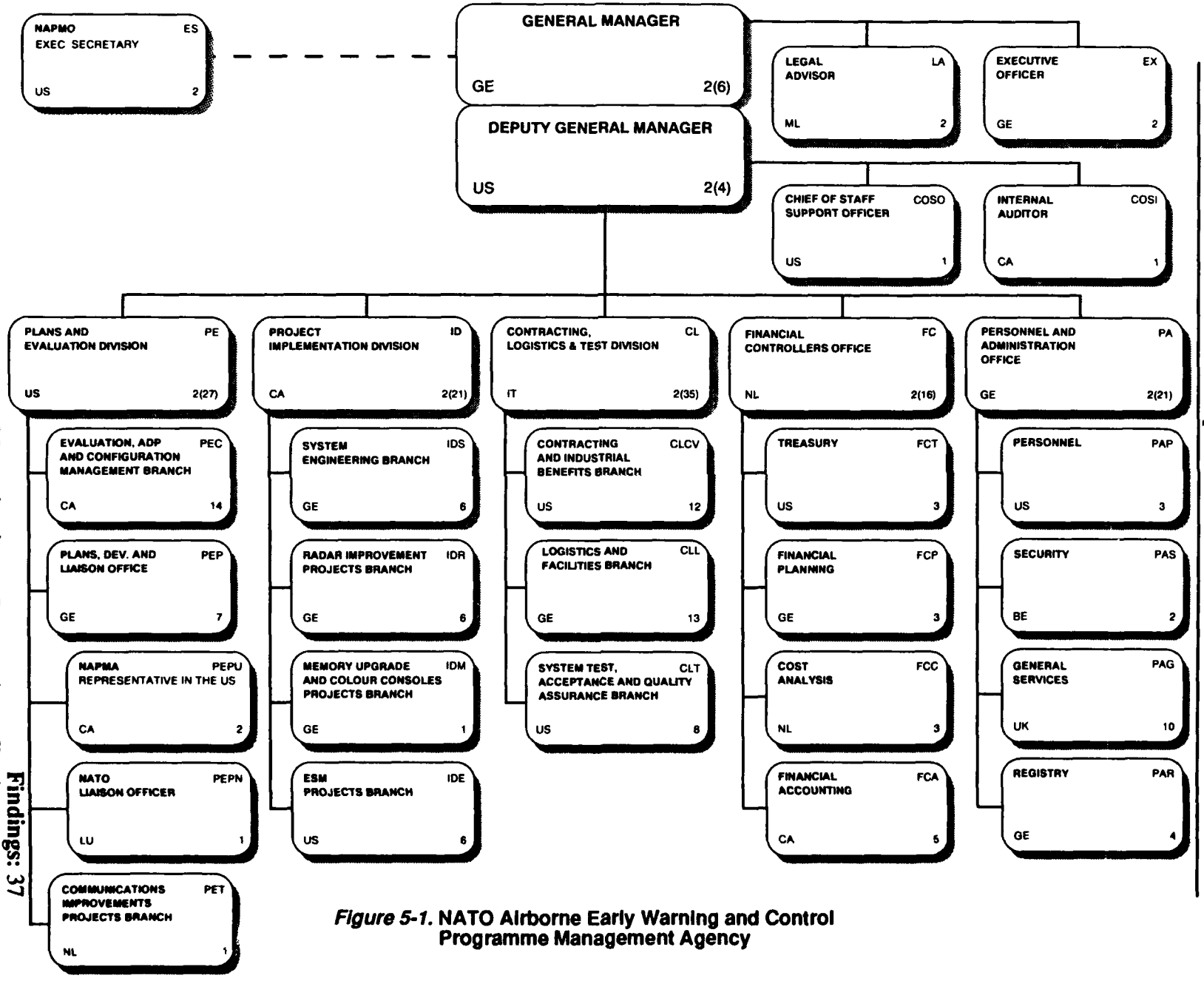



*Figure 5-1.* **NATO Airborne Early Warning and Control Programme Management Agency**

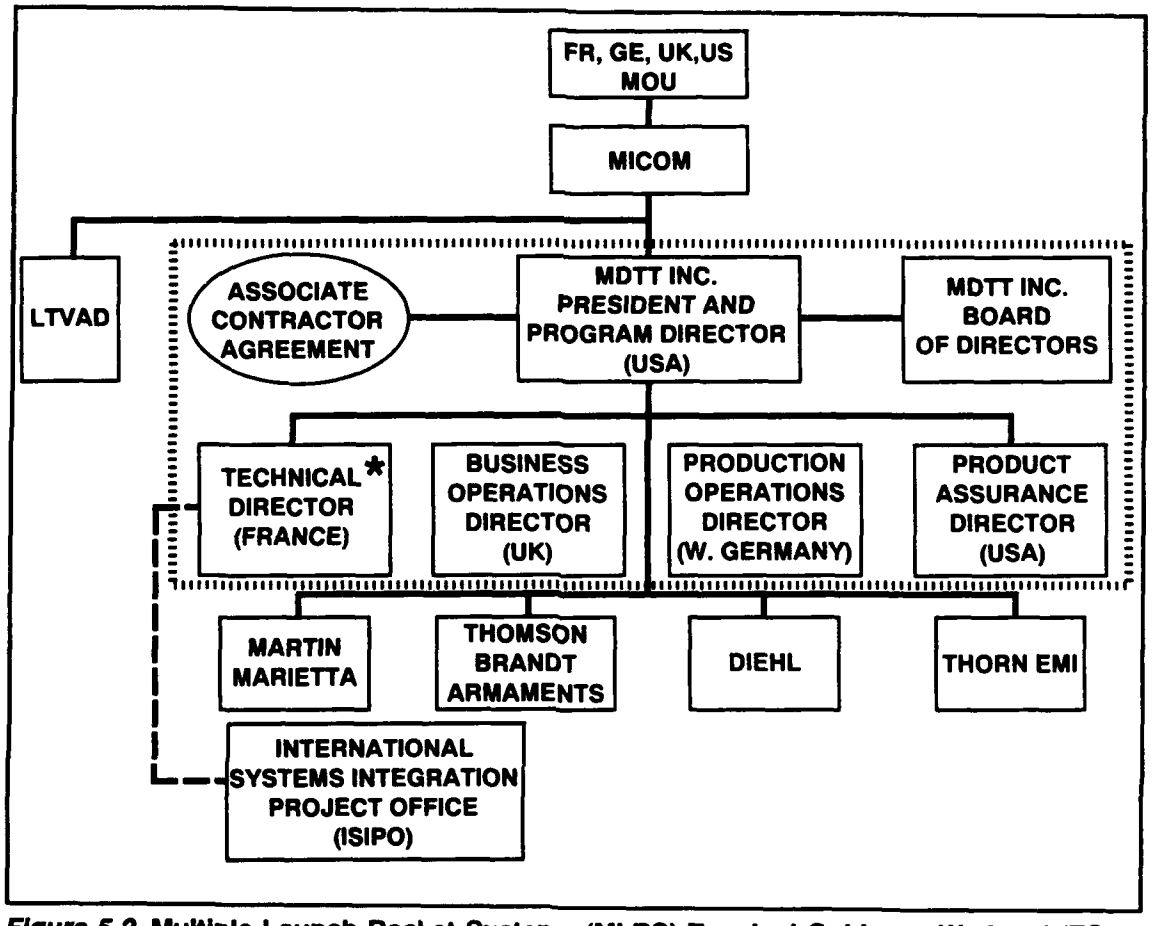



***Figure 5-2.*** **Multiple Launch Rocket Systems (MLRS) Terminal Guidance Warhead (TGW) Management Organization**

which enhances program efficiency. The president also has direct access to the primary national firms. Much of the program's success is attributed to the effective management of this industry team. The firm distributed work-share based on capability. MDTT has achieved cost savings through burden sharing and strong project loyalty. Higher headquarters, in this case the Army's Missile Command, does not micro-manage. They were notably successful at achieving the realistic schedules they helped to set.

One industry team supporting the Modular Standoff Weapon also formed a joint corporation. The five participating national companies became shareholders in the new venture. (See Figure 5-3, page 39) Representatives from each country together formed the management committee (steering group) to oversee the program office. A Memorandum of Understanding outlined the organizational structure and management principles of the program office, including the key positions and their specific duties. The program team was collocated and acted in close consultation. All members of the project team performed functional tasks, each a responsible role. The steering committee set dollar thresholds for contractual decisions and granted the program management team sufficient latitude to function effectively.

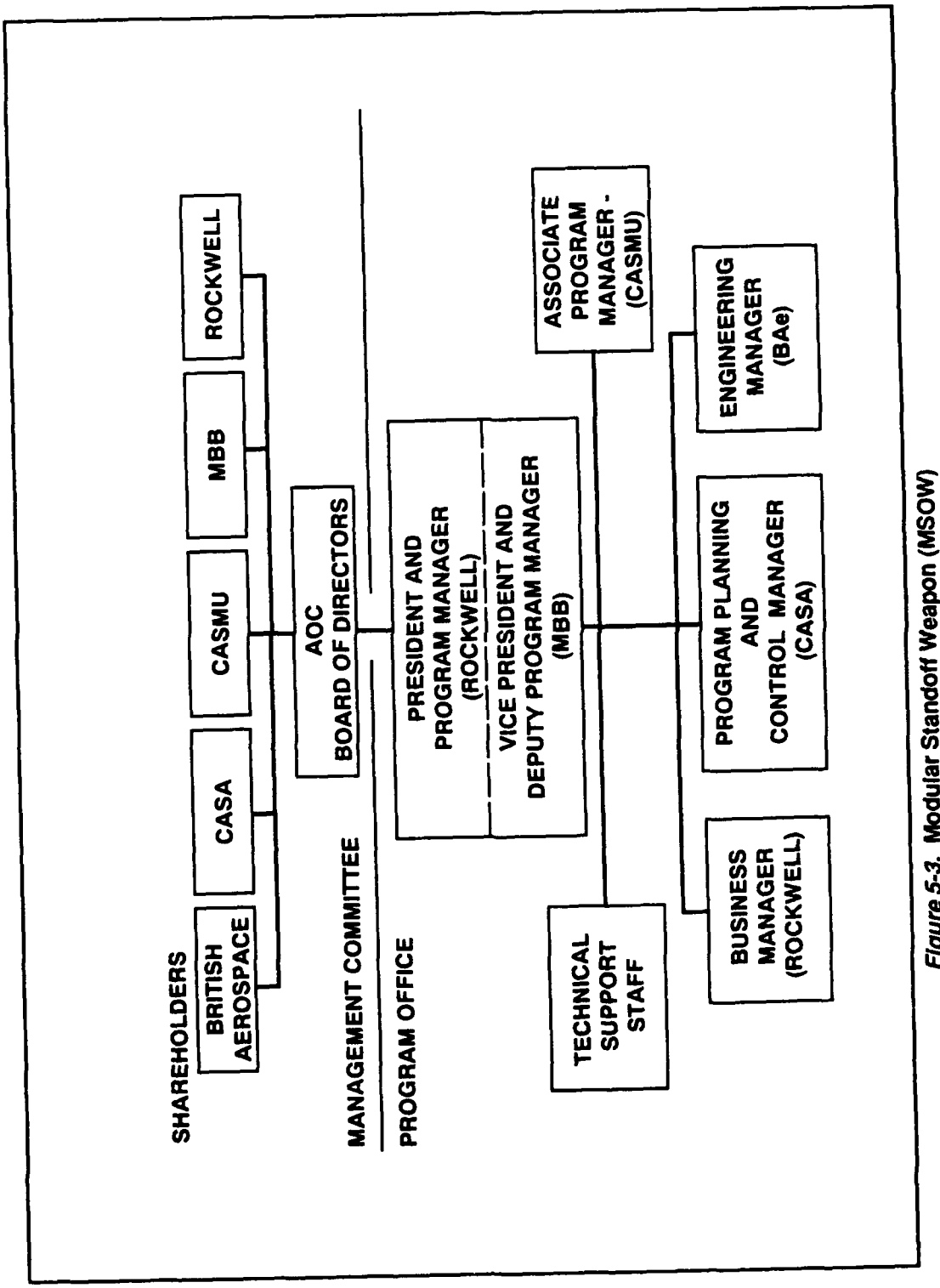



*Figure 5-3.* Modular Standoff Weapon (MSOW) Management Structure

LESSONS TO LEARN

The common characteristics in these examples are significant. The executive steering group (or Board of Directors) comprising senior, national representatives can resolve many issues regarding contributions, legalities and requirements. Steering groups are effective in both government-government as well as the industry-industry relations. The program is most successful when the steering group authorizes sufficient authority and independence to the program management team without micro-managing it.

The economic and industrial considerations for entering an international cooperative effort are key management concerns as well. Assuring sufficient resources to accomplish the job is a continuous, time-consuming battle. It includes monitoring the execution of the Memorandums of Understanding for compliance of the partners to their commitment. The agreements should provide clear understandings of each contribution and risk assumption. The ultimate distributions of benefits should reflect proportionately with the amount of contribution. It will likely boil down to the program's initiation, and management should insist on clear guidance for the execution phase to avoid later misunderstandings. Successful international organizations have effectively used the steering groups to ease the program planning into execution.

In successful programs (e.g., MLRS TGW, NATO AWACS, F-16) considerable time was devoted to team building (finding skills, using them effectively, sharing everything, and forcing participation). Key management people are collocated to the greatest extent possible. It is vital during program initiation to communicate clearly. Work may later be distributed to the participants' home operating base, but coordination must be continually emphasized. The management team, empowered with responsibility and authority, should have freedom to manage cost and schedule. While the political aspects are ever present, the team leaders must strive for project loyalty.

Stability is important in international program managers. The personal working relationships play a critical role in the success. Turnover of key personnel can disrupt that equilibrium. All members of the multinational team should perform as part of the management team, including the functional tasks, not merely in liaison roles.

TRAINING

INTERNATIONAL MANAGERS

Our survey asked industry managers of international projects to rate their qualifications for the job. Almost without exception, U.S. firms reported that they select key managers based on job performance, technical expertise and management skill. They also emphasize on-the-job experience for managers, with international exposure certainly a plus but not essential. For most companies, international defense programs are few in number. Therefore, the bulk of opportunities for project managers lie within the domestic programs. The interview respondents were split in opinion about selecting someone with technical versus managerial skill, with most desiring a strong technical background but choosing key personnel on the basis of management potential. Interestingly enough, the mix of technical knowledge and management experience may vary depending on the phase of the program. Several people pointed out that it was most important to blend the right amount of skill and personality for the situation.

Most companies do not have formal training in international projects. While a few firms reported having internal classes for project management, they rely primarily on academic institutions and government courses. According to a recent study conducted by the

Defense Systems Management College entitled, "The Problem of Training and Educating Defense Officials in the Area of International Armaments Collaboration" (See Appendix J), there are very few courses available for international defense acquisition. Our results draw the same conclusion. The United States, the United Kingdom and Germany offer government courses in selected areas of international program management, but industry does not place much emphasis on them.

The response identified a number of areas in which managers wished to have additional training. The most common was language and culture awareness. Although English has become a universal second language, U.S. participants are frequently disadvantaged by unfamiliarity with the partner's language. This symptom is deep-rooted in America where the average citizen is insulated from foreign exposure and isolated from the international economy. Therefore, there is not sufficient sensitivity in U.S. managers working in the global arena. Another reason for training was the differing procurement practices among participants. Managers would benefit by understanding the budgetary cycles, procedures that bear on an international program. Next, but certainly no less important, would be educating the key managers on licensing arrangements, export control responsibilities and procedures and international security assistance. Finally, all managers should understand business issues such as cost performance, taxation, contracting, offsets and marketing.

Government and industry executives should take advantage of the existing courses to equip their managers to work in the international environment. As the military/industrial complex adapts to the changing environment, particularly with the evolution of dual-use applications, participants will have more opportunities available to them in academic institutions which offer instruction in general business practices.

**IN SUM**

It is very difficult to isolate an international program from environmental uncertainties. The management team's challenge is to be proactive in the face of external forces such as inflation, threat of war and protectionist legislation. The steering group's task is to harmonize requirements, stabilize funding and, in general, minimize perturbations to the program. When the steering group and project team are working together,the international program's chances for success are greatly improved.

Selection and training of key personnel to function in the international environment is essential to program success. Executives within government and industry must invest the energies in order for programs to succeed.

## ENDNOTES

1. Henzler, Dr. Herbert and Young, Mark, *German and American Management: Similarities, Differences, and Problems*, Washington: American Institute for Contemporary German Studies, p. 3.

2. *Ibid.*, p. 7.

**It could be disastrous to our national security if we assume we can go it alone technologically.**

*— Frank Carlucci*[1]

# CHAPTER 6
# FINDINGS: TECHNOLOGY TRANSFER SURVEY RESULTS

In all interviews, technology transfer was identified as a significant barrier to initiating an international cooperative program. Both U.S. and foreign participants expressed considerable frustration with U.S. export restrictions and the process of obtaining an export license. Foreign participants frequently accused their U.S. counterparts of two things: arrogantly assuming the United States had the best technology and not offering it. The survey results also indicated that inadequate procedures exist to identify and exchange information regarding subjects for possible cooperation. Finally, we learned that technology flowback from a previous cooperative effort can have an impact on future programs.

## U.S. TECHNOLOGICAL LEAD HAS DECLINED

The U.S. hegemony in high technology is a thing of the past as all advanced nations, and a growing number of developing countries, are competing in the same critical technologies. The leadership we enjoyed in the post World War II years has eroded. The European and Asian nations have developed industries with technology equal to, or better than, that developed in the United States. A March 1991 report of the Council on Competitiveness deemed the United States to be trailing in 33 of 94 technologies rated crucial to future economic prowess.[2] Daniel Burton, the council's executive vice president, declared "the U.S. position in critical technologies is slipping...in some cases, it has been lost altogether."[3]

In 1989 testimony before the U.S. Senate, former U.S. Defense Secretary, Frank Carlucci, warned that the United States is experiencing a competitive decline across all industries as other countries are getting better.[4] He argued that this decline is the result of complacency bred by the fact that U.S. manufacturing had been so far ahead of the rest of the world in technology and productivity for so long. The result was that we failed to recognize the growing competitive challenge and make adjustments. Mr. Carlucci contended it would be disastrous to our national security if we assume we can go it alone technologically....and deprive ourselves of advances in technology being achieved in other countries.[5]

A concern for DOD must be future technology sources to satisfy military requirements. Figure 6-1, on the following page, contains a list of the 20 top technologies (see Endnote 4 in Chapter 1) considered critical to sustaining

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

LEGEND:

Position of U.S.S.R. relative to the United States

★★★★ Significant leads in some niches of technology
★★★ Generally on par with the United States
★★ Generally lagging except in some areas
★ Lagging in all important aspects

Capability of others to contribute to the technology.

☆☆☆☆ Significantly ahead in some niches of technology
☆☆☆ Capable of making major contribution
☆☆ Capable of making some contribution
☆ Unlikely to make any immediate contribution

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

***Figure 6-1.*** **Summary of Foreign Technological Capabilities**

the U.S. defense technological edge. The United States no longer has sole possession of many technical areas. The Japanese, for example, have highly regarded capabilities in: semi-conductor materials and microelectronic circuits, software, parallel computer architecture, sensitive radars, signal processing, pulse power, hyper-velocity projectiles, machine tools and robotics, composite materials, biotechnology materials and processes. According to a statement from the office of Senator Jeff Bingaman (D-NM), chairman of the Senate Armed Services defense industry and technology subcommittee, Japan is already beating the United States in 5 of the 20 areas (see Figure 6-1), Endnote 4, Chapter 1 also applies), and the United States needs Japan's assistance to maintain a competitive technology base.[6]

INDUSTRY CONCERNS

Industry interviews were unanimous in the concern that U.S. government policy and excessive export restrictions hamper international cooperative efforts and create barriers for U.S industry to compete in the global market place.

The long standing U.S. geopolitical role is being challenged as obsolete in addressing the challenges of globalization. The United States has tried to follow a dual role of being the political and military leader of the Free World while sponsoring and guaranteeing the free-market trading system. Robert Kuttner, an economics correspondent for the *New Republic*, cautions that this dual role has resulted in internally contradictory policies that now hobble the competitiveness of U.S. companies.[7] A laissez-faire philosophy, coupled with a commitment to free trade, has led to U.S. Government refusal to pursue an explicit civilian technology policy and to use trade policy to benefit U.S. industry. According to Mr. Kuttner, America's desire to maintain alliances means it looks the other way when allies use trade policy to promote their industries.[8] Meanwhile, to preserve military superiority, the DOD has been a leading supporter of technology deemed critical to the defense industrial base, while restricting the ability of U.S. companies to exploit those technologies and products. While the United States relies on defense spending as a de facto industrial policy, other countries follow a more direct route of investing directly in commercial research and development (R&D). Also, the U.S. commitment to free market ideas and their resultant antitrust policies precludes the pooling of U.S. technology resources required to compete adequately in the global market — in contrast to the policies quite common in Europe and Japan.

Many interviewees were concerned that the United States has taken too long to recognize the changing nature of the world economy and is slow to realize the responsibilities of participating in the global market place. One common criticism by overseas firms was that the United States tends to consider international aspects only after the project is well underway. Earlier participation could avoid problems endemic in negotiating requirements with little flexibility to accommodate change.

In a related vein, some country representatives expressed resentment that the United States doesn't share its latest technology. Europeans particularly felt that a condition for cooperation should be that the United States bring technology to the table that is clearly better than the Europeans have or can produce. Consequently, if current technology is not included in cooperative undertakings, the danger is that firms will produce second-rate systems and the defense will suffer. Europeans hold to the philosophy that sharing technology permits all participants to grow, while enhancing healthy competition.

The U.S. high technology companies also assert their business potential is restricted by ex-

port controls (especially, dual-use and third-country re-sale restrictions) that create serious barriers in the world market. Products that are readily available abroad and which are traded with few restrictions by other nations, are often restricted by U.S. dual-use export controls. Because many foreign companies will not agree to restrict sales, they avoid U.S. products. Additionally, the administrative burdens of acquiring export licenses lead many innovative small and medium-size high technology companies in the United States to decline defense business. Most industry interviews concluded that these controls result in lost trade opportunities and that they are counterproductive in keeping technology out of the marketplace, as similar or better technology is often available elsewhere. Joel Johnson, vice president of International Affairs, Aerospace Industries Assn., warns that "by withholding U.S. technology, you may end up with a [foreign] country obtaining even higher levels of technology from alternative sources." [9]

## U.S. EXPORT CONTROL SYSTEM

Technology transfer issues are paramount to international cooperative program negotiations. Additionally, the U.S. export control system represents a significant barrier that must be recognized in the management of a cooperative program. The U.S. export control system applies to 40 percent of all U.S. manufactured goods and technical data, and virtually all advanced technology. It is a decentralized system crossing 10 government agencies. The Commerce Department regulates dual-use technology/products; the State Department oversees arms shipments; the Energy & Arms Control & Disarmament Agency handles the nonproliferation of nuclear materials; and the National Security Agency monitors encrypted technology; the DOD monitors military technology. Within DOD, the Defense Technology Security Administration reviews dual use technologies/commodities and provides DOD's national security recommendations to the Commerce Department.

The principal problems with export licensing are: that the administrative burdens are cumbersome, while the policy it is set up to enforce is not keeping pace with the changing threat.

While initiatives to reduce license processing, introduced during 1990, have already demonstrated progress (see Figure 6-2), license processing remains a very complex system. All the industry interviews indicated it was essential that they have a representative in Washington, D.C., to work the export control system. The large defense systems companies have full-time staffs, the common contention being "it must be micro-managed daily." The sheer complexity discourages small companies which cannot afford specialists in export licensing. More importantly, most interviewees were concerned with the slowness of the policy-makers to update and implement policies to reflect changes in the global environment.

Most of the industry interviewees referred to the approval process as being a "blackball system—spring loaded to the 'No' position." Anyone in the review chain can deny the request and effectively end it. Denials are generally caused by reviewers who don't understand the program or by Service parochialism (often due to inter-service rivalries and/or competing service programs). Interviewees also faulted policy-makers for not being clear and decisive on international collaboration; thus, sending mixed signals to reviewers. There is also the problem of contractual documents often saying "thou shalt" without "how to" for industry participants.

Outside the United States, the Coordinating Committee for Multilateral Exports Controls (CoCom) was formed to ensure that export systems of the Western allies are roughly

equal in restricting the flow of high technology to the Soviet Union and its allies. While other members are liberal in enforcing CoCom policies, the United States employs higher standards and claims an extra-territorial reach for its export laws (e.g., requiring that exporters obtain customer certifications regarding the end use, and obtain licenses for the re-export of products made in the United States or by U.S. subsidiaries of foreign companies, if they use U.S.-originated technology).

## ECONOMIC AND POLITICAL COSTS ARE HIGH

Industrial interviewees expressed the concern that dealing in the international arena was extremely frustrating because of the mixed signals received from the U.S. government. The frustration threatens to widen the breach in the government-to-industry relationship. Companies take the lead for joint ventures to push for the next generation of technology. They lay the foundation for good working relations with the prospective partner, appease the worry of anticipated criticism for participating, and try to find something in it for all concerned. Because industry is profit-motivated, they are also cautious about national security because the "crown jewels" — the U.S. advanced technology — are also their livelihood. For that reason, the U.S. government should involve industry earlier in project planning. It also was recommended that the time spent in negotiation should also be used to define the "crown jewels," thereby fully coordinating a decision and being able to stick to it rather than send mixed signals later.

| ASPECT | STATUS AS OF JANUARY 1,1990 | STATUS AS OF JANUARY 1, 1991 | CHANGE |
|---|---|---|---|
| Total Licensing Staff | 15 People | 34 People | +127% |
| Average Licensing Time (Non-staffed cases) | 13 Days | 4 Days | -69% |
| Average Licensing Time (Staffed cases) | 70+ Days | 36 Days | -50% |
| Weighted Average Licensing Time | 29 Days | 13 Days | -55% |
| 10-Day Turnaround Statistic | N/A (Not available) | 92% | N/A |
| Average CJ Time | Several Months | 44 Days | N/A |
| Automated Services | 0 | 2 | +2 |
| Newsletters | 0 | 4 | +4 |

***Figure 6-2.*** **Office of Defense Trade Control, Licensing Changes in 1990**

Several United States industry interviewees complained of lost business opportunities while the government debated the merits of transferring technology which was available elsewhere. One senior defense industry executive asserted that "Government ignorance of where the state-of-the-art is handicaps industry's ability to compete."

Kuttner contends that this elaborate export control system hampers U.S. competitiveness —generating intractable economic and political costs.[10] While there are few denials, and there is considerable effort by the government to streamline the processing, delays are often enough to prevent a sale. One large defense firm indicated "export licensing penalties are so severe, we elect to err on the conservative side; probably submitting more requests than necessary." If other companies are doing this, how big is the impact on the bureaucracy? More importantly, denials and delays are most frequently associated with new technology, preventing U.S. companies from competing in the world market with its best technology. In some cases, U.S. restrictions discourage foreign companies from acquiring U.S. products, preferring not to deal with the export restrictions. The end result is that the business, and the financial benefits, go to the foreign competitors.

The U.S. export policy, as well as foreign protectionist policies, may have their greatest impact on sub-tier contractors. The U.S. government provides little support for small defense exporters, and export restrictions represent a significant barrier to successfully bidding foreign subcontracts. Smaller defense firms, which perform a large portion of the actual work generally can't afford to market overseas and they are not well positioned to compete with large foreign firms. Additionally, these smaller firms face stiffer competition in the United States from the larger foreign defense firms which are often content being a subcontractor to a large U.S. firm to gain access to the U.S. market. On the plus side, however, some larger firms prefer to release technology to second- and third-tier suppliers because they are not considered direct competitors.

There are numerous examples of lost trade opportunities resulting from the export control system. Because of the potential military use, supercomputer exports are very tightly controlled; but, this policy can be counterproductive, as stringent controls have driven other countries, like Israel, to design its supercomputer. Supercomputer technology is changing so rapidly that the Departments of Defense and Energy are unable to maintain an accurate definition of "supercomputer" — much less maintain a current policy regarding export of the technology. The U.S. controls don't prevent fast computers from being sold. While the U.S. supercomputers continue to outperform the foreign competition, many customers prefer to buy foreign, generally Japanese, computers, which don't perform as well but do avoid U.S. export controls.

In the FS-X program, the United States denied the transfer of flight control software because it was thought to be advanced technology. The Japanese are learning, by the "seat-of-the-pants," how to develop the software and as a result are expected to advance faster than if we had provided it.

A similar example is the NATO AWACS program. When the best available computer memory technology would not be provided by the United States, the program turned to the Japanese. The Japanese offered their leading edge bubble memory technology, and the United States subsequently imposed a restriction that precluded United States industry from transferring the Japanese bubble memory technology outside the United States.

Another example comes from the machine tool industry where DOD didn't keep up

with the pace of technological change, applying stringent controls on machines tools at tolerances that industry considered crude, thus denying overseas markets to American business. In one case, the Moore Special Tool company of Bridgeport, Conn., was denied a license to ship machinery to Hungary for making soft-drink cans because the DOD contended that the machinery was too sophisticated for the stated purpose. With profits reduced by the government policy limiting its overseas sales, Moore has been forced into foreign ownership. Recent approval by the Committee on Foreign Investment in the U.S. (CFIUS) paved the way for Fanuc, a major Japanese player in the machine tool field, to proceed with the acquisition. A recent *Washington Post* article reported that since "Moore was the only U.S. supplier of high-precision machine tools that can meet Department of Energy needs...the U.S. is now totally dependent on foreign machines (German, Swiss, and Japanese) for the most sensitive operations in maintaining the arsenal that has anchored its defense for almost 50 years..."[11]

A final example is underway as U.S. telecommunications companies are well-positioned to compete for emerging Eastern European markets. It is likely that the U.S. companies will lose the business to foreign competition as the U.S. government resists the idea that non-CoCom countries should have a state-of-art fiber optics communications system that restricts National Security Agency (NSA) monitoring ability. The South Koreans are currently negotiating to provide this capability.[12]

Stringent U.S. licensing constraints also are responsible for U.S. companies being denied the right to apply for overseas patents because DOD and NSA don't want foreign patent offices to see the specifications. Yet, comparable products made overseas are exportable. As a result, made-in-the-U.S. technology is denied protection overseas, leaving competing foreign companies at liberty to acquire technology and processes to which U.S. businesses should have property rights.

The distrust engendered by stringent restrictions on the transfer of technology to even our closest allies can also undermine U.S. foreign policy objectives.

## EXPORT POLICIES ARE BARRIERS TO INTERNATIONAL COOPERATION

It is clear from industry interviews that these policies are substantial barriers to initiating international cooperative efforts. Other advanced countries are unlikely to team with the United States in cooperative ventures unless we bring technology to the table which is clearly better than what they have or can develop. Advanced countries can build their own products which are equal to, or better than, the U.S. technology of the late 70s or early 80s, which is often all the U.S. partners are allowed to bring to the negotiating table. It is clear that companies entering into collaborative agreements seek partners offering the best technology and not just financial resources. Additionally, there is the issue of "strings" that come attached to our technology — the Allies won't tolerate third-country transfer controls simply because a product has a U.S. component.

## POLICIES DON'T REFLECT THE WORLD TODAY

This elaborate export control system was fostered in the late 1940s on presumptions that the United States leads advanced technology development, exports are insignificant to the U.S. economy, and dual-use technologies are a small category. Conditions today are different, suggesting that controls be re-evaluated.

The United States is no longer the leader in all advanced technology and has much to gain from sharing technology with other advanced nations. In fact, as shown in Figure 6-

**INTERNATIONAL COMPARISON OF CRITICAL TECHNOLOGIES**

| COUNCIL'S TECHNOLOGIES | OTHER ORGANIZATIONS | | | |
|---|---|---|---|---|
| | DOD | DOC | MITI | EC |
| **Materials and Associated Processing Technologies** | | | | |
| Advanced Structural Materials | ■ | □ | ■ | ■ |
| Electronic and Photonic Materials | ■ | ■ | ■ | ■ |
| Biotechnologies | ■ | ■ | ■ | ■ |
| Materials Processing | □ | □ | ■ | ■ |
| Environmental Technologies | | | ■ | □ |
| **Engineering and Production Technologies** | | | | |
| Design and Engineering Tools | □ | □ | ■ | □ |
| Commercialization and Production Systems | □ | ■ | □ | ■ |
| Process Equipment | □ | □ | ■ | ■ |
| **Electronic Components** | | | | |
| Microelectronics | ■ | ■ | ■ | ■ |
| Electronic Controls | □ | ■ | □ | □ |
| Optoelectronic Components | ■ | ■ | ■ | ■ |
| Electronic Packaging and Interconnections | □ | | | |
| Displays | | ■ | | ■ |
| Hardcopy Technology | | | | |
| Information Storage | | ■ | | ■ |
| **Information Technologies** | | | | |
| Software | ■ | ■ | ■ | ■ |
| Computers | ■ | ■ | ■ | ■ |
| Human Interface and Visualization Technologies | | □ | | |
| Database Systems | ■ | | | |
| Networks and Communications | | | | |
| Portable Telecommunications Equipment and Systems | | | | ■ |
| **Powertrain and Propulsion Technologies** | | | | |
| Powertrain | | | | □ |
| Propulsion | ■ | | | ■ |

Notes: ■ = Direct Correlation
□ = Indirect correlation, i.e., included as part of a larger category.

Source: Council on Competitiveness

*Figure 6-3*

3, different groups around the world consider most of the same technologies as critical to their countries—suggesting there will be a lot of competition or opportunities to share development costs and risks. Most industry interviews contend that the U.S. tendency to protect its technology (i.e., because of the belief that it is superior) is actually hurting U.S. industry and thereby hurting the U.S. economy. Additionally, the Congress often requires that high technology components (e.g., electro-optical devices) be manufactured in the United States — which means that industry/government cannot buy already proven foreign components.

COMPETITIVE TECHNOLOGY

With the trend toward a global economy, many in U.S. defense industry realize that profitability, and even survival, are linked to being competitive in the world market. It is not surprising that U.S. defense companies strongly support international cooperation because they live with the day-to-day realities of lost United States competitiveness, the escalating costs of new weapons, and the declining U.S. and overseas defense markets. Recognizing the difficulty in selling directly, they attempt to cooperate with foreign companies through joint ventures and other collaborative arrangements. Such activity has increased markedly in the past few years as American companies search abroad for opportunities.

However, most U.S. companies are not fully committed to the global game because many of them still see foreign sales as an additional market. They don't understand that they are part of a world industrial base where the key decisions concerning research and development, production and marketing take place on a global rather than national basis. Japan and Europe, because of their needs to reach beyond relatively small home markets, have moved further in the development of a global business perspective. They are further ahead in the willingness to share technology, with the realization they can move even further ahead by sharing in the advances of other countries.

TECHNOLOGY EXCHANGE

As companies work closely in international cooperation, it is inevitable that technology will be transferred; the only question is—on whose terms? Technology that U.S. companies import into the United States is often very advanced and can be superior to that available in the United States; that is one incentive for teaming.

Realizing that the rest of the world possesses technology that may be used by the U.S., the question becomes how to identify potential areas for cooperation and enter into cooperative arrangements. A tremendous amount of groundwork has been laid. The U.S.-Japan Exchange of Notes (EON) of 1983 recognized the revitalized technological and economic strength of Japan coupled with the mutual security interests of the United States and Japan.[13] Until recently, the technical cooperation agreement between the United States and Japan, dating back to 1956, has not drawn much attention. The agreement provided for the transfer of military technology from Japan to the United States and encouraged the transfer of Japanese defense related technologies to the United States. At first glance this appears quite a contrast to a generally held perception that Japan doesn't develop military equipment, let alone export defense-related technology.

There are two primary reasons for the lack of significant results of the 1983 EON. The first is that U.S. firms had funding from DOD for much of their in-house work, and need not seek technology elsewhere. Japanese firms, at the same time, remained limited to their own defense market. The second reason for limited success was the general misunderstandings of the 1983 EON

provisions. The U.S. participants didn't distinguish between military, defense, or dual-use technologies. Japan was explicit that their firms and the U.S. subsidiaries could not significantly modify the hardware from its dual-use configuration to meet military requirements. Another factor bearing on the lack of awareness has been where the expertise resides. In Japan, commercial firms take the lead for innovation. In the United States, DOD maintains an extensive government laboratory system, credited with significant technology advancement. The government of Japan does not. However, there have been government-to-government forums to exchange technical information and identify potential areas for cooperation.

The Joint Military Technology Commission (JMTC) includes the Director of Equipment Bureau, Japanese Defense Agency; the Director of International Affairs, Ministry of Foreign Affairs; Ministry of International Trade and Industry (MITI), Trade bureau; and the U.S. Embassy Representatives from the Political Office and the Mutual Defense Assistance Office (MDAO).[14] The United States requested exchange of technology four times: portable surface-to-air missile, ship building technology, ship repair technology, FS-X-related technology. In the case of the 2 ship technologies, the transfers have taken place. The FS-X technologies are in the process of being transferred at the present time. In the case of the missile technology, however, the transfer did not occur. The fact that the request was granted overshadowed the value of the technology exchanged.

The Japan Armament Study Team (JAST) Report of August 1988, which followed the U.S. visit by Japanese government and industry representatives, recommended continued dialogue, more focused agendas, and the inclusion of relative technology (instrumentation, vehicles, material, electronics, robotics). Japanese made presentations to U.S. industry on armament/munitions electronics. The Army Materiel Command (AMC) reciprocated in 1989, visiting missile, vehicle, and munitions industries, as well as the Self Defense Force Chemical School. JAST II visited AMC, its (i.e., AMC) laboratories, and industry in June-July 1990. The next reciprocal visit is scheduled for June 1991.

The Japan-U.S. Systems and Technology Forum (S&TF) includes the Director General of Equipment, Japan Defense Agency, and the U.S. Deputy Under Secretary of Defense for International Programs and Technology. The forum has met about once a year since 1980. In 1988, five items were identified for cooperative research:

1. Millimeter wave and infrared dual band seeker
2. Ducted rocket engine
3. Armor piercing munitions
4. Gas dynamic laser
5. Magnetic fields, and submarine degaussing.

In 1990, the forum chose items a, b and e for working groups. They added advanced steel material (ships and armor) and ceramic engines (fighting vehicles) as special interest topics. Several of these programs have been proposed for Nunn Amendment funding.[15]

At least four issues will influence the success of U.S.-Japan technology cooperation in the future.[16] The biggest barrier is the culture of Japan; the fear of anti-defense public opinion discourages cooperation. The Japanese do not wish to be labeled arms merchants, at the risk of losing commercial sales. Second, there is the potential impact of military-related technology and weapons development policies on Japan-U.S. competition and cooperation.

Third, there is the rise of Japanese industrial capabilities, coupled with the level of friction in overall U.S.-Japan trade balance. Fourth, global security issues, especially current changes in the communist world and in U.S.-Soviet relations, are a concern. Although these issues must be addressed, they are not "show-stoppers" when considering the overall value of cooperation with the principal international trade partner of the United States in the free world.

The mechanisms for dialogue are working and should be continued. During ongoing Memorandum of Understanding (MOU) negotiations, several of the identified technologies are being considered for cooperative programs. The discussions will undoubtedly lead to other forms of cooperation.

For example, Japan has agreed to invest in U.S. development, in the form of direct funding and equity investment. It will contribute an estimated $2 billion to construct a module for the National Aeronautical and Space Administration's (NASA) Space Station "Freedom," and at least $1 billion toward the space station's infrastructure in support of the module. They also may participate in the cost of the Superconducting Supercollider Particle Accelerator. The concept of reciprocal investment is that a domestic firm with real equity in a foreign firm or subsidiary will direct some of its technology into those new applications which are open to the foreign or subsidiary firm. This is another means of satisfying the intent of the U.S.-Japan agreement.

## DUAL-USE TECHNOLOGY

Dual-use technologies are no longer a small portion of advanced technology. The best example of this is in the electronics industry, where there are few technologies that aren't incorporated in both commercial and defense applications. Companies don't make money in research and development (R&D); profits come from future production. As the defense budget shrinks, capitalizing on R&D investments will become more difficult. Co-development of technologies that can be used in civilian and military applications has been an openly stated goal of Japanese and European governments for years. With commercial and defense aspects of European and Japanese industry being more closely coordinated (i.e., than in the United States), foreign companies also appear more able to exploit U.S. defense technology transferred in collaborative efforts, for civilian purposes, than their U.S. counterparts. Because they have cooperated with one another, the Western European countries have been able to develop technology capabilities which make them increasingly independent of the United States.

A likely scenario for U.S. defense is that technology, excluding the most sensitive, will first be developed for the commercial sector and then made available for military applications. Few military technologies are commercially viable (e.g., nuclear hardening), but many commercial technologies could be adapted to military applications. A report from the U.S. Office of Technology Assessment asserts "these investments will be made only by companies that expect to sell the resulting products in a civilian market that is many times larger than defense purchases."[17]

Dual-use technology also can be the key to successful cooperation with our allies because Japan is an acknowledged leader in its proficiency for adapting technology. Japanese business and government emphasize the more integrated approach to defense and civilian technologies. The major concern of Japanese public perception for developing defense-related products can be overcome with the commercial application of technology. The MITI is more concerned with the end-user than with the actual technology to be transferred. With its annual R&D budget

of about $220 million, Japan is the U.S. biggest high-technology and economic competitor.

Senator Bingaman has been outspoken on cooperation with Japan, stating that it is crucial for the Defense and Energy Departments to build stronger ties with Japanese government and industry if they are to stay abreast of rivals.[18] The Congress approved $20 million for DOD to pursue joint development of dual-use technologies with Japan. This included $10 million for cooperative research and development plus $10 million to establish 10 university-level language and management centers. The United States hopes to integrate Japan's technological success into DOD's Critical Technologies Plan. Until now, the plan has been a want list, not a strategy for obtaining the technologies. The bill contains mechanisms, which, when coupled with the forums for information exchange, could be the much-needed impetus to cooperate multinationally.

The trend toward multinational defense forces will continue to strengthen military relationships between the United States and its allies. Cooperative development will be driven by the military necessity for equipment interoperability as well as the political/economic necessity to reduce defense costs. At the spring 1990 NATO meeting of defense ministers, U.S. Secretary of Defense Dick Cheney suggested to NATO colleagues that we must design policies and programs to "build and strengthen the industrial base of the alliance as a whole."[19] To achieve this goal the United States must discard the mindsets and constraints that block cooperative efforts. To profit from advances taking place in other countries, the United States must be willing to share its latest technology.

## THIRD COUNTRY SALES

Agreement on third-country sales is a major barrier to initiating an international cooperative program. The Europeans, who are interested in sizing the market to ensure the economies of scale are right, want the United States to identify, up front, the countries to whom they can sell the weapons system. However, the United States prefers to defer that decision to the time when a sale is being considered; today's "friends" may be tomorrow's "enemies." European interviewees indicated the United States was too restrictive and they, the Europeans, would be more willing to support U.S. technology transfer policies if the United States' restrictions were more narrowly targeted and fully coordinated. Rather than generally restrict a technology from all nations, the Europeans believe the United States should decide up front which nations will be afforded access to a given technology, based upon the strength of the nation's alliance with the United States and its threat to world security. To facilitate third-country sales, it is a good idea to ensure that weapon system technology can be scaled back (i.e., an "export model"), or only sell last-generation technology to third countries.

## GOVERNMENT MAY BE GETTING THE MESSAGE

In 1989, The Defense Advisory Board, an independent group established to advise DOD, warned that *fragmented policies of the past, in which military security and economic issues were separated are no longer acceptable.*[20] The board called upon the administration to develop a "coherent policy" for long-term U.S. cooperation in defense, economics and technological growth.

There are signs of a shift from the traditional U.S. distinction between military and civilian technologies toward a more unified approach to the industrial base like that taken in Europe and Japan (where defense production is explicitly integrated into their civilian industries). The DOD critical technology plan for 1990, prepared at the request of the Congress, states DOD's concern about the decline

in U.S. technology and manufacturing leadership.[21] It identifies DOD contributions to the industrial base, noting that much of the sponsored R&D, especially semi-conductors, is "directly applicable to the domestic industrial front," and it could strengthen the U.S. technology base and worldwide competitiveness. Electronics, light-weight structural materials, and precision machining equipment are technologies which have strong linkages between the military and the civilian sectors, and they could provide the basic infrastructure for future economic growth.

There is an extensive overlap between DOD's list of "critical technologies" and that identified by the Department of Commerce in a 1990 report on emerging technologies.[22] The Commerce report complements the DOD view by indicating that many commercial technologies contribute to national security.

As the U.S. Government realizes the importance of global competitiveness, the political climate affecting technology transfer is changing. The DOD and the Department of Commerce are working closer on the industrial base impact of international cooperative programs. Additionally, The State Department is looking at trade and the foreign policy and security aspects of proposed arms transfers.

It appears DOD and the Department of Commerce may be moving toward a concept of the industrial base that views national security and economic competitiveness as mutually reinforcing. One approach accepts that the line between civilian and military technology is becoming increasingly blurred, and suggests that the promotion of dual-use technology may be in the best interests of the United States. Perhaps a "coherent policy" will become the next logical step — a policy that reconciles the commitment to free trade and international cooperative arms programs with the need to restrict the transfer of technology that threatens national security and/or commercial competitiveness.

Perhaps a true value analysis should be required by such a "coherent policy," before the decision to enter a technology transfer arrangement. The study would consider whether technology is available elsewhere that is similar or comparable. Then the United States should analyze the military and commercial costs of developing the applications. The decision must also consider the potential of dependency and/or vulnerability as a result of the cooperation. Next is the assessment of competition that the international collaboration may create on the domestic front. Finally, there is the "crystal ball" factor, assessing the presence or future availability of superior technology that would make this effort obsolete.

There are indications the U.S. government may be willing to liberalize export standards and streamline the Munitions List to make it more compatible with the Coordinating Committee for Multilateral Exports Control (CoCom) list. In a departure from their unwillingness to liberalize CoCom standards, the United States agreed in June 1990 to relax standards for computers and machine tools exported to the "emerging democracies of Eastern Europe." In the fall of 1990, controls were further softened when the President directed Executive departments to implement the following changes to he export control system.

First, eliminate all dual-use export licenses and re-export licenses to CoCom members, consistent with multilateral arrangements. Second, remove from the U.S. munitions list all items contained on the CoCom dual-use list unless significant U.S. national security interests would be jeopardized. [23]

A call for additional relaxation comes from a recent report on U.S. export controls by a

panel of U.S. foreign policy experts.[24] The report maintains that it would be in the best interests of the U.S. to provide Soviet and Eastern European access to some dual-use technologies. The presumption is that access to Western technology could strengthen the region's stability and security by bolstering the process of political and economic reform. The report cautions that the political uncertainty of the region and the existing Soviet military nuclear threat necessitates caution in any relaxation of controls.

As a result, only products whose end-use could be verified should be shipped, and the West would continue to constrain access to technology those end-products which contribute "significantly and directly" to improved military capabilities. To foster trade with the East, the panel is encouraging the CoCom to: adopt "more dynamic and responsive strategies to shift the focus of trade with the Soviet Union and Eastern Europe from denial to approval"; adopt a shorter list of commodities that are off-limits; and, agree on verifiable end-use conditions for certain products...while still retaining the traditional objective of retarding the qualitative progress of Soviet military capabilities.

While any relaxation of CoCom export controls is viewed by industry as a step in the right direction, it does not guarantee that the U.S. government, especially DOD, will not continue to apply more stringent controls. It remains the mind-set behind the controls that will be difficult to change.

**A POSSIBLE SCENARIO**

With so many reasons and opportunities for cooperation, the next question in technology transfer is the mechanism. There have been a few examples of international cooperation at the development phase where technology was exchanged. One of the most recent and perhaps more controversial was the FS-X, the Japanese fighter aircraft replacement. One primary reason for the heightened interest is the potential for technology flowback to the United States which may open the door for future, more adventurous cooperation.

The formal Memorandum of Understanding between the Japanese Defense Agency Bureau of Equipment and the U.S. Defense Security Assistance Agency in November 1988 broadly outlined the FS-X agreement. Japan would completely fund the program. The FS-X technology would flow back to the United States and the Japanese Defense Agency would chart the development of the FS-X in close consultation with the United States.

The noteworthy point was that the United States is now a buyer and a seller of defense technology and could learn from allies technological prowess. The flow of technology in both directions was to be expected when two allies with mature industrial democracies embark upon such a project. The other lesson to gain from the FS-X negotiations was that it is no longer possible to treat defense and economic concerns as two separate policy issues.[25]

Most of the disagreement on specific technology transfer and work-share focused on the wings. The MOU merely stated that the total U.S. work-share of FS-X would be between 35 and 45 percent. The two sides agreed that wings of two of seven prototype aircraft would be built in the United States. Negotiators settled on a 40 percent U.S. work-share based on quality, development work. The License and Technical Assistance Agreement (LTAA) between General Dynamics and Mitsubishi was finalized January 12, 1989.

The flowback provision of the MOU for the FS-X had another significance. Building on existing technology, in this case the F-16C, the risk of unknown modifications to the original design is potential loss of interoperability. Therefore, it is important to maintain con-

figuration control for supportability as well as managing the integration of technical improvements to the system.

Flowback of technology should be natural, one partner should not have to ask for MOU compliance to discover the change. Both sides contribute resources, assume the risks, and therefore should expect to share the potential benefits.

## SETTING THE DIRECTION FOR THE FUTURE

Technology is critical to the economic growth and competitive advantage of the United States. If the U.S. defense industry is to compete in an increasingly global market, and enter into increasingly complex cooperative projects with our allies, it is imperative that the United States rethink its management of defense-related technologies. Future strategies must include:

(1) More explicit defense export control and technology policies. A more coherent, global approach is required. Policies, organization and resources should be evaluated in order to establish an environment that fosters strong support for defense trade and international cooperation. It is essential that technology transfer policies be in sync with national objectives, and that the United States clearly identify what technologies (and related industrial base) must be protected.

(2) Narrowing technology transfer issues to restrict the flow of militarily useful technology from terrorist nations without disarming U.S. high technology; perhaps a stronger CoCom with more consistent rules could be the means to administer this internationally. Kuttner suggests *"not only higher fences around fewer products, but also equivalent fences around all prospective exporters."* [26]

(3) Putting a single agency in charge of strategic trade issues.

(4) Assigning specific organizational responsibilities for reviewing dual-use opportunities and recommending actions to facilitate a unified industrial base.

(5) Simplifying the export license processing. In this regard, DTSA is currently testing "workload reduction" initiatives to reduce and simplify licensing.

To speed the process of technology transfer, it is essential that technology assessment and control be initiated early in the acquisition process; determine the potential costs, benefits and risks associated with the U.S. technologies that could be transferred. This avoids delays caused by later revisiting transfer issues (a problem plaguing the FS-X effort), and it allows more timely allied planning while facilitating industrial teaming.

## WHAT INDUSTRY CAN DO TO FACILITATE EXPORT LICENSING

Interviews with government and industry representatives indicated that delays and denials of export licensing can be reduced if industry took care in the following areas:

(1) Centralized review and control of the corporate export functions to ensure applications are complete and accurate (particularly with regard to capabilities/purposes). A DTSA representative also cautioned that the marketing department should not be put in control of licensing requests as "they aren't realistic and tend to gloss over critical technical issues."

(2) Coordination with government agencies especially for new and/or complex, high technology items; i.e., "grease the skids."

(3) Identification of the military service or DoD agency having the technical expertise to review the request..."avoid delays that may occur from staffing a request with the wrong departments/agencies."

(4) Complete commodity description or end use, and technical information..."do your homework, and avoid delays caused by requests for additional information."

(5) A company "Export Procedures Manual" detailing all of the essential "need-to-know" information for employees involved in exporting defense articles and services. Appendix I is a list of 10 critical items that the Office of Defense Trade Controls recommends be included.

For U.S. defense companies, the alternative to successful overseas marketing and collaboration is a severe drop in business, which many may not survive.

## ENDNOTES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**Managers are to be reminded that a joint venture relationship is delicate at best and complicated at worst. Without fundamental trust and commitment by each partner, there is little hope for a working partnership.**

**— *Michael J. Geringer*** [1]

# CHAPTER 7
# FINDINGS: INTERNATIONAL COOPERATIVE RELATIONSHIPS

As we have seen, increasing globalization of the world market presents mounting challenges for U.S. defense acquisition. It dictates that we not only clearly identify our requirements, but seize every opportunity to align with our allies to consolidate and conserve. The resulting cooperative projects become even more complex as partnerships arise out of economic necessity. The harmony required for success is not easy to achieve. Cooperation will take on new, innovative forms, in addition to the more conventional modes. We have seen that a proliferation of laws and regulations have complicated the export control system and DOD's ability to overcome technology transfer issues to spawn international programs. Still facing budget cuts and competition, the U.S. defense industry recognizes the fight is just beginning over mismanagement and waste to remain competitive.

In the course of our interviews, the importance of sound management principles in international cooperation proved all the more significant at the program's initiation. To achieve harmony of purpose, the partners must develop a healthy working relationship. This relationship does not happen overnight. Partners must prepare to operate in a global environment—bring skills and resources to the table; train and equip knowledgeable people; and, invent new models for cooperation. Our study dealt with three key player relationships in the international program arena: government-to-government, industry-to-industry, and government-to-industry. To manage a successful international collaboration, one must understand the three relationships.

## ROLE OF GOVERNMENT

The responsibility of government to establish policy permeates international defense programs. Policy regarding national security, defense acquisition and international relations/trade are intertwined. In addition, derived from the policy decisions are the government organizations and resources to carry out that policy. Imbedded in these, are the implied responsibilities of the United States as leader of the Free World and as keeper of the nation's economic well being. It is a delicate balance to manage these integrated responsibilities. National security is nurtured by military strength and economic stability. Economic security has become a prerequisite to national security. Likewise, ex-

ports of defense products from the United States have become just as important for maintaining a strong defense industrial base as stabilizing the national economy and protecting the nation's security.

Two or more governments wishing to conduct cooperative defense programs must overcome a number of barriers. Largest of those, identified through our interviews, was technology controls. The management aspects of transferring technology involve identifying what is releasable, reaching agreement and managing consistently thereafter. As the discussion of goals pointed out, beginning a project with a clear understanding of the requirements is mandatory, but infrequently accomplished. Often hidden agendas and communication barriers prevent this critical step. From a management standpoint, differing requirements should not be raised as an excuse not to initiate a cooperative effort.

On the contrary, exploring the common elements of the requirements to determine the hard points and the negotiable aspects can achieve mutual agreement on a baseline of requirements for the multi-lateral project. It is important during this time to understand the interface requirements, particularly where interoperability and standardization are desired.

One such planning tool employed by NATO is the Conventional Armaments Planning System (CAPS), the purpose of which is to coordinate national defense research and development programs with future NATO military force requirements.[2] Such a technique would simplify negotiations among prospective partners exploring a cooperative venture to address common requirements. It might also prove useful in assessing the availability of any existing technology from the participants that applies to the requirement.

The DOD should recommend a coherent policy for long-term U.S. cooperation with our allies in defense, economics and technological growth; to maintain them as military allies and achieve U.S. technological and industrial strength in the long run.

In considering prospective multinational defense programs, the U.S. assesses the military capabilities of the U.S. and its partner(s) as a result of the new requirement. That includes the impact on the balance of power in the region and possible effects on international alliances. Another operational concern is the partner's ability to control and secure the proposed military capability for fear of the technology falling into the hands of an adversary or being used indiscriminately. If these criteria can be satisfied, attention turns from harmonizing requirements to identifying the possible means of meeting the need.

The budgeting process within each participating government is almost always different. As a result, management of cooperative programs continuously suffer the uncertainty of dedicated funding. Out-of-phase approval cycles may transmit erroneous signals to allies regarding program support. Participants should carefully consider the project's merits before making a commitment, but then stick to it — fencing program funds if possible and programming for the entire project. One of the keys to success for the NATO AWACS program has been the commitment by the participating nations to assure funding during a 7-year period.

Likewise, allied nations have differing procurement systems. Compounded by complex defense export laws, many government-to-government agreements never achieve harmony because of the bureaucracies. Interviewees frequently suggested that the U.S. government needs to re-examine its policies

for exchanging information in the interest of defining the security, trade, cooperation and industrial base aspects of the technology transfer system. The Defense Policy Advisory Committee on Trade (DPACT) *Year End Review 1989* capsulized it this way: "Changes should include a more sharply focused and limited effort to control technology, a clear understanding of trade-offs between the economic benefits of exports and the security or foreign policy benefits of controls, an emphasis of multilateral rather than unilateral efforts at such control, a greater commonality between controls imposed on military and commercial technologies, development of a west-west technology control policy, greater consideration for foreign availability in control decisions, liberalization of third country transfer controls with allied countries and more efficient use of Government resources for administering the export control process."[3]

Managing the issue of offsets is highly political, frequently driven by social and cultural motives. The political criteria for initiating a cooperative program may at times overwhelm the government-to-government negotiations. Analyzing the responses of our interviewees, the solution appears to be: establish good personal relationships, determine the needs of the program, understand the capabilities of the partners and allocate the work-share by what makes sense. It would simplify offsets discussions, basing them on the work that needed to be accomplished.

With the increasing importance of multinational cooperation, perhaps it is time for DOD to expand the management review of acquisition systems (Defense Management Review) to specifically consider the Department's international program activity. The new DOD Directive 5000.1, with its emphasis on a professional acquisition corps can become the foundation for improved international cooperation. Quality personnel with proper training and education in the global environment are the best bet for future success.

**INDUSTRY-INDUSTRY RELATIONSHIPS**

Nearly 70 percent of industry respondents identified personal relationships as essential to program success. (See Figure 2-1, page 13.) In most cases where industry is free to choose its partner, it chose a firm it had dealt with previously. Similarly, government program managers regarded the industry team as the single factor contributing most to the success of the effort. Therefore, we have included a discussion of the trends, barriers, relationships and recommendations for management principles among industry participants. We were particularly interested in how the U.S. defense industry is faring in this international competition.

Two specific trends will affect the defense industry relationship around the globe. The first is declining defense sales, resulting in a lure toward the commercial workplace to protect and/or expand corporately. This trend is not isolated to the United States but includes all industrial countries producing defense technology.

A good example is in the airframe manufacturing industry where Boeing, Airbus Industries, and McDonnell Douglas are intensifying the competition for commercial sales to shore up the shrinking defense market. The aggressive sales strategies and new market searches serve to protect or even increase market share. The airframe manufacturers are introducing new business arrangements with their suppliers and special alliances with prospective customer airlines. Most of these initiatives are financially driven, to spread investment risk, drive down manufacturing costs and accelerate aircraft deliveries.[4]

The second emerging trend affecting industry's relations is the international availability of technology. The U.S. industry is beginning to recognize the growing expertise of off-shore firms. Although short of complete reliance, U.S. companies are becoming more reliant on foreign suppliers for manufacturing equipment and critical product components. Such dependencies can lead to shortages and uncontrolled price fluctuations. The U.S. wants to protect its markets from monopolistic control, while also protecting its technological base.

It is, therefore, for these reasons that industry must carefully consider international relationships. The competition will be keen and survival may well depend on how a firm deals with its foreign competition. Some U.S. firms have already yielded to the competitive pressures. In several cases, companies have gone out of business because they could not compete with vertically integrated foreign companies having access to lower capital costs and government support.[5] See Figure 7-1, for a summary of international industry teaming as a result of the changing influences on the defense industry.

What, then, are the lessons for the defense industry? Interviewees responded that the defense industry needs to review fundamental business principles, adopting a more commercial outlook. That includes pursuing work that has long-term financial benefit for the company. The defense industry has been prone to over-design; instead they need a better balance between engineering and sound business practices.

Some firms have looked to conversion of defense production into commercial markets. In the future, scarce research and development monies will focus on technology with applicability in dual uses, probably favoring the commercial sector. The other area of increased interest will be manufacturing technology where better production efficiencies can result in reduced costs while improving the standards of quality. It is perfectly feasible to achieve higher quality while reducing costs. The leading response, though, for surviving defense industries, was finding a workable relationship with foreign competition.

Business relationships among defense industries can take as many different forms as there are types of international collaboration. Figure 7-2, page 66, contains forms of collaboration within the defense industry. From teaming arrangements and consortiums to joint ventures in cooperative research and development; co-production and international marketing to direct sales, companies are finding new business opportunities to compete for future defense programs. Foreign Military Sales (FMS) of U.S. defense equipment, while still a high-value business and the largest single form of arms transfer, is no longer the sole means of international cooperation with advanced industrial nations. As other nations improve their technological capacity they seek greater roles in cooperative ventures. For example, joint production has emerged to meet foreign competition and provide reliable domestic supplies of defense components and technology for the partner. Some companies are now actively seeking "equity-investment" programs which permit each partner to invest resources, skills or shares in a joint venture. Boeing and Japan have such an agreement on the Boeing 777 fuselage. The partners each design and develop portions of the program concurrently.[6] They expect to reduce recurring costs and development time by having greater production efficiency from designs compatible with manufacturing processes. The Japanese firms of Mitsubishi, Kawasaki and Fuji Heavy Industries share in the detailed design and they obligate themselves to manufacture. They assume market risks, sharing in the program's success and sales financing (but not direct sales).

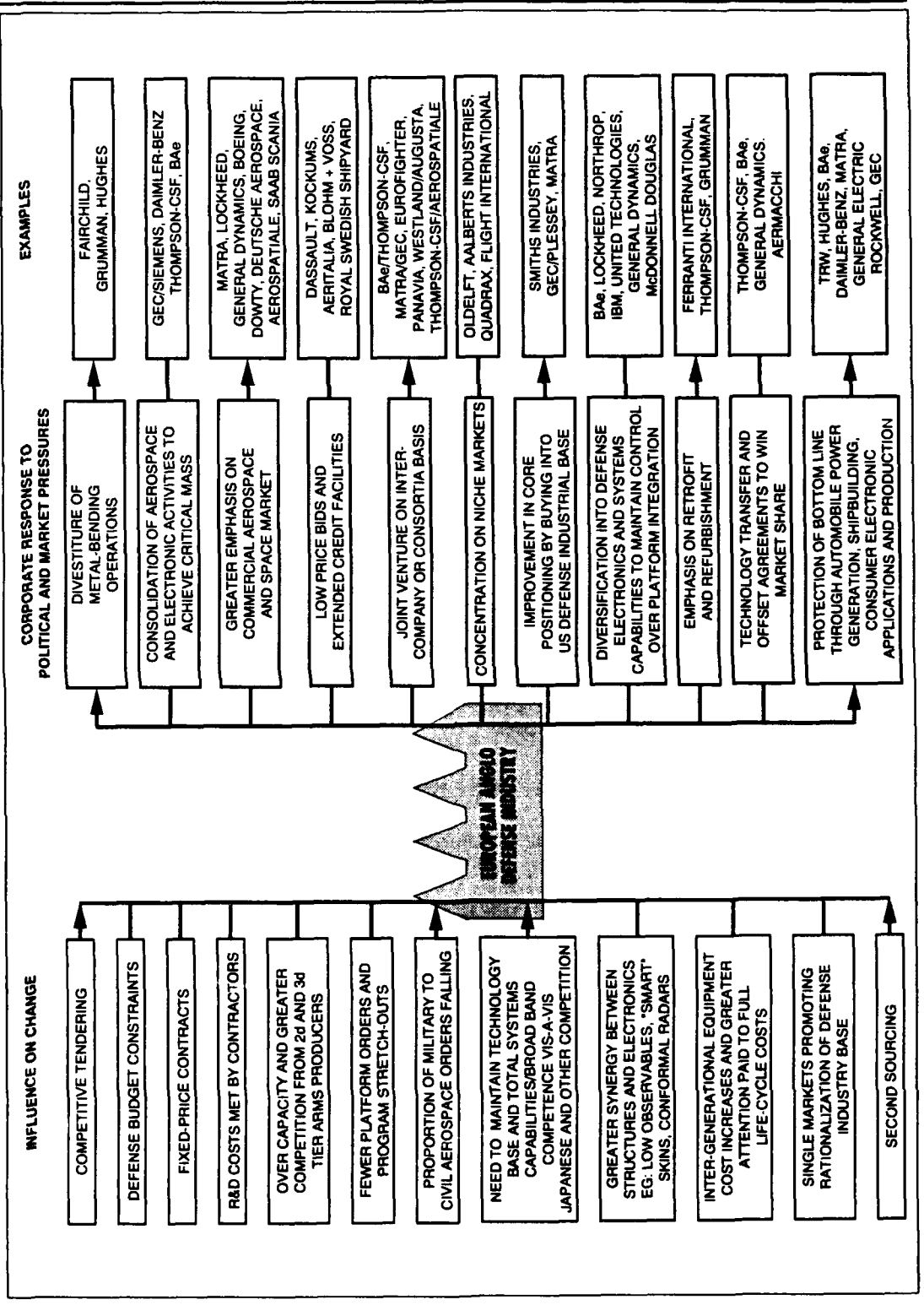


***Figure 7-1.*** **Defence Industry Environment and Corporate Response**

Other enterprises realize that multinational cooperation can lead to mutual benefits and have reacted. Rockwell and Fabbrica Italiana Apparecchiature Radioelettriche (FIAR) of Milan, which have worked together since 1960, will jointly compete for military aircraft retrofit and upgrade programs.[7]

One possible explanation for U.S.-European joint ventures is the renewed interest of some U.S. firms in the European market. For example, Rockwell employs an advisory board in Europe to identify areas of need which Rockwell could satisfy. Country councils consist of heads of overseas operations close to

**Data and Scientist/engineer exchanges:** Technology transfer through individuals

**Sourcing:** Direct purchase of a foreign-made part for a U.S. weapon system

**Subcontracting:** U.S. prime contractor contracts with a foreign company to develop or produce a part of a U.S. system

**Licensing:** Selling or buying the rights to produce another firm's product

**Foreign Military Sales (FMS):** Government sales of U.S. hardware abroad

**Coproduction assembly:** FMS with shared production and/or assembly

**Codevelopment:** Joint design, engineering and/or production

**Teaming:** Collaboration on a specific program as or prime subprime (also multiprogram teaming)

**Alliances:** Loose agreements to collaborate in specific areas of technology

**Joint venture:** A jointly owned corporate entity to pursue a particular program or class of programs

**Consortium:** Loose agreement of several partners to pursue a technology area from shared resources with shared revenues

**Revenue sharing:** Joint activity where each partner invests in his area with agreement to share benefits/profits

**Acquisitions:** Outright purchase of a firm, either abroad or domestically

**"Family of Weapons":** Agreement to minimize overlapping weapons development by cooperating, used by NATO

Source: Office of Technology Assessment, 1990.

*Figure 7-2.* **Forms of Collaboration in Defense Technologies**

the situation. Rockwell has broadened its outlook on cooperation by operating as a prime contractor, a subcontractor, a partner in a joint venture and as a systems integrator. By being so flexible, Rockwell has captured business otherwise turned away and, at the same time, shown a willingness to work with global partners. Customers feel confident, at ease and see a commitment to the project.[8]

Euromissile grew out of Franco-German cooperation in the field of tactical missiles, going back to the early 1960s. Both desired cooperation for the industrial and technological benefits.

After trying several schemes for European cooperation, the experiences with GIE (Groupement d'Interet Economique) have made believers of many skeptics. They formed Euromissile to manage the joint programs and market the missiles. Management includes all key technical, industrial, financial and commercial decisions. The steering group (Board of Management of Euromissile) meets monthly. The actual development and production are the responsibility of the mother companies. A share of development and manufacturing is assigned to each country proportional to its planned procurement quantities. Successful cooperation is rooted in single sourcing and total interdependency.[9] The success of the cooperative effort has led to the formation of the Euromissile Dynamic Group (adding British Aerospace to the Franco-German partnership of Euromissile) to develop, produce and market the Trigat (European anti-tank missiles), and short/medium range missiles.

## GOVERNMENT-INDUSTRY FINGERPOINTING

The relationship among defense contractors, the Congress and DOD has wavered during the years between apathy and mistrust. Voter displeasure, coupled with acknowledged examples of fraud, waste and abuse created an unhealthy environment. However, during it all, DOD had no problems getting potential bidders for work, even the high-risk ventures. To some extent, DOD has been isolated from many Free Market forces that have shaken global companies — earnings, stock performance, market value, etc. Times are changing. Competition from foreign sources for technology and the interdependent global economy now bear significantly on the government-industry relationship.

Numerous laws and regulations govern the defense industry as the U.S. government attempts to control costs, to avoid procurement abuses, to halt illegal transfer of technology and to promote burden sharing and collaboration with our allies. The Defense Policy Advisory Committee on Trade, *Year End Review 1989*, reported the worsening of government and industry relations in the United States, coupled with excessive legislative and regulatory changes, have caused many subtier contractors to exit the defense business altogether.[10] The "legislative and regulatory harassment factor" is but one of the inherent problems in the government-industry relationship.

The second set of problems is the fault of DOD and the Services. Invariably, DOD procurement actions require bids for unrealistic order quantities. When order quantities are reduced after contract award, unit costs increase. Firm-fixed price development costs invariably place the contractors at high risk in meeting ambitious schedule and technical goals within the specified dollar ceiling; this is further exacerbated when those programs are stretched. Only after award, are contract values reduced, driving up the R&D investment of the contractor and raising unit costs.

The third set of problems concerns the "competition factor." The judging of competing proposals and forced second-sourcing can

result in multiple competing production capabilities when actual production quantities do not support more than one source.

The fourth problem is the "minimum efficient production rate factor," striving for efficient production rates without regard to the value of low-rate costs with existing facilities. The strain these and similar problems have created for the U.S. defense industry discourages and, in fact, handicaps firms in the global market place.[11]

As markets and industries become increasingly globalized, countries become interdependent for goods, technology and capital necessary for defense. The impact of foreign dependency on national security is an issue. The current environment demands a core cooperative, less adversarial relationship between industry and government.

A recurring concern among our industry interviewees was identifying the focal point for international programs in the U.S. Government. The Department of State responsibility for international policy sometimes overlaps with the Commerce Department's concern for trade and industry. Meanwhile the DOD is working defense issues that include security assistance to our allies. Each department signals the world from its perspective, at times contradicting the other departments. The acquisition work within DOD involves many aspects of international industry. If, for the defense industry, the focal point is to be within DOD, many respondents felt the following mechanisms are needed to keep industry better informed of official policy guidance.

Give DOD a greater voice in establishing overall U.S. economic and trade policy where export of defense technology is concerned. Centralize data to assess current state of defense industrial and technology base. Develop more assertive defense trade and cooperation policy. Aggressively enforce current trade laws to minimize foreign targeting of selected U.S. industries important to national security. Streamline the acquisition process. And, stabilize defense budgets.[12]

The DOD acquisition policies should be reviewed with regard to the government-to-industry relationship to improve the financial health and economic competitiveness of the U.S. defense industry. Suggested areas for consideration are: an integrated financial and industrial base plan, a review of progress payment rate schedules, increased government allowance for contractor special tooling costs, full recovery of IR&D and minimal use of fixed-price contracts until completion of full-scale development.

The U.S. advantage of technological leadership for military security depends on the economic health of the defense industry. Industry will have to apply research advances quickly and aggressively. The government can help by removing barriers and burdens to investment, replacing them with incentives for risk-taking and commercialization. Antitrust reform to allow domestic companies to cooperate and pool resources on an equal footing with their world competition, permanent and expanded R&D tax credits, and a long-term capital gain rate cut should be provided. The best capital cost reduction of all would be low real interest rates through deficit reduction. Congress can set the example by changing the short-term, nearsighted mentality, but it must go beyond satisfying political whims to make the necessary investment in the nation's future.

At the first discussion of a possible cooperative effort, before the formal process begins, U.S. planners should consider the impact on the defense industrial base. That includes a review at all layers, down to the lowest tiers, of production capabilities and employment. It means potential benefits to the health of the

industry and the ability of the industry to perform successfully. Furthermore, it requires the analysis of jobs, lost or created. Other criteria for initiation of the multinational program involves market opportunities for either the United States or its partner(s). A sensitive subject, which must be addressed, is trade balance. The program will be weighed by its merits in the U.S. trade strengths and the state of trade with prospective partners.

The point of this is that future DOD planning must consider the international environment for the 1990s force structure, roles and missions changes. Perhaps a 10-year plan should be developed for major weapon systems. It could be used to guide legislative reviews and security assistance negotiations with allies. Such a plan would commit funding for RDT&E, minimizing the uncertainty in an era of unstable and rapidly changing requirements. "Rolling" plans can be updated rapidly with changes based on a clear understanding of how they affect at least a 10-year time horizon for major weapon systems and other items.

Europe and Japan rely more heavily upon industry's leadership in government-industry relations. For example, Germany's Ministry of Defence is very interested in electronics because the greatest advancements come from the commercial sector. The military can participate without investing large sums for development.

This is particularly attractive because German defense expenditures have been decreasing and greater declines are expected. And while the Ministry of Defence encourages competition on the domestic front, competition among German firms internationally is less desirable. New German directives require greater participation of medium-sized companies, hoping to spur more industrial development of military-related products.

West German shipyards and their affiliated companies have agreed to buy Israeli products equal to 75 percent of the amount of Israel's purchase of German Navy Products. The "buy-back" provisions have become a fundamental part of agreements among government agencies and large suppliers. General Dynamics will spend $800 million in Israel during a 5-year period in connection with the $2 billion buy of F-16s.[13]

European industry recognizes it will not likely make large inroads into the U.S. defense market. However, even relatively small gains in the U.S. market share can have significant return for Europeans. Companies are acquiring U.S. defense firms and making agreements with U.S. manufacturers to market European products to DOD. Europeans hope to capture an increased share of the declining U.S. defense market.[14] For this reason, emerging teams will apply more pressure on the U.S. government to modify technology transfer policies, reconsider third-country sales and implement Conventional Armaments Planning Systems (CAPS) for future cooperative planning. Europe, remaining nationalistic for arms purchases, realizes, however, that multinational industrial groupings, not governmentally driven ones, can increase cross-border attractiveness of resulting products. The governments must attempt to sort out long-term implications of the international linkages, after which there may be another round of mergers and alliances.

In Japan, greater defense cooperation means quieting public fears of greater Japanese industrial competition. Unlike many U.S. firms, Japanese enterprises enter foreign markets with their products, sell at competitive prices, and immediately repatriate their earnings to Japan, in order to increase both Japanese foreign exchange reserves and the funds for the corporation. This pattern has been followed by most companies for many years,

and it will likely continue as Japan's overseas investments expand.[15] With their stand on defense exports, Japan emphasizes multiple applications of technology. Their highly diversified, vertically integrated structures readily adapt military technology to civilian products. The "spin-on" theory includes effective use of production capabilities which provide many more options to Japanese firms.

## END NOTES

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3. Defense Policy Advisory Committee on Trade, *Year End Review 1989*, p. 2.
4. Bruce A. Smith, "Aircraft Manufacturers Use Innovative Deals to Counter Competition, Financial Squeeze," *Aviation Week & Space Technology*, 24 December 1990, p. 59.
5. The U.S. Congress, House Committee on Science, Space and Technology, *Government Role in Joint Production Ventures*, p. 3.
6. Smith, p. 60.
7. "Rockwell, Italians Join Together," *Defense Week*, 26 November 1990, p. 11.
8. Marvin Leibstone, "No Doubt There Have Been Major Changes," *Military Technology*, Vol. 14, p. 39.
9. *Year End Review 1989*, p. 3.
10. *Ibid.*, p.3.
11. *Ibid.*, p.4.
12. *Ibid.*, p.4.
13. "German Shipbuilders Assume 75% Buy-Back Commitment," *Israel Business*, October 1990, p. 7.
14. *Year End Review 1989*, p. 13.
15. Song M. Lee and Gary Schwendinam, *Japanese Management: Cultural and Environmental Considerations*, p. 259.

**When Alice asked, "Would you tell me, please, which way I ought to go from here?" The Cheshire cat replied, "That depends a good deal on where you want to get to." Similarly, defense planning depends a good deal on exactly where we want to get as a nation and on the amount and type of resistance we may face getting there.**

**— *The Defense Revolution***

## CHAPTER 8

# FINDINGS: INFRASTRUCTURE—FOUNDATION FOR COOPERATION

The Commerce Department's "The Competitive Status of the U.S. Electronics Sector" cites a strong, technologically superior industrial base as key to national security. Electronics, and high-technology in general, are important to the United States since the country's military advantage is based on technological superiority, not quantity of weapons.[1] During the interviews, the topic of U.S. competitiveness in the international marketplace frequently arose. We defined it as the nation's ifrastructure, or the ability to generate technology, including the education system, facilities, equipment, and business approaches. A number of economic forces are at work—for example, the high cost of capital results in reduced equipment investment and a subsequent revenue loss to the competition. Equally worrisome is the U.S. ability to maintain the cadre of skilled personnel and research facilities to produce technological innovation that is internationally competitive.

Of the areas that are going to be important in years to come, none is more important than engineering, especially electrical engineering. In 1980, Japan produced 20,000 more total engineers than the United States. The United States produced 14,000 electrical engineers in 1980, while Japan produced 1 and 1/2 times that number. About 40 percent of Japanese graduate students are in engineering, as compared to a very small percent in the United States.[2] The National Science Foundation estimates that by the year 2000, the United States will be turning out 400,000 fewer scientists and engineers than the country needs.[3] The shortage of technically competent manpower is undermining America's competitiveness and national security. Two theories account for this negative growth. The first is that unfair trading practices have put U.S. industry at a disadvantage. It calls for greater government intervention and protectionism. The second theory, acknowledges the slip of U.S. leadership, attributes it to normal effects in a world economy, and states that U.S. industries suffer from low product quality and mismanagement and that markets, not the political system, should decide which companies survive.[4]

The education system as a whole can and should be revitalized to equip the young

people with skills necessary to compete in tomorrow's world. For some it may mean expanded opportunities for vocational training to learn marketable skills. For those interested in college, there should be incentives for the sciences and engineering.

INVESTING FOR A COMPETITIVE EDGE

Next to producing qualified personnel to conduct the technology advancements and keep the U.S. competitive, the second problem is providing resources to promote research and development. (See Figures 8-1 and 8-2.) The U.S. government support of R&D laboratories has long been controversial. Compared to other countries, the United States leads all others in technology advancements from government sponsorship. The defense sector has contributed significantly to that progress. As other countries compete in high technology, what is the best strategy for the United States? The Congress hopes DOD will tap some foreign technology, specifically that of Japan. The FY91 Defense Bill, discussed in our technology transfer section, identified money and mechanisms to provide R&D results to industry.[5] Other congressional activities subsidize modern manufacturing techniques, computer-aided design and computer-controlled facilities.[6] The interest is high for improving the U.S. defense industrial base to make it more competitive in the global arena. However, government spending for research on new weapons is declining; about 4 percent of the federal budget and less than 1 percent of the gross national product.[7]

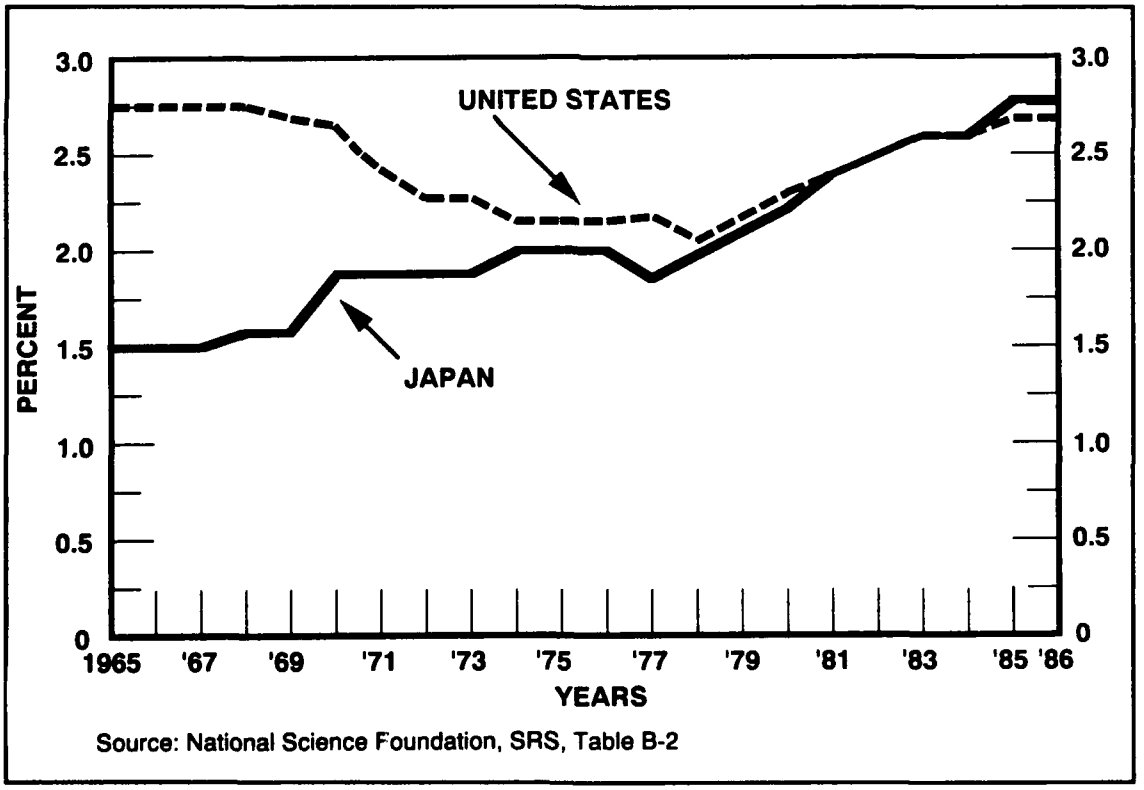



*Figure 8-1.* **Total R&D/GNP Ratios**

We previously alluded to a coherent industrial strategy which addresses international cooperation. To execute that strategic plan would require increased capital investment. The interviews identified two immediate alternatives. The first was to encourage increased personal savings. The savings rate in the United States is about one-third that of Japan and about one-half that of Germany. Personal savings are a source of money for capital investment through loans from lending institutions to companies. The second alternative is equity investment by the companies. To incentivize industry to make those capital investments, the government must seriously consider changes in capital gains taxes and the cost of capital which would better align with the foreign competition. When the cost of capital rates exceed the expected rate of return, which is common today, firms lose competitiveness.

Industry must also change its corporate thinking to compete in the global environment. The quarterly profit and loss business approach to "make a fast buck" stifles research and development and major capital investment needed for long-term survival.

Another form of investment in technology is foreign direct investment. Benefits can be many: economic growth (including transfer of technology, management techniques and manufacturing methods), lower domestic interest rates, consumer benefits, and access to foreign markets. Opening up defense contracts for non-U.S. owned firms raises fears that secrets will be leaked, and that the few

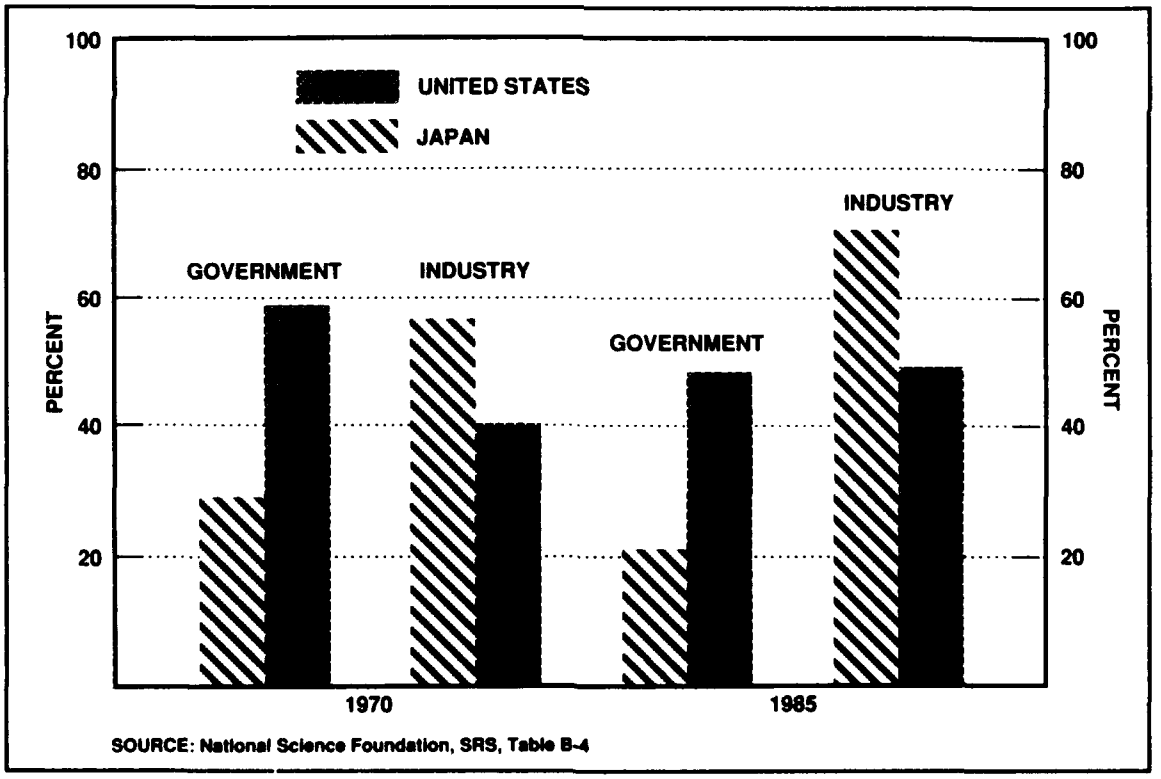



*Figure 8-2.* **National R&D Funding by Source**

new jobs created will be controlled by the parent company. Yet there are good reasons for foreign investment in U.S. defense firms. A well-educated work force and political stability add to the charisma of some of the world's most dynamic manufacturing and service corporations.[8] A U.S. presence is mandatory for becoming a world-class player. In today's environment, a major high-tech firm needs to spread the staggering research, development and production costs among major markets of the United States, Asia/Pacific and Europe.[9] The transnational links will spread as markets become more integrated and defense contractors press for collaboration to protect earnings.

In the United States, a fear of an eroding industrial base pressures contractors, politicians and the military. Fewer "high-ticket" contracts for industry means lower margins, but that may be better than no margins at all. The alternatives for non-winners are the system improvement contracts or teaming on a European or Asian project. Therefore, looking for teaming arrangements within industry has been logical. The government-industry relationship plays a key role. The antitrust syndrome needs a change in order to permit U.S. industries to work together, develop a national synergy and compete internationally. European and Japanese companies form "critical masses" to pool resources.

Europe's need for risk sharing has yielded joint ventures, consortia and other agreements. To reduce the dependence on domestic defense budgets, some companies have sought to invest substantially in the U.S. defense industry. The fear of all participants is trading away vital parts of their technology base to foreign partners. Europe faces a greater political challenge with European Community 1992, when the question of armaments technology sharing among European nations may be too great to resolve.

Regarding Japan, the United States finds itself pulling two ways—on the one hand encouraging Japan to assume a greater share of the security burden and, on the other, worrying about a more competitive Japanese defense sector. The final resolution will probably come to the fact that U.S. companies need partners with deep pockets. The U.S. industry needs to expand collaborative ties with Japan or forfeit global market share. America's General Electric and Pratt & Whitney, along with Britain's Rolls-Royce PLC and France's Snecma are interested in MITI's hypersonic jet engine. Western industry will exchange state-of-the-art engine technology for Japanese funding and insight into advanced materials and processes.

The infrastructure of the U.S. defense industrial complex will play a vital role in future international cooperation. The United States must commit to a form of higher education that will ensure the scientific and engineering personnel to keep the country's competitive edge in technology development. Second, there need be resources for coordinated research and development in government and industrial sectors. Where necessary, that means preserving the critical defense sectors and technologies that promote technological superiority as key to national security. However, when applicable, the incentives for risk-taking should emphasize investments in dual-use technologies. The defense industry, government and private, should also look to U.S. allies for opportunities to cooperate on technology advancement.

# ENDNOTES


1. Robert S. Dudney, "The Electronics Industry Is Sinking," *Air Force Magazine*, December 1990, p. 12.

2. Lee and Schwendiman, p. 259.

3. Dudney, p. 14.

4. *Ibid.*, p. 14.

5. Reilly, p. 1.

6. "Top Defense Official Outlines Strategy for Preserving National R&D Base," *Aviation Week & Space Technology*, 13 August 1990, p. 20.

7. "Defense Spending Isn't Stunting U.S. Economy," p. 22.

8. Don Hicks, "Foreign Ownership of Defense Firms Boosts U.S. Security," *Armed Forces Journal International*, October 1990, p.

9. *Ibid.*, p. 60.

Socrates was a philosopher. He went around pointing out errors in the way things were done. They fed him hemlock.

— Augustine's Laws

# CHAPTER 9
# CONCLUSIONS AND RECOMMENDATIONS

## INTRODUCTION

The new world situation is driving a restructuring of defense forces and budgets of the United States and its allies. Declining defense budgets are forcing a rationalization of the Free World defense industry. However noble the goal, no single nation, including the United States, will be able to afford total self sufficiency regarding its defense industry.

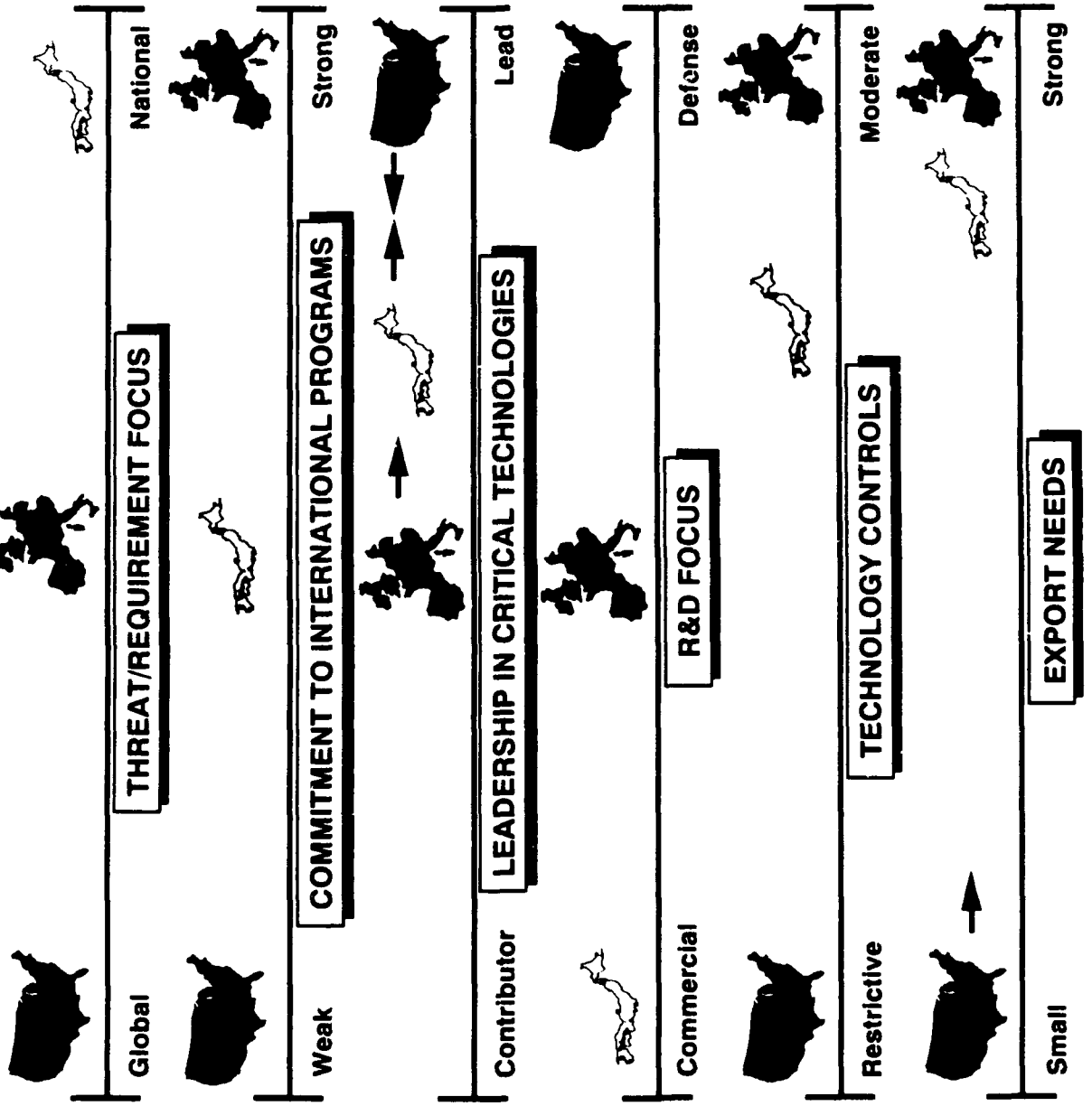
International programs provide a framework for operating in the new world of smaller defense forces and reduced defense budgets. However, international programs are a complex, often frustrating, and should not be viewed as the latest fad in weapon system procurement. All programs are not suited to international collaboration. The ability to execute an international program is a function of how well the potential partners blend their unique perspectives, orientations and cultures into a coordinated effort. Major issues affecting the "blend" were discussed in the previous chapter and are summarized in Figure 9-1, on the following page.

Issues are significant. The United States and its allies don't view the world the same way and don't operate identically. Agreeing on the threat, the requirement, the work share and the industrial benefits is difficult and time consuming; structuring a program to meet them is equally arduous. But, where it "fits," an international program can present significant advantages to all participants.

As discussed, those advantages include economies of scale in development and production, acquiring a new technology or weapon system for cents-on-the-dollar, intellectual synergy regarding technology development and business management, foreign market access, and greater interoperability among the United States and its allies. For most defense companies, collaboration may be critical to survival.

## CONCLUSIONS

(1) **Harmonization of requirements is the very foundation of a successful program. Like your credit card, "don't leave home without it."** Without a clear agreement on program requirements and goals, international collaboration is not possible; it is a non-starter. Governments must define the threat and, with industry participation, must determine technical requirements, establish work-share arrangements, and agree to a division of industrial benefits. Agreements must be fully documented in the international Memorandum of Understanding, and an international executive steering group should oversee interpretation and enforcement. Managing an inter-


Global
National
THREAT/REQUIREMENT FOCUS
Weak
Strong
COMMITMENT TO INTERNATIONAL PROGRAMS
Contributor
Lead
LEADERSHIP IN CRITICAL TECHNOLOGIES
Commercial
Defense
R&D FOCUS
Restrictive
Moderate
TECHNOLOGY CONTROLS
Small
Strong
EXPORT NEEDS

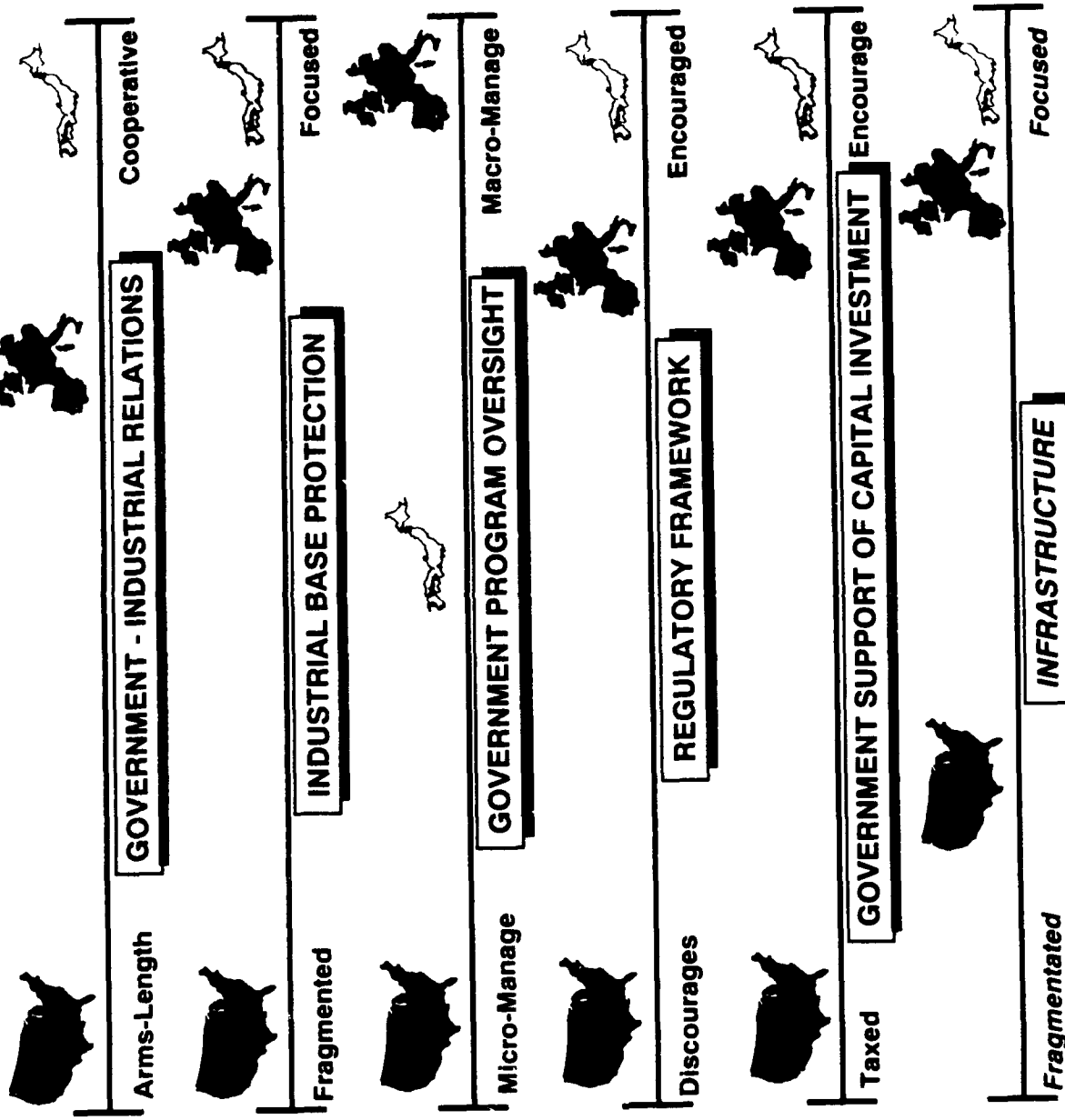



*Figure 9-1.* International Factors

national program is an extremely complex business, and keeping the program moving in the proper direction, focused on the established goals, requires extraordinary measures.

Joint-venture arrangements, versus prime-subcontractor relations, tend to foster a closer working relationship and harmony among partners; there is a greater feeling of equality and mutual dependency as opposed to big-brother:little-brother apprehensions. Limiting the number of equal partners to three or four reduces chances for disagreement and increases the probability of achieving consensus on difficult issues. Wherever possible, industries should pick their partners; "forced marriages" are the least desirable means of forming joint-venture companies.

Close relationships among partners are critical to achieving and maintaining harmony. European and Asian industries enjoy closer ties with their governments than does U.S. industry. The U.S. arms-length approach in dealing with industry often places U.S. industries at a disadvantage with their overseas partners. Better rapport, framed within clearly defined roles and responsibilities, is clearly desired by U.S. industry; they do not perceive themselves as crooks guilty of willful fraud, waste and abuse. Clearly they are in business to make money, which is important to industry's survival and the economic strength of the United States; but, industry views itself as a patriotic member of the defense team. Through greater cooperation with industry, the U.S. Government stands to gain much from the broader industrial experience in establishing multinational programs in the commercial sector.

(2) **Commitment to the success of the program, designed to meet those harmonized requirements, is absolutely essential.** The United States must carefully choose the programs and its partners for international collaboration, and stick to those programs for the long haul. That kind of firm commitment entails a unity among the U.S. participants, including the Department of Defense, the Services, and the Congress. It means providing an environment that encourages, not hinders, multinational work; for example, stable program funding, and appropriate visa laws and export license controls. Lacking significant improvement in those areas, the United States is considered a high risk to the success of an international program.

Competing programs, viewed as another threat to U.S. commitment to international program, come in two forms—"black" programs and other Service programs. Our allies believe "black" programs should be devoted to developing the long-range, leading-edge technology solutions to a requirement; a technology that undoubtedly would be very close-hold, and highly classified by the developing nation. "Black" programs are unlikely candidates for international cooperation and should not be used as a rationale for canceling participation in an international program. Other Service programs, however, are seen in the same league as, and competitive with, multinational programs; i.e., designed to meet a requirement in the short- or mid-term. In this regard, our allies believe true U.S. commitment to an international program would entail harmonizing Service needs to establish a U.S. Department of Defense requirement that would be brought to the multinational arena. This would eliminate duplicative programs, save

defense dollars, and facilitate a commitment to the international collaboration.

(3) **It is imperative that the United States rethink its policies regarding transfer of defense-related technologies among allies, and develop more explicit defense export control and technology policies.** The conditions of 1949, upon which U.S. technology controls are based, are no longer valid: the United States is no longer the world leader in all technologies; exports are important to the economic strength of the United States; and, dual-use technologies comprise a major part of today's research and development. The U.S. restrictions on technology transfer have endangered the economic strength of U.S. industry. The United States must find a way to restrict the flow of militarily useful technology from terrorist nations without disarming U.S. high technology. The national security of the United States is a function of military and economic strength. Policies, organization and resources should be evaluated to establish an environment that fosters strong support for defense trade and international cooperation.

(4) **There is no single best industry organizational structure for an international program. "It all depends."** There are numerous possible organizational structures for a multinational program, ranging from prime-subcontractor arrangements to joint-venture holding companies. It should be left to the participating industries to organize themselves as they deem best. However, it was obvious during our research that the preferred method was some form of a joint-venture company, wherein the major national industries were equal partners. Such a structure tends to supplant big-brother/little-brother anxieties and suspicions with an atmosphere of trust, mutual dependency and, above all, teamwork. It is essential that key management and staff personnel be collocated to facilitate the sharing and teamwork essential to a successful cooperative effort.

## RECOMMENDATIONS

(1) **The USD(A) designate a central organization to identify cooperative alternatives, to include Conventional Armaments Planning System (CAPS) linkage.** The objective of preparing a Cooperative Opportunities Document (COD) is to enhance armaments cooperation in research and development, production, and acquisition of defense systems. A COD is to be prepared and submitted with the Integrated Program Summary (IPS) for the Milestone I review. While there are many sources of information on international cooperative opportunities, there is no focal point for obtaining the "market survey" data. The DOD needs to establish that focal point, wherein resides the knowledge of what acquisition programs are being considered and proposed by our allies and other friendly nations. We recommend that the focal point be the DUSD(IP).

The DUSD(IP) should be the U.S. interface to the NATO Conventional Arms Planning System (CAPS). We would also recommend establishing a CAPS-like process for other allies and friendly nations such as Japan and Korea. The results of those forums would become the starting point for conducting the informed analysis required to prepare the COD.

These recommendations are essential to making COD preparation a value-added process; not just another block-checking

requirement. The DOD needs to have a single, responsible voice among its allies and other friendly nations. The Services need a single source of information regarding opportunities for international collaboration. And DOD needs to put teeth into the program.

(2) **USD(A) work with DPACT and industrial trade associations to help define government and industry roles in removing barriers to international acquisition.** The primary role of the U.S. Government should be to identify and coordinate the requirement, and provide the stable operating environment for international programs. Industry should assemble the international joint-venture organization and provide assessments on the technical, schedule and cost risks. Within the framework of the government-to-government Memorandum of Understanding, the industry partners should finalize and manage work-share arrangements, industrial benefits distributions, and management of daily operations. Government doesn't have the resources to micromanage programs, and industry can't manage the programs if they are responding to the queries resulting from government's micromanagement. A new era of trust is required.

The Defense Policy Advisory Committee on Trade (DPACT) is an existent body, comprising senior representatives from industry, whose function is to advise the SECDEF. The DPACT should also seek input from international and domestic trade associations (e.g., NATO Industry Advisory Group, American Defense Preparedness Association). Together, and with the Congress, they should clarify the proper roles and responsibilities of government, both the legislative and executive bodies, and industry. They would also seek the means to tailor procurement practices for the international environment. The goal must be to make defense acquisition more efficient and more compatible with the processes of our allies.

(3) **Examine the effects of international programs on the subcontractor levels of U.S. industry. This area could also be a study topic for a future group of DSMC Research Fellows.** According to Jacques S. Gansler, about 55 percent of the weapon system business is subcontracted. Given the relative sizes of European and PACRIM industries, the sub-tier level is precisely where their industries can best enter the U.S. defense market. The administrative and regulatory burdens associated with defense contracts have shrunk the pool of small U.S. industries which perform subcontractor work for the large prime defense contractors. The new competition from overseas, at the lower tiers of the defense industry, is apt to cause a further erosion. The decision to enter an international collaboration, therefore, must be a conscious one which considers the military, industrial and economic aspects driving the government-to-industry relationships.

(4) **Negotiate comprehensive yet livable international Memorandum of Understanding (MOU).** The tough issues, like technology control procedures, third-country sales, and industrial benefits, don't get easier with time. Postponing serious discussions and resolution of those issues up front (i.e., by inserting vague language to just, cover the bases), only creates needless friction later in the program. In fact, it could cause the break-up of the program and waste of millions of dollars among the partnering nations. Like the Europeans, the U.S. needs to build a cadre of skilled negotiators,

capable of dealing with the technical and the very sensitive political issues in a timely manner.

(5) **Commit to international program success.** When the United States and its allies enter into an agreement to collaborate, the goal(s) must be clearly defined; be it pure research, full-scale system development, co-production, or a combination thereof. Once agreed to in the Memorandum of Understanding, the United States—DOD, Services and the Congress—must commit its will and resources to program success. Competing programs and midstream down-selects must be eliminated. Multiyear or fenced funding must be provided for the defined program.

(6) **The Departments of State, Defense and Commerce should charter a Technology Control Working Group to update the U.S. policy and procedures for controlling technology. This area could also be a study topic for a future group of DSMC Research Fellows.** The current policies must be modernized to reflect the global economic conditions of the 1990s. This will require close coordination among the Departments of Defense, State and Commerce, in addition to other U.S. agencies currently involved in controlling the flow of defense technology. Given the large percentage of technology, which is dual-use technology, industry also must participate.

Specific government actions include:

(a) More explicit defense export control and technology policies.

(b) Narrowing technology transfer issues to restrict the flow of militarily useful technology from terrorist nations without disarming U.S. high technology; perhaps a stronger Coordinating Committee for Multilateral Export Controls (CoCom), with more consistent rules, could be the means to internationally administer this.

(c) Putting a single agency in charge of strategic trade issues.

(d) Expanding the Defense Technology Security Agency's (DTSA) "workload reduction" initiatives to reduce substantially the administrative burden of processing requests for export licenses.

(e) Reinforce the "flowback" provisions in Memorandums of Understanding to learn the improvements made to U.S. systems and technology by allies. Emphasizing this affords the opportunity to improve existing capability or spin-off new applications at greatly reduced costs in time and money.

Specific industry actions include:

(a) Centralized review and control of the corporate export functions to ensure applications are complete and accurate, particularly regarding capabilities and purposes. This is not a marketing function.

(b) "Grease the skids" with the appropriate DOD agency or Service which will review the request for an export license; don't staff the request with the wrong office. Educate/arm the decision-makers with necessary information regarding the technology involved, the technology end-use, and the availability of the technical knowledge and production capability overseas.

(7) **DSMC should conduct an educational needs assessment regarding internation-**

**al armaments cooperation.** All acquisition corps members must be educated in the fundamentals of international armaments cooperation. Also, special training and experiential assignments, possibly leading to professional certification, should be provided for international acquisition specialists prior to becoming MOU negotiators; the United States must overcome its "rookie" image.

**Closing Remarks**

Several high-level executives we interviewed emphasized the need for, not gamblers, but risk-takers. Many problems and issues discussed are not new, and have been "studied" and "identified" and "rediscovered" before. What has been lacking are Action-People; people willing to take risks, to challenge the accepted way of doing business, to make the tough decisions and try to improve or fix the system. We close with one final quote, found within *Augustine's Laws:*

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*It is not the critic who counts, not the man who points out how the strong man stumbled, or where the doer of deed could have done better. The credit belongs to the man who is actually in the arena; whose face is marred by dust and sweat and blood; who errs and comes short again and again; who knows the great enthusiasms, the great devotions, and spends himself in a worthy cause; who, at best, knows in the end the triumph of high achievement; and who, at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who know neither victory nor defeat.*

*— President Theodore Roosevelt*

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We need stability in programs, stability in budgeting, and a Congress that doesn't micromanage, but acts as a board of directors.

Norman R. Augustine
April 18, 1991
Executive Leadership Seminar

# CHAPTER 10
# EXECUTIVE SUMMARY

## WORLD SITUATION

The new world situation is driving a restructuring of defense forces and budgets of the United States and its allies. Declining defense budgets are forcing a rationalization of the Free World defense industry. However noble the goal, no single nation including the United States will be able to afford total self-sufficiency regarding its defense industry.

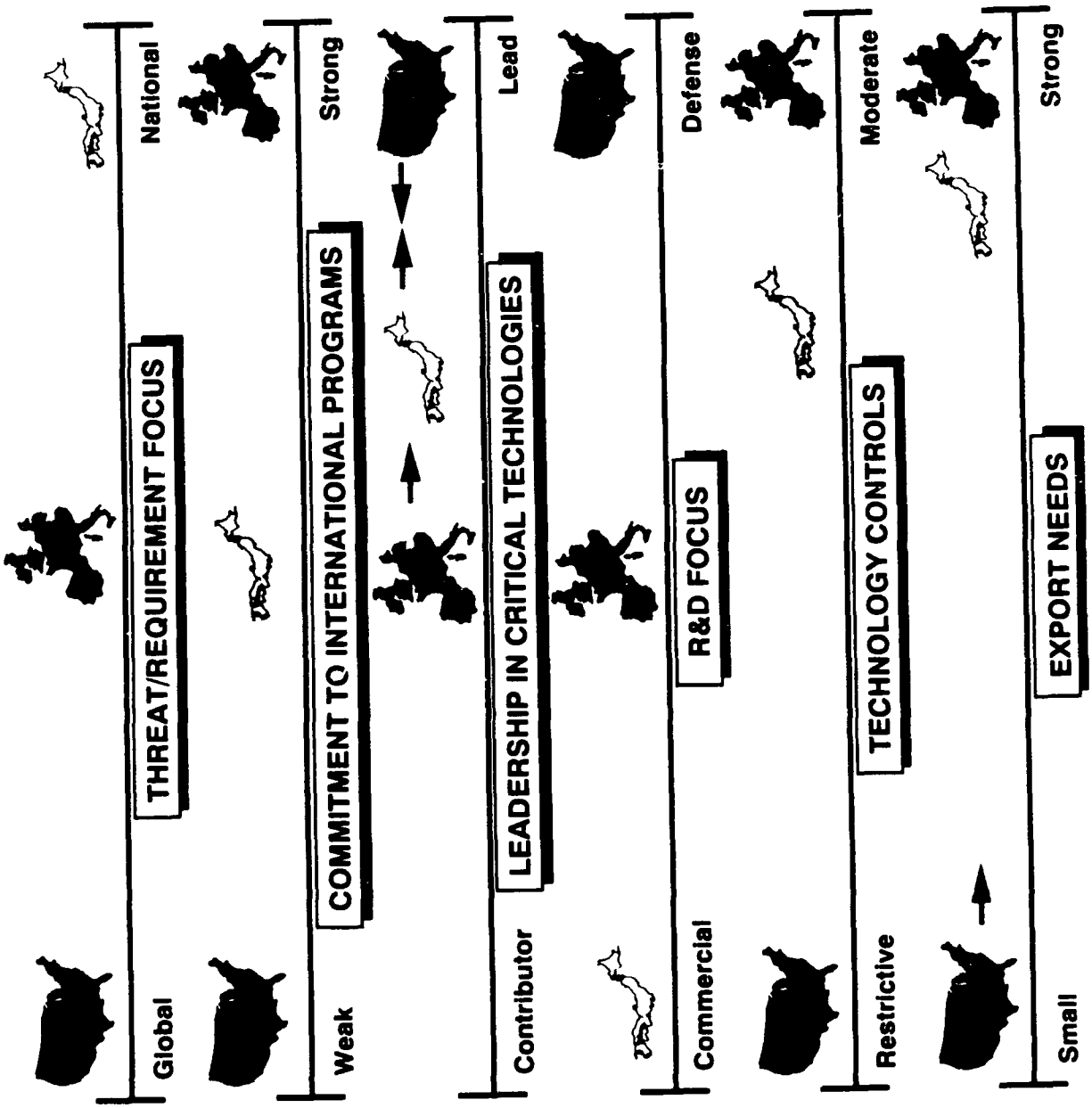
International programs provide a framework for operating in the new world of smaller defense forces and reduced defense budgets. However, managing international programs is a complex, often frustrating process, and should not be viewed as the latest fad in weapon system procurement. All programs are not suited to international collaboration.

The United States and its allies, governments and industries, don't view the world in the same way and don't operate identically. Agreeing on the threat, the requirement, the work-share and the industrial benefits is a difficult and time-consuming process. The major issues, and the different perspectives/philosophies, are portrayed in Figure 10-1, on the following page.

The ability to execute an international program is a function of how well the potential partners blend their unique perspectives, orientations and cultures into a coordinated effort. The up-front work of addressing the issues and formalizing the agreement in an international Memorandum of Understanding is an arduous task which can take 18-24 months, certainly not an easy undertaking.

Where it "fits," an international program can present significant advantages to all participants. Advantages include: economies of scale in development and production; acquiring a new technology or weapon system for cents-on-the-dollar; intellectual synergy regarding technology development and business management; foreign market access; and, greater interoperability among the United States and its allies. For many defense companies, cooperation may be critical to survival.

The Europeans and Japanese are further along than the United States in restructuring their industries to operate within the environment of a global marketplace. Unlike the United States, the European and Japanese home markets, either military or commercial, have never been large enough to support their domestic industries; they have been forced to export products. In 1957, the Treaty of Rome began the Europe 1992 process of removing barriers to the freer movement of goods, services, capital, and people among participating nations. Cooperative programs among European nations, and the exporting of the resultant goods and services to third


Global
National
THREAT/REQUIREMENT FOCUS
Weak
Strong
COMMITMENT TO INTERNATIONAL PROGRAMS
Contributor
Lead
LEADERSHIP IN CRITICAL TECHNOLOGIES
Commercial
Defense
R&D FOCUS
Restrictive
Moderate
TECHNOLOGY CONTROLS
Small
Strong
EXPORT NEEDS

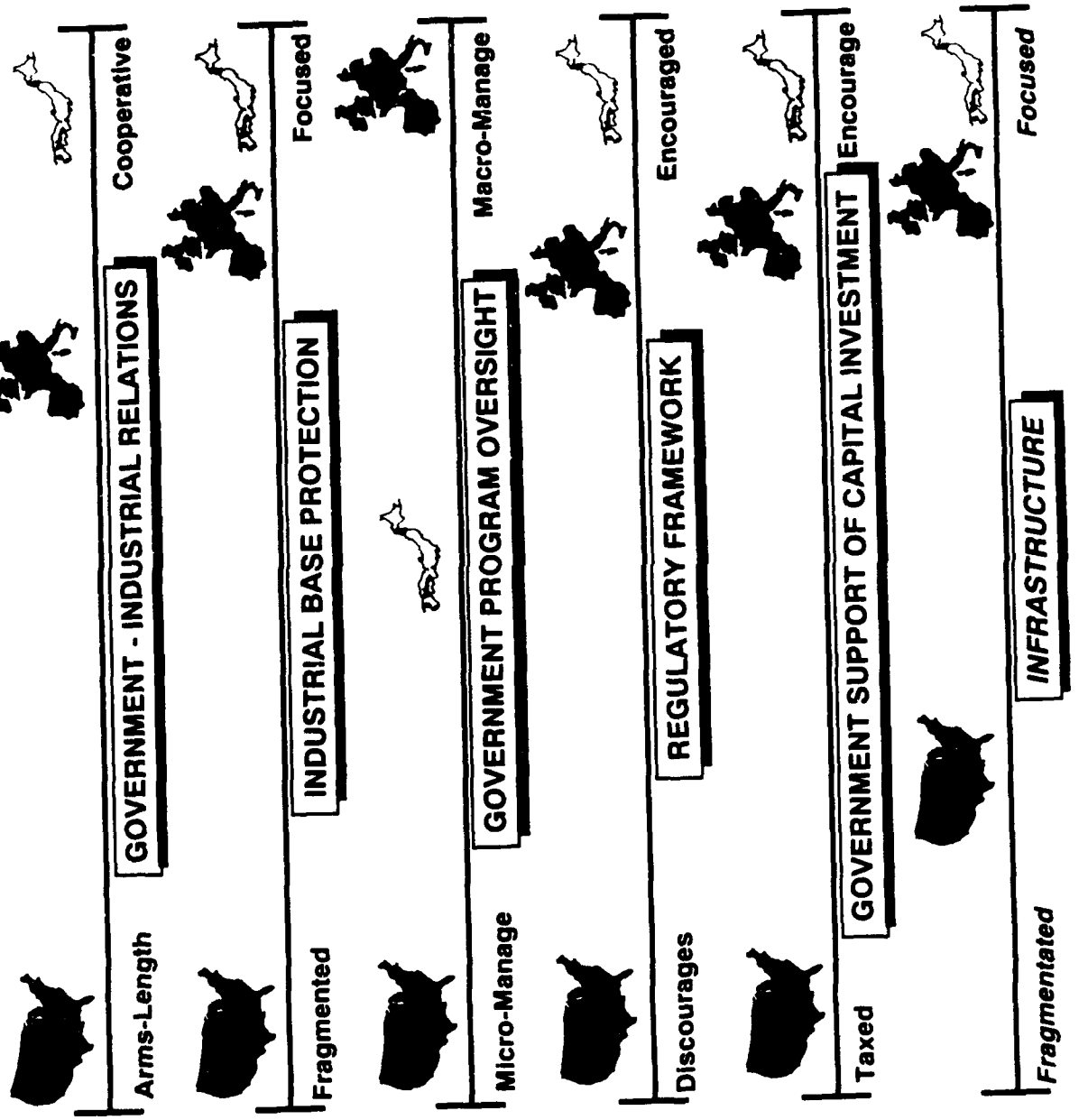



*Figure 10-1.* International Factors

countries, have gradually become a way of life for European industry.

The predominant, historical U.S. attitude toward international cooperation has been "We don't think anyone has anything to teach us" and "The U.S. builds and our allies buy." This U.S. attitude is slowly changing, primarily within industry, and U.S. policy must be adjusted to recognize the shift to, and encourage participation in, a global economy.

STUDY METHODOLOGY

present when nations decide to enter into an international collaboration, and what factors must be managed with particular attention during execution of an international program.

Over 105 interviews with senior executives from government and industry, U.S. and foreign, were primary sources of information. A primary emphasis was placed on acquiring industry views to balance the government perspectives gained from the previous Defense Systems Management College (DSMC) study and that done by Lieutenant Colonel C. Michael Farr, USAF, Air Force Institute of Technology (AFIT). Interview data was supplemented with information gathered from recent publications.

KEY FINDINGS

**I— Harmonization of requirements is the very foundation of a successful program. Like your credit card, "Don't leave home without it."**

Without a clear agreement on the requirements and goals of the program, international collaboration is not possible; it is a non-starter. Critical issues that must be harmonized include the threat, technical approach to meeting the threat, distribution of work, and distribution of industrial benefits. The key to maintaining harmony is planning for it and taking the time, up front, to establish a firm foundation — consisting of the memorandum of understanding, management structure, definition of roles and responsibilities, and channels for effective communication.

**II—Commitment to the success of the program, designed to meet those harmonized requirements, is absolutely essential.**

The United States must carefully choose the programs and its partners for international collaboration, and then stick to those programs for the long haul. The United States must make significant improvements regarding stable program funding, visa regulations, and export license controls if it is to be considered a low-risk partner in an international program.

**III—It is imperative that the United States rethink its policies regarding transfer of defense-related technologies among allies, and develop more explicit defense export control and technology policies.**

The conditions of 1949, upon which current U.S. technology controls are based, are no longer valid. The United States is no longer the world leader in all technologies, exports are important to the economic strength of the United States, and dual-use technologies comprise a greater part of today's research and development. The national security of the United States is a function of military and economic strength. A more coherent, global approach is required. It is essential that technology policies be in synch with national objectives, and that the United States clearly identify which technologies must be protected. The United States must find a way to restrict the flow of militarily useful technology from terrorist nations without disarming U.S. high technology.

**IV—There is no single best industry organizational structure for an international program. "It all depends."**

Participating industries should pick their partners and organize themselves as they deem best. Forced marriages generally don't work; they tend to cost more and require more up-front work to negotiate an acceptable work agreement. It was obvious during our research that the preferred organizational structure was some form of a joint-venture company, wherein the major national industries were equal partners.

KEY RECOMMENDATIONS

**I—The USD(A) designate a central organization to identify cooperative alternatives, to include Conventional Armaments Planning System (CAPS) linkage.**

The objective of preparing a Cooperative Opportunities Document (COD) is to enhance armaments cooperation in research and development, production, and acquisition of defense systems. A COD is to be prepared and submitted with the Integrated Program Summary (IPS) for the Milestone I review. While there are many sources of information on international cooperative opportunities, there is no focal point for obtaining the "market survey" data. The DOD needs to establish that focal point, wherein resides the knowledge of what acquisition programs are being considered and proposed by our allies and other friendly nations. We recommend that focal point be the DUSD(IP).

The DUSD(IP) should be the United States interface to the NATO Conventional Arms Planning System (CAPS). We would also recommend establishing a CAPS-like process for other allies and friendly nations such as Japan and Korea. The results of those forums would become the starting point for conducting the informed analysis required to prepare the COD.

These recommendations are essential to making COD preparation a value-added process; not just another block-checking requirement. The DOD needs to have a single, responsible voice among its allies and other friendly nations. The Services need a single source of information regarding opportunities for international collaboration. And DOD needs to put teeth into the program.

**II—USD(A) work with DPACT and industrial trade associations to help define government and industry roles in removing barriers to international acquisition.**

The primary role of the United States Government should be to identify and coordinate the requirement, and provide the stable operating environment for international programs. Industry should assemble the international joint venture organization and provide assessments on the technical, schedule and cost risks. Within the framework of the government-to-government Memorandum of Understanding, the industry partners should finalize and manage work-share arrangements, industrial benefits distributions, and management of daily operations. Government doesn't have the resources to micromanage programs, and industry can't manage the programs if they are responding to the queries resulting from government's micromanagement. A new era of trust is required.

The Defense Policy Advisory Committee on Trade (DPACT) is an existent body, comprising senior representatives from industry, whose function is to advise the SECDEF. With the Congress, the USD(A) and DPACT (i.e., with input from international and domestic trade associations) should seek to

realign the proper roles and responsibilities of government, both the legislative and executive bodies, and industry. The goal should be to make defense acquisition more efficient and more compatible with the processes of our allies.

**III—Examine the effects of international programs on the subcontractor levels of U.S. industry.**

Given the relative sizes of European and PACRIM industries, the sub-tier level is precisely where their industries can best enter the U.S. defense market. The administrative and regulatory burdens associated with defense contracts have already shrunk the pool of small U.S. industries which perform subcontractor work for the large prime defense contractors. The new competition from overseas at lower tiers of the defense industry is apt to cause further erosion. The decision to enter an international collaboration, therefore, must be a conscious one which considers the military, industrial and economic aspects driving the government-to-industry relationships.

**IV—Negotiate comprehensive yet livable international Memorandums of Understanding (MOU).**

Like the Europeans, the United States needs to build a cadre of skilled negotiators, capable of dealing with the technical and the sensitive political issues in a timely manner.

**V—Commit to international program success.** Once agreed to in the Memorandum of Understanding, the United States — DOD, Services and the Congress — must commit its will and resources to program success. Competing programs and midstream down-selects must be eliminated. Multiyear or fenced-funding must be provided for the defined program.

**VI—The Departments of State, Defense and Commerce should charter a Technology Control Working Group to update the U.S. policy and procedures for controlling technology.**

The current policies must be modernized to reflect the global economic conditions of the 1990s. This will require close coordination among the Departments of Defense, State and Commerce, in addition to other U.S. agencies currently involved in controlling the flow of defense technology. Given the large percentage of technology which is dual-use, industry also must participate.

**VII—The Defense Systems Management College should conduct an educational needs assessment regarding international armaments cooperation.**

All acquisition corps members must be educated in the fundamentals of international armaments cooperation. Also, special training and experiential assignments, possibly leading to professional certification, should be provided for international acquisition specialists prior to becoming MOU negotiators; the United States must overcome its "rookie" image.

**"A phenomenon noticeable throughout history regardless of place or period is the pursuit by governments of policies contrary to their own interests. Mankind, it seems, makes a poorer performance of government than of almost any other human activity."**

***— Barbara W. Tuchman, March of Folly***

# APPENDIX A
# Conclusions and Recommendations

## INTRODUCTION

When the clenched fist of the Soviet Union began losing its grip on the Warsaw Pact, a new political and economic world order began to emerge. Eastern European nations started tossing aside communism and professing a newfound taste for capitalism. The two Germanys began discovering a 40-year dormant desire for unification. Even the Soviet Union is getting into the act. Unheard of agreements to cut back on Soviet arms are occurring while the Kremlin struggles to convert its failing, centrally controlled economy into one based on market forces.

As these surprising changes dominate headlines, the European Community's Europe 1992 program is quietly pulling together Western European states into the world's largest trading bloc, and other Western nations are scrambling to establish new trading relationships, ranging from the free trade agreement between the United States and Canada to more open and accessible Japanese markets. It is an exciting time—a time of hope and promise. But it is also a time for adjustment.

Adjustments required by the Department of Defense because of these changing world orders will be tremendous. New relationships and arms control agreements are forcing budget cuts, base closures and reductions in force levels. Along with smaller forces will come new requirements for weapon systems as Services begin to concentrate on surveillance capabilities and highly mobile, quick-strike forces.

While DOD is preoccupied with which fighter wings to shut down and which ships to decommission, global economic forces are creeping in on a second front and changing the way DOD will do its business in the future. Used to dealing with a self-sufficient domestic defense industry, DOD is finding itself increasingly faced with multinational suppliers as a result of increased competitiveness of other nations' industries and rapidly globalizing economies. Probably the most far-reaching and influential of these economic changes from DOD's viewpoint are those of its closest ally and largest trading partner: NATO Europe.

**Source:** *Europe 1992: Catalyst for Change in Defense Acquisition,* Report of the DSMC 1989-90 Military Research Fellows

Although Europe's drive toward a fully united and integrated economy is not yet complete, widely supported movements centered around the European Community's Europe 1992 program point toward a restructured European defense industry, improved European infrastructures, more competitive technologies, and open defense markets within Western Europe. These changes can be expected to result in a loss of U.S. defense industry competitiveness, lowered U.S. defense sales to Europe, a reduction in transatlantic cooperative programs, and an increase in unit costs of U.S. defense items. No longer can DOD afford to concentrate only on political changes and internal restructuring caused by Defense Management Reviews and administration changes. Implementation of a broader based strategic approach to economic changes and armaments collaboration would represent enlightened self-interest. To do otherwise, or not act at all, could be the path of folly.

CONCLUSIONS

(1) **Europe 1992 can be expected to successfully achieve its goal of economic integration.** Accelerated legislative performance has created confidence and anticipation within the European Community's business community. Business strategies for new, open markets are being implemented. The CEOs of Europe are betting on Europe 1992 and have initiated a massive and unprecedented industry-wide consolidation throughout Europe, expending tremendous resources in the process. These investments will eventually act as a compelling forcing function for progress on some of the more difficult social issues surrounding full economic integration.

(2) **Europe 1992 will improve efficiencies of the European defense industry.** The removal of barriers to trade and harmonization of industrial standards among EC member states will increase competition and increase efficiencies across all economic sectors. Removal of people barriers will eventually create a European workforce as mobile as the workforce in the United States. Movement of goods and equipment between European defense firms will be facilitated. The deregulation of Europe's most heavily protected industries like banking, transportation, telecommunications, utilities, etc., will improve infrastructures and help build a business environment required for world class competitiveness.

(3) **Europe's defense industry is becoming heavily concentrated.** Increased corporate efficiencies and declining defense budgets are providing the motivation, and a liberalized European antitrust framework the means, for defense industry consolidation both nationally and internationally through mergers and acquisitions. Fewer but larger defense firms will result. Furthermore, these large defense firms are connecting themselves through a series of complex national and international strategic alliances, resulting in specialized industry groups and international consortia aimed at focusing combined resources to effectively penetrate world defense markets.

(4) **An improved European defense technology base should result** from coordinated European research programs. The European Community's EURAM, BRITE, and ESPRIT research programs, along with the 19-nation EUREKA program, are concentrating on dual use, high technology fields such as communications, aerospace, manufacturing, data processing, etc. The results of these programs should translate into direct benefits to technology bases of growing European defense firms. Moreover, the EUCLID re-

search program established by the IEPG to reduce research duplication and enhance technology transfer among participants should improve defense-specific technology.

(5) **More open and competitive defense markets within Europe should result** from the efforts of the IEPG. The trend toward one, or at most, two large defense firms within France, Germany, Italy, and the United Kingdom will result in near monopoly situations for these nations and cause them to support more open defense markets within Europe. Increased competition within these more open markets will further improve efficiencies of European defense firms.

(6) **There is a developing preference within Europe for pan-European programs vice transatlantic programs.** Factors contributing to this trend are: a desire to reap the benefits of the investments required to restructure the European defense industry; political pressures to protect industries and jobs during an era of declining defense budgets; an improving technology base within Europe making it no longer necessary to turn to the United States for the latest in weaponry; efforts of the IEPG to create pan-European cooperative programs; and disincentives generated by U.S. policies and practices associated with cooperative programs.

(7) **Stronger, more competitive European defense firms can be expected.** The combination of the above improved technologies, enhanced economic infrastructures from the Europe 1992 program; increased benefits of economies-of-scale from pan-European programs; larger, more integrated defense firms able to take advantages of pooled corporate resources and international alliances; and increased competition from more open defense markets within Europe will result in stronger, more formidable competitors for the U.S. defense industry.

(8) **U.S. defense firms are reacting by forming short-term project specific alliances** with European defense firms. These are company-to-company alliances on programs that would not generally be considered as important national programs: equipment upgrades, bids, etc. These type of collaborations have accelerated from as few as 6 in 1986 to more than 36 in 1989. The U.S. defense firms agree that future participation or access to the European defense market will be facilitated with an established European partner. The lack of long-term alliances (direct investment, joint ventures, etc.) being formed today with Europe's defense firms portends a reduced long-term involvement in Europe's defense markets by U.S. defense firms.

(9) **Defense exports, as a percentage of total U.S. defense industry sales, can be expected to decline** as a result of more competitive European defense firms and growing European self-reliance for armaments. An accompanying increase in unit costs for U.S. defense equipment can be expected along with this decline in defense exports.

(10) **DOD policy and management structure for international defense trade and cooperation is ineffective.** No single directive governing international defense cooperation exists and the two directives currently in effect date back to 1967 and 1980, neither of which address important developments in cooperative programs that have occurred in the last 10 years (Nunn program, NATO CAPS etc.). Official DOD policy stating goals and objec-

tives is non-existent (DOD personnel involved in defense cooperation programs are currently using a 1985 letter by former Secretary of Defense Weinberger as guidance). Management responsibility is fragmented, complex and confusing to those within DOD as well as industry and our allies. A number of government sponsored management reviews, including *three separate studies* by the Defense Science Board and most recently by the Defense Policy Advisory Committee on Trade (DPACT) have recognized these organizational impediments and have recommended carefully considered and tightly reasoned recommendations. At the time of this writing, these recommendations calling for the DOD to update, restructure and consolidate its management approach to cooperative programs in response to global economic trends, have not been acted upon.

RECOMMENDATIONS

The DOD can lessen the impact of these changes by supplementing its current armaments cooperation structure with appropriate high-level advocacy and oversight. In addition, the DOD should review its current organization and policies for international armaments cooperation and trade to meet future relationships with a strengthened European acquisition community. Furthermore, DOD can send a strong and timely signal to Europe that it is serious about maintaining transatlantic relationships in armaments collaboration by implementing the following recommendations. These recommendations correspond closely to previous recommendations made by some of the most knowledgeable and respected advisors in the defense business: the Defense Science Board, the Defense Policy and Advisory Committee on Trade, and the Rand Corporation. Unfortunately, their recommendations have yet to be acted upon. Perhaps the challenging economic movements occurring in Europe will add a new sense of urgency, encouraging DOD to reexamine its basic approaches to armaments cooperation and trade.

(1) **Update DOD armaments cooperation goals** through a Secretary of Defense letter: To capitalize on economic benefits available through armaments cooperation during an era of declining defense budgets, and to deter a growing polarization between the U.S. and European acquisition communities, a Secretary of Defense letter replacing and updating the 1985 Secretary of Defense letter on armaments cooperation should be issued. The letter should include policies on non-NATO, Nunn initiative programs, and NATO CAPS. A realistic goal to replace the previous goal of 25 percent cooperative programs by the year 2000 should be established through the letter. Direction to establish a permanent Defense Cooperative Working Group and an *ad hoc* Defense Cooperative Action Group should also be included. It is imperative that goals be initiated from highest levels in DOD; otherwise, Europeans will not view any initiated changes as credible due to past experience, nor will lower levels of DOD change their cultural attitude or methods of handling cooperative programs.

(2) **Reestablish the Defense Cooperation Working Group (DCWG).** The Defense Cooperation Working Group (DCWG), chaired by the Deputy Secretary of Defense for approximately six months and thereafter by the Under Secretary of Defense for Acquisition, should be reestablished as the central DOD body for overseeing and planning armaments cooperation. In addition to providing an interface with allied defense acquisition communities, formation of such a group

would supply top-level advocacy and oversight for armaments cooperation now missing within DOD. For the DCWG to be effective, participation and commitment of individual Services, as well as state and commerce departments, will be required. The group should meet periodically and, among other activities, should:

- Track ongoing cooperative programs.

- Work with the Services to establish valid and important cooperative programs early in the acquisition process. To accomplish this for NATO cooperative programs, a combination of the NATO CAPS process and the DOD budgeting process should be used. For non-NATO programs, the budgeting process should be used.

- Monitor industrial base impacts of armaments cooperation. Areas where declining defense budgets could result in complete shutdown of a specific capability within allied nations should be closely monitored. Maintenance of two available embryonic capabilities within allied nations through cooperation should be preferred over a monopolistic capability in any allied nation.-

- Work toward resolving interdepartmental, interservice, and international problems on technology transfer, re-export sales, and export licensing.

- Work closely with the Congress to obtain support for armaments cooperation.

- Oversee actions of the below *ad hoc* DOD Cooperation Action Group. Upon completion of action group tasks (approximately six months) chairmanship of the DCWG should be transferred to the Under Secretary of Defense for Acquisition.

**(3) Establish optimal DOD organization and policies for defense cooperation and trade** through an *ad hoc* DOD Cooperative Action Group. The *ad hoc* action group should be tasked with updating DOD organization, management practices and policies associated with armaments cooperation. The action group should:

- Review DOD management structure and procedures with the aim of establishing a more centralized DOD organization for armaments cooperation (See Appendix F for a Defense Science Board recommendation on DOD organization for armaments cooperation).

- Review current DOD policies, directives, and management practices on armaments cooperation. Special attention should be given to any policies that tend to lessen competitiveness of the U.S. defense industry.

- Initiate and monitor updating of DOD directives concerning armaments cooperation.

- Develop an Armaments Cooperation Master Plan. To establish a roadmap for armaments cooperation into the 1990s and to help expedite current efforts along this line by the Deputy Under Secretary of Defense (International Programs), the DOD Cooperative Action Group should write an armaments cooperation master plan. Revised program management procedures for international cooperative programs should be included in the master plan. Industry inputs should be solicited during writing of the plan to receive benefits of industry's expertise and experience.

(4) **Increase DOD-wide education on international aspects of program management** through the Defense Systems Management College. In a 1989 DSMC survey of Program Management Offices, selected DOD personnel, and attendees of an international program management seminar, only 12 percent of 177 respondents felt that existing educational opportunities for international program management were adequate. When asked what areas of knowledge are most essential to performance of those involved in international programs, Program Management Office respondents with international experience rated the field of contracting highest.

While contracting is the most obvious area in need of additional educational focus, there are additional specialties where education could improve performance of functional managers involved in international programs. Because of differences between DOD and allies in approaches to program schedule and cost control, a course in international program control and monitoring would be especially helpful. Other obvious fields are licensing arrangements and technology transfer, two areas that often create problems and misunderstandings among cooperative program partners. To allow maximum exposure of these courses to the acquisition community, they should be offered in programmed text style as correspondence courses.

(5) **Work through the NATO Conference of National Armaments Directors (CNAD), to ensure changes in the European acquisition community are not detrimental to transatlantic armaments cooperation and trade.** The CNAD should be encouraged to work toward open defense markets NATO-wide and to increase efforts toward ensuring success of the NATO Conventional Armaments Planning System. The United States should propose a North American Defense Industrial Base (NADIB) type arrangement with NATO European nations to ensure free and open markets for defense goods within NATO. Simultaneously, the United States should propose a more formal relationship between NATO CAPS and the IEPG to allow inputting of IEPG progress and concerns into the NATO CAPS process.

Parallel to these DOD actions:

(6) The U.S. defense industry should develop appropriate strategies to establish and maintain strategic alliances with the European defense industry. Industrial alliances within Europe are developing quickly, and U.S. defense firms without established transatlantic alliances may find it difficult to be involved in future European defense business. These alliances must be formed quickly, for as one U.S. defense industry analyst has noted"...there are far more American grooms than European brides."

## APPENDIX B

# Model for Evaluating Changes in Unit Cost

The Defense Systems Management College has developed a limited scope model to give an approximate indication of the impact of a reduction in foreign sales to DOD overall unit acquisition costs. The model was developed by Dr. Rolf Clark.

Let: P = the ratio of the revised to the original procurement
($P_r/P_o$)
Q = the ratio of the revised to the original quantity
($Q_r/Q_o$).
C = the ratio of the new to the original unit cost.
k = the initializing constant.
e = the elasticity of unit cost with respect to quantity.

Now let the relationship between the variables of cost and quantity take the form (consistent with historical U.S. data):

$$C=kQ^{(e)}$$

Then it can be shown that the relationship between Q and P is:

$$Q=(P/k)^{(1/(1+e))}$$

Historical data on U.S. systems procurement show that unit cost is reasonably related to quantities through these relationships with k approximately equal to 1.0 and e=-.33. The latter implies that fixed costs are about one third of total system cost.

As an example; for FY 92, if the United States wants to purchase the same number units of equipment, but foreign sales are reduced by one-half, then:

1992 U.S. acquisition (Budgeted Procurement and RDT&E): $142.131B.

If assume foreign sales are 10% of total manufacture/procurement or $14.213B, resulting in a total of $156.344B for acquisition (see Figure B-1).

If the U.S. loses 50% of foreign sales in FY 92, the total spent on acquisition changes from $156.344B to $148.527B, then:

$$P=P_R/P_o = 148.5/156.3 = .953$$

Assuming elasticity of unit cost ratio quantity is = .33 (fixed overhead = 33%) and k=1 then:

$$Q=Q_r/Q_o = (P/k)^{(1/(1-.33))} = (.951)^{1.5} = .926$$

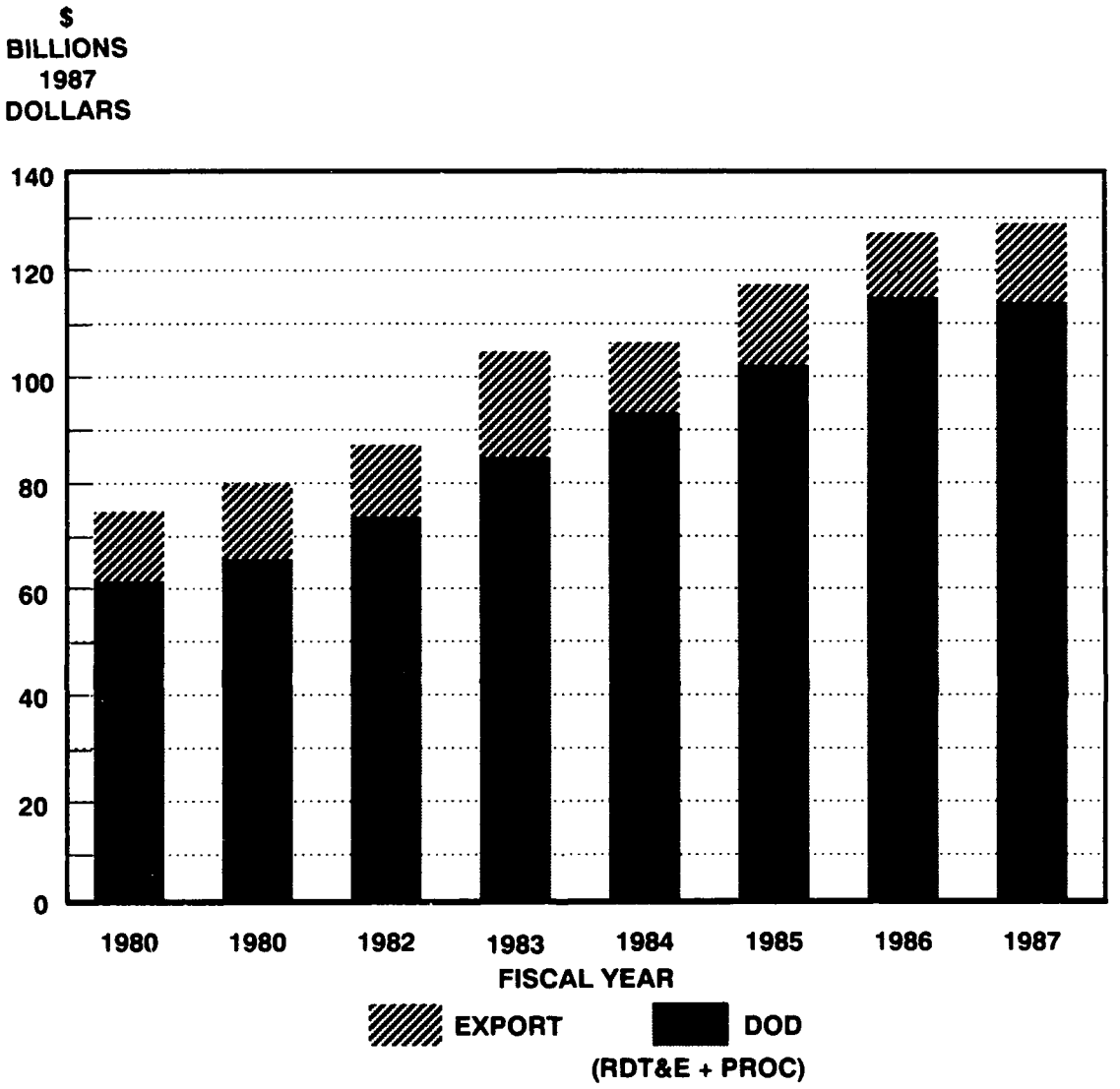
then: $C=kQ^{-.33} = 1(.93)^{-.33} = 1.026$

This implies that unit costs will rise by 2.6%, for a 50% reduction in foreign sales.

Therefore, in FY92, the cost of acquisition for the same total number of units, would rise 2.6% from $142.131B to $145.795B or $3.7 billion (assuming foreign sales are normally 10% above U.S. purchases and are cut by 50%)

Using these relationships, and assuming that changes due to reductions in foreign sales are evenly distributed, if one assumes fixed costs are 33% and foreign sales are about 10% of the total U.S. purchases, then the following can be derived:

| Reduction in Foreign Sales | U.S. Costs Increase By | Budget Increase for Same Number of Units |
|---|---|---|
| 0% | 0.0% | $0.00B |
| 33% | 1.7% | $2.4B |
| 50% | 2.6% | $3.7B |
| 66% | 3.4% | $4.8B |
| 100% | 4.8% | $6.8B |




**SOURCE:** EIA Requirement committee. Electronics Industry Association presentation, 1988.

*Figure B-1.* **Outlays In 1987 Dollars**

## APPENDIX C

# EFFECTS OF INTERNATIONAL COLLABORATION ON COST

A Rule-of-Thumb in estimating the cost of an international program says that the total program cost for the international program is proportional to the square root of the number of national involved in the international program. While this relationship is not found in any texts that we examined, it was commonly held and often cited by the people whom we interviewed.

Let: C =the cost of a single nation program organized to meet a requirement

n =the number of nations involved in the international program

K =the cost of a multi-national program organized to meet the requirement

P =the cost to each partner nation in the international program

Then, the Rule-of-Thumb says:

$$K \sim C(n)^{1/2}$$

and

$$P \sim (K/n) = C / (n)^{1/2}$$

Figure C-1 illustrates the cost effects for 2, 3, 4, 5, and 6 partners, against a base case of a national program; i.e., where there is only 1 partner.

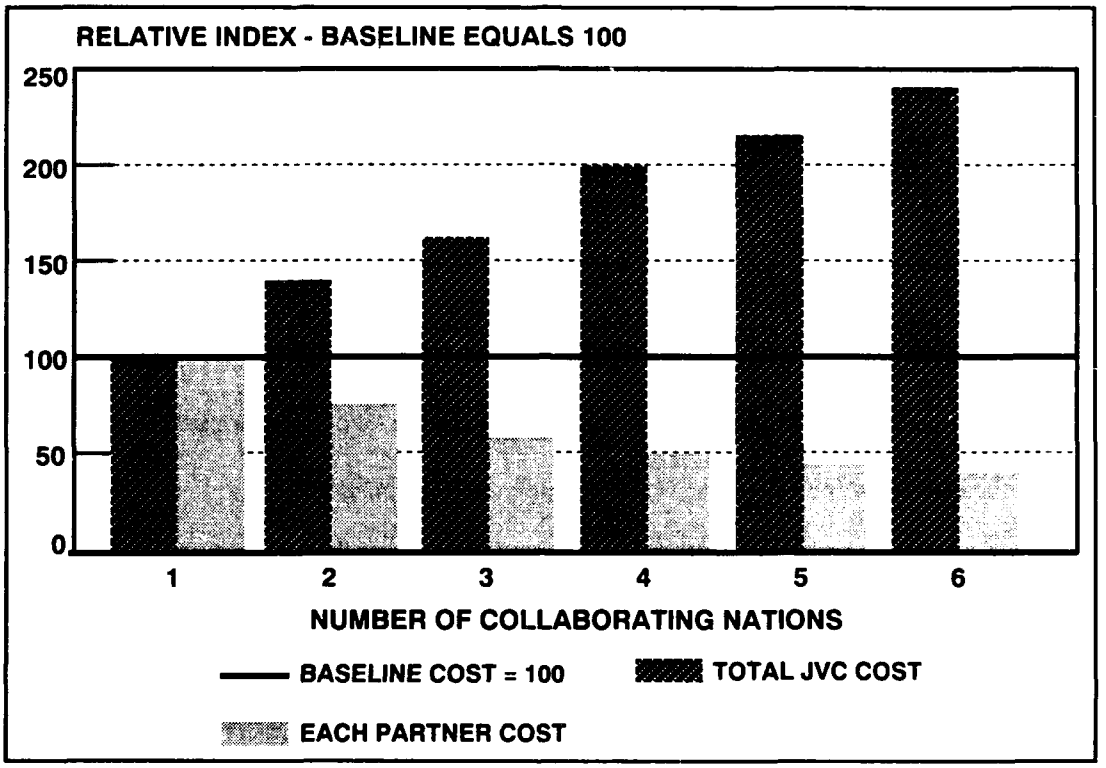



*Figure C-1.* Relative Program Costs— National versus Collaboration Program

APPENDIX D

# Critical Success Factors for International Program Management

**SOURCE:** *The Management of International Cooperation Projects, C. Michael Farr, with contributions by Robert D. Materna, a research report compiled for the Defense Systems Manageent College in support of the Advanced International Management Workshop*

## Critical Sucess Factors for International Program Management:

| Legend: | ● Characteristic is present | ◒ Characteristic is partially present | ○ Characteristic is absent |
|---|---|---|---|

Clear Vision:

| SUCCESSFUL | UNSUCCESSFUL | FACTORS | COMMENTS |
|---|---|---|---|
| ● | ◒ | Strongly shared sense of need or mission | "Win-Win" sense of mission important |
| | | Clear and common requirements: | Goals must be harmonized and operational requirements should be clearly specified before program enters the acquisition process |
| ● | ◒ | - Cost | |
| ● | ● | - Schedule | Production and cost sharing arrangements must be clearly specified in the MOU |
| ◒ | ◒ | - Technical | Especially important that international programs be based on sound technical concepts |
| | | | Technological advances should be made in an evolutionary incremental fashion |

## Top Management Support:

Legend: ● Characteristic is present ◒ Characteristic is partially present ○ Characteristic is absent

| SUCCESSFUL | UNSUCCESSFUL | FACTORS | COMMENTS |
|---|---|---|---|
| | | Effective Program Manager should have appropriate: | |
| ● | ○ | - Rank | Minimum rank of Colonel |
| ● | ◒ | - Experience | Managing partners should be equal in rank |
| ● | ◒ | - Authority | Managerial experience most important |
| ● | ○ | - Stability | International experience desirable |
| | | An Effective Steering Group: | Technical experience a bonus |
| ● | ◒ | - Should have all partners represented with equal vote | Authority of PM must be clear and sufficient for the job |
| | | | PM should be involved in negotiating MOU |
| ● | ◒ | - Should have real decision-making authority and the ability to make decisions in a timely manner | PM turnover must be minimized |
| | | | Civilian deputy PM may be helpful |
| ● | ◒ | - Should not be involved in the routine management of the program | |

**Qualified Office Personnel:**

Legend: ● Characteristic is present ◒ Characteristic is partially present ○ Characteristic is absent

| SUCCESSFUL | UNSUCCESSFUL | FACTORS | COMMENTS |
|---|---|---|---|
| | | In addition to the Program Manager, other program officer personnel should: | |
| ● | ◒ | - Have prior program management experience | People who are new to the acquisition process should not be directly assigned to international programs |
| ◒ | ○ | - Have prior international management experience or training in international management | Frequently suggested topics for education and/or training include:<br>- Fundaments of international law<br>- Fundaments of technology transfer regulations and policies<br>- An understanding of the program approval, budgeting, and financial processes of participating firms and governments<br>- An understanding of cultural and work ethic differences<br>- An understanding of how to deal with exchange rates<br>- Access to lessons learned from previous international programs |
| ● | ○ | - A strong sense of loyalty to the program | As opposed to nationalistic view<br>There should also be a sense that benefits from the program are being appropriately shared and that no partner is being exploited |
| ● | ○ | - Be co-located and able to perform in more than just a liaison role | Staffing for co-located personnel must be worked well in advance |

**Ability to Overcome External Obstacles:**

Legend: ● Characteristic is present ◒ Characteristic is partially present ○ Characteristic is absent

| SUCCESSFUL | UNSUCCESSFUL | FACTORS | COMMENTS |
|---|---|---|---|
| ● | ○ | - Geographical separation | Techniques that help:<br>- Computer-based electronic mail<br>- Facsimile machines, including enough to handle classified information<br>- Using authorized contractors to courier classified information<br>- Establishing a classified telephone network with sufficient phones in the right places for decision-makers<br>- Factor jet lag into travel planning and meeting schedules |
| ● | ◒ | - Difference in culture | Clearly identify all holidays and build into plans<br>Understand how different work standards may affect schedules<br>Developing a sense of mutual trust is important |
| ◒ | ◒ | - Difference in language | Specify official language(s) in MOU<br>Arrange for interpreters and for documents to be translated<br>Use bilingual team members when possible |
| ◒ | ○ | - Difference in philosophies and practices | Different contracting policies, procedures, and terms must be defined and understood<br>Each participant's program approval, budgeting, and financial processes must be understood |
| ◒ | ◒ | - Different technical capabilities | Participating firms should be of similar size and capabilities<br>Technical contributions should be balanced |

## APPENDIX E

# INTERVIEWS AND PERSONAL CONTACTS

**Anstee, R.F.W.,**
Assistant Director/Air Armament 4, Procurement Executive, Ministry of Defence.
London: 5 March 1991.

**Bade, Bruce C.,**
Assistant Deputy Under Secretary of Defense International Development and Production.
Washington: 12 February 1991.

**Basell, John E.,**
Contracts Manager, British Aerospace Dynamics.
Hertfordshire: 4 March 1991.

**Beagles, J.W.,**
Vice President, Boeing Japan.
Tokyo: 18 March 1991.

**Bearmont, Liz,**
Regional Marketing Directorate, Defence Export Services Organisation, Ministry of Defence.
London: 4 March 1991.

**Betterman, Peter N.,**
Program Director MLRS TGW Program, Martin Marietta Missile Systems.
Orlando: 26 February 1991.

**Bolz, Robert C., Jr.,**
Director F-16 C/D International Programs, General Dynamics.
Personal Interview. Fort Worth: 29 January 1991.

**Brownell, Thomas F.,**
Chief, Plans and Evaluation Division, NATO AEW&C Programme Management Agency.
Brunssum: 8 March 1991.

**Carpen, Thadeus, Lt Colonel, USAF,**
Washington: 10 January 1991.

**Carter, William A.,**
F-16 European Participating Air Force Program Manager, General Dynamics.
Fort Worth: 29 January 1991.

**Christensen, Peter K.,**
Chief, Defense Cooperation in Armaments, U.S. Embassy.
London: 4 March 1991.

**Cochran, Stanley H.,**
Director International Marketing, TRW Systems Engineering & Development Division Systems Integration Group.
Los Angeles: 30 January 1991.

**Cuperthwaite, John,**
Assistant Director/Avionics, Procurement Executive, Ministry of Defence.
London: 5 March 1991.

**Desmouliere, Maurice,**
French Liaison Officer.
Huntsville: 24 January 1991.

**Doran, William K.,**
Manager, International Planning, E-Systems.
Washington: 17 January 1991.

**Durando, Norbert A.,**
Program Manager, Mid-Life Update, General Dynamics.
Fort Worth: 29 January 1991.

**Dziedzic, Walter T.,**
Director, Japan Programs, Defense Systems & Electronics Group, Texas Instruments.
Tokyo: 19 March 1991.

**Edlund, Donald G.,**
Simulator Site Engineer, T-45 Training System, McDonnell Douglas.
Washington: 25 February 1991.

**Egawa, Hideo,**
Assistant Director, Business Department, Mitsubishi Heavy Industries, Ltd.
Nagoya: 22 March 1991.

**Ello, John V.,**
Executive Director, Defense Science Board.
Washington: 4 February 1991.

**Esaki, Michihiko.,**
Senior Manager System Engineering, Kawasaki Heavy Industries, Ltd.
Gifu: 22 March 1991.

**Farr, C. Michael, PhD, Lt Colonel, USAF,**
Air Force Institute of Technology.
Washington: 12 December 1990.

**Ferguson, Michael,**
Director Navy Programs, Rolls Royce Inc.
Washington: 19 February 1991.

**Flores, Noboru Y.,**
Deputy, Defense Technology Trade Program, Embassy of the United States of America - Japan.
Tokyo: 18 March 1991.

**Gallagher, Richard F.,**
Program Manager Advanced Standoff Weapons, Missile Systems Division, Electronics Operations, Rockwell International Corporation.
Atlanta: 25 January 1991.

**Ganzer, Uwe, Dr.,**
Executive Vice President Engineering Design and Technology, Deutsche Airbus.
Personal Interview. Hamburg: 7 March 1991.

**Gardner, Paul B., P.E.,**
S-76 Program Manager, International Programs-Japan, United Technologies Sikorsky Aircraft.
Stratford: 24 January 1991.

**Garmon, Patrick E.,**
Director International Coordination, MDTT, Inc.
Orlando: 26 February 1991.

**Gatling, William L., Major, USA,**
Director, Ground Programs, American Embassy - Japan.
Tokyo: 18 March 1991.

**Gomez, Henry L.,**
Director FS-X Operations in Japan, General Dynamics.
Nagoya: 21 March 1991.

**Graham, Benjamin,**
United Kingdom Liaison to Multiple Launch Rocket System.
Huntsville: 24 January 1991.

**Hager, John A.,**
Manager of International Programs, Alliant Techsyustems Inc.
Personal Interview. Washington: 11 January 1991.

**Haigh, Richard J.,**
Program Manager, Material, International Programs-Japan, United Technologies Sikorsky Aircraft.
Personal Interview. Stratford: 24 January 1991.

**Hanus, Robert G., Colonel, USAF,**
Office of the Under Secretary of Defense for Acquisition.
Personal Interview. Washington: 9 January 1991.

**Harding, Roger,**
Director of Defence Marketing, Ministry of Defence.
Personal Interview. London: 4 March 1991.

**Hastings, William H.,**
Chief, International Programs Office, Multiple Launch Rocket System Project Office.
Personal Interview. Huntsville: 24 January 1991.

**Hedges, Steven M.,**
Program Business Manager, International Programs-Japan, United Technologies Sikorsky Aircraft.
Personal Interview. Stratford: 24 January 1991.

**Higgins, Gregory A.,**
Manager, Management & Information Systems Finance, Tactical Systems Division, Rockwell International Corporation.
Personal Interview. Atlanta: 25 January 1991.

**Hindman, Nancy L.,**
Defense Technology Security Administration.
Personal Interview. Washington: 14 February 1991.

**Hopler, Paul D.,**
International Programs and Technology, Office of the Under Secretary of Defense for Acquisition.
Washington: 29 March 1991.

**Horner, Timothy F., Captain, USN**
Weapons Systems Division/Plans, Office of the Secretary of Defense, Defense Security Assistance Agency.
Washington: 26 February 1991.

**Hubbard, Samuel W.,**
Vice President, Aerospatiale Incorporated.
Washington: 21 February 1991.

**Hunt, C.L., Commander, USN**
Director of Naval Aviation Programs, American Embassy - Japan.
Tokyo: 18 March 1991.

**Iig, O. Robert,**
Vice President, Raytheon Systems Company.
Tokyo: 19 March 1991.

**Jacobsen, Helge O.,**
Director - Business Development and Special Programs Defence Division, Norsk Data.
St. Louis: 30 January 1991.

**Jeffs, K. Peter, C.M.G.,**
President MLRS International Corporation.
London: 5 March 1991.

**Johnson, Joel L.,**
Vice President, International, Aerospace Industries Association.
Personal Interview. Washington: 22 January 1991.

**Kameya, Atsushi,**
Manager, Fort Worth Liaison Office, Mitsubishi Heavy Industries, Ltd.
Fort Worth: 21 February 1991.

**Kaminski, Stephen C.,**
First Secretary, American Embassy - Japan.
Tokyo: 20 March 1991.

**Kammier, Richard W.,**
T-45 Project Manager, Flight Simulation Operations, Hughes Simulation Systems, Inc.
25 February 1991.

**Kawai, Michio,**
General Manager, Business Planning Department, Ishikawajima-Harima
Heavy Industries Co., Ltd.
Tokyo: 20 March 1991.

**Koehler, Richard E., Captain, USN,**
Program Manager T45TS, Naval Air Systems Command.
Washington: 14 January 1991.

**Krueger, Stanley P..**
President-Japan, United Technologies International Operations.
Tokyo: 18 March 1991.

**Kunstel, Kenny J..**
Senior Manager, U.S. Government & International Trade, Tactical Systems Division,
Rockwell International.
Washington: 11 January 1991.

**Lackman, Leslie M., Dr.,**
Vice President Research, Engineering & Advanced Systems, North American Aircraft
Rockwell International Corporation.
Los Angeles: 29 January 1991.

**Laing, Alan J.,**
Manager Stand Off Weapons Forward Strategy and Planning,
British Aerospace Dynamics.
London: 4 March 1991.

**Lee, Vernon A., Dr.**
Vice President, Japan, Gerneral Dynamics.
Fort Worth: 21 February 1991.

**Lenehan, James,**
International Programs, Rockwell International.
Washington: 11 January 1991.

**Lester, Frank W., Jr., Lieutenant Colonel, USAF,**
Mutal Defense Assistance Office, American Embassy - Japan.
Tokyo: 18 March 1991.

**Lorraine, Mike,**
Project Executive Long Range Trigat, British Aerospace Dynamics.
London: 4 March 1991.

**Luce, Clyde E.,**
Contracts Manager, Corporate Secretary, MDTT, Inc.
Orlando: 26 February 1991.

**Luther, Peter J.,**
U.S. Army Research, Development and Standardization Group (UK).
London: 4 March 1991.

**Manning, T.C.,**
Program Manager, NATO AEW Modernization Program, Aerospace & Electronics Division, AWACS Program, Boeing Defense & Space Group.
Seattle: 31 January 1991.

**Marschall, Bruce R.,**
AV-88 Program Development, McDonnell Douglas.
St. Louis: 30 January 1991.

**Marshall, Howard B.,**
Director of Program Management, Flight Simulation Operations,
Hughes Simulation Systems, Inc.
Washington: 25 February 1991.

**Massey, Peter,**
Washington: 4 February 1991.

**Matsubara, Yoshinori,**
Senior Manager, Contract Administration Department, Kawasaki Heavy Industries, Ltd.,
Gifu: 22 March 1991.

**Matsumiya, Kiyoshi, Lt. General, Japan Defense Agency,**
Director, Department of Air Systems Development,
Technical Research & Development Institute.
Tokyo: 18 March 1991.

**Matsumoto, Lt. Col. Kenshi, Japan Defense Agency,**
Technical Liaison Officer.
Fort Worth: 21 February 1991.

**May, John L.,**
Research Scientist, Kaman Sciences Corporation.
Colorado Springs: 28 January 1991.

**McClelland, Joe,**
Marketing Executive, Marconi Defence Systems.
Washington: 18 January 1991.

**Monahan, George, Lt General (ret), USAF,**
F-16 Program Manager.
Washington: 8 February 1991.

**Moriarty, Thomas M.,**
Marketing Manager, North Asia, Allied-Signal Aerospace Company.
Tokyo: 19 March 1991.

**Morishige, Nobuaki,**
Manager, Business Planning Department, Ishikawajima-Harima Heavy Industries Co, Ltd.
Tokyo: 20 March 1991.

**Morris, William W. III.,**
Director Modification and Retrofit Management, General Dynamics.
Fort Worth: 29 January 1991.

**Moruzzi, Dave,**
Manager, Marketing, Rockwell International Corporation.
Washington: 16 January 1991.

**Nakamura, Midori,**
Business Planning Department, Ishikawajima-Harima Heavy Industries Co., Ltd.
Tokyo: 20 March 1991.

**Nelson, James R.,**
Director International Marketing, Martin Marietta Corporation.
Washington: 6 February 1991.

**Nix, John B., Jr., Lt Colonel.**
Aerospace and Strategic Technology Office, Defense Advanced Research Projects Agency.
Washington: 9 January 1991.

**Noguchi, Yoshiro.**
Manager of Contracts, Kawasaki Heavy Industries, Ltd.
Gifu: 22 March 1991.

**Onion, John R.,**
Project Executive, ASRAAM, British Aerospace Dynamics.
Hertfordshire: 4 March 1991.

**Otsuka, Michiaki.**
Manager, Helicopter Contract Section, Kawasaki Heavy Industries, Ltd.
Gifu: 22 March 1991.

**Paldino, Nicholas,**
Marketing Executive, GEC-Marconi.
Washington: 18 January 1991.

**Pentelow, David,**
Programme Manager, Thorn EMI Electronics Limited, Electronic Systems Division.
Feltham Middlesex: 6 March 1991.

**Petek, James M., Lt Col, USAF,**
Director, USAF R&D Liaison Office, United Kingdom.
London: 4 March 1991.

**Poetzl, Joyce E.,**
Manager Licensing, McDonnell Douglas Corporation.
Washington: 4 February 1991.

**Post, Gary L.,**
T45TS Program Development, McDonnell Douglas.
St. Louis: 30 January 1991.

**Powell, David L.,**
Vice President, International Programs-Japan, United Technologies Sikorsky Aircraft.
Stratford: 24 January 1991.

**Rabjohn, H. A.,**
Manager Coproduction Business Management, General Dynamics.
Fort Worth: 29 January 1991.

**Raybould, B.,**
Project Manager, ASRAAM, British Aerospace Dynamics.
Hertfordshire: 4 March 1991.

**Robineau, Veronique A.,**
Contracts Administrator, MDTT, Inc.
Orlando: 26 February 1991.

**Robinson, M.R.,**
Director, Advanced Systems & Technology Development Programs,
Rockwell International Corporation.
Washington: 16 January 1991.

**Rushing, Michael A.,**
Contracts Administrator, MDTT, Inc.
Orlando: 26 February 1991.

**Schlosser, Judy,**
Project Manager FS-X Program Operations, General Dynamics.
Fort Worth: 21 February 1991.

**Schmitt, Dieter, Dr.**
Vice President Future Projects, Deutsche Airbus.
Hamburg: 7 March 1991.

**Scott, John,**
Politics and Military Department, American Embassy - Japan.
Tokyo: 20 March 1991.

**Shibata, Tomoharu,**
Senior Chief Engineer, Mitsubishi Heavy Industries, Ltd.
Nagoya: 22 March 1991.

**Sibert, George W.,**
Manager, Business Development, Helicopter Engines, Rolls Royce Inc.
Washington: 19 February 1991.

**Smith, Colin E.,**
Manager Air Force Systems, Embassy of the United States.
London: 4 March 1991.

**Snow, Pete,**
Program Manager, Kaman Sciences Corporation.
Colorado Springs: 28 January 1991.

**Soucy, Robert,**
Deputy Team Leader, T45TS, McDonnell Douglas Corporation.
St. Louis: 31 January 1991.

**Stein, Donald P.,**
Staff Director, International Industrial Base, Deputy Under Secretary of Defense for International Programs.
Washington: 6 December 1990.

**Stumpf, Thomas S., Major, USAF,**
FS-X Liaision Officer, Technical Research & Development Institute.
Tokyo: 18 March 1991.

**Sweeney, J. Gregory,**
Director-Japan License Programs and International Contracts, United Technologies Sikorsky Aircraft.
Stratford: 24 January 1991.

**Tamama, Tetsuo,**
Manager, Defense Systems-Technology Exchange, Mitsubishi Electric Corporation.
Tokyo: 19 March 1991.

**Tamura, Tomotoshi, Major General.**
Director of Logistics Department, GSO.
Tokyo: 18 March 1991.

**Tanaka, Rodney S., Colonel, USA,**
Head Armaments Cooperation/Army, American Embassy - Japan.
Tokyo: 18 March 1991.

**Thorpe, James W., Commander,**
Director, Naval Sea Systems Programs, American Embassy - Japan.
Tokyo: 18 March 1991.

**Tyler, John T.,**
Director, Plans, Defense Security Assistance Agency.
Washington: 12 February 1991.

**Von Kospoth, E. K., BGen, AF**
General Manager NATO AEW&C Programme Management Agency.
Brunssum: 8 March 1991.

**Von Nordheim, Manfred, Dr.,**
President, MBB of America, Inc.
Washington: 15 January 1991.

**Wasielewski, Michael C.,**
Managing Director, General Dynamics LTD.
London: 5 March 1991.

**Wedmeyer, Karl, Colonel,**
Military Attache, American Embassy - Japan.
Tokyo: 20 March 1991.

**Whitley, Ted D.,**
Manager, Spacecraft Systems, Aerospace & Electronics Division;
Boeing Defense and Space Group.
Washington: 22 August 1990.

**Wood, Fred,**
Associate General Dynamics (Retired).
St. Louis: 30 January 1991.

**Yasue, Masahiro, Ph.D.,**
Deputy Section Chief, Department of Air Systems Development,
Technical Research & Development Institute.
Tokyo: 18 March 1991.

# APPENDIX F
# INTERVIEW GUIDE

## Part I

The following questions are related to factors considered important by previous studies of international program management.

A. Describe the extent to which the following international characteristics have affected program success.

| | NOT AT ALL | | | | A GREAT DEAL |
|---|---|---|---|---|---|
| GEOGRAPHICAL SEPARATION | 1 | 2 | 3 | 4 | 5 |
| CULTURAL DIFFERENCES | 1 | 2 | 3 | 4 | 5 |
| LANGUAGE BARRIERS | 1 | 2 | 3 | 4 | 5 |
| DIFFERING TECHNOLOGICAL CAPACITY / RESOURCES | 1 | 2 | 3 | 4 | 5 |
| DIFFERENT MANAGERIAL PRACTICES | 1 | 2 | 3 | 4 | 5 |
| RELATIVE SIZES OF THE INDUSTRIAL PARTNERS | 1 | 2 | 3 | 4 | 5 |
| MARKET COMPETITIVENESS OF THE INDUSTRIAL PARTNERS | 1 | 2 | 3 | 4 | 5 |

Explain any 4 or 5 responses, and discuss how those characteristics were addressed.

B. Steering Groups

1. Is the program guided by a Steering Group? YES NO

If YES, answer questions 2 - 4.

If NO, answer questions 5 - 6.

2. Describe the composition of the steering group. Are members of relatively high rank, as compared to members of the daily team? Was industry represented on the steering group?

3. What is the basis for decision-making by the committee? Does each nation have an equal vote or a vote weighted in proportion to their contribution to the program, or are the decisions made by consensus? How often do they meet, and are they effective?

EQUAL VOTE PROPORTIONAL VOTE CONSENSUS (Explain)

4. Has the steering group generally helped or hindered program progress?

| HINDERED | SOMEWHAT HINDERED | NEUTRAL EFFECT | SOMEWHAT HELPED | HELPED |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

5. Since your program did not have a steering group, describe the alternative management structure. (Use diagrams or any other useful aids.)

6. Do you believe that the presence of a steering committee would have improved your program's ability to resolve especially difficult issues? YES NO (Explain)

C. Program Management Authority

1. Does the Program Manager(s) have sufficient authority to make important decisions, resolve conflict, etc. without undue interference or frequent higher level overturning of decisions?

| NO AUTHORITY | INSUFFICIENT AUTHORITY | MODERATE AUTHORITY | SUFFICIENT AUTHORITY | COMPLETE AUTHORITY |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

2. Are key management people co-located? YES NO

3. Does management generally find itself in a reactive or proactive mode?

| ALWAYS REACTIVE | SOMEWHAT REACTIVE | NEITHER | SOMEWHAT PROACTIVE | ALWAYS PROACTIVE |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

4. Describe the industry management structure, as compared to the program management office structure.

5. How much authority was vested in the industry managers? By whom?

| NO AUTHORITY | INSUFFICIENT AUTHORITY | MODERATE AUTHORITY | SUFFICIENT AUTHORITY | COMPLETE AUTHORITY |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

6. Did the program management office generally help or hinder the cooperation among the industry management process?

| HINDERED | SOMEWHAT HINDERED | NEUTRAL EFFECT | SOMEWHAT HELPED | HELPED |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

D. Harmonizing of Requirements

1. To what extent did all participating nations contribute to specifying desired operating characteristics, cost goals, schedule goals, etc. of *this program*?

NOT AT ALL 1 2 3 4 5 A GREAT DEAL

Explain:

2. To what extent did industry contribute in establishing cost and schedule goals?

NOT AT ALL 1 2 3 4 5 A GREAT DEAL

3. How should industry have contributed more in establishing cost and schedule goals?

4. What technical and political problems resulted from a failure to harmonize requirements and objectives?

a. What was the impact on cost and schedule risk?

b. How were those risks addressed by the program management office and the industry partners?

5. Given your experience on this, and possibly other international programs, what are key considerations in achieving harmony?

E. State-of-the-Art Advance

1. The technical risks associated with this program were:

| LOW | | *MEDIUM* | | *HIGH* |
|---|---|---|---|---|
| COMPLETELY PROVEN TECHNOLOGY | NEXT LOGICAL INCREMENTAL STEP | MODERATE ADVANCE | SIGNIFICANT ADVANCE | LARGE ADVANCE |
| 1 | 2 | 3 | 4 | 5 |

Explain:

2. How did your technology risk assessment compare with that of:

The program management office:

Your industry partners:

3. Where advanced technology is involved, what program barriers were encountered or could be expected, and how were they addressed? Would the barriers be addressed differently, given different program phases?

F. Distribution of Benefits

1. To what extent are the benefits received by the U.S. proportional to its contributions to the program?

| NOT AT ALL | SLIGHTLY | MODERATELY | SIGNIFICANTLY | TOTALLY |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

2. To what extent are the benefits received by the other participating nations proportional to their program contributions?

| NOT AT ALL | SLIGHTLY | MODERATELY | SIGNIFICANTLY | TOTALLY |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

3. To your knowledge, did / do any of the participating nations or companies feel that they were "exploited" technologically? YES NO

Explain:

4. Are there any obvious commercial spin-off applications from the program? YES NO

Explain:

5. If so, are the resulting benefits available to all participants?

6. If all participants do not share potential spin-off benefits, Why not?

How has this affected partner relationships?

What is your recommended solution, particularly if it adversely affected partner relationships?

G. Experience with international programs and relevant technology

1. How extensive is your participation in international programs?

2. Have any of the participants on this current international program worked together before?

YES NO

Explain:

3. How many times have your key industry managers previously occupied important management positions on programs of this type (answer for the 2 or 3 most key management positions)?

4. How are key managers selected for international programs? If forced to choose between a manager with technical expertise or one with proven management experience, which would you choose? Why?

5. To what extent do key managers also possess technical knowledge and training?

| NONE | SLIGHT | MODERATE | SIGNIFICANT | BONA FIDE EXPERT |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

6. What additional training would have been useful?

H. Program Loyalty

1. When national interests / desires conflict with the best interests of the program as a whole, are the program managers, the program office team members, and industry partners more oriented to the best results for the program, or do they tend to put national interests first?

| PROGRAM | NATIONAL INTERESTS | (Explain) |
|---|---|---|

2. Do co-located members from the partner countries perform functional tasks (i.e. manufacturing, engineering, configuration management, etc.) as distinguished from purely liaison roles? YES NO

3. In your experience, when problems arise do they tend to stem from problems with:

U.S. bureaucracy, economy, managerial philosophy, etc.?

Foreign nation's bureaucracy, economy, managerial philosophy, etc.?

I. Environmental Uncertainty

1. Circle any of the following types of unplanned changes that have affected this program:

**BUDGET / SCHEDULE / INFLATION / INCREASED THREAT OF WAR / DECREASED THREAT OF WAR / PROTECTIONIST LEGISLATION / OTHER** (Explain)

2. Has the U.S. or another participant altered its goals / requirements after the program began because of political pressure or other reasons? **YES NO**

Describe the effects on the program:

3. Has the composition of the participants changed? If so, why and what were the effects?
**YES NO**

Explain:

4. To what extent has the reassignment of key managers occurred during this program?

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **U.S.** | **NOT AT ALL** | **1** | **2** | **3** | **4** | **5** | **GREAT DEAL** |
| **FOREIGN** | **NOT AT ALL** | **1** | **2** | **3** | **4** | **5** | **GREAT DEAL** |

J. Program Phase

1. To what extent does the program phase (i.e., R&D, production, etc.) impact success?

| NOT AT ALL | SLIGHTLY | MODERATELY | SIGNIFICANTLY | TOTALLY |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

Explain:

## PART II.

This part asks you to rate the success of your program, and/or to make any additional comments that you feel are important to the success of future programs.

A. Please rate your program's performance relative to the following dimensions:

| | | | | | | |
|---|---|---|---|---|---|---|
| **FULLY SUCCESSFUL** | **1** | **2** | **3** | **4** | **5** | **UNSUCCESSFUL** |
| **COST** | **1** | **2** | **3** | **4** | **5** | |
| **SCHEDULE** | **1** | **2** | **3** | **4** | **5** | |
| **TECHNICAL** | **1** | **2** | **3** | **4** | **5** | |
| **ACHIEVEMENT OF OFFSET GOALS** | **1** | **2** | **3** | **4** | **5** | |

What other criteria do you use to judge the success of an international program (e.g. extent of technology transfer, jobs created, potential for commercial spin-off, etc.)?

B. What are the selection criteria for a successful international program? What elements must exist if there is to be any chance of success?

C. What is your sense regarding U.S. dependency on foreign nations for defense programs?

D. What should the U.S. government be doing to successfully encourage, and participate in, multinational programs?

E. Many national governments maintain a ministry for trade and industry which has broad responsibility for research and development. What is the need in the U.S.?

F. What changes need to be made to the U.S. infrastructure (i.e., education system, facilities, and equipment) to improve its competitiveness in international programs?

G. What actions is your company taking in order to compete globally?

H. In your experience, is there anything important that seems to have been overlooked? Feel free to attach memos, references, or other documents that might illustrate your point.

## APPENDIX G

# Nunn Cooperative Programs

**AA B/C Detector**
All Agent Biological/Chemical Detector

**Ada Prog Support**
Ada Programming Support Environment

**Adv Avionics Arch**
Advanced Avionics Architecture
(includes Advance Video Processing)

**Adv Sea Mine**
Advanced Sea Mine

**APGM**
Autonomous Precision Guided Munition

**ARDS**
Airborne Radar Demonstration System

**Armor/Anti-Armor**
Armor/Anti-Armor (Reactive Armor)

**ASTOVL**
Advanced Short Takeoff - Vertical Landing Aircraft

**BICES**
Battlefield Information Collection and Exploitation System

**Combat Veh C2**
Combat Vehicle Command and Control

**C3 Interoperability**
Command, Control, and Communications Interoperability

**Ducted Rocket**
Ducted Rocket Program

**EFM /X31**
Enhanced Fighter Maneuverability Demonstrator X31

**F-16 Upgrade**
F-16 Mid-Life Upgrade Program

**HME**
Hawk Mobility Enhancement

**International Map**
Digital Chart of the World, International Map and Chart Database

**JSTARS/SOSTAS**
Joint Surveillance Target Attack Radar System Interoperability

**Laser Standoff Chem**
Laser Standoff Chemical Detector

**MIDS**
Multi-Functional Information Distribution System

**MPA-90**
Maritime Patrol Aircraft 90

**MSOW**
Modular Stand-off Weapon

**NATO AAWS**
NATO Anti-Aircraft Warfare System

**NATO Frigate**
90 NATO Frigate 1990

**NIDS**
NATO Identification System

**Non-Acoustic ASW**
Non-Acoustic Anti-Submarine
Warfare Research

**Patriot MM Seeker**
Patriot Multi-Mode Seeker Demonstration

**Post-2000 Comm**
Post 2000 Tactical Area Communications

**RIMM-116A/RAM**
Rolling Airframe Missile

## APPENDIX H

# ACRONYMS

| | |
|---|---|
| **AEW&C** | Airborne Early Warning & Control |
| **AMC** | Army Materiel Command |
| **APGM** | Autonomous Precision Guided Munition |
| **ASRAAM** | Advanced Short Range Air-to-Air Missile |
| **ASTOVL** | Advanced Short Takeoff - Vertical Landing Aircraft |
| **AWACS** | Airborne Warning and Control System |
| **BAe** | British Aerospace |
| **CAPS** | Conventional Arms Planning System |
| **CFIUS** | Committee on Foreign Investment in the U.S. |
| **CoCom** | Coordinating Committee for Multilateral Exports Control |
| **DOD** | Department of Defense |
| **DPACT** | Defense Policy Advisory Committee on Trade |
| **DTC** | Office of Defense Trade Control |
| **DTSA** | Defense Technology Security Administration |
| **EON** | Exchange of Notes |
| **FAR** | Federal Acquisition Regulation |
| **IEPG** | Independent European Program Group |
| **JAST** | Japan Armament Study Team |
| **JMTC** | Joint Military Technology Commission |
| **LTAA** | License and Technical Assistance Agreement |
| **MBB** | Messerschmitt-Bolkow-Blohm Gmbh |
| **MDAO** | Mutual Defense Assistance Office |
| **MITI** | Ministry of International Trade and Industry |
| **MLRS** | Multiple Launch Rocket System |
| **MOU** | Memorandum of Understanding |
| **MSOW** | Modular Stand-off Weapon |
| **NAPMO** | NATO AEW&C Programme Management Organization |
| **NATO** | North Atlantic Treaty Organization |
| **NIAG** | NATO Industrial Advisory Group |
| **NSA** | National Security Agency |
| **OTA—** | Office of Technical Assessment |

| | |
|---|---|
| **PACRIM** | Pacific Rim |
| **R&D** | Research and Development |
| **RDT&E** | Research, Development, Test and Evaluation |
| **RFP** | Request For Proposal |
| **S&TF** | Systems and Technology Forum |
| **TAT** | Technology Assessment Team |
| **TGW** | Terminal Guidance Warhead |
| **Trigat** | New generation of European anti-tank missiles |

# APPENDIX I
# COMPANY EXPORT PROCEDURES MANUALS

## TEN CRITICAL ITEMS THAT SHOULD BE INCLUDED

The purpose of export procedures manuals. To avoid unauthorized exports and any resultant penalties that might be imposed, each person and company engaged in the business of exporting defense articles and services should have an export procedures manual. The manual should contain all of the essential "need-to-know" information for employees involved in exporting defense articles and services. Specifically, it should detail the methods and procedures the exporter uses to ensure compliance with sections 38,39, and 40 of the *Arms Export Control Act* (AECA) and the *International Traffic in Arms Regulations* (ITAR).

Trying to lend a helping hand. The following is a list of 10 critical items that the Office of Defense Trade Controls' Compliance Analysis Division (DTC/CAD) recommends be included in company export procedures manuals. We provide this list to assist the various private sector efforts to improve U.S. industry's understanding of and adherence to proper export procedures. We hope it is helpful. If you have any questions about the following, please contact DTC/CAD at (703)875-6650.

## THE LIST OF 10 CRITICAL ITEMS:

1. A functional explanation of the company's organizational structure, including names, titles, and responsibilities of senior officials. This should include the point of contact for questions regarding export licensing procedures.

2. A detailed explanation of the operational safeguards that have been instituted to prevent employees of the company from violating the ITAR or the AECA.

3. Internal operating procedures within the firm for the proper dissemination of information regarding the export of defense articles and services (e.g., changes to the

4. Operating procedures pertaining to the export of defense articles and services that arewritten for general distribution to company personnel.

5. An operating procedure for handling potential illegal exports or diversions, including the materials provided in the article "Indications of Questionable Exports."

6. Operating procedures pertaining to the export of defense articles and services that are used by the company's export administration office, including how the office keeps in-

formed of changes in the applicable laws, regulations, and policies. The following elements should also be included in this item:

- an operating procedure that addresses how you determine whether a Department of State license is required for an export, including the use of the Commodity Jurisdiction procedure;

- an operating procedure that describes what constitutes an export according to [TAR Section 120.10 and how that relates to the exporting of commodities, providing of defense services, providing of technical data, employing foreign nationals, and other similar situations encountered at the firm;

- an operating procedure that describes the various types of Department of State license applications and other forms (see [TAR Section I 20.25) and the type of supporting documentation that is required in each export transaction (for example, DSP-83, ITAR Section 126.13 statement, ITAR Section 130 statement, etc.);

- an operating procedure that describes the procedure for prior written Department of State approval for re-transfer of an item that was exported pursuant to the [TAR to a foreign country and which that foreign country now desires to transfer to another country; an operating procedure that describes the prohibition in [TAR Section 126.1 regarding exports to proscribed countries;

- an explanation of the need to Incorporate the statement in ITAR Section 123.9(b) on the shipper's export declaration, the bill of lading, and the invoice.

7. An operating procedure that distinguishes sales in the United States by the XYZ Co. to a foreign person from sales in the United States by the XYZ Co. to a U.S. person, as defined in ITAR Section 120.23, when the XYZ Co. will not be the exporter:

- If the sales order (eg., purchase order, contract, letter of intent, etc.) is for defense articles, related technical data, or defense services, then the XYZ Co. will not sell the items except in compliance with [TAR Section 126.1 (fl;

- If the sales order (eg., purchase order, contract, letter of intent, etc.) is placed by a foreign person, as defined in [TAR Section 120.11, for defense articles, related technical data, or defense services, then the XYZ Co. will require evidence of an approved Department of State license for that item(s) from the foreign person before transferring title of that item(s) to the foreign person;

- If the sales order (eg., purchase order, contract, letter of intent, etc.) is placed by a U.S. person for defense articles, related technical data, or defense services, then XYZ Co. will require the following to be typed on the invoice:

— This equipment is covered by the United States Munitions List (22 C.F.R. Section 121.1) under category

—and the export of the equipment must be licensed by the Office of Defense Trade Controls, United States Department of State, prior to export from the United States.

8. An outline of the company's training program in which employees receive training concerning laws, regulations, and company policies and procedures applicable to the export of defense articles and services. Include training dates and titles of employees who receive training.

9. If there is a Business Conduct Code, it should include the following:

- In the export of defense articles, technical data, or furnishing defense services, the appropriate approval must be obtained from the Department of State pursuant to the Arms Export Control Act and International Traffic in Arms Regulations.

10. Operating procedures for handling proposals to foreign persons for the sale or manufacture abroad of significant military equipment (SME) pursuant to ITAR Section 126.8.

APPENDIX J

# The Problem of Training and Educating Defense Officials in the Area of International Armaments Collaboration

NOTICE

*This chapter represents only the views of the author. It does not represent Department of Defense policy, or approved plans or Policy of the Defense Systems Management College.*

**by**
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**February 1991**

# INTRODUCTION

In June 1985, the Secretary of Defense issued-a memorandum to the Military Departments, the Joint Chiefs of Staff, Directors of Defense Agencies, and the Under and Assistant Secretaries of Defense, placing renewed commitment and emphasis on NATO armaments cooperation.[1] The Secretary requested seven new steps be taken; the seventh of which, education, is the overall topic for this chapter. This step requested an education program "... to develop and maintain appreciation for the significance of the individual role in furthering of collective security through armaments cooperation. " There was bad news and good news in the education objective. The bad news was that the request for education was the final step on the list; the good news was that it finally made the list. This chapter will discuss what has been done on armaments collaboration training during the last five years, what we are doing currently, some parallels with international education in the private sector, and where we believe we should go from here.

To avoid confusion over the various kinds of international defense programs, This chapter will address primarily cooperative programs. These are programs where the U.S. and at least one other NATO nation, or other designated ally, make an equitable contribution to the full cost of the program and participate in joint management of the program. The projects may be for research and development, testing, evaluation, or joint/concurrent production (including follow-on support) of defense articles.[2] These exclude direct commercial sales of defense articles and foreign military sales under the Security Assistance Program. Furthermore, the terms cooperation and collaboration will be used interchangeably.

At this time the Defense Systems Management College (DSMC) at Fort Belvoir, Virginia is the only educational institution in the Department of Defense (DoD) offering courses in armaments cooperation. These are the *Multinational Program Management Course*, our baseline course in international armaments cooperation; and our new Advanced International Management Workshop, which focuses on international negotiation and acquisition management of cooperative programs. More will be said about these later in this chapter.

# THE PAST

In August 1987, DSMC completed a survey of 155 past graduates of our Multinational Program Management Course to assess our responsiveness to the needs of our customers and determine whether improvements should be made[3] These were students who had graduated from the course from one to no more than two years prior to conducting the survey. Eighty four percent of those surveyed were Department of Defense (DoD) military and civilian, eight percent were students from industry, and seven percent from allied nations. The results of that survey indicated that DSMC had been responsive to the needs of its customers, but due to changes occurring around that time, especially the Nunn[4] [5] and Quayle[6] [7] [8] Amendments, and the evolvingnature of international defense programs, many additions and improvements could be integrated into future international activities of the DSMC. The majority of former students felt that the most useful aspect of the course was a broadening in perspective — imparting an understanding of both the variety of view-

points and the difficulty of problems in the international arena. This led us to conclude that this course was an excellent baseline from which to expand and incorporate many of the suggestions from the survey and other sources. We found the former students to feel overwhelmingly favorable toward the utility of foreign guest speakers, speakers from international program management offices and classroom discussion. The survey report also made ten specific recommendations, the majority of which DSMC has been able to implement. These recommendations were:

- Subsequent surveys should include questions on organizational affiliation for statistical purposes and to avoid ambiguity.
- Drop or supplement the traditional multinational case study with more contemporary exercises (ie Nunn/Quayle Amendments).
- Develop ways to increase interaction of participants.
- Complete existing initiative on a European offering.
- Expand the publicity effort for this unique course.
- Obtain speakers to address additional suggested topics.
- Seriously consider all suggestions and comments from the survey respondents not specifically addressed above (there were 24 more).
- Explore the possibility of a three week offering of the MPMC (at this time there were one and two week offerings).
- Consider the possibility of offering more focused short courses/seminars on international topics. Also consider tailoring this approach to specific DoD customers.

Two years later the College initiated another survey of armaments cooperation educational needs.[9] This time it was directed to Program Management Offices, selected DoD personnel, and attendees from a seminar held in London that DSMC had conducted. This survey obtained 177 responses, at a remarkable rate of over 60 percent. The results indicated a very strong need for education or training in international program management. Only 12 percent of the respondents felt that existing educational opportunities were adequate. Eight specific areas of knowledge or understanding were identified by more than 30 percent of the respondents as being essential to their jobs. Three areas stood out as being **very necessary** to all respondents as well as being rated as essential to over 40 percent of the respondents with international involvement. These were:

- DoD policy related to technology transfer
- DoD policy related to international security
- International Memoranda of Understanding

The topic of establishing contractual arrangements also ranked very high. In fact, the Program Management Office respondents with international involvement rated this area highest. Closely following these important areas came four additional ones which were considered **necessary** to all respondents, and rated essential by at least 30 percent of those with international involvement. These were all related to the DoD policy for:

- Foreign Military Sales
- License Arrangements

- Coproduction
- Codevelopment

Conversely, the areas of knowledge clearly determined to be least necessary to the respondents with international involvement were the following:

- NATO Organization and Functions
- Acquisition of Foreign Weapons Systems

How DoD responded to these findings will be discussed later in this chapter.

A more recent examination of the topic of armaments cooperation education was conducted by a committee of participants at the "Bonn Seminar on Armaments Cooperation" in July 1989.[10] Educational issues were among the topics addressed by the committee, and their report included a recommendation for management resolve to educate a dedicated corps of international armaments cooperation experts. This committee, consisting of representatives from the United Kingdom, Germany, France, Norway, and the United States, felt that education resources were inadequate or non-existent when viewed in relation to the number of people who needed the training, including: offices of defense cooperation, security assistance offices, research and development support groups, ministry/department of defense staffs, international program offices, industry personnel, educators and the public. The committee concluded that the national schools should:

- Evaluate current courses taught in the national schools to determine how education can be used more effectively to achieve better armaments cooperation. (They made specific recommendations about resident instruction, an entry level course, mid-level courses, and a senior level short course.)
- Develop a "how to" cookbook on international armaments cooperation procedures, processes, organizations, and guidelines.
- Develop correspondence courses.

The committee further concluded that:

- Trained and experienced armaments cooperation personnel should be identified in the work force, and their careers managed to insure repeated international assignments and career growth.
- There should be oversight of the education system by high level managers who are responsible for international armaments cooperation.
- Universities should be encouraged to include armaments cooperation issues, policy and processes in their international curriculum.
- Professional associations should be encouraged to sponsor seminars on international armaments cooperation issues.

A subsequent examination of the question of training in international armaments cooperation came during exhaustive interviews of six international program managers as part of a comprehensive research study of international program factors for success. (also see chapter by Dr. Farr)[11] The following question was posed. "Could you or a member of the Program Management Office (PMO) staff have benefitted from training in the management of international programs; and, if yes, what area/topics would have been useful?" The question was posed to the Program Managers for the NATO Anti-Air Warfare System, the Autonomous Precision Guided Munition (155MM), the Modular Standoff Weapon, the Rolling Airframe Missile, the Multiple Launch Rocket System (Terminal Guidance Warhead), and a sixth program which provided respon-

ses on the basis of non-attribution. Five of the six responded"yes", whereas the one who responded negatively said that "good people with a good work ethic" were more important. Of course, "good people" might imply experience and/or training. Four of the five positive respondents identified training in the area of allied nation processes, such as decision making, funding, contracting, tax structure and acquisition.

The analysis of surveys in armaments cooperation over the years has helped modify the education. A discussion of accomplishments and future directions follows.

## THE PRESENT

As previously mentioned, the Defense Systems Management College is the only DoD educational institution having a program for international armaments cooperation. This program was described in detail in articles in the January 1989 issue of *Program Manager Magazine* [12] and the Spring 1989 issue of the *DISAM Journal of International Security Assistance Management.*[13] The following is a brief description of our current educational program. It has three major components:

1. The Multinational Program Management Course (MPMC)
2. The Advanced International Management Workshop (AIMW)
3. The International Defense Educational Arrangement (IDEA)

The first, the Multinational Program Management Course, is the foundation of the DSMC international armaments cooperation educational program. It is the baseline course for all those entering this field. Key national, DoD and service policies on international codevelopment, coproduction, and logistics are explored. This course is offered six times a year: three times at the DSMC campus (at Fort Belvoir, VA), once each year at our Huntsville, AL and Boston, MA regional sites, and once each year in Europe.

The second, the Advanced International Management Workshop, is a focused and advanced workshop on international negotiation and acquisition management. Participants gain detailed knowledge of and practical skills in :

- International Memoranda of Understanding
- Preparing, negotiating and staffing international agreements
- Specific negotiation issues
- Factors resulting in successful international programs
- Congressional interaction in cooperative programs

This workshop has received considerable interest and support from the Office of the Secretary of Defense (OSD) and all the services. Nearly a quarter of a million dollars was invested by OSD and the services in workshop development and materials. DSMC spent over a year, with contractor support, in developing the workshop. Our first production offering was during the week of June 18-22, 1990 and was recently described in *National Defense.*[14] We are currently offering three workshops per year exclusively at the DSMC campus

The third, the International Defense Educational Arrangement, is a grouping of national defense educational institutions with similar goals whose mission is to improve the economy, efficiency, and effectiveness of international training and education for acquisition management. Current members are the United States (represented by DSMC), the United Kingdom (represented by the Royal Military College of Science), and Germany (represented by the Federal Academy of Defense Administration and Technology). Additional national defense educational institutions sharing there goals are encouraged to join.

There are several other government organizations which offer short courses which could be beneficial to someone in a cooperative defense program. The Defense Institute of Security Assistance Management (DISAM) offers extensive training in foreign military sales procedures and the Security Assistance Program. The U.S. Office of Personnel Management (0PM) offers courses on foreign policy, national security policy and technology transfer, as well as occasional seminars on trade and foreign policy issues. Some additional specialized courses exist, such as the NATO Staff Officer Orientation course at the National Defense University and the Cross Cultural Communications Course at the USAF Special Operations School.

No summary of training opportunities in international armaments cooperation would be complete without mentioning those which are offered by our Allies. The first is the Management of International Projects offered by the Royal Military College of Science in Shrivenham, United Kingdom. This is a five day course for senior managers with responsibilities involving international programs from the staff of the Ministries of Defense of NATO and the defense industry. Topics covered are concepts of collaboration, memoranda of understanding, international management structure, industrial and technical issues, and contracts and finance. It is offered three times a year.

The second training opportunity offered by our allies is the EURO/NATO weapons Systems Management use by Industrieanlagen - Betriebsgellschaft mbH (IABGJ, a company working with the Germany[11] Ministry of Defense, located in Ottobrunn, Germany (a suburb of Munich).

This is a two week course for middle and senior management personnel in the field of project management as practiced in the development, procurement and utilization of defense materiel. Course objectives address the management of NATO armaments programs, international armaments cooperation, life cycle tasks and decisions, and exchange of experiences among NATO partners. It is offered only once each year in the early Fall. It is open to all NATO nations on a quota basis. This course is offered in English only.

The third training opportunity offered by our Allies is conducted in German by the Federal Academy of Defense Administration and Technology in Mannheim, Germany. A translation of the course title, which preserves its meaning into English, is International System / Project Management: the word system to connote technical skills and the word project to connote acquisition knowledge. This is a two week course to prepare midlevel acquisition personnel for beginning responsibility in international programs. It is last in a series of four two-week courses comprising a training program on German defense acquisition roughly equivalent to DSMC's 20-week Program Management Course. The official policy of the Federal Academy is that one should have taken the other three courses prior to taking the international course.

# PARALLELS WITH THE PRIVATE SECTOR AND THE ROLE OF ACADEMIA

The roles of government and industry in armaments collaboration are quite different, but the roles of government and industrymay be mutually supportive.[15] The government role is to establish the framework for collaboration with allied or friendly governments through an agreement normally called an international Memorandum of Understanding. The industry role is to develop and the roles of government and industry in armaments collaboration are quite different, but may be mutually supportive.[15] The government role is to establish the framework for collaboration with allied or friendly governments through an agreement normally called an international Memorandum of Understanding. The industry role is to develop and produce the defense product, while realizing an adequate profit. The private sector therefore focuses on international business, and the training of international business managers. Much has been written about this business training[16 17 18] but there is little which is directed toward defense officials.

There are some parallels between the efforts at the Defense Systems Management College in international training for defense officials and what is occurring in the private sector. A recent article in the *Training and Development Journal*[19] presents a statement that "most business leaders say that intercultural skills training is essential, but few do anything about it." Citing a survey 55 presidents and chairpersons of *Fortune 500* firms, all agreed that " most business firms (domestic as well as multinational) will be directly or indirectly affected by economic and political developments in the international scene. Businessmen will therefore need to understand and anticipate these efforts." However, another survey of multinational U.S. companies indicated that only 12 percent of U.S. firms said they offered seminars and workshops on cross-cultural aspects of doing business in foreign countries. This dismal picture was reinforced by a more recent article in the *Management Development Report.*[20] An executive survey reported that 40 percent of respondents said that international business is currently a significant part of their overall business, and 60 percent reported that international business will increase over the next three years. However, the article further stated " numerous studies report that 70 percent of American business people who are sent abroad are given no advance training or preparation." Regrettably, no similar set of statistics exists for international acquisition personnel in the government.[21] There may be no need for such statistics if one believes that defense acquisition personnel respond to governmental policy, rather than market forces. Defense policy had been determined in the past primarily by our national security interests. Recent trends in business globalization suggest that the way DoD approaches acquisition may become more influenced by economic forces, both domestic and international.

Academia is responding to the international needs of business either by more integration of international aspects into basic classes or increasing specifically international courses. The situation and trends in academia are well summarized in a recent article in *North America International Business.*[22] There are varying approaches taken which are exemplified by certain universities.

The fully internationalized approach has an international component to all courses, a focus on international research, and overseas visits and exchange programs. This is ex-

emplified by the University of Pennsylvania's Wharton School of Business and the American Graduate School of International Management in Glendale, Arizona. No government institution utilizes this approach for armaments cooperation education or training.

The approach of adding international courses to a basically American program is becoming more and more common The George Washington University's associate Educational Services Institute offers two courses which are directly related to armaments collaboration: one on international contracting and the other on offsets.[23] This is the approach favored by the government educational institutions as well

Another approach is to focus on international research. The Harvard University's John M. Olin Institute for Strategic Studies is vigorously pursuing research in armaments collaboration (this volume being an excellent example), and is the only university known to be active in studying the government aspects of collaboration. However, they do not as yet offer courses on this subject.

The Defense Systems Management College is the only educational institution known to combine their courses in international armaments collaboration with an international research program.

There is a new Congressional requirement for the Secretary of Defense to establish a Defense Acquisition University structure (to include the Defense Systems Management College). [14] The purpose will be to provide professional educational development and training for the acquisition work force, and to perform research and analysis of defense acquisition policy issues from an academic perspective. This new Defense Acquisition University will be the Department's senior level institution for acquisition education, and as such will provide a senior course for personnel serving in critical acquisition positions. The implementation of this is governed by a board created by the Under Secretary of Defense for Acquisition in November 1990.[25] At the time of this writing, little is known regarding the specifics of the integration of international acquisition considerations into the senior course. However, it is known that these considerations are being addressed in the preliminary planning documents. One can only hope that the international acquisition considerations will exceed the anemic one percent found in the current 20-week intermediate level course for program management education and training. The "Defense Acquisition Work Force Improvement Act" requires the Secretary of Defense to submit an implementation plan to Congress by October 1, 1991, and to implement that plan by August l, 1992.

## THE FUTURE

The future will pose a number of challenges in the training and education of defense officials.

- There will be a need for integrating international aspects into all basic domestic acquisition courses, especially those of the newly created Defense Acquisition University.

- There will also be a clear need for more, mid-level international courses. Specifically, three opportunities stand out:

1 A course on technology transfer, defense product export control and international security.

2 A course on the government aspects of international defense business management, particularly focusing on

* contractual aspects
* financial aspects
* licensing arrangements, and
* offset agreements

3 A course on allied nation processes for

* defense acquisition
* decision making
* contracting
* funding
* taxation

- A brief executive level offering also might be useful for senior personnel who have recently became part of the international process, or wish to be refreshed on current topics.

- All of the above should be combined with the Defense Systems Management College's existing baseline Multinational Program Management Course and advanced courses/workshops, such as the Advanced International Management Workshop, into a complete international acquisition management curriculum including a certification program in international defense acquisition. This could be used to supplement the training and education of our emerging domestic acquisition corps.

# ENDNOTES


1. Memorandum from the Secretary of Defense, Subject: Emphasis on NATO Armaments Cooperation, June 6, 1985.
2. Memorandum from the Secretary of Defense, Subject: NATO Cooperative Projects, January 28, 1986.
3. *Multinational Program Management Survey Report*, Richard Kwatnoski, DSMC internal document, August 1987.
4. Public Law 99-145, Section 1103 of the DoD Authorization Act,"Cooperative Research and Development." November 8, 1985.
5. FY 1987 Defense Authorization Act, section 1105, "Cooperative Research and Development with Major Non-NATO Allies."
6. Public Law 99-83, Section 115, Amendment to the Arms Export Control Act, entitled: "North Atlantic Treaty Organization Cooperative Projects." 1985.
7. Public Law 99-145, Section 1102, FY 1986 DOD Authorization Act, entitled: "Acquisition of Defense Equipment Under North Atlantic Treaty Organization Cooperative Projects."
8. Public Law 99-661, Section 1103, Pu 1987 Defense Authorization Act, "Cooperative Projects.
9. *Multinational Program Management Questionnaire Report*, Michael G. Krause, DSMC internal document, May 1989~
10. *Bonn Seminar on Armaments cooperation, proceedings, co-sponsored by DSMC, the Royal Military College of Science, and the Federal Academy of Defense Administration and Technology, July 17-21, 1989.*
11. Interviews conducted by LtCol C. Michael Farr, USAF, unpublished, circa summer 1989.
12. "Educational Initiatives in International Armaments" *Program Manager Magazine*, Richard Kwatnoski, January-February 1990
13. "Educational Initiatives in International Armaments Cooperation by the Defense Systems Management College," *The DISAM Journal of International Security Assistance Management*, Richard Kwatnoski, Spring 1989.
14. "DSMC Launches New Workshop in International Acquisition Management," *National Defense*, April 1990
15. This mutual support has varied considerably over the years. Current thinking within the Executive Branch is supportive of most defense sales to allied and friendly nations.
16. "Culture Shock," *Training & Development Journal*, Jean McEnery and Gaston DesHarnais, April 1990.

17. "The Key to Expatriate Success," *Training & Development Journal,* Gary W. Hogan and Jane R. Goodson, January 1990.

18. "Multinational Corporate Policies for Expatriate Managers: Selection, Training, Evaluation," *SAM Advanced ManaGement Journal,* Dr. Gurudutt M. Baliga and Dr. James C. Baker, Autumn 1985.

19. "Preparing the New Global Manager," *Training and Development Journal,* Madelyn R. Callahan, March 1989.

20. "Why Aren't American Firms Training for Global Participation?" *Management Development Report,* Marcia Kirkpatrick, editor, Summer 1990.

21. The term "acquisition" in the defense department refers to the research, development and procurement of defense systems. Acquisition personnel are therefore analogous to business personnel in the private sector.

22 ." The Making of a Global Manager," *North American Business,* Patricia M. Carey, June 1990.

23. Offsets are industrial and commercial compensation practices offered or demanded in connection with the purchase of defense goods and services.

24. Public Law 101-510, FY 1991 Defense Authorization Act, "Defense Acquisition Work Force Improvement Act."

25.. "Defense Acquisition University Coming," *National Defense,* J. Gerald Land, January 1991.

## Summary of Past Surveys
### Armaments Cooperation

- August 1987—155 Past Graduates of MPMC
- May 1989—300 PMOs, Selected DoD Personnel, and Lonmdon Seminar Attendee
- July 1989—Committee of Participants in Bonn Seminar on Armaments Cooperation

Table J-1

## Course in International Armaments Cooperation

| COURSE TITLE | INSTITUTION | LOCATION | LENGTH(WEEKS) | NO/YR |
|---|---|---|---|---|
| Multinational Program Mgmt | DSMC | Wash., D.C. | 1 | 3 |
| | | Huntsville, AL | 1 | 1 |
| | | Boston, MA | 1 | 1 |
| | | Europe | 1 | 1 |
| Advanced Intl Mgmt Workshop | DSMC | Wash., DC | 1 | 3 |
| Mgmt of Intl Projects | RCMS | Shrivenham, UK | 1 | 3 |
| EURO/NATO Wpns Systems Mgmt | IABG | Munich, GE | 2 | 1 |
| Intl Systems/ Project Mgmt | FADA&T | Mannheim, GE | 2 | 4 |

February 1991

Table J-2

| International Acquisition Course Model | | |
|---|---|---|
| **Advanced** | | |
| **Workshops** | | **Executive** |
| **AIMW*** | | **•Seminars<br>•Refreshers** |
| **Mid-level** | | |
| **Technical** | **Business** | **Policy** |
| **•Tech transfer<br>•Eport control<br>•Intl security & forieign disclosure** | **•Contractural<br>•Financial<br>•Licensing<br>•Offsets** | **(Allied nation processes)<br>•Defense acquisition<br>•Decision making<br>•Contracting<br>•Funding<br>•Taxation** |
| **Basic** | | |
| **MPMC*** | | |
| **•Policy (SD/service)<br>•Programs<br>•NATO/non-NATO<br>•OGA roles** | | |
| ***Existing courses** | | |

**Table J-3**

## APPENDIX K

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