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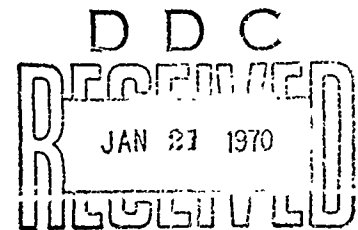
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FOREIGN
MILITARY SALES:
UNITED STATES
INVOLVEMENT
IN
COPRODUCTION
AND
TRENDS TOWARD
CODEVELOPMENT



A STUDENT THESIS BY:

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202

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FOREIGN MILITARY SALES: UNITED STATES INVOLVEMENT IN
COPRODUCTION AND TRENDS TOWARD CODEVELOPMENT

A Thesis

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Logistics Management

By

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August 1969

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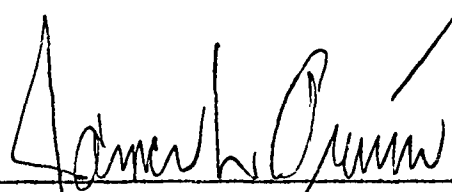
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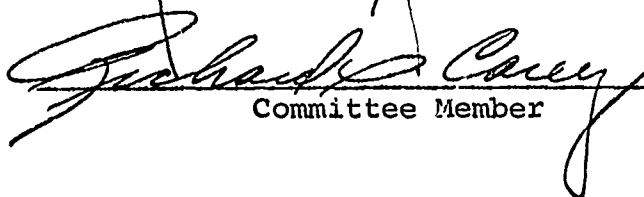
and approved in an oral examination, has been accepted by
the undersigned on behalf of the faculty of the School
of Systems and Logistics in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

Date: 20 August 1969



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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	v
LIST OF TABLES	ix
LIST OF CHARTS	xi
Chapter	
I. INTRODUCTION	1
Problem Statement Definition of Coproduction and Codevelopment Background Study of Coproduction/Codevelopment	
II. A STUDY AND ANALYSIS OF "COORDINATED" PRODUCTION	25
General The M-113 Coproduction Project Analysis of the M-113 Coproduction Project Synopsis of Other Coordinated Production Programs	
III. A STUDY AND ANALYSIS OF "COOPERATIVE" PRODUCTION	45
General The F-104 Coproduction Project Analysis of the F-104 Coproduction Programs Summary of Cooperative Production	

IV. U.S. INDUSTRY'S ROLE IN COPRODUCTION/ CODEVELOPMENT	79
Questionnaire to U.S. Industry	
Licensing Coproduction	
Transfer of Technology	
Barriers to U.S. Industry's Participation in Coproduction/Codevelopment	
V. FUTURE OF INTERNATIONAL WEAPONS PRODUCTION. . .	117
General	
Current Government Views on Foreign Military Sales	
Market Potential	
Complexity of the U.S. Foreign Military Sales Program	
Growing Competition in the International Arms Market	
U.S. Coproduction Efforts	
Foreign Arms Competition	
The Proposal of a Common Defense Market	
International Weapons Development Efforts	
VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . . .	179
Summary	
Conclusions	
Recommendations	
BIBLIOGRAPHY	187
BIOGRAPHICAL SKETCHES OF THE AUTHORS	199

LIST OF TABLES

Table	Page
1. Military Assistance Authorization Legisla- tion for Fiscal Years 1950-1964	6
2. International Receipts and Payments of Royalties from 1957 to 1966	108

LIST OF CHARTS

Chart	Page
1. Types of Foreign Aid	7
2. M-113 Italy Coproduction Project Annual Gold Flow to the United States	35
3. M-113 Italy Coproduction Project Cumulative Gold Flow to the United States	36

CHAPTER I

INTRODUCTION

Since World War II, the United States' allies throughout the world have become progressively stronger--militarily and economically. The resulting increase in stability among the various nations of the Free World is producing changes in the attitudes of the people of these countries and changes in the relationships between the governments of the countries and the United States. One of the most significant areas in which these changes are increasingly evident is in the field of Military Assistance.

The United States was able, at one time, to direct what countries would receive the arms considered to be in their best interests--and in the best interests of the United States. This was the prerogative granted a sole supplier of arms. No longer does the United States enjoy this unquestioned superior position--being faced with either competing with other arms suppliers or relinquishing its role in the international arms market.

Problem Statement

The various management practices and decisions employed by the agencies involved in the Foreign Military Sales function have been and continue to be inconsistent with trends toward multi-national cooperation in developing and producing weapon systems. These inconsistencies may prove to be resulting in less than optimal benefit to the United States and/or foreign governments. Therefore, this thesis will address the international arms situation, particularly in the area of coproduction/codevelopment ventures. Specific attention will be focused on the management procedures and attitudes in the Department of Defense (DOD) and in United States industry and their resulting impact on the countries involved in these joint ventures.

Definition of Coproduction and Codevelopment

Since the terms, coproduction and codevelopment, often mean different things to different people, their meaning in the context of this thesis is delineated as follows:

Coproduction.--Coproduction may be classified into two different categories, coordinated and cooperative production. The first type, coordinated production, is the interchange or transfer of manufacturing technology in which the United States, as developer of a weapon system, provides data,

technology, and other assistance to enable a foreign manufacturer to produce the system. In this case there are no appropriated funds from the United States. (76:11)* An example of this type of coproduction is the M-113 armored personnel carrier program discussed in Chapter II of the thesis.

The second type, cooperative production, is the sharing of production of the weapon system in which both the United States and the foreign nation(s) jointly participate in the manufacturing of the parts, the assembling of the final product, and the providing of funds and facilities to allow the program to be carried out. (76:11) The largest coproduction program of this type, the F-104 aircraft project, is discussed in detail in Chapter III of the thesis.

Codevelopment.--For purposes of this thesis, codevelopment (synonymous with cooperative development) is considered to be an international sharing of research and development (R&D) costs. Codevelopment, if successful, may eventually lead to cooperative production. This distinction between codevelopment and coproduction is important, because many view cooperative development as being much more complex than

*The numbers in parentheses refer to the Bibliography. The first number indicates the source and the second indicates the pages.

it really is, misunderstanding the meaning and purpose of the arrangement. The intense dislike often accorded cooperative development by people involved in the coproduction and sales business may, in part, be attributed to the lack of understanding of what it is and how it operates. Chapter V cites two examples of cooperative development--the U.S./West German V/STOL and the U.S./West German MBT-70.

Background

Foreign aid has evolved as a series of responses to specific challenges. It may be viewed as a tool of diplomacy with three roles to play. First, foreign aid serves to create or dramatize a symbolic American "presence" abroad. Second, it is used as a compensatory device in exchange for international favors. Third, it is used to introduce or influence changes in other countries. Foreign aid is hardly ever a simple, unified program; rather it is a complex instrument of national policy and domestic politics. (71:321-23)

Foreign aid may be in the form of economic aid or military assistance. Although the main concentration of this thesis is on the latter, it should be noted that economic aid had an earlier beginning than military assistance--in 1812 a shipment of grain was given to Venezuela to help it recover from a disastrous earthquake. (71:324)

The military assistance being provided by the United States to allied countries plays an important role in this nation's foreign policy. Distinguished from the other forms of foreign aid, its name implies its nature--providing aid to friendly allied and selected nonaligned nations of the world. The budgets authorized for military assistance from 1950 to 1964 are shown in Table 1. Note that only in 1951 was the total amount authorized equal to that originally requested by the Executive Branch. The trend toward reduction of military assistance is illustrated by the budget request in FY 1968 of only \$596 million. Obviously, much of the reduction may be attributed to politically more pressing domestic needs, but other-than-domestic reasons for the reduced budget include: (1) the discontinuance of military aid to Western Europe; (2) the transfer of NATO funds outside of this budget; and (3) the transfer of military assistance costs for Laos and Thailand to the military budgets. (62:155)

As shown in Chart 1, military assistance may be classified into three major categories--grant aid, foreign military sales, and cooperative logistics. Grant aid is that part of military assistance in which the United States provides military equipment, hardware, and services to countries who, due to their economic instability, cannot pay for this

TABLE 1

MILITARY ASSISTANCE AUTHORIZATION LEGISLATION
FOR FISCAL YEARS 1950-1964

(Millions of dollars)

Fiscal Year	Executive Branch Request	Passed By House	Passed By Senate	Authorization
1950	1,400.0	819.5	1,314.0	1,314.0
1951	5,222.5	5,222.5	5,222.5	5,222.5
1952	6,303.0	6,013.0	5,976.0	5,997.6
1953	5,425.0	4,596.0	4,600.9	4,598.4
1954	4,274.5	3,581.5	3,781.5	3,681.5
1955	1,778.3	1,751.3	1,613.3	1,591.0
1956	1,595.2	1,450.2	1,595.2	1,450.2
1957	2,925.0	1,925.0	2,525.0	2,225.0
1958	1,900.0	1,500.0	1,800.0	1,600.0
1959	1,800.0	1,640.0	a	1,605.0
1960	1,600.0	1,440.0	1,300.0	1,400.0
1961	b			
1962 ^c	1,885.0	1,800.0	1,550.0	1,700.0
1963	d			
1964	1,405.0	1,000.0	1,000.0	1,000.0

^a The Senate consolidated military assistance and defense support.

^b With respect to military assistance, the Mutual Security Act of 1959 (PL 86-108), approved 24 July 1959, states: "There is hereby authorized to be appropriated to the President for the Fiscal Years 1961 and 1962 such sums as may be necessary from time to time to carry out the purposes of this chapter, which sums shall remain available until expended."

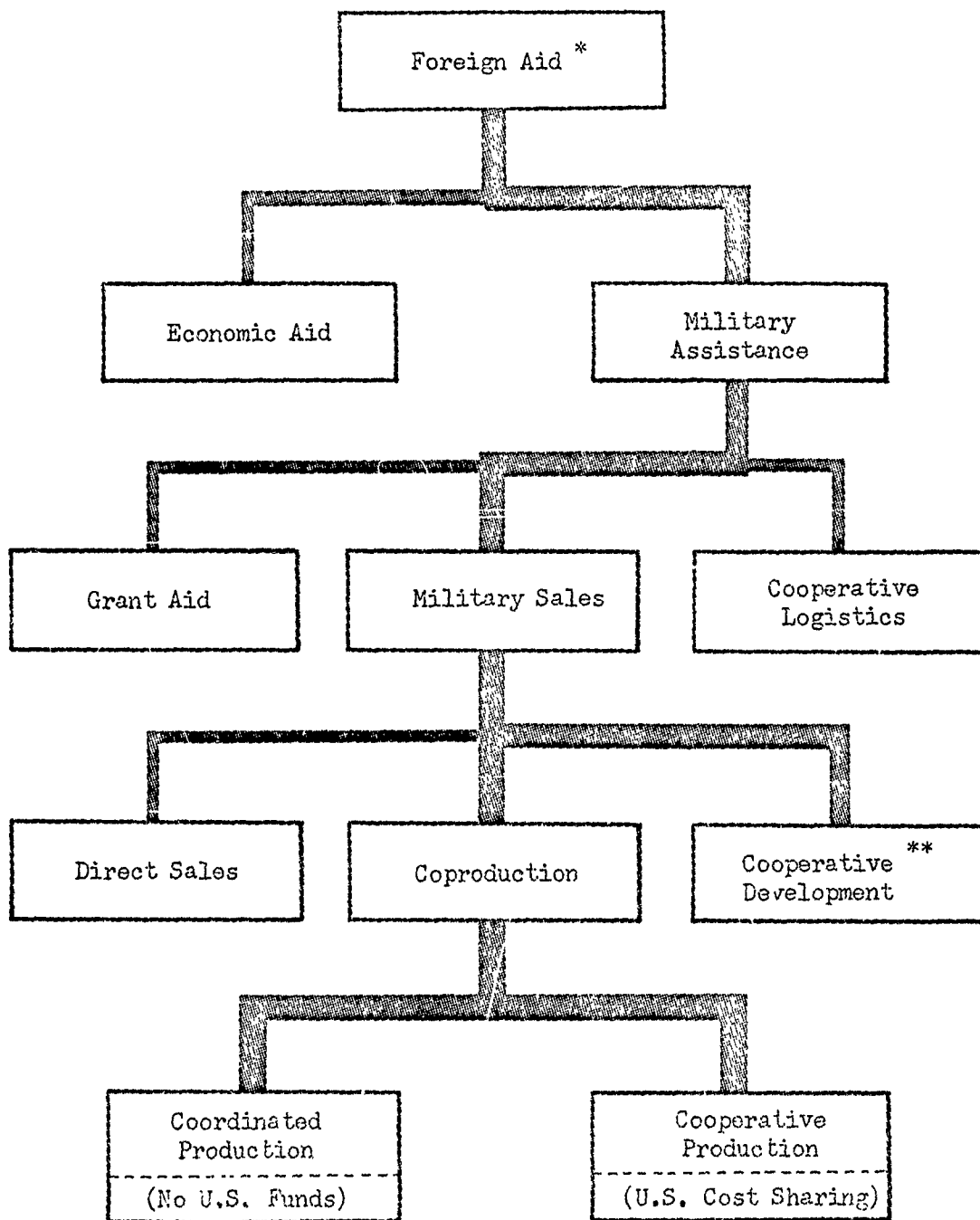
^c Excludes "Special Authority" in the amount of \$400.0 million executive branch request, \$200.0 million passed by the Senate, and \$300.0 million authorized by PL 87-195.

^d Foreign Assistance Act of 1961, as amended, authorized \$1,700.0 million and an extension of \$300.0 million "Special Authority" was granted in Fiscal Year 1962.

Source: Heintzelman, Warren C. "The Administration and Operation of the U.S. Military Assistance Sales Program." Industrial College of the Armed Forces thesis, 1965.

CHART 1

TYPES OF FOREIGN AID



* This chart of U.S. Foreign Aid is not meant to depict the organizational structure of the agencies designated to carry out such programs, but rather it is meant to illustrate the various types of Foreign Aid.

** Cooperative development may lead to cooperative production.

assistance. Foreign military sales (FMS), on the other hand, is the program in which countries purchase military equipment, hardware, and services from the United States. Cooperative logistics is the providing of logistical support to foreign governments for those items of equipment and hardware furnished under military assistance and for which reimbursement is made to the U.S. Government.

Historical Perspective

The general scope and nature of military assistance and, more directly, the function and role of coproduction/codevelopment as a part of the military sales program may be understood better by reviewing the history of these programs.

Lend-Lease Program.--The beginning of contemporary military assistance was marked by the lend-lease of fifty destroyers to Great Britain in exchange for base rights in British territories in the Western Hemisphere. By the end of World War II, the value of similar military assistance programs conducted by the United States exceeded \$48 billion.
(42:3)

Truman Doctrine.--The first peacetime foreign aid was signaled by the announcement of the "Truman Doctrine" on 12 March 1947 when President Truman told Congress, "It must be the policy of the United States of America to support free

people who are resisting attempted subjugation by armed minorities, or by outside pressure." (76:5-6) In May of 1947 an appropriation was made in the amount of \$400 million to assist Greece and Turkey, and similar assistance was provided to other nations of the Free World. (114:72) These first military assistance programs were in the form of grants rather than sales to the recipient foreign nations.

Mutual Defense Assistance Act.--In 1949, passage of the Mutual Defense Assistance Act provided a single enabling act for all military aid programs. The basis of this legislation was the determination of the United States to provide tangible support for the North Atlantic Treaty which this country had signed on 4 April 1949. On the strength of the provisions of this 1949 Act, the United States was permitted not only to provide military assistance as grants to the foreign governments but also to allow foreign countries to participate in purchasing military hardware, equipment, and services for the United States. (93:4) Thus commenced the second half of the military assistance program--the foreign military sales activities.*

*Also in 1949, the Point Four Program was initiated to offer American technical assistance to developing countries, since it was estimated that it would have cost these countries approximately \$19 billion per year, on their own, to achieve a two per cent increase in their national income. (71:326)

Mutual Security Act of 1951.--Unfortunately, the Mutual Defense Assistance Act of 1949 did not provide for effective, coordinated administration among the various governmental agencies responsible for carrying out the military assistance program. To correct this inadequacy, Congress passed the Mutual Security Act of 1951 which consolidated all of the foreign aid activities under a single administrator. The position of Director of Mutual Security was established within the Executive Branch with responsibility to manage the overall aspects of foreign aid programs. In turn, the Director assigned the actual administration and operation of military aid to the Department of Defense. (93:4-5)

Until 1951, military foreign aid had been supplied primarily from surplus or obsolete war reserve stocks remaining from World War II. However, the Korean War dissipated these stocks, requiring a complete review of the grant aid portion of the military assistance program in order to determine the number of commitments which the United States had made to various countries. A review was also made of the amount and types of sales commitments which the United States had negotiated with its allies. The purpose of these reviews was to determine the overall effect on the American military structure should these commitments be finalized.

Mutual Security Act of 1954.--The review of the military assistance program led to the enactment of the Mutual Security Act of 1954 which was, in reality, a supplement to the 1951 Mutual Security Act. The 1954 Act authorized the assignment of Department of Defense personnel, solely in advisory capacities, to assist the foreign governments in carrying out their programs. This provision was designed to help strengthen the military posture of the foreign nations and to assure that proper utilization of military aid was achieved. (75:17)

Official Recognition of Coproduction.--By the middle 1950s, Western Europe had made considerable economic progress and was in a position to assume a more significant and responsible role in actually developing military forces rather than merely relying on the United States to furnish the necessary military equipment. On 14 December 1956, Secretary of Defense Charles Wilson announced a policy whereby this country offered to supply designs and technical assistance on newer and more sophisticated weapon systems to certain Western European countries. The purpose of the policy was "to develop a coordinated production base in Europe for modern weapon systems." (67:6) This marked the beginning of a new form of the military sales program--coproduction. Some of the major programs to evolve from the

early coproduction ventures included the Hawk, the Bullpup, the Sidewinder, and the F-104 weapon systems.

Successes and Failures.--Before discussing coproduction and the even newer codevelopment programs, these successes and failures attributed to the military assistance program should be reviewed. The major successes since the close of World War II include the following:

1. Italy and Greece were saved from communism following World War II.
2. Russia was prevented from seizing control of the Turkish Straits.
3. The Middle East oil fields and Iran were saved from Russian domination.
4. Laos, Cambodia, and Nationalist China were saved from communist aggression.
5. Vietnam would have fallen to the communists.
6. NATO would not have been an effective force.

The major failures attributed to military assistance include the following:

1. There was a failure in separating long-range objectives from immediate problems, with resulting dilution of the desired impact of the overall aid program.
2. Cuba was lost to communism.
3. Cambodia's Western orientation was apparently lost.
4. Yugoslavia was not converted to the Western camp.

5. South Vietnam's armed forces were unable to maintain internal security without assistance from U.S. combat units. (79:21-23)

These listings are not meant to be comprehensive but only indicate that the Military Assistance Program has met with mixed results. Thus, recent cuts in the program indicate that many lawmakers apparently feel there is a lessening need for foreign military aid.*

Shifting Emphasis

Since 1961, the orientation of the military assistance program has been shifting away from grant aid and toward sales. The de-emphasis on grant aid is evident in the provisions of the Foreign Assistance Act of 1961 which is the statutory base for the current military sales program and replaces the Mutual Security Acts of 1951 and 1954, as amended. (42:5)

The emphasis given to military assistance in the 1961 legislation stresses the great importance of military sales as compared to grants of military assistance to U.S. allies. This act requires that the United States engage in foreign military sales to the greatest extent possible when such activities are in the best interests of the U.S. and not to continue to engage in military assistance grants when it is

*This information was obtained from DOD personnel.

within the capability of a foreign country to buy that assistance. (42:5)

The stated objectives of the foreign military sales program include the following:

1. Fostering an improved climate of political independence and individual liberty.
2. Improving the ability of friendly countries and international organizations to deter or, if necessary, defeat communist or communist-supported aggression.
3. Facilitating arrangements for individual and collective security.
4. Assisting friendly countries in maintaining internal security.
5. Creating an environment of security and stability in developing friendly countries through civic actions and other programs essential to ensure more rapid social, economic, and political progress. (89:1-1)

The importance of the military sales program was recognized in a statement before Congress in 1964 by Secretary of Defense Robert S. McNamara:

The sale of military equipment, supplies and services to other countries is of considerable importance to the United States at this time. First, it contributes to our economic well-being by providing jobs in this country. Second, the receipts from these sales help to reduce our adverse balance of payments; and--Third, the use of common equipment, supplies, and services helps to promote the continuing cooperation of U.S. and allied forces. (42:17)

The success of the foreign military sales program has generally been greater than originally predicted. By Fiscal Year 1966, the annual sales had reached \$1.9 billion, bringing the cumulative total, when added to commitments for arms from the United States, to \$11.2 billion income from foreign military sales--enabling the United States to offset about forty-five per cent of the cost of maintaining its forces overseas other than in Southeast Asia. (87:38) This purchase of military equipment and hardware also had an important effect upon the defense structures of the nations procuring the armaments in that it standardized the military forces throughout the Free World to a degree which could not have been achieved through other means.*

The U.S. Government's chief sales promoter, Henry J. Kuss, Jr., former Assistant for International Logistics, viewed the foreign military sales program in this light: "As far as I'm concerned we have achieved our basic goals' to strengthen U.S. allies, to promote cooperative logistics and to offset the balance of payments deficit caused by overseas deployments." (87:38) In fact, he terms the military export sales program as a "key element" in keeping U.S. forces abroad.

*This information was obtained from DOD personnel.

Study of Coproduction/Codevelopment

As the importance of the military sales program has increased in recent years, so, too, has the importance of joint arms programs such as coproduction and codevelopment. The latter types of military aid are particularly valuable to a country that has achieved economic recovery and wants to integrate a defense manufacturing capability into its economy but lacks the technical skills and resources to do so independently. (42:19)

While the Department of Defense has established a goal of \$1.5 to \$2.0 billion per year in military sales over the next three to five years, this target may be unrealistic. (87:38) As the allied countries continue to grow economically and militarily, they desire to become arms producers themselves--they want a "piece of the action" to increase their own industrial base, to increase their own capability to manufacture weapon systems, and to become a participant in the field of military sales. While these desires may represent a greater leap forward than many of the nations can achieve at this time, the United States cannot ignore these changing attitudes. Even though a country might presently lack the capability of entering into production of a major system, failure of the United States to recognize

these rising industrial and technological ambitions may lead the country to seek military assistance from sources unfriendly to the United States. Should this occur, the United States would not only be losing a customer but may likely be losing an ally.

Restatement of the Problem

In the face of these obvious international trends there appears to be a lack of understanding and preparation by the United States in the area of coproduction/codevelopment. The market of yesterday, which was grant aid and off-the-counter sales, is not the market of today, which is coproduction, nor of tomorrow, which is codevelopment. The danger to the United States lies in not recognizing the changing environment and making good managerial decisions fostering America's position as a competitor in this arms market.

Many influential people having the capability to implement the necessary changes in the United States' arms policies have failed to do so because of a lack of understanding of the growing importance of coproduction and codevelopment. They are not to be blamed, in many cases, because the information is not readily available to the casual observer. To become aware of the international trends, one must actively search for what little information is available on the

subject--talking to representatives of both industry and government within the United States and foreign countries, and, perhaps most importantly, talking with the international decision-makers who establish the policies under which everyone at the lower levels must operate.

This thesis, then, attempts to bring together much of this scattered information and show, by example where possible, the growing importance of coproduction/codevelopment in the international arms market. In the process, several misconceptions hampering the progress of American coproduction/codevelopment efforts shall be exposed in order to clear the way for a better understanding of the concepts involved.

Assumptions and Limitations

In conducting this research study, the following assumptions and limitations were made:

1. Political considerations, while recognized as playing a major role in coproduction/codevelopment programs, will receive very limited reference in this thesis.
2. Since a partial case study of the F-104 and the M-113 are to be used in gathering data, it is assumed that there are common "test points" that could be applied to each case study in the final analysis. "Test points" include economics/balance of payments, defense standardization, parts standardization, and technology.
3. It is assumed that the F-104 and the M-113 are representative examples of cooperative and coordinated coproduction, respectively.

4. No effort will be made to quantify the various areas of coproduction/codevelopment as in "evaluation," but rather, a close scrutiny and examination of the constituents of these areas will be made to arrive at an accurate prediction of the trends in the operation of these programs.

5. The subject of this thesis has been narrowed to primarily addressing the trend in international arms production; however, even within this area there are certain aspects which will not be discussed in detail in this thesis but will be mentioned in the recommendations for further study in Chapter VI.

Proposition and Research Questions

The main proposition is that international arms contracts have been lost, are being lost, and will continue to be lost by the United States until such a time as the United States is prepared to compete with foreign firms on an equal basis in the area of coproduction/codevelopment.

The following research questions have been developed to guide investigation of the proposition:

1. Does coproduction/codevelopment increase the availability of technology to the countries involved?
2. Does controlled standardization of coproduced/codeveloped military hardware improve interchangeability of parts on the end item of equipment?
3. Will specific coproduction/codevelopment programs reduce the net production/development costs to both countries as compared to a single, independent production/development program of the same system?
4. Do coproduced military weapon systems result in more flexible defense alliances?

5. Compared to direct military sales, does coproduction have a greater effect on reducing the balance of payments deficit?

6. Is American industry hampered in its international arms competition by unfavorable policies and regulations affecting coproduction/codevelopment programs?

7. Does the current organizational emphasis within the Department of Defense promote successful U.S. coproduction participation in view of the trend in foreign military sales?

Methodology

Interviews were held with personnel from both the Department of Defense and United States industry. Since the primary objective of the interviews was to gain additional insight into the problem area, in many cases a guarantee of anonymity was given to the interviewee in order to obtain his unhesitating response and uninhibited comments. Thus, in many places within the thesis where a citation would normally be expected, no reference is provided. In a subject of this sensitivity in which revelation of the sources of information might have serious consequences for those involved, this drawback is unavoidable. However, the possible benefits that may be derived from the information provided by this research study override slight deviations from scholastic protocol.

Interviews were not held with foreign officials and foreign industry representatives. Their comments would have been valuable, since this is the "other side of the coin" that should be researched to provide a total picture of the subject area. Unfortunately, time did not allow the examination of this data source directly; instead, the authors relied on the accuracy and timeliness of news articles to show the foreign side of the subject area.

A questionnaire was used to solicit comments from American industry in regard to foreign military sales. The major companies that were known to participate in defense contracting were selected for the inquiry. Since no questionnaire could be sufficiently comprehensive to cover the entire subject area without a loss in percentage of responses, interviews were used to supplement the questionnaires. Again, the specific sources of information must remain anonymous to protect their businesses from possible financial repercussions. The results of this questionnaire will be discussed in Chapter IV.

The F-104 Starfighter and the M-113 armored personnel carrier programs were selected as examples of coproduction ventures because each was the first and largest major program in its respective category of coproduction--cooperative production for the F-104 and coordinated production for the

M-113. And, although cooperative development is so new that no major weapon system has been completely phased through a program at this time, the MBT-70 tank and V/STOL aircraft are discussed in Chapter V as examples of the increasing trend toward codevelopment.

In summary, the information contained in this thesis was obtained from interviews with representatives from both industry and government, from responses to questionnaires sent to firms engaged in defense contracting, and from extensive library research conducted by the authors. The bulk of the information presented in this introduction, Chapter I, was obtained from the library research as well as the personal interviews. The discussion of the M-113 armored personnel carrier coordinated production program in Chapter II and the F-104 aircraft cooperative production program in Chapter III were based primarily on information obtained from documented sources and from private interviews. The Chapter IV discussions were based primarily on the authors' interpretation of responses to the questionnaires sent to companies engaged in defense contracting, and secondarily on documented sources and personal interviews. The trends toward the future, discussed in Chapter V, were based, for the most part, on the conclusions drawn by the authors from

the collected data. And, of course, the summary, conclusions, and recommendations presented in Chapter VI were a logical consequence of the authors' research efforts.

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CHAPTER II

A STUDY AND ANALYSIS OF "COORDINATED" PRODUCTION

General

The two types of production--coordinated and cooperative production--defined in the previous chapter will now be discussed and the impact upon the Foreign Military Sales program analyzed so these international weapon production ventures can be more fully understood and appreciated. The major requirements and necessary actions for establishing coproduction programs will be reviewed, the magnitude of such projects will be presented, and the benefits--both to the United States and to the foreign country or countries involved--will be examined.

As examples typical of the coordinated production programs, a number of successful projects could be discussed--such as the M-113 armored personnel carrier, the UH-1D helicopter, the M-60-A1 tank, or the M-109 self-propelled howitzer projects. However, for the purpose of this research, the M-113 armored personnel carrier has been selected for study, with other coordinated production programs

being but briefly alluded to throughout the subsequent analysis. The M-113 coproduction program was selected because of two principal reasons: (1) it is the first coordinated production effort entered into by the U.S. Army, and (2) this program represents the largest coproduction arrangement with the U.S. Army.

The M-113 Coproduction Project

In late 1962 the Italian Government approached the United States Government with a proposal to enter into the production of the U.S.-designed M-113 armored personnel carrier, being manufactured for the Army at that time by the Food Machinery Corporation (FMC). The Italian proposal, subsequently approved by the U.S. Government, led to the first coordinated production agreement made by the U.S. Army. Italy's requirement for armored personnel carriers was initially set at 4,000 vehicles. Of this number, the first 1,000 vehicles were to be purchased directly from the United States with the remaining 3,000 vehicles to be coproduced in Italy. (91:1)

Objectives of the Participating Countries

The Italian Government was interested in the M-113 coproduction effort for four basic reasons:

1. to improve its economy,
2. to reduce unemployment,
3. to improve its technology, and
4. to gain a competitive advantage; i.e., entering into the field of manufacturing tracked vehicles would place Italy in contention for producing larger vehicles such as tanks. (76:28)

So far as the U.S. Department of Defense was concerned, this international weapon production effort was designed:

1. to promote foreign military sales,
2. to achieve maximum standardization of NATO equipment, and
3. to assist the U.S. in reducing its balance of payments deficit. (44:59)

Each of these reasons for both the United States' and Italy's considering the coproduction project is significant and will be more closely examined in the later analysis in this chapter.

Coproduction Agreements/Arrangements

The Army Materiel Command (AMC), designated to carry out the directives of the Department of Defense in connection with the proposed coproduction program, began negotiating the Memorandum of Understanding with the Italian Government in December 1962. The Memorandum, signed on 12 February 1963 by Roswell Gilpatric, Deputy Secretary of Defense, and Giulio Andreotti, Minister of Defense of Italy, (94:B-1)

outlined the principal areas of concern to the two governments. This agreement, describing the coordinated production of the M-113 armored personnel carrier on a progressive basis for use by the Italian Armed Forces only, covered such details as:

1. Specifying what items were to be managed and outlining the responsibilities of the parties to the agreement.
 2. Establishing decision levels for the settlement of disputes and establishing channels of communications.
 3. Providing legal protection for proprietary rights, patents, and royalties for the United States manufacturer--FMC Corporation.
 4. Delineating the parameters of the program with respect to third countries.
 5. Placing restrictions on the use and dissemination of technical data.
 6. Fixing responsibilities for control of the manufactured item (covering such aspects as changes and modifications, quality assurance, requirements for interchangeability, U.S. specifications, U.S. approval of proposed engineering changes, etc.).
 7. Determining the number of vehicles to be coproduced.
 8. Determining the amount of funds to be spent by the Italian Government in the United States for machine tools, equipment, components, engineering and support services, licenses, etc..
 9. Outlining other important aspects, such as services to be rendered by the U.S. military department concerned (in this instance the Department of the Army), and the method of reimbursement for such services.
- (25:4; 76:29)

Subsequent to the signing of the Memorandum of Understanding, technical agreements between the United States manufacturer, Food Machinery Corporation, and the Italian companies involved in the coproduction program were negotiated. The government-to-government memorandum served as an "umbrella" for the follow-on industry-to-industry agreements between FMC Corporation and the Italian coproducers--OTO-Melara, Fiat, and Lancia. The Italian Government had selected OTO-Melara in La Spezia as the primary assembly plant, while the Fiat Company in Turin and Lancia in Bolzano were selected to produce some of the M-113 major components. (42:25)

The purpose of the technical arrangements between the American and Italian industries was "to insure the production of a high-quality vehicle, on schedule, at an economical price." (1:648) Under the terms of the arrangements, FMC Corporation was to provide production know-how and act as the agent to supply the Italian coproducers with M-113 components and supplies as necessary. More specifically, FMC Corporation was obligated to provide the Italian coproducers with:

1. The initial increments of parts and components, at the commencement of the program, required to assemble approximately the first 200 vehicles in Italy.

2. All of FMC Corporation's M-113 know-how requested by the Italian coproducers. (Such know-how included all of the processes, techniques, drawings, specifications, and all other information and data relating to the materiel, production, manufacture, inspection, and testing of all operations of the M-113 and its parts and components.)

3. The technical advice and assistance necessary for the assembly or manufacture of the M-113, its components, and spare parts, by the coproducers. (94:C-1)

The provisions of both the government-to-government and the industry-to-industry agreements established controls to insure that the Italian-produced carriers were of appropriate quality and that maximum interchangeability of parts would be achieved between the vehicles manufactured in the United States and those produced in Italy. Project management officers were established in both the United States and Italy to administer these controls. Further assistance was provided by representatives of the U.S. Army Tank-Automotive Center at Warren, Michigan, and the Food Machinery Corporation of San Jose, California, which provided the Italians documentation, technical and engineering assistance, quality assurance, inspection and test, and field service support at OTO-Melara in its La Spezia plant. (91:3)

Phased Production of the M-113 Vehicle

The United States/Italian arrangement for the M-113 project consisted of a two-part, three-phase program. The

first 1,000 vehicles were purchased outright by Italy through the Foreign Military Sales program, with the remaining 3,000 vehicles constituting the coordinated production portion of the arrangement. It is within this coproduction portion that the three-phase agreement was developed.

Phase I.--Beginning in December 1963, 200 vehicles were to be assembled in Italy with the United States furnishing all of the M-113 components.

Phase II.--Beginning in July 1964, 300 vehicles were to be assembled using Italian-produced hulls and some parts manufactured by Italian companies, with the balance of the necessary items furnished by the United States.

Phase III.--Beginning in February 1965, the final 2,500 vehicles were to be produced in Italy by the most economical combination of Italian and U.S. manufactured components. This final phase involved the production in Italy of the maximum number of components of the M-113 armored personnel carrier, although there were certain components which were deemed uneconomical to be produced in Italy because of the limited quantity required compared to the high cost of manufacture. (94:D-1; 91:3-4)

Analysis of the M-113 Coproduction Project

Having completed a description of the M-113 coproduction program, the specific advantages and results of this project will be examined to determine if the original objectives of both countries in entering the agreement were actually realized.

Benefits Derived by the United States

Among the objectives stated by the United States for engaging in the M-113 coproduction program were the promotion of foreign military sales, alleviation of gold flow problems, and standardization of NATO equipment. The following analysis indicates that the program was quite successful from the American viewpoint.

Promotion of the Foreign Military Sales Program.--Since coproduction programs are a part of the overall Foreign Military Sales program, any effort on the part of foreign governments to manufacture U.S.-designed military weapon systems naturally promotes foreign sales. However, the U.S./Italian M-113 program served the Foreign Military Sales promotion in two ways. First, the provision for the initial buy of 1,000 armored personnel carriers from the United States provided an avenue for the direct sale of the M-113 vehicles to the Italian Government. Second, the

program promoted the military sales phase of foreign assistance through the actual coproduction venture itself.

Improvement of the Balance of Payments Problem.--The objective of the promotion of Foreign Military Sales and the objective of improving the United States' balance of payments problem are, by nature, related. There is no question that the direct purchase of 1,000 armored personnel carriers by Italy contributed measureably to reducing the drain of gold from the United States. However, the more pertinent question is "did the coordinated production of the M-113 system contribute to reducing the gold flow from the U.S.?"

The total value of the M-113 program was originally estimated at \$120 million. The government-to-government and industry-to-industry agreements provided that an average of fifty per cent or more of the costs of components, sub-assemblies, and materials required to manufacture and/or assemble the M-113 vehicles be purchased in the United States. However, this arrangement was subsequently amended to provide for a minimum of \$30 million to be spent in the United States. (91:3) The coproduction arrangement was further amended increasing the quantity of M-113 vehicles to be produced by Italy from 3,000 to 3,600, thus increasing the value of the

program by \$24 million for a total value of \$144 million.

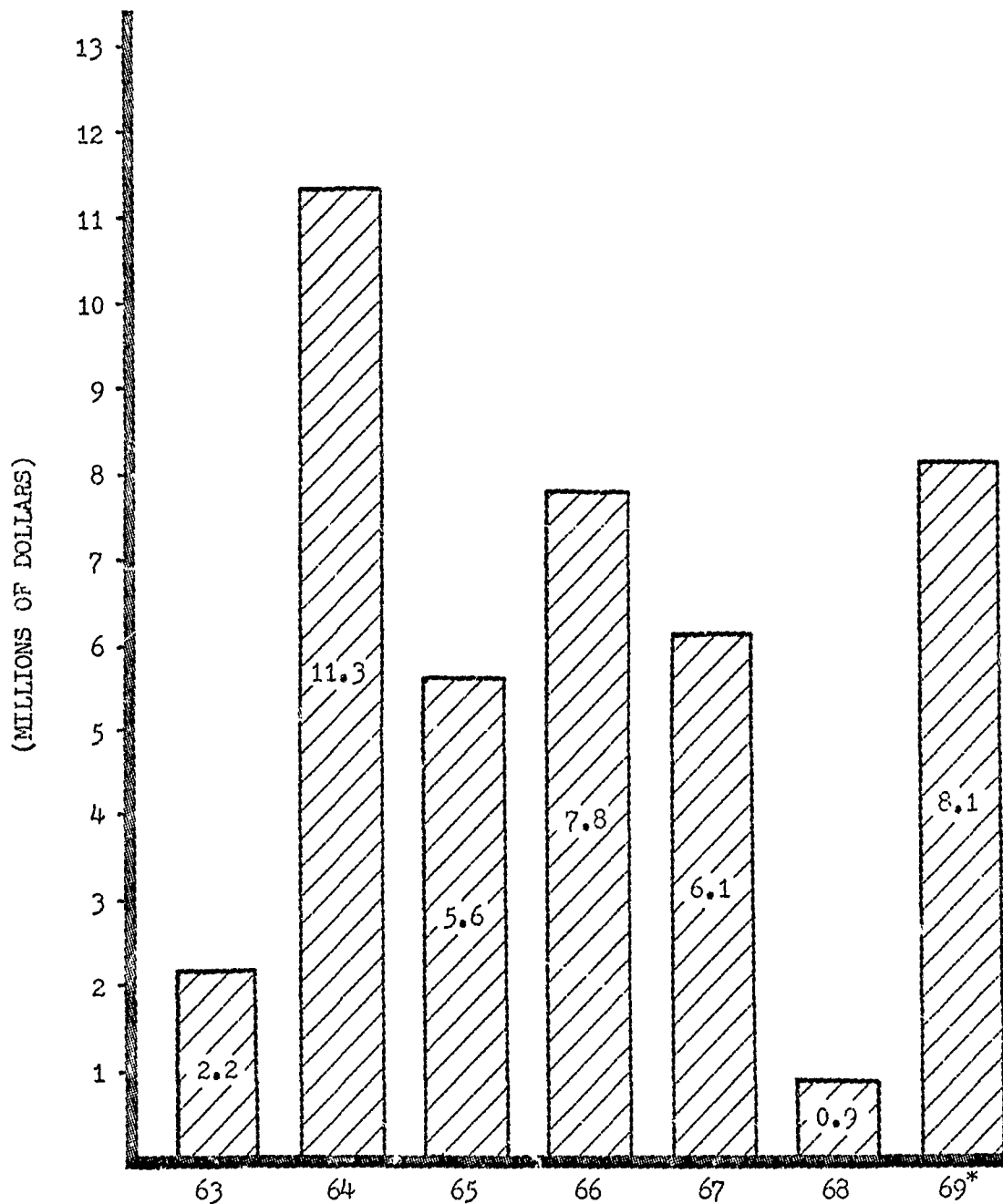
(92:2.6)

By 30 June 1967, reverse gold flow to the United States had exceeded by \$2 million the \$30 million target established by the coproduction agreement. Total annual expenditures by the Italian Government through 30 June 1968 exceeded \$33 million. (91:4) It is estimated that the total expenditures in the United States through 1969 will be \$42 million. With 2,651 vehicles having been accepted by the Italian Army as of 31 December 1968, thus leaving nearly 1,000 vehicles remaining to be manufactured, it is quite possible that the final funds expenditure in the United States will exceed the estimated \$42 million target. (92:2.6) Charts 2 and 3 summarize the funds spent in the United States by the Italian Government for supplies, components, etc., for the M-113 coproduction project. (91:4.2)

This review of the amount of funds spent, or estimated to be spent, in the United States as a result of the Italian M-113 coproduction effort indicates the beneficial effect of the program on the U.S. balance of payments deficit. Not only will the United States benefit from coproduction of the 3,600 vehicles by Italy, but also from the continued support of these vehicles required so long as the weapon system

CHART 2

M-113 ITALY COPRODUCTION PROJECT
ANNUAL GOLD FLOW TO THE UNITED STATES

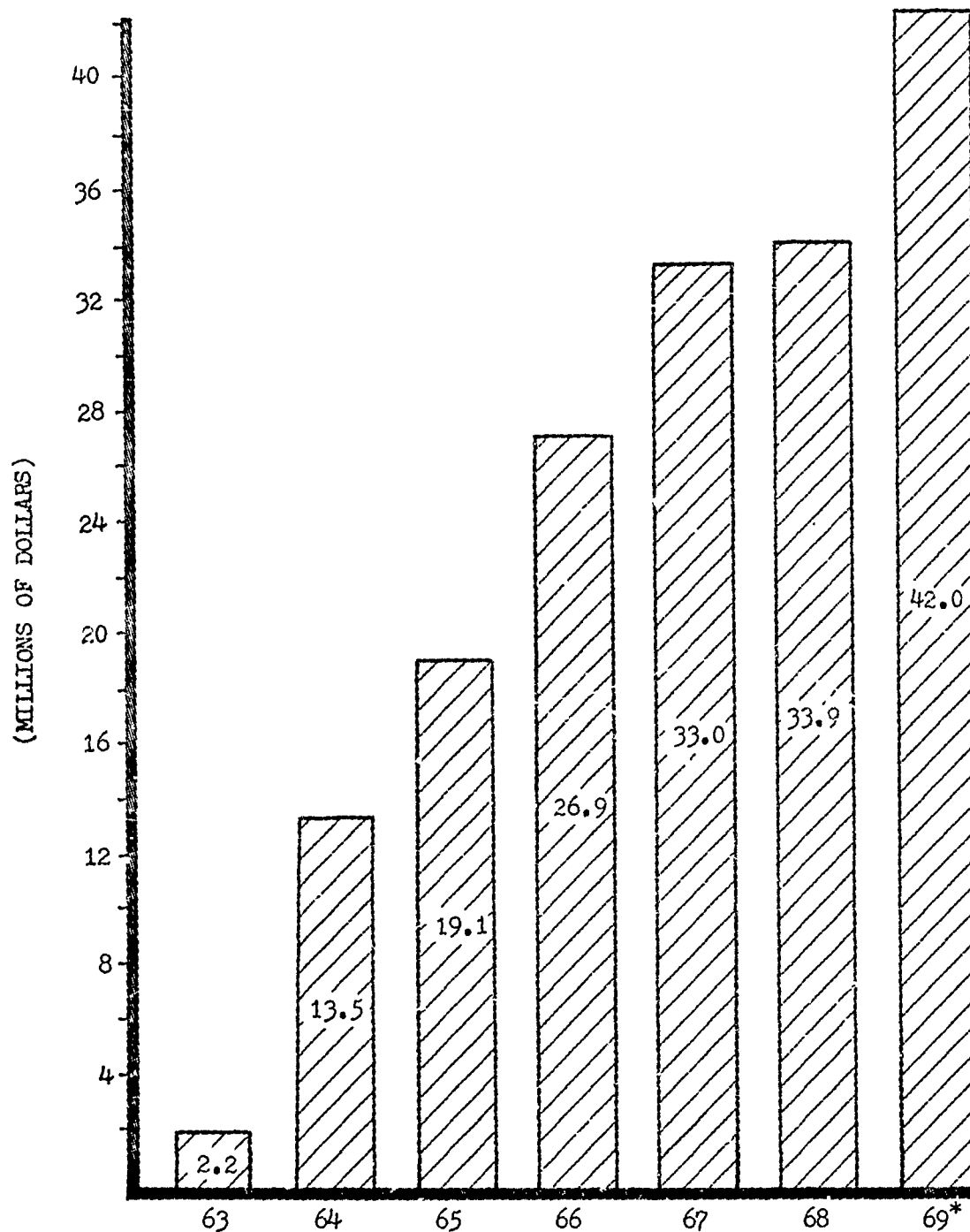


* Estimated annual gold flow in 1969.

Source: History of the AMC, 1962 - 1968: Co-Production, Army Materiel Command, Washington, D. C., 1969.

CHART 3

M-113 ITALY COPRODUCTION PROJECT
CUMULATIVE GOLD FLOW TO THE UNITED STATES



* Estimated cumulative gold flow in 1969.

Source: History of the AMC, 1962 - 1968: Co-Production, Army Materiel Command, Washington, D. C., 1969.

remains in the Italian defense structure. Such support is guaranteed because not all of the M-113 components or parts are being manufactured in Italy, such items as engines, transmissions, and aluminum armor plating being U.S. supplied. (44:61) The necessity that some quantity of support equipment and/or components be purchased from the United States on a recurring basis will bring in additional revenue, further increasing the dollar value of the program to the United States and helping reduce the balance of payments problem faced by this country. *

Another area of cost to be analyzed involves the funds expended by the U.S. Army in providing technical assistance to the Italian industries. This expense was covered in the government-to-government arrangement between the two countries, which required that the Italian Government fully reimburse the United States Government for all services rendered by U.S. personnel. (25:4) Therefore, while the reimbursement for personnel services will not reduce the U.S. balance of payments deficit, it will prevent the United States from having to provide funds for the support of these personnel during the M-113 coproduction program.

*This information was obtained from DOD personnel.

Standardization of NATO Equipment.--Analysis of the third U.S. objective--the standardization of NATO defense equipment--includes considerations additional to the fact that the equipment utilized by the NATO military units are common to each group.

A by-product of the goal of achieving maximum standardization of defense equipment in NATO countries is the fact that the M-113 armored personnel carrier is extremely popular. For instance, Canada, Denmark, the Federal Republic of Germany, Norway, and Switzerland, in addition to the United States and Italy, are utilizing this vehicle. (44:61) Thus the capability for one of the European NATO countries to manufacture this weapon system, as well as the United States, simply increases the locations where the system can be obtained. This is not to say that Italy is selling its manufactured item to her sister European countries; however, the fact remains that a production line does exist in Europe which could be readily available to provide the M-113 vehicle if such action becomes necessary.

The ability for the Italian-produced M-113 armored personnel carrier to be compatible with the U.S.-produced item lies in its degree of interchangeability. In this aspect, the Italian coproduction program has been highly

successful--for the Italian vehicle is 100 per cent functionally interchangeable with the U.S.-produced vehicle. There is only one item that was not logistically interchangeable--the starter. (44:61) This problem has been studied by both the Italian and the American manufacturers and has been resolved to the satisfaction of both parties. (106)

Another benefit derived from the standardization of the M-113 vehicle is that the Italian industry now provides an alternative source of logistical support for the M-113 carriers based in Europe, promoting a strong military alliance and contributing to the longevity of the equipment originally delivered. (25:5)

These advantages arising from the standardization of NATO defense equipment could not have been achieved without the establishment of the M-113 coproduction program between the United States and Italy. These advantages, coupled with the attainment of the other U.S. objectives, have certainly promoted the continued use of such coproduction programs.

Benefits Derived by Italy

The benefits derived by Italy in the M-113 vehicle coproduction program are as important as those accruing to the United States.

Standardization of Defense Equipment.--The comments made in discussing weapons standardization are, to a great degree, as applicable to the Italian Government as they were to the United States. Italy's position within NATO is enhanced by having military hardware and equipment compatible with the other NATO countries; and Italy's importance to that alliance is increased by its having a second production base from which commonly used equipment can be obtained should such action become necessary.

Increased Technological and Industrial Bases.--Probably the most important benefit accruing to Italy from the M-113 coproduction project is the increase in Italy's technological and industrial bases. The capability to manufacture an armored tracked vehicle has advanced Italy's prominence in the field of heavy military vehicle production--an original objective of the Italian Government in entering into this coproduction arrangement. The degree of success in attaining this objective may be judged by Italy's subsequent entry into a program to coproduce the U.S.-designed M-60-A1 tank. The new coproduction arrangement provides for the manufacture of 200 of these vehicles in Italy. (92:2.8)

Reduced Unemployment.--Attainment of other objectives stated by the Italian Government for entering into the M-113 coproduction program met with similar levels of success.

The project increased the number of jobs in Italy thus reducing the unemployment rate in that country. With the assistance of the Food Machinery Corporation, an unoccupied building in La Spezia was converted by OTO-Melara into a modern production facility similar to the FMC plants in the United States. Today this production plant employs from 300 to 500 people. Hundreds of workers are also employed at the Fiat and Lancia plants where subassemblies for the M-113 armored personnel carriers are being manufactured.

(76:28-30)

Improved Economy.--Having increased its technological and industrial bases, plus improving its unemployment rate, Italy has--as a result of the M-113 coproduction program--naturally improved its overall economy. Therefore, the analysis of this international coordinated production venture indicates that the original objectives of the Italian Government have been achieved. In fact, as will be noted in the following paragraphs, Italy has gained far more from this coproduction program than it originally had envisioned.

Synopsis of Other Coordinated Production Programs

Italian M-60-A1 Tank Coproduction Project

A brief analysis of the previously mentioned M-60-A1

coproduction program will further illustrate the value that may be gained by all participants in such cooperative international ventures.

In the M-60-A1 tank program, the United States will benefit by the direct sale to Italy of 100 tanks for a sum of \$20 million. And, Italy's coordinated production agreement to manufacture an additional 200 M-60-A1 tanks will result in an estimated \$23 million income to the United States in the form of expenditures for parts, components, technical assistance, etc.. (92:2.8)

It is extremely likely that had the United States not agreed to engage in the coproduction of the M-113 armored personnel carrier with Italy, then Italy would not have entered into the production of the M-60-A1 tank. This is not to imply that Italy would have been unable to develop the capability to manufacture tanks or even armored personnel carriers. Italy could have agreed to enter into some type of production arrangement with other European nations or even the Soviet Union or perhaps Australia to develop such a production capability. What would have been important in such an event is that the income of the United States would have been reduced and also the standardization of NATO defense equipment would have been affected. Another question which cannot be answered at this time, is "what would

have been the Italians' future attitude toward engaging in military coproduction with American industry had the United States decided not to agree to the M-113 program?"

M-109 Howitzer Coproduction Project

Italy's success in the M-113 armored personnel carrier coproduction project enabled the Italians to negotiate with the United States for the M-60-A1 tank production project and may well have established the foundation for Italy's participation in the M-109 self-propelled howitzer coproduction program. Certainly it is evident that the failure on the part of the Italians in any one of the programs would have created some difficulty in negotiating for follow-on production projects.

Concluding Comments Concerning Coordinated Production

It would be possible to analyze other coordinated production programs involving the United States and foreign governments throughout the Free World; however, the examples and comments noted thus far in this study are representative of all such international weapons production arrangements. Under the terms of the coordinated production agreements, it can unequivocally be stated that the United States stands to benefit--both economically and militarily--by engaging in international coordinated production programs.

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CHAPTER III

A STUDY AND ANALYSIS OF "COOPERATIVE" PRODUCTION

General

The second of the two forms of international weapons production within the Foreign Military Sales program to be discussed in this thesis is cooperative production. It is more difficult to immediately recognize the value and benefit to the United States of this type of coproduction than of the coordinated production described in the preceding chapter. This difficulty principally lies in the nature of cooperative production activities and the involved arrangements required to carry out such a program. It should be recalled that when the United States engages in cooperative production with a foreign country, or a group of countries, the U.S. agrees to assist the recipient participant, or participants, in accomplishing the program by contributing funds for the project. This type of assistance results in a much more complex involvement on the part of the United States and requires a careful and detailed analysis to ascertain the advantages and objectives of cooperative production programs.

As was the case with coordinated production, a number of programs could be discussed as typical examples of cooperative production projects--the F-104 aircraft, the Hawk missile, the Sidewinder missile, the Bullpup missile, or the MK-44 torpedo. For the purpose of this research, the F-104 Starfighter aircraft has been selected for examination because of three primary reasons: (1) this program represents the largest of any coproduction operation insofar as the amount of funds involved is concerned, (2) it represents the longest production life of any coproduction operation--regardless of the type of coproduction being considered, and (3) it involves a cross section of foreign nations which cannot be found in any other cooperative production program to date.

The F-104 Coproduction Project

The Lockheed Aircraft Corporation's F-104 Starfighter aircraft has been coproduced by a number of countries under varying production arrangements for over ten years. For example, the F-104J aircraft was coproduced by Japan, the F-104G was coproduced by a group of European countries constituting a consortium, the CF-104 was coproduced by Canada, and the F-104S is currently being coproduced by Italy. Each of these programs was developed under separate

coproduction arrangements. However, in discussing various aspects of cooperative coproduction, only the European F-104G and the Japanese F-104J projects will be analyzed in detail. The other F-104 aircraft coproduction programs may be briefly mentioned in the subsequent analysis.

F-104G European Consortium Coproduction Program

Formation of the Consortium.--The initial inquiry into the need for a new fighter for the Federal Republic of Germany (also referred to as Germany or FRG) began in 1956 when the German Ministry of Defense began looking for a new fighter aircraft to fulfill Germany's role in the mutual defense efforts of the western nations. Germany had been investigating some thirteen different competitors--located in France and England, in addition to the United States--in evaluating the aircraft it wished to eventually add to its defense inventory of weapon systems. (101:49; 70:3) The German evaluation required some two years before tentative selection was made of the F-104. In December 1958, Lockheed and the Federal Republic of Germany began discussions on the configuration and contractual matters pertaining to the follow-on production arrangement. These discussions were carried out in accordance with established U.S. State Department policies regarding licensing of a foreign country to manufacture U.S.-designed weapon systems. (70:3)

The agreement by Lockheed Corporation to manufacture the F-104 aircraft for Germany resulted in the design of a new F-104 model--the F-104G. This requirement came about because of the differences in the defense role of the German airplane. The U.S. models were primarily day superiority fighters--the Germans required an all-weather fighter with fighter-bomber capabilities. (70:3-4)

The arrangements agreed to by the United States and Germany were actually in two parts:

1. In February 1959, the German Government and Lockheed Corporation signed a contract providing for the initial delivery of ninety-six U.S.-manufactured aircraft. These aircraft were completely produced in the United States and shipped as "whole" airplanes to the Federal Republic of Germany.
2. In March 1959, the German Government purchased the licensing rights to build its own aircraft in Germany. Thus after the initial aircraft delivery, Germany began to manufacture its own parts and components through its own industrial capabilities. (101:49-50; 117)

The licensing arrangement did not allow the German Government to buy outright the manufacturing data or information from Lockheed, rather the Germans were granted the right to use the manufacturing know-how or data for so long as the licensing agreement was in effect. Upon the completion of the license term, the German Government agreed to return to Lockheed all of the data and information provided by that company. (70:4)

By the end of 1959, Belgium and the Netherlands had decided that the F-104G aircraft being developed for the Federal Republic of Germany met their requirements for a defense weapon system--thus they joined with Germany in commencing a coproduction program for the Starfighter. Three basic reasons were considered by these countries' governments in reaching their conclusions to locally integrate manufacture* of the F-104G:

1. The standardization of NATO armament in Europe would be increased through the integrated production.
2. The economic advantages to each country would be greater through an integrated production arrangement than if the countries individually manufactured the aircraft.
3. The industrial development advantages to each of the participating countries would be increased through an integrated production program. (117)

In 1960 Italy, following the same reasoning, joined the F-104G aircraft coproduction venture--forming the European Consortium. On 17 December 1960, the details of the technical and financial assistance to be provided to the Consortium by the United States were agreed to by each of the foreign governments and the U.S. Government. These agreements

*Locally integrated manufacturing is meant to imply that the management of the coproduction efforts is under the auspices of a single organization, while actual production lines may be established in each country.

constituted the Memorandum of Agreement for the cooperative production of the F-104G aircraft. (95:1)*

Production Arrangements and Agreements.--After the signing of the Memorandum of Agreement, separate licensing arrangements were made between each European country and the U.S. companies involved in manufacturing the various parts and components comprising the F-104G weapon system. While Lockheed Corporation was the principal U.S. company involved, other U.S. companies making the engine, electronic components/systems, etc., had to negotiate separate licensing arrangements with the European countries. Regardless of the participant concerned, all of the licensing arrangements with the Consortium countries followed the arrangements initially established for the German manufacture of the F-104G aircraft. Generally, the terms of these Consortium agreements stated that:

1. The data and support for the licensees is the data developed by the U.S. manufacturers under the initial German development and production contract.
2. The aircraft to be manufactured by the addition of Belgium, the Netherlands, and Italy had to be manufactured to the identical configuration agreed to by Germany in the initial production arrangement. (86:2)

*It should be noted that the Memorandum of Agreement discussed in this chapter and the Memorandum of Understanding discussed in Chapter II concerning the M-113 coordinated production program were essentially identical documents. The purposes were the same--only the specific agreements, commitments, etc., were different.

More specifically, the licensing arrangements were categorized as follows: (1) items which the U.S. manufacturers did not sell to the European countries nor for which any charge was made to the Consortium, and (2) items which U.S. industry received payment from the Consortium for the use of the data and information.

The types of items which American industry did not sell to or charge the Consortium for the use of the information were:

1. Technical data in the possession of the United States Government or in which the U.S. Government had a right to possession--provided there was no prohibition against the use of such data by the U.S. Government and/or disclosure of such data to other parties. (This did not preclude charging reasonable fees for reproduction, handling and mailing, and other similar administrative costs.)

2. Royalties or amortization for patents or inventions in which the United States Government held a royalty-free license. (70:5)

Any and all rights falling into the "free of charge" category were subject to any existing rights of the United States Government.

Under the category of data and information for which the European Consortium paid, reimbursement was made for:

1. The furnishing of technical data by U.S. industry:
 - a. which the United States Government had no possession or right to possession,

b. which the United States Government had no right to use or to disclose to others for their use,

c. which the United States Government had no royalty-free license, and

d. which was not in the public domain.

2. The right of the Consortium to use manufacturing techniques, procedures, and methods developed by U.S. industry over many years of experience in the design and manufacture of aircraft. (These rights must be within the framework of Item 1 above.)

3. The furnishing by U.S. industry to the Consortium general management advice and information relating to the manufacture of a complex, high performance aircraft.

4. The right to use U.S. manufacturers' trade names, trademarks, and other proprietary designations.

5. Certain warranties by U.S. industry relating to the F-104G.

6. Patent indemnity to Germany for infringement on German patents in an amount up to \$1 million.

7. The furnishing by U.S. industry to the Consortium of assistance in obtaining materials from third parties.

8. The right to use certain U.S. inventions belonging to American industries in which the United States Government had no interest.

9. The furnishing by U.S. manufacturers to the Consortium certain technical assistance.

10. Physical reproduction of the technical data.

11. The furnishing by U.S. industry of office space, equipment, and services for European representatives in visiting and utilizing U.S. facilities.

12. The factory training of unlimited numbers of European personnel within the U.S. manufacturers' facilities. (70:5-6)

Although the licensing agreements required the foreign governments to reimburse U.S. industry for assistance and information of the type listed above, American manufacturers were not to receive payment for services, technical data, and other information if the Consortium countries had previously paid the United States Government for such materials. (70:6-7)

Consortium/NATO Relationship.--Upon the completion of the arrangements and agreements for the European F-104G production project, the Consortium countries established an organization, "Organisme de Direction et de Controle" (ODC), to coordinate the coproduction effort. In 1960 this organization recommended to the North Atlantic Council (a NATO organization) that the F-104G Consortium production program be approved as a NATO project and that the controlling structure which administered the program be adopted as a NATO organization. This recommendation was adopted and, in late 1961, the NATO F-104G Starfighter Production Organization (NASPO) undertook the duties previously carried out by the ODC. (95:1-2)

NASPO consisted of a Board of Directors and a permanent staff called the NATO F-104G Starfighter Management Office (NASMO). The Board of Directors consisted of representatives

from each of the four Consortium countries, the United States, and a representative from the Secretary General's office of NATO. Later a representative of Supreme Headquarters, Allied Powers, Europe (SHAPE) and one from Canada joined the Board of Directors. (95:2)

NASMO had the responsibility for the coordination and supervision of the cooperative production of the F-104G aircraft, thus having effective control over the efforts of the member countries of the Consortium. All changes of design and purpose of the aircraft being developed and produced for NATO defense were reviewed by NASMO, which made recommendations concerning such changes to the Board of Directors for final approval. (95:2) Thus NASMO served a very important role since it was the responsibility of this body to insure that the weapon system being manufactured in Europe met the defense criteria required for each specific country and for NATO as a whole.

European assembly and production of the F-104G aircraft, under the auspices of the NASMO, totaled 949 aircraft--604 of which were required by Germany, 125 by Italy, 120 by the Netherlands, and 100 by Belgium. (12:54-55) All of the aircraft were grouped into a composite inventory from which each of the Consortium countries purchased their share of the required planes.

U.S. Cost Sharing.--The difference between the type of involvement of the United States in cooperative production vis-a-vis coordinated production is best illustrated by the manner of payment for the aircraft. The Federal Republic of Germany, being economically stable, purchased its share of F-104Gs directly from the Consortium's controlling body. On the other hand, Belgium and the Netherlands received American assistance consisting of direct financial support, parts, and services equivalent to the cost of twenty-five aircraft for each of the two countries. And Italy received United States assistance for the amount equivalent to fifty aircraft.

(101:50-51) The contribution of financial assistance by the United States is the key difference between the two types of coproduction. Furthermore, it is in this specific area that much of the criticism is made of U.S. involvement in international weapon systems.

F-104G European Consortium Summary.---The program for coproduction of the F-104G aircraft by the European Consortium was certainly not without problems. The magnitude of the production effort alone was a difficult problem to overcome. Since production lines were established in each country for manufacturing the same item, quality control and standardization became of prime concern to the producers. The fact

that this type of program was the first of its size ever attempted further added to the control problem. It was inevitable that the program could not be accomplished without difficulty. However, it is not the intent of this thesis to address the production problems associated with the F-104G coproduction project; more important is the fact that problems were recognized and that future coproduction programs should benefit from the lessons learned from the European F-104G project. These lessons will be significant--this type of international weapons production will play an important role in future U.S. Foreign Military Sales programs.

F-104J Coproduction Program

Formation of the Program.--The F-104 aircraft coproduction program formalized between the United States and Japan was, in several aspects, similar to the U.S./European F-104G coproduction program. While there was not the varied number of countries involved in manufacturing the F-104 in Japan as in Europe, there were several different foreign companies involved in the Japanese coproduction project.

The Japanese Government began a series of studies in 1957 to find a successor to the F-86F Sabrejet fighter that was its first-line defense aircraft at the time. By 1958

it had narrowed its choice to two American weapon systems-- the Grumman F-11F and the Lockheed F-104. After an inspection of each aircraft by a group of Japanese representatives who visited the United States in 1959, the F-104 was chosen as the weapon system to be Japan's next first-line defense fighter. (109:59)

An important consideration in evaluating the aircraft selections was that Japan's Government wanted a military aircraft manufactured which would concurrently increase her capability to produce commercial aircraft. (40:101) Although not an immediate goal, development of such capability was a definite future objective which probably influenced the ultimate choice of the U.S. manufacturer as much as the characteristics of the weapon system itself.

Mitsubishi Heavy Industries (MHI) was selected by the Japanese Government as the prime F-104 contractor while Kawasaki Aircraft Company (KAC) was selected as the major airframe subcontractor. (40:103) Each of these companies had previous experience in coproducing U.S.-designed aircraft--MHI the F-86F, and KAC the P-2V-7 and T-33 weapon systems. Ishikawajima-Harima Heavy Industries (IHI) was selected as the major engine manufacturer for the F-104. (83:22)

On 7 November 1959, the Governments of the United States and Japan began negotiating the type of arrangement under which Japan would coproduce the F-104 aircraft. At the time of the government negotiations, Lockheed and Mitsubishi were discussing financial arrangements, technical terms, purchase agreements, and similar matters which would constitute the required industry-to-industry and licensing agreement.

(40:103) Other U.S. companies involved in manufacturing components for the F-104 were also negotiating arrangements with the applicable Japanese company which would be responsible for producing the items in Japan. In the aggregate there were over 500 licensees and licensors involved in the Japanese F-104 coproduction program.*

The government-to-government and industry-to-industry agreements were finalized by 1961, at which time Japan's Air Self-Defense Force placed an order with Mitsubishi for 200 of the F-104s. This initial order represented the first portion of the production arrangement--the second portion called for an additional thirty F-104s. (40:103)

The F-104 production in Japan compared similarly to the F-104G European production requirements in that the Japanese

*The information concerning the number of participating parties was obtained from discussions with Defense Department and U.S. industry personnel.

desired an aircraft of different design than the F-104 weapon system employed by the United States Air Force. The Japanese sought better electronic equipment and a heavier airframe than that of the U.S. aircraft. Furthermore, the Japanese wanted an aircraft equal to or superior to the German version of the F-104. The finally agreed-upon Japanese version of the F-104--designated the F-104J--actually represented an advanced design of the F-104G with the primary difference being in the aircraft's electronics systems. (40:104)

Production Arrangements.--The coproduction arrangements between the United States and Japan were quite similar to those made between the U.S. and the European Consortium countries for the F-104G. Therefore, detailed description will not be made of the licensing arrangements between American manufacturers and the Japanese producers, which covered such items as:

1. Manufacturing rights.
2. Technical assistance.
3. Warranties.
4. Development activities.
5. Technical data.

Lockheed and the other U.S. manufacturers agreed in the technical arrangement to provide all of the data required to manufacture the F-104J, including any revisions which may

have been developed during the licensing period. All of the U.S. designs were warranted, including the assembly of the aircraft itself by Lockheed Corporation. The arrangement further granted exclusive rights to Mitsubishi to sell the F-104J in Japan, but stipulated that the sale of the weapon system would be limited to the Japanese Government only.

(40:105)

Of the 200 planes initially ordered by Japan's Air Self-Defense Force, 180 of these were to be F-104Js and twenty were to be of the trainer type--designated the F-104DJ. The agreement between Lockheed and Mitsubishi stated that the twenty F-104DJs were to be totally manufactured in the United States, then disassembled and shipped to Japan where these aircraft were to be reassembled by Mitsubishi. The first group of F-104Js to be received by the Japanese defense force consisted of components and parts manufactured in the United States and shipped to Japan in the form of "knock-down" kits where they were assembled by Mitsubishi. The remaining 100 aircraft, all F-104Js, were primarily manufactured in Japan by Japanese industries. There were certain parts and components which were not intended to be manufactured in Japan due to economical reasons--these items were furnished by the U.S. manufacturers. (84:95) All of the second phase of the F-104J coproduction project, consisting

of thirty aircraft, followed the pattern of being principally manufactured in Japan.

In determining the level of production which would be established in Japan to produce the F-104J, the Japanese officials responsible for the program made manufacturing decisions based primarily on the following considerations:

1. Was the capital equipment expense too high to justify Japanese production of the item?
2. Was the project tooling expense too costly to establish an assembly line?
3. Did Japan possess the necessary technical capabilities to accomplish the required tasks? (40:110)

These were valid questions which must be asked of any country considering the manufacture of modern, sophisticated weapon systems.

Japan's decision as to what parts, components, etc., to manufacture locally resulted in about thirty-five per cent of the aircraft being produced in Japan at the beginning of the coproduction program. By the middle of 1963 Japan had increased its capability to a point where over eighty per cent of the F-104J items were being produced in-country.

(84:95) Of the thousands of parts and components comprising the F-104J, only 181 items could not be locally manufactured in Japan by the middle of 1965. (40:110) And by 1966 nearly all of the J-79 engine was being manufactured in Japan.

(40:132) However, the majority of the electronic equipment installed in the F-104J had to be supplied by the United States. In evaluating the questions concerning whether or not to develop local capability to manufacture a certain item, Japan had elected not to manufacture most of the electronic systems required by the aircraft. This did not imply that Japan was without reason in making such a choice, as will be shown in the analysis of the Japanese coproduction project. Indeed, Japan had very definite objectives in mind when it made certain decisions to manufacture or not to manufacture an item.

Analysis of the F-104 Coproduction Programs

In analyzing the form of Foreign Military Sales exemplified by cooperative production, a composite of the European and Japanese F-104 projects will be presented--since many of the advantages and benefits of each effort are quite similar. Also, the United States and the foreign governments involved in the manufacture of the F-104 aircraft received benefits quite similar to those derived from the Italian M-113 coproduction program. Therefore, in such instances, only a brief mention of these advantages will be made in this analysis.

Benefits Derived by the United States

Economic Advantages.--The economic benefits that the United States gained from engaging in the F-104 aircraft coproduction projects can be covered in four categories:

1. Direct military sales.
2. Reverse gold flow.
3. Assistance in the development of new design technology.
4. Royalties and patent rights.

The advantages of directly selling military hardware to allied countries have been covered already in this thesis. In the F-104 coproduction programs both Germany and Japan aided the United States in fighting its balance of payments problem by directly purchasing a number of F-104 aircraft which were not a part of the coproduction efforts. The advantages to the United States arising from the other categories are perhaps not quite so obvious and therefore will require further explanation.

Analysis of the effect of the F-104 aircraft coproduction program on the U.S. balance of payments indicates the disadvantage of using U.S. funds to help accomplish the projects may not be as great as often supposed. For the F-104J program, the United States provided \$75 million to Japan for its cooperative share of the program. The entire

amount was spent in the United States, being paid to American firms manufacturing parts and components to be shipped to Japan. (40:117) Furthermore, Japan spent an estimated \$88.7 million of its own funds in purchasing parts and components from U.S. suppliers. Thus not considering the \$75 million spent by U.S. industry, the F-104J program netted nearly \$90 million in foreign exports from the expenditures by Japan alone--a favorable contribution in offsetting the U.S. balance of payments deficit. (40:184-185)

For the F-104G project, Department of Defense testimony in the House Appropriations Hearings on Foreign Operations in 1965 clearly reveals the contributions of the European Consortium coproduction program toward reducing the U.S. balance of payments problem:

. . . An interesting feature of this program is that by agreement all of the support provided by the United States (\$145 million) is in the form of U.S. produced material and technical assistance. Additionally, an estimated \$800 million in purchases by the consortium from the United States is expected to result from the project. (76:38)

The funds expended by the European Consortium were shared by 632 companies in the United States--located in twenty-seven states. Thus the balance of trade as well as the balance of payments for the United States was affected by the F-104 programs. (70:8)

In addition to the purchases made by Japan, Germany, Belgium, Italy, and the Netherlands in the F-104 cooperative production programs, the American companies involved in the ventures received payments for royalties and patent rights through financial arrangements agreed to at the commencement of the coproduction programs. Japan agreed to pay approximately \$63,600 per airplane for airframe royalties, rights, and technical assistance--and approximately \$11,900 per aircraft for engine technology--in the F-104J project. (40:137) The European countries paid similar fees to U.S. companies for the development and production of the F-104G aircraft.

Except in the area of economics, the United States' reasons for engaging in the coproduction of the F-104 aircraft, either in Europe or Japan, are not as clearly defined as in other coproduction efforts--such as the Italian M-113 armored personnel carrier. Therefore, a careful examination of the F-104 project must be made to uncover many of the "hidden" benefits.

Standardization of Equipment.--Because the United States did not utilize the F-104 aircraft in either Japan or Europe, it was not concerned in standardizing the equipment of its military forces with the equipment used by its allies--at least not as far as the F-104 was concerned. In fact, the

United States did not become a major participant in the selection of the weapon system until after Germany and Japan had announced that the Lockheed F-104 Starfighter was their choice of an aircraft for coproduction. This does not imply that the United States was unaware that advantages would exist if a single fighter aircraft became the main air defense weapon in NATO; certainly it was recognized that one type of aircraft being utilized by several countries increased standardization for those countries while reducing logistical support requirements. But the fact remains that since the United States did not employ the F-104 aircraft overseas, the decision permitting the aircraft to be coproduced was not made on the basis of increasing standardization of U.S./allied military forces.

The standardization of equipment to be achieved from the F-104 coproduction efforts of the European Consortium countries and Japan would allow these nations to acquire a weapon system compatible with the military hardware required to maintain a strong defense structure. From the U.S. viewpoint, if these countries could be assisted in developing the capability to manufacture and logistically support aircraft capable of defending their borders, then the commitments of the United States in both Europe and the Far East could be

reduced. Thus the United States would be able to decrease its military forces deployed in these overseas areas and could turn over some defense responsibilities to its allies. Such action would reduce the amount of funds required to support overseas forces and, in turn, reduce the balance of payments problem of the United States.

Soon after the completion of both the Japanese and European F-104 coproduction programs, the United States did decrease its military forces overseas, particularly in Europe. While many factors undoubtedly influenced the decision to reduce United States forces in Europe, the F-104G coproduction project certainly was a major consideration--one probably overlooked by critics of U.S. involvement in coproduction ventures.

Development of Technology.--In the case of the development of technological design, the United States agreed to produce an F-104 model quite different from the F-104 aircraft being utilized in the U.S. weapons inventory. For the European Consortium this model was the F-104G; for Japan the model was the F-104J. Development of the F-104G required an expenditure of funds in the amount of some \$35 million--all of which was paid for by the German Government. The development contract stipulated that the U.S. Government would not,

in any event, be required to pay any portion of the development costs. (70:4) For the development of the Japanese F-104J, Mitsubishi agreed to pay Lockheed Aircraft Corporation \$5.8 million to develop the J-version of the airframe. (40:105) Therefore, capital from the United States was not required in either instance to develop the advanced models of the F-104--yet the technological capability of U.S. industry was obviously advanced in designing and producing a newer weapon system. Such advancement in technology can contribute greatly to the development of future weapon systems--another consideration often overlooked by critics of U.S. involvement in cooperative production programs.

Concluding Comments of U.S. Benefits Derived from F-104 Program.--The preceding analysis of the benefits and advantages derived by the United States in agreeing to participate with Japan, Germany, the Netherlands, Belgium, and Italy in the coproduction of the F-104 fighter aircraft indicates that the U.S. was not a loser but a net gainer. Even though the United States provided some amount of funds to assist the foreign governments in these cooperative production programs, it is evident that the arrangements negotiated for the projects can be beneficial to the United States.

Benefits Derived by the Foreign Countries

Objectives of the Foreign Countries.--The objectives of the nations participating in the European Consortium and the Japanese F-104 coproduction programs were basically the same:

1. to advance their aircraft industry, and
2. to obtain a good defense weapon system. (117)

The aircraft manufacturing capabilities of nearly all of the countries involved in the F-104 coproduction programs had been virtually destroyed during World War II. Subsequent to the war, these nations initially depended upon the United States to provide military defense and weapon systems--through the Grant Aid portion of Military Assistance. However, as their economies improved over the years, these nations began to seek ways to support their own defense requirements--while at the same time obtaining newer and more modern weapon systems. In each case, they selected the F-104 Starfighter aircraft as offering the best possibility for achieving their objectives. Whether or not political pressures influenced the foreign governments in selecting this particular aircraft is not so important to this research study as the fact that a U.S.-designed weapon system was selected. Thus the question becomes "did the foreign governments achieve their objectives?" The following analysis will address this question.

Increased Technological and Industrial Bases.--The

increase of the industrial and technological bases of each of the participating allied countries is of primary consideration in evaluating the results of coproduction of the F-104--just as in the case of coordinated production discussed in Chapter II of this thesis. That the European Consortium countries and Japan did successfully manufacture the F-104 aircraft clearly indicates they did increase their industrial capability. Thus obtaining the skill level and technological know-how to manufacture modern aircraft, these countries, to a great degree, eliminated the deficiencies which existed at the end of World War II.

In the case of the European Consortium, the increase in manufacturing capability was probably more pronounced than in Japan which, prior to engaging in the F-104J coproduction program, had previously coproduced such aircraft as the T-33, the P-2V-7, and the F-86F. The European countries were without this advantage and the F-104G represented the first major attempt to manufacture aircraft since World War II. On the other hand, Japan benefited in slightly different ways than the European countries--as will be brought out in this analysis.

Specific Japanese Advantages.--Japan had developed, by the end of the F-104J program, the capability to nearly totally manufacture the aircraft airframe and associated parts. The same is true for the engine. This represented a refinement of the production capabilities developed in earlier aircraft coproduction programs. One of the most significant results of the F-104J project was that Japan began to manufacture military electronic components and systems--although on a small scale. Even though Japan was quite well known for its commercial type electronics, it had not achieved this level of proficiency in manufacturing military type electronics. The fact that Japan is now entering a new coproduction project involving one of the latest U.S.-designed aircraft--the McDonnell-Douglas F-4E--is quite indicative of its achievements in manufacturing a complete sophisticated weapon system. (90:F-4E Attachment)

Another important result of the Japanese F-104J coproduction program was the development of the capability, although perhaps small, to move into design work and production of commercial aircraft for sale on the world market. (40:183) This objective was one of the compelling reasons of the Japanese Government initially entering aircraft coproduction arrangements--it could not have gained this proficiency

alone as the cost would have been prohibitive. It is interesting to note that the Japanese produced the F-104J at a lesser cost than the United States produced the F-104G-- even though the J-version was an advanced model of the F-104G. The final unit cost analysis of the F-104J program showed that this aircraft cost \$852,000 produced in Japan while the F-104G cost \$973,000 per aircraft manufactured in the United States. (40:159) Japan devoted a great amount of attention to quality control and production techniques which enabled that country to reduce the manufacturing costs lower than that achieved by any other country. Even though labor in Japan is significantly cheaper than in many countries, much of the decreased costs can be attributed to the great emphasis on production techniques and manufacturing principles to insure that a high-quality, reliable aircraft would be turned-out from the production lines in Japan.

Specific Consortium Advantages.--A review of the European program indicates that the Consortium members could not have developed the level of capability of their aircraft industries without the cooperative production arrangements agreed to by all parties. This statement considers the Consortium as a whole rather than considering the individual countries which were members of the Consortium. Alone,

Germany probably had the economic stability to carry out its production, as evidenced by Germany's paying the development costs of the G-version of the F-104 to the applicable U.S. manufacturers. However, Belgium, Italy, and the Netherlands could not have independently engaged in such a coproduction venture on their own. Germany allowed the Consortium to be formed when it agreed to combine its production with that of Belgium, Italy, and the Netherlands and required the other three nations to pay only a token amount of the development costs of the F-104G aircraft.* Thus, four European countries were able to increase their industrial and technological bases quite effectively--the capability to manufacture aircraft was so successfully achieved that today Germany is challenging the United States in some areas of advanced weapon systems development.

Concluding Comments of Allied F-104 Production.--The F-104 cooperative production programs proved very satisfactory to the foreign governments concerned. It improved each country's economy; it increased both the technological and industrial capabilities of each country; it increased the pride

*Some military assistance observers feel that Germany did this to promote the NATO alliance; others argue that Germany satisfied its guilt feeling of World War II in this manner.

and nationalism of these countries; and it contributed much toward placing these countries among the future producers--and perhaps developers--of modern weapon systems. The fact that the countries achieved this objective makes it quite obvious that the countries achieved the second objective of the F-104 programs--that of acquiring a new and modern defense weapon system. Thus, the F-104 coproduction programs had to be considered completely successful from the standpoint of accomplishing the original goals established by the allied governments.

Summary of Cooperative Production

As in the case of coordinated production programs, other cooperative production projects could be reviewed in addition to the F-104 program. However, the discussion and analysis of the F-104 projects present a picture that is quite representative of other cooperative production projects between the United States and its allies.

Importance of Cooperative Production Programs

For further emphasis of the importance to both the United States and the foreign nations of cooperative production programs successfully completed, a short resume is made of follow-on projects.

F-104S Project.--Italy, subsequent to the F-104G program, negotiated a production arrangement for still another version of the F-104--the F-104S. This is indicative of that country's success in the F-104G project and should further promote both the United States' and Italy's objectives in international weapons production ventures. Italy, of course, benefits by advancing its own technological and industrial bases. And, the United States gains an opportunity to further advance its technical design capabilities at Italy's expense. Further, the \$165 million which is estimated for expenditure in the United States by Italian companies during the life of this coproduction program should assist in reducing the balance of payments problem of the United States. (102)

F-4E Project.--Already mentioned in this thesis is the coproduction program between the United States and Japan involving the F-4E aircraft. Although the arrangements for this project are being negotiated during the writing of this research study, Japan has already announced that it desires to produce some 104 F-4Es through 1977. (90: F-4E Attachment) Thus Japan has certainly achieved success in aircraft production and the United States has benefited by being able to engage in additional programs which will help this country.

Rebuff to Critics of U.S. Coproduction Efforts

Many opponents of the Foreign Military Sales effort carried out by the Department of Defense consider the United States' involvement in international weapons production ventures of the "cooperative" nature a grave mistake. They argue that the United States is simply "paying" its allies to obtain U.S. technical know-how and equipment. These same critics are generally opposed to coordinated production programs as well--but the fact that the United States provides the foreign nations with U.S. funds with which to carry out cooperative production projects increases the opposition to this type international collaborated production efforts.

However, these arguments tend to lose their validity when a review is made of the entire processes and results of cooperative production programs. The United States can, in most cases, receive benefits from engaging in cooperative production ventures with allied countries even though America's allies do increase their technological and industrial bases somewhat at the expense of American know-how. This same fact is true with coordinated production programs as well. The more immediate purpose of this analysis was directed toward projecting the advantages and benefits which

the United States gains by entering into cooperative production programs--not toward an attempt to promote or disguise the "giving away" of U.S. know-how. As such, this analysis was based principally on whether or not the objectives of the program were achieved.

It is hoped that the discussion presented herein may help convince critics of the Military Assistance Program that cooperative production ventures are not detrimental to this nation. In the following chapter, more direct attention will be given to explanations and reasons why the United States must continue to engage in international weapon production programs--perhaps even in a more active role than it has in previous years. The future of the Military Assistance Program may depend upon such action.

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CHAPTER IV

U.S. INDUSTRY'S ROLE IN COPRODUCTION/CODEVELOPMENT

Both industry and government must work in partnership if the United States is to successfully compete in the international arms market. (41:34) Although this has always been desired for military sales programs, it is mandatory for the new coproduction and codevelopment ventures. For many years foreign industries have worked in partnership with their governments, perhaps, in part, because of the heavy government subsidization of these firms.

On the other hand, U.S. industry has complained that it has not been taken into partnership; rather the government has spent too much time selling and not devoted enough effort to fostering an environment that would encourage industry to do the selling itself. (43:37)

Questionnaire to U.S. Industry

Questionnaires were mailed to thirty-two U.S. defense companies in an effort to gain insight into the potentially sensitive area of coproduction/codevelopment ventures. Many of the replies are highly illuminating, with the overall

result of the survey being to dispel some of the myths formerly associated with these sensitive areas. Analysis will be made of the response to each question, in turn, and pertinent additional information will be discussed to clarify problem areas related to the questions.

Question 1--What coproduction programs has your company engaged in?

Respondents indicated participation in both major types of coproduction, cooperative and coordinated, and only a limited participation in codevelopment since it is relatively new. Analysis of the response indicated that the foreign participants included Japan, Canada, Australia, Nationalist China, and Western Europe--countries with a sufficient industrial base to allow them to proceed beyond normal transactions into the coproduction/codevelopment ventures.

Respondents included the prime developers of the major weapon system and vendors who provide components and sub-assemblies to the main system. Each has his own licensing procedure which will be covered later in this chapter.

Question 2--How many years have you been engaged in coproduction activities?

The replies to this question ranged from 1948 to 1966 as the date respondents began to engage in coproduction

activities, indicating, of course, a considerable variance in the experience backing up the respondents' replies.

This significant time lag tends to corroborate industry's complaint that it has not been taken into partnership by the government in the foreign military sales area, for if a true partnership between industry and government existed, then one partner normally would not recognize the change in the international environment without the other partner recognizing it also.

Question 3--Did you seek out, through your own volition, coproduction ventures or were you contacted by the U.S./foreign government?

The responses to this question indicated that a multiple approach was often taken. Often foreign industry or foreign governments took the initiative in seeking a coproduction contract with American firms. Sometimes the U.S. Government would contact the U.S. firm about a potential contract and, once the firm entered into a coproduction/codevelopment agreement, it would find the arrangement rewarding enough to contact the foreign firm and/or government for future contracts.

It is extremely important that American companies know who to specifically contact in a foreign country in regards

to a coproduction/codevelopment offer. As a recent example, on 16 February 1968, Belgium announced the selection of the Mirage V fighter over the American F-5, the A-4 Skyhawk, the A-7 Corsair II, and the F-104. In negotiating the agreement, the French dealt with the military leaders and the American firms approached the political leaders. The military made its recommendation which was accepted. (7:57) Although the offer by the French was also more inviting economically, the approach was a significant factor in the outcome. In contrast to the American firms who were essentially on their own, the French firm and French Government worked closely together in closing the deal.*

Question 4--For what reasons did your company elect to engage in coproduction activities?

In almost every case, the reply indicated that the international market situation dictated going the route of coproduction or not having made a sale. The respondents pointed out that the industrially-advanced countries were no longer satisfied with buying off-the-shelf items when they could be produced at home. Additional reasons for entering into coproduction included: increasing the sales

*This information was obtained from U.S. defense industry.

potential internationally, enlarging the production base, keeping production lines open, increasing profits, obtaining royalties with minimum cost and investment, and establishing a basis for further business activities overseas.

Some of the more experienced companies indicated more of a "systems approach" in understanding the additional contributions made by coproduction/codevelopment. These additional considerations mentioned included: contributing to reverse gold flow both in the U.S. and in the foreign country (each in a different sense), meeting the needs of the U.S. Government in international arms agreements, strengthening the defense of the U.S. and its allies, and satisfying foreign government's and industry's desires to expand technology and develop an industrial base. The better the American firms understand the total impact of coproduction/codevelopment, the more successful they will be in the international competition.

Question 5--Based on past experiences would you engage in future coproduction ventures?

In all cases, the respondents indicated that they would engage in coproduction in the future. Many of the replies showed that successful programs in the past, on both sides, had developed working relationships that could be expanded

in the future. Some of the respondents qualified their affirmative replies with the statement that they still preferred the military sales approach because of the higher profits and more favorable gold flow, compared to coproduction arrangements. Once again, the U.S. firms showed an awareness of the international arms market situation--that is, it was to be either coproduction/codevelopment or none at all. Of course, this situation is true only for the industrially advanced countries and not for the underdeveloped or developing nations who are still forced to buy off-the-shelf items.

Question 6--Does your company favor exchange of technology in coproduction?

This particular question is of significant value to the thesis, since technology transfer is cited by foreign governments as the main reason for their desiring coproduction arrangements. Thus, if the U.S. firm is unwilling to exchange technology, then the foreign firms will deal with firms that will--whoever or wherever they may be. The problems inherent in the exchange of technology are complex and will be covered in greater detail later in this chapter. However, a limited analysis of the response to the question is made, at this point, to indicate U.S. industry's attitude toward technology exchange.

The actual exchange of technology was favored in only a very few cases. Care is usually taken to insert a clause in a contract guaranteeing that both parties will benefit from derived technology. Sometimes the coproduction effort did result in the exchange of additional technology. But the exchange was often not really an exchange, rather it was a unilateral flow of technology from the U.S. firm to a foreign firm.

A distinction must be made between production technology, which all firms were willing to offer in order to guarantee the sale, and design and development technology, which the firms usually considered as proprietary information. There was greater reluctance to market the second type of technology because of the competition it would breed. However, any firm entering into a coproduction arrangement should expect competition to develop--th's is a calculated risk that many of the U.S. firms indicated they are willing to take in order to guarantee a sale.

The free exchange of technology was sometimes limited by the security classification attached to it by the U.S. Government. In such cases, the foreign government is usually held responsible for safeguarding this information. A clause covering all security factors involved is normally included in the contract. (96:5)

A few of the U.S. firms recognized the exchange of technology as a valuable bartering tool in negotiations. They preferred to avoid a general clause that would allow free exchange and proceeded on a step-by-step basis.

Question 7--Were your efforts to coproduce a military item of equipment hampered by the lack of competent technological knowledge on the part of the foreign country?

There was only one affirmative reply to this question. All of the other firms indicated that this was not a problem area because of the pre-license preparation. The necessary technology is transferred early in the program and necessary training in programs is set up to bolster the anticipated weak areas. Although the U.S. firm sometimes underestimated the technological base possessed by the foreign firm, this rarely hampered the progress of the programs. In general, the technological competency on the part of the foreign firms was found to be extremely good, if adequate preparations were made.

The responses to this question also cited problems in other areas which will be discussed later in the thesis.

Question 8--Has your company had difficulty in the past in protecting its patent rights while engaging in coproduction activities?

This question was selected for inclusion in the survey because of the allegation in a magazine article that the U.S. Government was giving away proprietary information over which it really had no control. (43:37-38) If true, this factor would discourage many U.S. firms from entering into coproduction/codevelopment.

The data gathered in response to this question does not support the allegation--all responses indicated no problem in the firms protecting their patent rights. The U.S. companies have protected themselves by applying for foreign patents, dealing with reputable foreign firms, and carefully wording clauses in the agreements. No mention was made of conflicting interests between U.S. industry and the U.S. Government.

Question 9--Could you have produced the military item of equipment more efficiently and more effectively without the presence of foreign personnel?

The overwhelming response to this question was that the equipment could have been produced at lower cost and in shorter time without the presence of foreign personnel--but, there would not have been a program. Part of the transfer of technology involves training of foreign personnel at U.S. factories. A problem arises when certain areas must be made

off limits due to proprietary classification, but the success of the programs depend on the presence of foreign personnel. This is a sensitive problem requiring close coordination on the part of the industries involved. The presence of foreign personnel at either plant is usually viewed with suspicion at first; but as the program progresses, each partner learns that the success of the program is what is of overriding importance.

Question 10--Have you encountered difficulty in interchangeability of parts of coproduced items due to a lack of standardization of measurement (inches vs metric)?

None of the respondents indicated a problem in this area, because of the thorough preplanning which was done for the program. Some firms sent master tools to the foreign firms and required production according to U.S. specifications. Other firms required only that American standards be used and foreign firms were allowed to make their own tools. Differences in tolerances and materials standardization had to be resolved--usually with control maintained by the U.S. firm.

Interchangeability tests were often conducted, with each firm providing one or more models of the product in disassembled form. The products were then assembled and a percentage of interchangeability determined.

In a few cases the foreign firm was interested only in interchangeability in their country or local area and was allowed to convert inches to metric units. In one case a computer was used to convert inches to metric to four decimal places. It would be more advantageous to the U.S. to have international standardization--particularly with defense organizations such as NATO. Then, if the overseas plants were closed down, the parts could be provided by the United States.

Unwritten production techniques and differences in emphasis on quality control were cited as two more problems requiring resolution. Often, there is a tendency on some U.S. production lines to skip steps in the production process or to make minor changes in the process of which only the production line worker is aware. It becomes necessary, in coproduction, to make a written record of these minor variances in order to reduce production costs. The foreign firms, for the most part, are interested in turning out a "perfect" product and may have ten quality control checks where the U.S. firm would have only five. It is difficult to explain to the foreign government that even finding the error later in the process will result in lower unit cost. (8:22-23)

Question 11--Have your production costs been reduced through participation in coproduction?

The varied responses to this question indicate some confusion as to what had been asked. The purpose of the inquiry was to find out if overall system cost (or unit cost) was higher in coproduction versus a normal production run. Some respondents took the desired interpretation, while others referred only to the production phase of weapon system acquisition; therefore, the question was somewhat misleading. The results, however, provided insight to both questions.

In the first case, the respondents indicated that unit costs and overall costs were usually higher because of duplication of the many activities that go into a coproduction effort--such as duplication of production lines and of administrative functions. Ordinarily, duplication of production efforts, for a given quantity of items produced, means each facility producing the product will have shorter production runs; and, of course, the costs of the shorter run will be higher because of less progress along the learning curve to amortize costs. It is a principle of cost analysis that high volume production runs result in greater efficiencies and lower unit costs. In only very few cases

has coproduction proven less expensive than a single production run--the F-104 coproduction program with Japan was cited in Chapter III. However, foreign countries are not really concerned with higher costs of coproduction, being well-aware that they could buy off-the-shelf at a lower cost--but without improving their technology. These foreign firms are tooling for the future, not for the present. (102) The overall costs in coproduction may run fifteen to twenty-five per cent higher, in most cases, than single-line production in the United States. (103)

Referring now to the response which considered only the production phase, most firms indicated that overall production costs were generally lower because of expanded requirements. In some cases the coproduction partner was able to buy materials at the higher volume price--often at a lower price than purchasing materials in his own country. The net effect was to help offset the overhead operating expenses, bringing total cost (or unit cost) closer within reason.

Question 12--In regards to your coproduction ventures, did you regard the U.S./foreign government's management organization of the project to be adequate to sufficiently monitor the operation of the activities?

The respondents indicated, in general, that the monitoring of the programs was not sufficient to insure its success-- there was a requirement for the licensee and licensor to assist in the foreign/U.S. management areas to insure efficient production at least cost. It was sometimes necessary to train foreign government representatives in quality control and program management. The firms that had been assigned a U.S. and/or foreign government project management office enjoyed shared-responsibility and fruitful working relationships.

Approximately half of the respondents had no basis for comment on this question since there was no official foreign/U.S. government monitoring of the program. No indications were given that the success of the program was thereby hampered, and it is quite likely that there was unofficial monitoring at least on the part of the foreign government. The U.S. Government's participation may have been limited to granting of the export license.

Question 13--Would your company favor greater freedom in negotiating coproduction programs with the foreign country directly rather than through the United States Government?

Responses to this question varied from indications that the firm had complete freedom in negotiations to charges that

the U.S. Government, for various reasons, supported one U.S. company against another--thus allowing a foreign firm to win the contract. Several firms indicated satisfaction with the degree of freedom allowed in negotiation, once a country-to-country Memorandum of Understanding had been established. Since the memorandum may set the basic parameters of the contract in volume and/or cost, the U.S. firm would, of course, prefer to be consulted.

Other firms preferred to be allowed to do their own negotiations with the foreign government and/or firm. Reasons cited for this preference were the amount of "red tape" involved in going through the U.S. Government and the lack of understanding on the part of U.S. officials.

Although a few firms indicated that no problem existed in this area, most felt that improvements could be made, citing deficiencies in this area as a reason for U.S. industry's reluctance to enter into coproduction. (43:38)

Question 14--Would your company prefer to limit coproduction to the production phase rather than to include research and development of the weapon system?

Most of the respondents preferred to limit their participation to coproduction and not become involved in codevelopment, which was really the concern of this question.

Reasons offered included reducing transfer of technology by staying with coproduction only, reducing the number of channels technology must flow through, and greater problems in configuration management when participating in codevelopment.

The preferences were qualified by explanations of what was practical. In many cases the foreign firm insisted on codevelopment as an incentive to go into coproduction. Some of the firms indicated they refuse codevelopment contracts altogether; and other firms make but rare exceptions. It is likely, and a few firms are aware, that U.S. companies may find themselves becoming involved in codevelopment contracts in the hope that they will lead to coproduction programs. This is a natural evolutionary step in the changing international arms market.

Question 15--Do you consider outright sales to a foreign country more advantageous to your company than coproduction?

The response to this question shows that the preference depends on the situation. The profit motive, in the short run, is higher with direct sales than in coproduction. Again, the overriding consideration is whether the contract can be won based only on sales. The foreign firms are becoming

more adamant about acquiring a "piece of the action." Many firms indicate that long-term considerations often make the prospect of coproduction more inviting; particularly attractive is the expanded market that may result. Each situation, then, must be judged on its merits and the program selected that best meets the needs of all parties concerned.

Industry Categorization

The companies to which this questionnaire was sent may be grouped in three categories. First are those firms which indicated they have participated in coproduction. Their responses, providing the foundation for the discussions in this chapter, show that, despite certain weaknesses, sufficient incentive is offered in coproduction to keep these firms in the coproduction field. None of these respondents indicated that they were withdrawing from competition in coproduction to concentrate on the domestic U.S. arms market.

The second category includes those firms who responded that they were not involved in coproduction at this time. Since these are all large American defense firms, the question arises as to why these firms do not participate in coproduction. It could be that many of these firms are satisfied with the U.S. market or are able to sell items

across-the-counter. And other firms in this category may find the problems associated with coproduction are too great to consider entering the competition at this time. Whatever may be the reason these companies do not presently participate in coproduction ventures, the success enjoyed by the positive respondents to this question should point the way in the future, thus encouraging more firms to enter into coproduction arrangements.

The third category of industries gave no response to the questionnaire and cannot be evaluated. Apparently, disinterest or suspicion of the guarantee of anonymity prevented their response.

Licensing Coproduction

One of the more confusing and complex aspects of coproduction, and one with which all firms participating in coproduction must be familiar, is licensing. The confusion arises from the many meanings and variations attached to the term.

In the strictest sense, a foreign firm is licensed to produce a U.S. item, with the U.S. firm providing the technology and/or engineering data. Since the U.S. firm does not produce anything in this case, some people consider this form of licensing to be separate and distinct from coproduction. (104) In actuality, this form of licensing should

be considered as the coordinated category of coproduction.

Any form of coproduction/codevelopment involves licensing if the item to be coproduced/codeveloped is on the U.S. Munitions List. (97:15179) If the agreement is to involve technical assistance a license is also required. (97:15181) The U.S. developer, termed the licensor, must license his coproduction partner, the licensee, to produce the item of equipment. At the same time, the licensor clears all components to the system, including those components that are subcontracted, through the State Department. The subcontractors must also clear their own components, on an individual basis, through the Department of State--even though this is a duplicative effort. (40:78) The reason for the duplication is to guarantee control of the item in the event there is future development that could change the item's security classification.

The agency within the State Department that controls the approval and licensing of items and technology for export is the Munitions Control Office. It is guided by regulations from the International Traffic in Arms and may seek assistance from the Department of Defense (ISA) concerning military export cases. In this way the DOD and Department of State work in close coordination with U.S. industry. It

had been a complaint, before 1964, that many firms had to wait up to six months for a license. However, expedited procedures have cut the waiting time to approximately one month. (42:46-48) This reduction in time lag is fortunate, since time may become extremely critical when U.S. firms are in competition with foreign firms for a coproduction contract.

Selection of the Weapon System by the Foreign Government

It is important for the U.S. firm to understand the selection process involved on the part of the foreign government. The decision may be made in one of three ways: (1) the foreign company may recommend to its government a U.S. firm with which it would like to work; (2) the foreign military leaders may establish their requirements and make their recommendations to their government; or (3) the finance minister, the economic minister, and the parliamentarians may make the selection based on benefits derived for the country. The most common routing is from the military to the ministry of defense to parliament. If the selection of the system is made before selection of the foreign firm to work on the program, the licensor may have some opportunity of choice in the partnership. (118)

No matter what system is considered, the selection is no longer primarily based on weapon performance. The systems available for consideration will often be highly competitive, performance-wise. Thus the questions of more importance relate to the economic benefits involved. "How much will the U.S. firm spend in the country on this contract and in other industries not even related to the contract?" "Will the U.S. firm build factories?" "Will the U.S. firm consider a merger?" Questions of this nature are becoming the prime basis for negotiation--not whether or not the weapon system under consideration is actually the most suitable based on performance.*

Coproduction Fees

There are two types of coproduction fees. The first is a license fee covering the technological data and is usually a flat fee. The second is a royalty fee which may be paid at a flat rate of so much for each item produced or, if the production is split among a number of firms, may vary depending on the length of the production run. Royalties can also be based on a percentage of the production value.

(118)

*This information was obtained from U.S. defense industry.

The contract covering the two fees is usually signed simultaneously. If the licensee asks only for the technological data, then this fee would be raised to take into consideration the loss of royalties. (118) Consequently, both fees are usually involved in coproduction. In codevelopment, however, the contract would include only the proprietary fee which would be higher than normal since design data would be included with the production information.

Other Considerations and Problems in Licensing

Many considerations and problems have already been discussed in analyzing the questionnaire responses. Although it is not the purpose of this thesis to comprehensively review all of the facets of coproduction in industry, some areas are worthy of more detailed discussion.

Flexibility.--One of the chief problems of the U.S. companies in licensing is not being flexible when negotiating the contract. There are so many considerations in licensing that they cannot possibly all be covered by clauses in the contract. Some firms are finding it easier to remain flexible--to write a short, general contract, leaving room for interpretation. This does not mean that certain sensitive areas, discovered through experience, should not be pinned down by contract clauses. However, "overkill" in

this area has often been the case.*

Operational Phase Communication.--Another problem a licensor faces is communication with military representatives in the operational phase. It is difficult for a licensor to walk onto a foreign installation and tell military personnel that they need more spares or more ground-support equipment. The foreign military representative is likely to accuse the licensor of wanting more profits. Often the licensee will be of little help because he is concentrating on producing an acceptable system and has little time for follow-on support. The licensor, on the other hand, is concerned with success of the program since the company trademark is associated with the product. Under these circumstances, the licensor may be forced to go to the foreign government or to the U.S. Government if he decides the shortage endangers the success of the project. The U.S. and foreign governments will usually be just as concerned about the success of the program, although, of course, for different reasons.*

Use of MAAGs.--One consideration is to make greater use of the Military Assistance Advisory Groups (MAAGs) in the

*This information was obtained from U.S. defense industry.

foreign countries to assist in setting up appointments with foreign representatives, monitoring implementation of the weapon system, and assuring the necessary training to operate it. Up to this point, U.S. industry representatives have found support from military advisors to vary with the individual--often senior officers were awaiting retirement and not interested in supporting U.S. industry. And, in general, the MAAGs were better informed in grant aid programs than in coproduction programs.*

A Further Listing.--A few of the many other problems and considerations in licensing relate to language barriers, adequacy of foreign management, support and operational training, tracking and control, lack of acceptance of responsibility by U.S./foreign vendors, erroneous assumptions as to capability, foreign/U.S. government pressures, overhaul rights, third country provisions, which country's laws are to govern the terms of the contract, and overseas personnel problems. Barriers to U.S. industry participation in coproduction are covered in a later section of this chapter.

*This information was obtained from U.S. defense industry.

Transfer of Technology

In discussing the responses to the questionnaires, it was pointed out that the ultimate objective of coproduction is to transfer technology. It is important, then, that one understand more about technology. This becomes particularly true because coproduction arrangements vary according to the type of technology that is transferred between firms. (40:51)

Basic Forms of Technology Transfer

There are two forms of technology transfer. The first is a physical form that includes the transfer of drawings, machinery, tooling process information, blueprints, specifications, and patents. The other is the transfer of knowledge and skills derived from personal contact. This second form is often termed "technical assistance." (40:45)

Types of Transferrable Technology

One may distinguish between three types of technology that may be transferred. The first is general technology which includes information that is common to all firms in an industry, profession, or trade. The second type is firm-specific technology which includes non-general knowledge possessed by the firm that cannot be attributed to experience with any specific item. The final type of technology is system-specific and includes information, acquired by a

firm in manufacturing an item, that is peculiar to that particular item. (40:46-47)

Established firms, such as those typical of the licensor, are usually more willing to make available the general technology than the specific technology. It is the general technology that will enable a firm, the licensee for example, to enter an industry. There is greater reluctance to transfer specific technology--particularly firm-specific technology. The firm-specific type is often viewed by the licensor as information that gives it a competitive edge over its rivals. On the other hand, the system-specific technology is often protected by patents or other property rights. The transfer of this latter technology is usually more acceptable to the licensor. In the latter case, the technology is usually applicable only to the particular system under contract. (40:49-50)

It is generally agreed that coproduction arrangements would be simplified if there was no specific-technology transfer involved or if all specific technology had clear property rights. (40:52) The importance of the specific technology makes it a valuable asset in negotiation of coproduction contracts.

Transfer Costs

Transfer costs of technology may be classified under two categories. Included in the first category are direct costs such as license fees, royalties, and technical assistance expenses. The second category contains the indirect costs resulting from the impacts on production costs of dividing production responsibilities between two or more lines. (40:53)

Cost Variance.--The types of technology transferred also vary in cost. The transfer of general technology is usually the most costly because it requires intensive, broad training to master the practices and procedures to establish an industry. Firm-specific knowledge is usually more expensive to transfer than system-specific knowledge because the latter often involves transfer of only physical forms while the former often involves both personnel and physical equipment. (40:50-51)

Learning Curve Effect.--Because of the learning curve effect which reduces cost per unit as volume increases, the extent to which learning is transferrable is an important determinant of the cost of a coproduction arrangement.

(40:53-54)

Effect of the Organization on Costs.--Transfer costs also determine and are determined by the organization of the firms involved. Since the technology must be transferred from individual to individual or group to group, a means must be selected to effect this transfer. The personnel affected could be combined into one large organization and the flow of technology directed through administrative procedures. Another alternative is transfer of technology by transfer of ownership. (40:54-55) The last case is more of an extreme and is rarely used in international coproduction.

Conclusion

It is apparent that the transfer of technology is extremely complex. The willingness of the licensor to transfer certain specific technology will vary according to how he views his competition and the value he has placed on the more valuable technology. There are fewer problems in coproduction since the design data is usually not sold. In codevelopment, however, the problems of proprietary information are compounded and reluctance to participate on the part of the chief supplier of technology is apparent. The degree to which design data may be extracted from production models will vary between countries and firms. Care must be

exercised by the licensor to choose his partner carefully or he is likely to see his designs extrapolated on future systems without benefit of payment. Fortunately, this has not been a major problem up to this time.

As a final point, to emphasize the growth of international licensing over the years, payment of royalties in international licensing are shown in Table 2. The data clearly demonstrate the growth of the technology market.

Barriers to U.S. Industry's Participation in Coproduction/ Codevelopment

In order to gain a better understanding of U.S. industry's views of the international arms market, it is necessary to look beyond the mechanics of establishing the business. Certain intangibles discourage many industries from participating and also make participation difficult for others. These intangibles include attitudes on the part of government and industry officials, outdated policies and procedures hampering expansion into the market, and excessive emphasis on the balance of payments deficit. The first two will be discussed together as they often impact on one another. And, although the balance of payments problem has had great impact on attitudes and legislation, it is of a level of importance deserving of a separate section for discussion.

TABLE 2
INTERNATIONAL RECEIPTS AND PAYMENTS OF ROYALTIES
FROM 1957 TO 1966

(Millions of dollars)

Year	Receipts From Foreign Firms			Payments To Foreign Firms		
	Affil- iated Firms	Other Firms	Total	Affil- iated Firms	Other Firms	Total
1957	238	140	378	26	22	48
1958	246	168	414	26	25	51
1959	348	166	514	24	28	52
1960	403	247	650	27	40	67
1961	463	248	711	34	46	80
1962	580	257	837	57	43	100
1963	660	267	927	61	50	111
1964	756	301	1,057	57	60	127
1965	924	301	1,225	67	66	133
1966	1,045	271	1,316	64	73	137
Total	5,663	2,366	8,029	453	453	906

Source: U.S. Department of Commerce, Office of Business Economics,
Washington, D. C.

Attitudes, Policies, and Procedures

The broad U.S. policies laid down by Congress have often been in conflict with one another. A few of them may be summarized as follows: assist friendly countries in individual and collective self-defense; limit such assistance to countries who follow the U.N. Charter; limit aggression by one country against its neighbor; bar military assistance to communist countries; encourage U.S. foreign trade; and protect the U.S. lead in advanced technology. When the Executive Branch implements many of these policies, they result in conflict, inconsistencies, and reversals. (14:75) In the face of such confusion, it is not difficult to understand why U.S. industry is reluctant to become embroiled in it.

Timeliness.--The Department of State has often not been sufficiently open in informing U.S. industry of changes in policy so that the necessary adjustments may be made. The attitude of the State Department and of the DOD has been to wait until application has been made for an export license. In all fairness, the companies have often been slow in relaying their own intentions to the government. (119:76) This situation helps emphasize the need for the U.S. Government and industry to work in closer partnership with each other.

Export Complexity.--The complex mechanisms governing export trade are enough to discourage many firms. For example, the Military Export Guide, which serves to condense and codify the export procedures, is 900 pages long; and the monthly additions and revisions average 150 pages. Obviously it is a difficult task just keeping up to date.
(119:76)

DOD Support.--The support of the Department of Defense, because of a small staff, has been limited chiefly to the major international projects. Since only twenty companies control the majority of this market, they are receiving most of the support of the DOD. (119:76) In this atmosphere, it is difficult for other U.S. firms to break into the international market. They are often on their own and find the U.S. Government supporting another U.S. firm against them in the competition. As mentioned earlier, this situation may result in a foreign firm winning the contract.

Positive Actions by Industry.--Faced with these attitudes and policies, U.S. industry is taking two approaches to the problem. In the first approach, U.S. firms are going into joint ownership with foreign firms or are setting up wholly-owned subsidiaries. The U.S. Government generally opposes this approach because of the gold flow problems

associated with it, and the foreign countries often view it as a U.S. takeover of their economy. In the second approach, U.S. industry is making an organized appeal to the U.S. Government to aid in resolving these problems. The efforts are being made through such organizations as the National Security Industrial Association, the Aerospace Industrial Association, the Electronics Industries Association, and others. These groups, working with the DOD through the Defense Industry Advisory Council, have achieved favorable results such as the following: favorable treatment of the smaller export industries, revisions to the International Traffic in Arms Regulation, establishment of industry counseling centers in Washington and abroad, creation of incentives for industry participation, creation of workshops and symposiums, and expediting of clearances for export license applications. (119:76)

Trends.--All indications point toward improved relations between government and industry. The changing of Congressional views will probably take more time, one reason being the emphasis placed on the balance of payments problem which shall be examined next.*

*This information was obtained from defense industry.

Balance of Payments

The emphasis on the balance of payments deficit has influenced decisions affecting policy to the degree that the progress of coproduction/codevelopment has been discouraged.

One of the stated principal objectives of the Foreign Military Sales program is to offset the unfavorable balance of payments that result from U.S. military deployments abroad. (89:3-1) Sales are expected to accomplish this task at the rate of around forty per cent per year (excluding Southeast Asia). (4:C-1)

It cannot be denied that direct sales are more effective in offsetting the balance of payments deficit than is either coproduction or codevelopment, since, in a sale, all funds flow into the United States. On the other hand, what must be understood about coproduction programs is that the flow of money is multi-directional, with much of U.S.-furnished funds being returned through purchase of materials and technology in the United States.

International Impact of Gold Flow.--Since the dollar is used as an international reserve currency, the U.S. balance of payments problem becomes an international monetary problem. Continued deficits mean a loss in gold resulting in a

weakening of the stability of the international monetary system. (4:C-1)

The foreign countries also have a gold flow problem to consider, so it is not surprising that they have an aversion to direct arms purchases which have a detrimental effect on their balance of payments. They have much to gain from coproduction due to the "multiplier effect," arising from the number of times a dollar turns over when spent in-country. For example, a dollar spent in Belgium on a coproduction program turns over an estimated eight times.* For this reason, a foreign firm is willing to spend much more on a coproduction program than on a direct sales--the net effect on his economy is much better.

Principal Cause of Deficit.--As previously mentioned, the greatest contributor to the U.S. balance of payments deficit is the deployment of troops abroad. The United States shoulders a great share of the Free World defense burden; for instance, approximately seventy-five per cent of the NATO military budget is financed by the United States. More than half of the U.S. balance of payments deficit is with countries that are its strongest allies. (85:10)

*This information was obtained from U.S. defense industry.

Two Key Questions.--The United States is thus faced with two major questions affecting the balance of payments. "Is the U.S. going to continue to pay for more than its 'fair share' of the Free World defense budget?" "Is the U.S. going to encourage foreign countries to participate in coproduction/codevelopment programs with U.S. firms--two programs less desirable than sales from the U.S. balance of payments standpoint?"

This thesis does not address itself to the first question, which is being decided at high levels of government at this time. In answer to the second question, it is possible that the foreign countries will play a large part in the decisions. It is the responsibility of the U.S. Government to create an atmosphere that will allow the programs to thrive--if considerations favor participation in view of the balance of payments.

Summary.--Government representatives have acknowledged that restraints on private foreign loans and investments are not in the long-run interests of our balance of payments--because future U.S. income abroad may be resultingly reduced and exports are also likely to be discouraged. (85:7) It is important to realize that the long-run benefits go far beyond the quoted dollar amounts contracted in

coproduction/codevelopment programs. The analyses in Chapters II and III gave examples of the many benefits derived from such programs. While it is the decision of the Congressional leaders, government agencies, and the DOD whether or not to support these programs, it is their responsibility to become well-informed as to the values that may be derived.

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CHAPTER V

FUTURE OF INTERNATIONAL WEAPONS PRODUCTION

General

Military sales has been an effective and reasonably inexpensive implement of United States national security policy. (77:72) The validity of this statement has been generally proven thus far in this thesis; however, the question is--"will the present military sales program continue to enjoy this level of prosperity?"

Maximizing U.S. foreign military sales, however, poses problems for the buying countries. They, too, face balance of payments problems, as well as the problem of how best to employ their defense industry capabilities. Yet no country outside the United States can afford to undertake independent development and production of costly weapon systems purely for its own national market. To sustain a healthy defense industry as part of a healthy economy, these countries must look to alternatives in joint production . . . for an international market. (41:41)

This quotation reflects recognition of the changing environment in the international arms market.

A developing trend indicates that foreign countries are becoming more desirous of engaging in weapons production--either partially or in total. There are very definite reasons

underlying the pattern that is developing in the field of international weapons production, both on the part of the United States and the foreign countries. Many of these reasons have been discussed in Chapters II and III of this research study and additional reasons will be presented in this chapter. The United States is increasingly confronted with opposition from its allies to the "pure" purchasing of weapon systems. As the technological and industrial bases of countries increase, their desire to enter into manufacturing of military defense equipment is evident--but at the same time, the desire to protect the economic stability of these countries is also a factor that must be reckoned with.

A new and different approach to the current U.S. Foreign Military Sales program must be taken to meet the changing attitudes of the nations of the Free World. The policies which now govern the United States' involvement in military sales activities must be altered to incorporate the attitudes of America's allies--while at the same time fostering the interests of the United States. It is the purpose of this chapter to present indications of the developing trend in international weapons production, to discuss the principles of U.S. military sales, and to

provide a general overview of what actions are necessary to prevent the U.S. military sales program from losing its potential power in the international arms market.*

Current Government Views on Foreign Military Sales

The Department of Defense's view of the military aid climate of today is reflected in a quote from Paul C. Warnke, Assistant Secretary of Defense (International Security Affairs):

It is in the light of the real world of defense requirements, technology and logistics that we have established the principles that guide our action. Policy objectives in international armaments and defense logistics arrangements have to incorporate overall national objectives, such as encouraging controlled disarmament, avoiding arms races and achieving a proper balance between defense and the other strong claims on Free World resources. Within these confines, we must bring to bear a whole battery of elements to respond to the Free World's need for arms--including cooperative research and development, coproduction, sales and competitive procurement abroad. (77:81)

The United States Government utilizes the following five basic guiding principles to satisfy the aims mentioned in the preceding statement:

1. To encourage increased allied capability--tempered by concern with the demands of economic development and political realities.

*There are other areas that could be discussed, however, these are considered to be the most important.

2. To sell U.S.-produced defense equipment to free-world, financially capable buyers--tempered by a willingness to consider coproduction or licensed production abroad when sales seem precluded.

3. To share U.S. technology with our allies so as to evoke their defense effort without incurring duplicative costs--tempered by the need to avoid a gratuitous weakening of the U.S. competitive position.

4. To make first-line equipment available to our allies--tempered by a need to avoid uncompensated security risks of compromise.

5. To be willing to procure selected defense equipment abroad for use by U.S. forces as a part of large scale foreign purchase programs in the United States under competitive arrangements including participation by the United States when this nation can be assured of quality, cost, delivery and support terms equal to those obtainable from U.S. industry. (89:3-1)

Note that each of the above guiding principles has a qualification attached to it. It is these qualifications with which foreign governments and foreign industry are taking issue and which are causing the United States to "lose out" on many of the international arms programs being negotiated today. Foreign governments criticize the inconsistencies in policy issued from different levels in the U.S. Government in the promotion of military sales, as well as the inconsistencies between their own policies and objectives and those of the United States.

It is not the intent of this thesis to entertain the position that the United States Government should alter its

objectives and policies to coincide with those of its allies simply for the purpose of satisfying its Foreign Military Sales program. But it is the intent of this thesis to point out areas where the United States is endangering the success of its military sales program by refusing to modify its outdated policies or by ignoring the changing attitudes of foreign governments in international weapons production programs today. It is in this context that the future of international weapons production is examined.

Market Potential

The World's Sales Market

The countries of the world are currently spending over \$127 billion each year on national defense, with the Free World nations spending \$104 billion or fifty-nine per cent of the total. The advanced countries account for over ninety per cent of the total, but the underdeveloped countries still spend \$12 billion a year (seven per cent of the total) for weapons and military equipment--nearly double the amount they receive in economic aid for national development. (4:4-5)

The chief arms suppliers include the United States, the United Kingdom, France, the Soviet Union, and Communist China. Research and development capability, to a large degree, determines the capacity for leadership in the arms

market. In terms of percentage of the defense budget allocated to research and development activities, Communist China ranks first, followed by France, the United States, the United Kingdom, and Russia. In terms of dollars spent, the United States spends almost twice as much as its nearest competitor--the Soviet Union--in research and development programs. (4:4-6)

The industrialized countries of the Free World account for ninety per cent of the United States' foreign military sales. The best customers are Australia, the Federal Republic of Germany, Italy, and the United Kingdom--accounting for seventy-one per cent of the total. (4:7)

Despite U.S. desires to maintain military export sales at a \$1 to \$1.5 billion level annually, the most optimistic forecast for 1968 was less than \$900 million in sales. The reasons given were strong French competition--including generous credit terms--and a shortage of acceptable weapon systems that the United States could offer. (99:78)

The second reason, the lack of available weapon systems for sale, is of primary concern to this thesis study. For example, consider the availability of aircraft where in Europe--in the foreseeable future--there is promise only for the coproduction of the McDonnell F-4 and RF-4E, the Lockheed F-104G, the Northrop F-5, and the Sikorsky CH-53 aircraft.

(100:29) In this area, the outlook in Germany and England seems to be the most promising. Germany had been considering the purchase of \$1 billion worth of U.S. aircraft; these plans have been finalized and will be covered in detail later in this chapter. (55:29)

Foreign Attitudes Indicate the Trend

The United Kingdom is considering spending \$2.5 billion on major U.S. defense equipment through 1977. England has been making purchases of nearly \$230 million per year, or thirteen per cent of its annual defense budget, for military equipment. On the other hand, United States purchases established in offset agreements from the United Kingdom will amount to only \$200 million for the twelve year period, 1966-1977. The unfairness of this reciprocal arrangement was addressed by Raymond S. Brown, defense sales head of the United Kingdom's Ministry of Defense, who said, "You are not going to get lots more of our business unless we work on a two-way street." (85:75-76)

Other countries share the same view with England. Australia's Defense Minister, Allen Fairhall, agrees with England's Mr. Brown that there must be increased willingness on the part of the United States to permit the foreign country to gain more benefits from its purchases of military

hardware than has been possible in the past. Mr. Fairhall has adopted a policy in buying defense equipment overseas that no major contracts will be signed unless there is an offset program roughly equal to the foreign exchange cost of the procurement. He has further stated that no item of equipment will be obtained overseas if its manufacture in Australia is economically feasible. (46:31)

Thus, the stage has been set. The United States, faced with an expanding international arms market, has a diminishing prospect of holding the status quo. Not only does the sales program have a scarcity of items to sell, but the foreign nations are becoming increasingly more reluctant to purchase "off-the-shelf" equipment. Furthermore, the foreign countries are beginning to look for sources other than the United States to satisfy their requirements for military equipment.

The next two sections of this chapter will discuss the two most critical areas which should be of concern to the promoters of military sales: (1) the complexity of the U.S. Foreign Military Sales program; and (2) the growing competition facing the United States in the international arms market. In many ways these areas are related--when considered jointly, they amply illustrate why the United States

should be gravely concerned over its future position in the arms market of tomorrow.

Complexity of the U.S. Foreign Military Sales Program

The management structure of the U.S. Government's international arms program is presently oriented toward direct military sales; only when the prospects for sales appear dim is an alternative method, such as coproduction or codevelopment, favored for promoting U.S.-designed equipment. As discussed in Chapter I, the reasons for the United States' establishing the Foreign Military Sales program were, basically, to pursue the national objectives of strengthening the security of the free nations of the world to help achieve world peace, while at the same time increasing this nation's own economic well-being. The principles involved in establishing the sales program are not the issue of this discussion--rather the focus will be upon the methods and attitudes or carrying out the program.

Attitudes

Following the authorization of foreign military sales in the Mutual Defense Act of 1949, the United States encountered very little serious arms sales competition through the early 1950s, primarily because only the U.S. had the economic stability and technical know-how to produce modern weapon

systems. The conduct of the sales program was, and still is, governed by three basic standards:

1. The U.S. will not sell equipment to a foreign country which that country does not require and/or cannot afford.
2. The U.S. will not ask a potential foreign customer to buy anything which is not truly needed by that country's own forces.
3. The U.S. will not encourage any foreign country to purchase any equipment from the United States which that country can buy cheaper or better elsewhere.
(39:3-1)

It would be difficult to prove that these standards have always been followed--but that is not the issue. The important point which must be considered is that sales have been lost as a result of these restrictive attitudes.

The Latin American Debacle.--The following illustration is but one example of the results of such restrictive attitudes. The U.S. State Department restricted major sales to Latin America in order to conserve the limited resources of these countries--resources which the United States considered could be better spent on economic development. However, certain Latin American countries, wanting to acquire modern aircraft to equip their defense structures, were interested in purchasing the Northrop F-5. The State Department delayed approval of the sale, and Peru countered by threatening to buy Mirage Vs from France. Confronted with this alternative,

the State Department granted approval for negotiations with five Latin American countries for sale of the F-5 aircraft. However, after six months of fruitless negotiations, Peru finally grew tired of wasting its efforts, gave up, and agreed to purchase twelve Mirage Vs from France. (99:79)

Although the sale of twelve aircraft by France would not appear to be a significant buy, it provided the French with an entry into the Latin American market with a resultant decrease in U.S. military, economic, and political influence. Since the potential market for the Mirage V in Latin America is 150 aircraft, the loss of the F-5 contract is a serious blow to U.S. arms sales in that area. (29:41; 99:79; 77:77) This example is representative of the complicated measures which must be followed before arms sales can be finalized--measures which tend to deter potential buyers from dealing with the United States. The length of time required to obtain approval to commence with negotiations and the inability to arrive at agreeable terms were actions which tended to ignore the sequence of events which would ultimately occur. First, the United States was not the only source of arms available. Second, Latin America was definitely going to buy a modern aircraft. Third, the loss of the sale of American equipment in this case could result in the loss of

future sales. Fourth, the United States lost prestige with its neighboring countries.

Credit Attitude.--Another prominent attitude displayed by the United States has been in the area of credit granted to countries wishing to participate in the military sales program. This is an extremely important aspect to the lesser developed countries who desire more modern weapon systems but do not possess the funds to buy such equipment "outright." During Fiscal Years 1962-1966, approximately twenty-eight per cent of all military sales were conducted on a credit basis. Recent restrictions in this area are expected to have a serious impact on sales. Since 30 June 1968, the Department of Defense has had authority to grant credit only to the underdeveloped countries on the Communist periphery, with the funds allocated for this credit having been reduced from \$294 million to \$190 million. (4:B-3)

A restriction which further complicates the lending of credit to the lesser developed allied countries is that if these nations choose to buy advanced weapon systems, they stand to lose U.S. economic aid equal to the amount spent on arms. (4:B-3)

Thus in recent years, the United States' attitude in granting credit to nations desiring to purchase modern

weapon systems has caused these countries to turn elsewhere to satisfy their needs. Again, the United States is ignoring the fact that these countries are going to buy military equipment--if not from the U.S., then from another seller. And again, the United States becomes the ultimate loser.

U.S. Government/Industry Attitudes.--The discussion of the relationships between the United States Government and U.S. industry, in Chapter IV, pointed out that the current sales environment is not always conducive to successful endeavors in the international arms market.

Organization

The organization of the present Foreign Military Sales program is not structured to meet the current trend developing in the international arms market. The emphasis remains mainly on direct sales of military equipment, while the trend is toward coproduction/codevelopment.

The Department of Defense has been assigned the responsibility of administering and operating the military aid program, to include Foreign Military Sales. Within the Office of the Secretary of Defense, the Office of the Assistant Secretary of Defense for International Security Affairs (OASD/ISA) is to accomplish the tasks involved in executing the military sales activities. And under OASD/ISA, the

Deputy Assistant Secretary for International Logistics Negotiations (ILN) is involved in actually promoting military sales and performing the negotiations with foreign nations concerning possible purchase arrangements. (42:31)

Once the negotiations for military sales have been completed and the sales executed, the Office of the Assistant Secretary of Defense for Installations and Logistics (OASD/I&L) is responsible for insuring that the logistics support for the weapon systems is available to the buying country for the lifespan of the system. Such support includes, but is not limited to: maintenance, spare parts, repair parts, tools, and technical assistance. (42:35)

In the Defense Department, outside the military departments, there are two separate agencies involved in foreign military sales, neither of which are responsible to the other through established lines of authority. Therefore, those persons in OASD/ISA (ILN) who actually initiate the sales of military equipment are not involved in the details of insuring that the recipient countries are satisfied with the product or the support available and/or provided for the product. On the other hand, the persons who are responsible for this support, OASD/I&L, do not have the authority to veto a proposed sale based on the possible non-support of the equipment after it has been sold.

The above description of the OASD agencies, ILN and I&L, does not imply that interoffice coordination does not take place, but the fact remains that there is no formal authority, other than the Secretary of Defense, which guarantees that such coordination will always take place. In fact, one of the complaints of foreign nations wishing to participate in U.S. sales programs is that conflicting policies are followed at different offices within the U.S. Government.* The real basis for such complaints, of course, probably lies in the organizational anomalies just discussed.

Another consideration in discussing the DOD organization to carry out the Foreign Military Sales program at the OASD level is that the persons who are responsible for direct sales are also responsible for coproduction and codevelopment. But if promotion of the direct sales is the primary policy of the United States, then it is very unlikely that the promotion of coproduction and/or codevelopment projects can be effectively accomplished by the same persons promoting direct sales.

Within the military departments, where individual military sales programs are further administered, similar organizational inadequacies exist as are found in OASD. For

*This information was obtained from discussions with Defense Department personnel and personnel within U.S. industry.

example, in the Air Force, the agency (Deputy Chief of Staff/Systems and Logistics) responsible for direct sales is also responsible for coproduction, but the responsibility for codevelopment is that of another office (Deputy Chief of Staff/Research and Development). With the apparent decline of pure military sales and the rise of coproduction/codevelopment as the prominent features of the Foreign Military Sales program, certainly the Air Force and other military departments must create viable organizations capable of effectively and efficiently carrying out their necessary tasks.

Foreign Viewpoint in Arms Selection

In the light of today's complex arms environment, it would be worthwhile to examine the bases used by foreign governments in their selection of weapon systems for defense. Such an examination is of value from two standpoints: (1) it gives some insight into the buyer's problems; and (2) it further indicates the complexity of the United States' role in international arms sales. The following considerations often enter into a buy decision:

1. The urgency and character of need for the equipment.
2. The suitability of the equipment offered to meet the need.

3. The availability of the equipment offered in relation to need and suitability.
4. The compatibility of the supplier and the equipment with national objectives, the alliance structure, and security of supply.
5. The confidence placed in the capability and willingness of the supplier to support equipment with repair parts throughout the life cycle and to arrange follow-up buys if desired.
6. The economics of the buy--the expenditure of national resources with emphasis on:
 - a. funds required, availability of credit, currency exchange penalties;
 - b. domestic R&D capabilities in relation to the level of effort, time, funds, and diversion from other work in progress required for domestic development of comparable equipment;
 - c. domestic production capabilities in relation to available facilities, production cost per unit versus the supplier's unit price, the possibility of producing all or part of the equipment offered in-country, and the domestic production of comparable equipment, stimulation of the domestic economy, elimination of the foreign exchange penalty, and improved security of supply are important background factors; and
 - d. operating/maintenance costs over the equipment life cycle.
7. The introduction of the equipment into the inventory in relation to obtaining technical assistance in the field, training/manpower requirements, and the overall logistic load represented.
8. The standing of the equipment in comparison to alternatives evaluated in the same terms. (4:G-1)

Each of the considerations noted above is extremely critical to the buyer, and much evaluation is given to each before an arms purchase is made. As a case in point, Israel is considering the cancellation of its order for fifty Mirage V aircraft due to the arms embargo made by France as a result of the last Middle East war. Included in this embargo were spare parts for French aircraft already in the Israeli inventory. As a counter to the sales cancellation, Israel is now considering purchasing forty McDonnell F-4 fighters from the United States. (33:18)

Third Country Involvement

A final feature of direct sales that contributes to the complexity of Foreign Military Sales programs to be discussed is the "third country clause." Such clauses require the approval of the United States Government before a resale may be made to a third country after the original buyer decides it no longer needs the item. Congress is quite concerned over unauthorized resale of equipment to other countries when the sale runs counter to U.S. policy. West Germany was going to sell M-47 Patton tanks to Pakistan, but Congress objected. West Germany then received approval to sell 775 M-47s to Fiat Company of Italy. Fiat, in turn, sold 100 of the tanks to Pakistan. This situation

demonstrates the difficulty in maintaining control and further exemplifies the need for closer coordination of the entire Foreign Military Sales program. (26:32)

Growing Competition in the International Arms Market

Current Sales Programs Limited

Comment has already been made concerning the scarcity of American hardware for foreign sale. There is a need to develop further sales customers--but the outlook at the present is not as bright as Defense Department salesmen would prefer. Such a condition is not one that has come about without evidence. Pure military sales is a declining program in light of the increasing desires on the part of Free World nations to commence producing their own military equipment. Only a small number of major military sales prospects are currently under negotiation.

In addition to the few aircraft considered by Israel (forty F-4s), Austria and Switzerland are presently appraising several U.S.-designed aircraft for possible purchase. Norway and three other NATO countries are buying the Lockheed P-3B Orion anti-submarine patrol plane (74:32&34) and Canada is purchasing 175 FMC Lynx command and reconnaissance vehicles. (73:33) The recent sales of M-109 howitzers and M-113 armored personnel carriers to Switzerland make market

prospects in that country likely. (69:57; 100:29) But these limited number of military sales ventures are alarmingly below the number of sales enjoyed by the United States during the early 1960s.

Increasing Availability of Foreign Weapon Systems

The international arms sales market is becoming increasingly competitive--as should be clearly evident at this point. In the face of growing coproduction/codevelopment possibilities, it is becoming very difficult to make direct sales to Germany, France, England, Italy, and Australia. These countries, with the exception of Australia, are determined to outsell the United States in Europe--and are doing quite well. Other European countries are entering the arms market with competitive weapon systems. For instance, despite offers by France and the United States, Denmark bought Swedish J-35XD Draken fighters. (19:31-32)

France has tied most of her sales into coproduction agreements and offset investments in foreign industry, as has Germany to some degree. An example of the success of such a policy can be found in the Dutch decision to purchase 415 German Leopard tanks over the British Chieftain and the U.S./FRG MBT-70 tanks. Not only would 400 MBT-70s have cost twice as much as 550 Leopard tanks, the Germans agreed to

offset seventy-five per cent of the total cost of the Leopards with investments in Dutch industry. (23:31)

The Swedes are marketing the Saab 105XT training/light strike aircraft strictly with an eye on the sales market in Europe, Latin America, and the Far East; market potential is for 500 to 1,000 units. (37:40) Aircraft such as these will reduce sales for the American F-4, F-104, and F-5 systems--the leading marketable aircraft for the United States.

U.S. Military Evaluates Foreign Weapon Systems

The shortage of available weapon systems for sale overseas is also reflected in the United States' local requirements for military hardware. The United States finds itself in the embarrassing position of not being able to fill a major requirement of one of its operational units. The U.S. Marine Corps has a need for 100 vertical or short take-off and landing (V/STOL) fighters. Lockheed's XV-4B and Ryan's XV-5 V/STOLs have crashed repeatedly. The LTV SC-142 V/STOL is still being tested, but four out of five aircraft have been damaged in tests. There has also been a failure with the U.S./German V/STOL program (to be discussed later in this chapter). The British Harrier, designated the P-1127, is the world's only V/STOL in mass production. (113:128)

The U.S. Marines are asking for \$58 million to buy twelve prototype P-1127s for testing and, if they perform well, will ask for 1970 funding to buy 100 more at \$2 million each. Final negotiations could result in the purchase of the Super Harrier, the P-1176, which has improved performance characteristics. The major hurdle is to obtain Congressional approval in light of the balance of payments problem, but the request is further complicated by the British cancellation of a purchase of fifty U.S.-designed F-111 aircraft and U.S. complaints over other British aviation imports. The U.S. Marine Corps' position is aided by the fact that, since V/STOLs do not require runways and are easy to camouflage, money could be saved in ground protection and construction. Approval is expected, even if the Marines have to reduce their purchases of domestic-production aircraft. (65:27)

The Competitive Trend Has Been Established

The trend in the international arms market, then, is toward greater competition from industrially advanced countries. The domination of the arms market by the United States has ended. The pressing need now is to concentrate attention on the type of Military Assistance which is replacing direct sales as the leading form of Foreign Military Sales activities--coproduction. The requirement is two-fold:

First, to present an overview of U.S. coproduction efforts; and second--perhaps more importantly--to give emphasis to the increasing number of coproduction ventures in foreign countries which are not connected with U.S. involvement.

U.S. Coproduction Efforts

Early Status of Coproduction

In the late 1950s and early 1960s, U.S. coproduction programs achieved good success in competition with foreign-led coproduction ventures. This success was principally due to the advanced technological know-how possessed by the United States. Need of access to this technology encouraged U.S. allies to negotiate coproduction contracts for major U.S. weapon systems.

Many of the principal weapon systems involved in coproduction during this time period have already been mentioned, but for the purpose of emphasizing the domination of the overall coproduction activities by the United States over other Free World nations, a review of the major programs is offered at this time.

The United States entered into approximately thirty-five coproduction or licensing agreements of U.S.-designed aircraft involving nearly 8,000 airplanes during the 1950-1964 time period. The other countries of the Free World

also had a combined total of thirty-five arrangements but involving only about 4,700 aircraft. (51:56-58) Thus from the standpoint of quantity, the United States was clearly the leading nation in providing aircraft hardware to other countries for manufacture.

The fact that the United States provided the bulk of weapons to be coproduced does not mean that it had the only available equipment on the market; rather it indicates that the U.S. was able to out-negotiate its competitors without too much difficulty. The F-104J aircraft was selected by Japan over British and French aircraft; the F-104G won over the British Firestreak and the French Mirage III for coproduction by the European Consortium countries. The Bullpup missile was selected over the French AS-30 in Western Europe, except in England where the Royal Air Force uses one type and the Royal Navy uses the other. The Hawk missile won over the British Bloodhound. The UH-1D helicopter was selected over the French Alouette. And, the Sidewinder missile was selected over a French-designed competitor. (81:57)

Thus, while the competition between the United States and its allies in the 1950 to mid-1960 time period was brisk, it was highly rewarding from the United States viewpoint.

Synopsis of Current U.S. Coproduction Projects

In the mid-to-late 1960s, the competitive environment of international coproduction changed drastically. While the United States is still winning contracts with such weapons as the F-4, the F-5, the F-104, the UH-1D, and the CH-53 aircraft; the M-60-A1 tank; the M-109 howitzer; and the M-113 armored personnel carrier--contracts for other major weapon systems are practically non-existent. Smaller military hardware contracts, such as a \$75 million contract with Japan to produce the Hawk and Nike-Hercules missiles (49:43), are helping to promote U.S. coproduction ventures.

Sikorsky CH-53.--A major program with a tremendous market potential is the Sikorsky CH-53 medium transport helicopter. An agreement has been negotiated with Germany for coproduction of 135 CH-53s, with a fifty-fifty cost sharing arrangement. The value initially expected for the program totalled \$350 million, but another \$25 million was added due to improvements and contract recalculations requested by the West German Government.* The United States may reap even further benefits from this program, since other

*A contract of this size is expected to lead to mergers in German industry with a possibility of nationalization of the aircraft industry in the future. (9:20)

European nations, including Austria, Belgium, Holland, Italy, and Switzerland, have indicated an interest in coproducing the CH-53--but only if it is produced in Europe. (35:28; 9:20)

McDonnell F-4.--The most controversial of the recent coproduction ventures involves England's F-4 aircraft program as an offset to the direct sale of fifty F-111 aircraft to Great Britain. The F-111 purchase was later cancelled, costing Great Britain \$150 million in contract penalty costs, with an additional \$129 million being lost in associated U.S. contracts as a result of this cancellation. The F-4 coproduction program is still in-process and will involve \$460 million for 210 aircraft. (78:65; 90:34)

Another somewhat controversial coproduction venture is the RF-4E program with the Republic of Germany. The West German Air Force requested funds to purchase two wings of RF-4E reconnaissance aircraft despite the advantages in purchasing the advanced RF-104G aircraft. Since production lines had previously been established for coproduction of the F-104G, retooling to produce the newer RF-104G would have been relatively easy and logistic support would have been simplified. However, the German Air Force favored the RF-4E, a modern aircraft with better operational capabilities.

The decision was further complicated by President Johnson's request that West Germany offset the annual \$700 million cost of maintaining U.S. forces in Germany;* Great Britain also requested an offset of \$200 million in British troop costs. These offset requests, occurring at a time when Germany's economy was growing slower than anticipated, were important factors that had to be considered in making the RF-4E decision. Despite all of the objections, an agreement was reached to purchase eighty-eight RF-4Es with an option to buy eighty-eight more for the German Navy. It is expected that \$100-\$125 million worth of components will be coproduced in Germany. As a part of the U.S./German coproduction arrangement, Germany agreed to buy an additional fifty F-104G aircraft at a cost of \$100 million, with eighty per cent to be spent in West Germany. (59:28; 56:26; 37:22)

The German RF-4E coproduction program is an excellent example illustrating the growing desire of foreign countries for the latest in military hardware--despite the fact that a production capability had been established for an earlier model aircraft and in the face of some degree of economic difficulty.

*Germany eventually offset seventy-five per cent of the costs of maintaining U.S. troops in Germany. (39:18)

Other than the German and English projects, only one other F-4 coproduction venture, with Japan, is currently under discussion. Although the amount of funds involved in the Japanese project is not yet known, 104 aircraft are to be produced by licensed production. The F-4E was in competition with the French Mirage F1C and the Lockheed CL-1010-2 aircraft. An outgrowth of the Japanese coproduction effort may be a Japanese-designed missile for use on the F-4E, but Japan is currently expected to purchase Raytheon Sparrow and Hughes Falcon air-to-air missiles. (38:26; 48:30)

Northrop F-5.--The last major U.S.-controlled coproduction program to be discussed in this thesis involves the F-5 aircraft, which has faced heavy French competition and fared poorly, as was evidenced by the previously mentioned Latin America sales debacle. The single most important program at this time is the coproduction arrangement established with Spain for the manufacture of its aircraft, designated the SF-5. Although a small program worth only \$42.6 million and involving seventy aircraft through 1971, it is very important to Spain's blossoming aircraft industry. For the past fourteen years, the Spanish industry had been limited to overhaul and maintenance work, but it has now built and installed seventy-five per cent of the hard tooling for the

SF-5. Spain is attempting to establish an international reputation for its industry, and the SF-5 is a relatively simple aircraft with which to accomplish this goal. The success of this coproduction effort may eventually mean an expanded market for the United States in selling the F-5.

(61:42)

Limitations on U.S. Coproduction Expansion

As the nations of the Free World increase their technological and industrial bases and achieve more stable economies, the United States is encountering greater difficulty in negotiating coproduction programs. The international arms market is becoming more competitive. Other nations are beginning to manufacture weapon systems comparable with those designed and produced by the United States. These conditions, coupled with the restrictions placed on the Foreign Military Sales program by U.S. national policy, are allowing other countries to take the lead from the United States in the international arms competition. U.S.-controlled coproduction programs are not yet being given the emphasis needed to insure America's continued leadership in the arms market. There is a need to review the major obstacles in the path of coproduction growth, for there is little doubt that the trend in foreign military sales is toward this avenue of arms production.

It is recognized that any discussion concerning the U.S. domination of the arms market involves many political aspects--and this thesis is not designed to cover political issues of international arms production. However, in reviewing the problems associated with the growth of coproduction, mention must be made of some of the major attitudes and actions on the part of the United States Government which have hampered progress in this area.

Balance of Payments Barrier.--As repeatedly stressed in this thesis, concern over the balance of payments has resulted in legislation which restricts the United States in competing on a par with the foreign countries. A possible answer to this problem is the consideration being given to reducing troop strength overseas and placing greater reliance on military air transportation. With such action, it is estimated that up to \$800 million could be saved annually with the recommended reductions. (24:27)

Overseas Investment Barrier.--No relief is expected from the mandatory curbs placed by the U.S. Government on foreign investments made by American industry. The investment legislation affects about forty major U.S. aerospace firms. That the long term effects of this legislation may be harmful is indicated by the following assessment,

"Industry sources say that the curbs, if prolonged, would ultimately reduce the aerospace industry-generated dollar flow into the U.S. by discouraging highly profitable joint ventures." (116:16)

The alternative to these joint ventures is licensed production, but most U.S. firms feel that licensing is less satisfactory in transferring technology and, furthermore, that the licensor has little voice in the marketing and direction of research and development programs. (116:16)

In considering the harmful legislation curbing overseas participation by U.S. industry, the following quotation is apropos: ". . . Congress, in the national interest, has an obligation to provide the means to carry out these negotiations, albeit with increased participation." (7:81) And, finally, since the legal basis for curbs on investments overseas stems from the 1917 Trading with Enemy Act, a question arises as to whether this act is outdated or should be considered to be legal authority for the curbs. (116:16)

Concluding Considerations

The involvement of the United States in coproduction programs must be allowed to develop in relation to the desires of its allies for increasing participation in these programs; that is, the United States' efforts and allies'

desires must be correlated. Thus, if the United States is to maintain its position of leadership in manufacturing and supplying arms for the Free World, then all handicapping restrictions and limitations must be lessened or eliminated. The United States has always enjoyed the freedom of competitive marketing within its own confines; it must be permitted to achieve this same competitiveness within the international arms market. Otherwise, continued restrictions curtailing competition may result in the loss of United States leadership and influence among the free nations of the world.

The current position of the United States becomes even more apparent when an examination is made of the increased development in technological and industrial capacities of nations throughout the world.

Foreign Arms Competition

The area of international military sales that has been undergoing the most dramatic change in recent years is foreign coproduction--that is, coproduction efforts among the foreign nations only, to the exclusion of the United States. The competitive success enjoyed by these totally foreign ventures has undermined the volume of U.S. sales and coproduction. While foreign coproduction is not the most recent

innovation in military design and production--the most recent being codevelopment--the greatest impact on the international arms market today is being made by foreign coproduction.

The Changing Environment

In the mid-1960s, the industrialized foreign nations came to realize that advanced technology is the basis for industrial growth. More importantly, they recognized that the required technology could not be obtained by making direct purchases from the United States--the major arms supplier--or any other nation. Only through the development of in-country capabilities to manufacture military weapon systems could the industrial and technological bases of the countries be increased.

Confronted with an insufficiency of funding necessary for individually developing advanced technology, several of the European countries decided that collaboration was the only alternative available for keeping in the technology race. By combining resources, these nations found they could collectively engage in the manufacturing of modern weapon systems.

The problems in foreign coproduction programs are similar to those encountered in coproduction projects involving the United States; these include: language problems,

technical problems, strong feelings of nationalism, and problems in establishing similar requirements for the equipment being produced. The last two problems--nationalism and establishing requirements--present the greatest barriers to collaboration in arms production. (17:81; 16:90-95)

European Technology

Foreign nations readily admit that America's technology leadership is needed, but several of these countries have made significant contributions in the advancement of technology. Examples include operational V/STOLs, hovercraft, steam catapults, mirror-deck landing, aircraft automatic landing equipment, ejection seats, jet engines, and the first jet bomber. The United States has sometimes been charged with stealing these innovations or ignoring them altogether. The leaders in various areas of European aerospace technology--England, France, Germany, and Italy--fear complete U.S. domination of European industry and science within ten years unless the smaller countries of Europe may be induced to participate in coproduction and/or codevelopment programs. (82:76; 17:81; 112:54)

Foreign Dissatisfaction

The British, in particular, have found U.S. sales tactics to be overbearing and quantitatively unfair. The United States is receiving over \$2 billion worth of military

business from the United Kingdom. The U.K. understandably objects that it received very little in return. The U.S. Congress even objected to the British sale of \$50 million in shipping agreements. Only Rolls-Royce feels that it is receiving an adequate share of the United States market. The United Kingdom is placing its future hopes in joint production and development programs with France and Germany--for the most part the United States is being omitted from such participation. (21:67-70) The British feeling, and perhaps the feelings of all foreign countries, regarding the international arms market may be reflected by the following quotation by Iain McLeod, a leading voice in England's Conservative Party:

This country is gradually committing itself to the view that American business activities are ruthless and can be dangerous. If either Britain or France is to compete with the enormous capacity of the United States, then they can no longer do so alone. Together they may not always compete to win, but second place is worth having. (41:33-34)

The Europeans are not the only foreign nations showing their displeasure with American business tactics. Australia, long a good U.S. customer, is becoming concerned about her relationship in business dealings with the United States. Australia's attitude toward future purchases from the United States, previously discussed in this thesis, is that arms

purchases will no longer be made without offset arrangements being part of the deal. Australia does not necessarily want to take part directly in the manufacture of the item, but it does want arrangements to offset the foreign exchange cost of the purchase. In addition to the offset policy, Australia also does not plan, whenever possible, to buy an item that could be produced locally. The effect desired is for a stimulated economy and an advancement in technology.

(3:35)

Industrial Mergers

Perhaps the greatest challenge to U.S. dominance in the international arms market is the trend toward internal industrial consolidation as a technique for increasing competitiveness in arms production. The consolidation arrangements between foreign governments, or between industries in a single country, provides a more responsive, manageable, and competent production base, with reduced risks to the nations involved; however, the costs are usually higher. (58:90)

The trend toward consortium-type mergers can be demonstrated by several examples. France presently has two government-controlled aerospace groups--Nord Aviation and Sud Aviation. Eventually all aviation work will go to Sud and all missile contracts will go to Nord. The two major

privately owned aircraft companies, Avions Marcel Dassault and Breguet Aviation, are managed by a single team and will eventually merge--perhaps in two years. And the various French engine manufacturers have merged into two non-competitive groups--Snecma and Turbomeca. (58:91)

The German aerospace companies have remained independent despite completion of the F-104G and Fiat G-91 production programs. However, the Ministry of Economics recently warned the aerospace firms that, unless they merged, contracts would be withheld from uncooperative companies. All firms are to be merged into two groups called Nord and Sud--modeled after the French. (9:20; 58:93)

The Italians are in the process of forcing mergers in the southern portion of the country because of the area's poor competitive posture. Eventually, groups in the north as well as the south may be merged, although plans have not yet been finalized. (27:19)

In addition to the internal mergers just discussed, international merges have been brought about by arms contracts. The European Consortium F-104G program, probably the largest of such mergers to date, was discussed in Chapter III and other examples will be cited later in this chapter. Through such international consortiums, the

foreign governments hope to improve the competitive potential of the firms involved and thereby land large and important manufacturing contracts.

Foreign Government Support of Industry

The amount of cooperation between the arms industry and the government in a foreign country differs significantly from the cooperation shown between the government and the arms industry in the United States. In Europe, not only do the governments play a major role in assisting firms in obtaining customers for their products, but the firms are often heavily financed by their governments. The difference in support given by the U.S. Government and foreign governments seems to be based on nationalistic desires and economic necessity. The loss of a major international arms contract would not affect the U.S. economy nearly as severely as it would any one of the European nations. Nevertheless, the cooperation rendered by foreign governments in promoting their industries will contribute to the continuing decline in U.S. ability or opportunity to participate in future international coproduction programs.

The willingness of foreign governments to support their domestic industries is illustrated by the following two examples. The French Government recently agreed to provide

seventy per cent of the funds for the coproduction of a twin-engine jet trainer. The tremendous success in the international market enjoyed by its predecessor, the Magister, of which 800 units were sold, proved to the French Government that it would be beneficial to support the follow-on jet trainer program. The second example involves British payment of seventy per cent of the development costs for the RB.211 and RB.207 Rolls-Royce engines. The British Government's faith in the ultimate success of the program is shown by the willingness to be repaid out of the profits. If successful, the British Government will make a twenty-five per cent return on its investment, as well as having given a healthy boost to a sagging economy. (15:35)

These examples should clearly demonstrate the willing desire of foreign governments to actively support their industry through cooperation with other countries in producing weapon systems. The degree of success achieved in these efforts may be illustrated by the following coproduction projects which have been conducted, or are being conducted, without U.S. involvement.

Foreign Coproduction Efforts

Although not a recent innovation in the international arms market, coproduction involving foreign-designed weapon

systems was not of significant magnitude in the 1950 to 1964 period; participation by foreign firms in coproduction ventures was not at a level equal to that of the United States during this earlier period. The growth of industries and the achievement of a rather high level of technology has enabled the situation to change significantly--today the foreign countries are extremely active in coproduction programs and are demonstrating a very competent ability to challenge the United States in providing weapon systems for other countries to manufacture.

Helicopters.--The design and production of helicopters is one area of European strength in the international arms market. France has been particularly competitive in the marketing of helicopters and inducing its neighbors to engage in the production of French-designed systems. The British and French have recently signed a \$140 million joint helicopter coproduction deal involving the SA-330, the SA-340, and WG-13 aircraft. The SA-330 and the SA-340 are of French design and the WG-13 is an English model with Rolls-Royce/Bristol Siddeley engines. (2:43) With the current trend in military tactics favoring the use of helicopters as a primary weapon system, this represents a lucrative field in coproduction competition.

The Breguet-1150.--The French-designed Breguet-1150

Atlantic anti-submarine warfare aircraft represents a highly successful consortium production weapon system. This aircraft was totally designed and developed by France but the production costs were shared by a group of European nations. Under a consortium arrangement, the cost was shared by four countries--sixty per cent by France, twenty per cent by Germany, ten per cent by the Netherlands, and ten per cent by Belgium. France ordered forty aircraft, Germany ordered twenty, the Netherlands ordered nine, and Italy has recently ordered sixteen to share in the coproduction plan. In selecting the Breguet-1150, the Italians rejected Lockheed's P-3B Orion, Hawker Siddeley's HS-801 Nimrod, and Fiat's G-222. In order to join the consortium, Italy agreed to pay France \$14 million in past research and development costs. (47:32; 22:46) It is interesting to note that Fiat's model was rejected despite \$17 million invested in Fiat's program by the Italian Defense Ministry over the past five years. Another interesting feature of this coproduction case is that it emphasizes the point that in consortium production arrangements, the country with the original developing industry usually buys the largest number of units--probably due to the greatest investment of funds by that country. (47:32)

The Mirage V.--France is making a concerted effort to erase United States supremacy in the military export market-- and is achieving remarkable success. The greatest success seems to be with the Mirage V. This aircraft has been exported, not only on a sales basis as with Peru, but on a coproduction basis as in Belgium. The Belgian program came as a rather shocking surprise to the United States, for after the Netherlands purchased the F-5 aircraft from the U.S., it had been expected that the Belgians would follow suit to standardize the two countries' forces. In fact, Belgium had spent considerable time in negotiations for the F-5 coproduction program. Instead, Belgium made a \$150 million deal with France to coproduce part of the Mirage V, as well as negotiating additional contracts on the Mirage III, the Mirage F1, and the Jaguar engines. This arrangement represented a better bargain for Belgium than the fifty-fifty split in production offered by Northrop for the F-5. (5:16-17)

The French Mirage V is also competing in Denmark where the Swedish J35 aircraft is currently favored over the Mirage V and the F-5. The latter two aircraft are also competing in Switzerland, but the F-5 is presently favored because of the escalating costs in the previous Mirage III

coproduction programs. However, the F-5 could still lose the competition because of Swiss concern over her own neutrality and America's involvement in the Vietnamese war. In this case, the Jaguar coproduction program could enter the competition and win. Regardless of the outcome, the fact is that the French are determined to out-compete the United States in coproduction programs. The Mirage V is recognized as being a higher performance aircraft than the F-5, and the French are offering better credit rates.

(5:16-17) Informed U.S. military sales personnel state that France is so desirous of engaging in production ventures with other countries that it will offer to "tool up" the other country in order to get its weapon system into production in another country. On the other hand, with poor credit terms and few new competitive systems, the United States stands to lose much of the potential international aircraft market.*

Allied/Communist Arms Production Negotiations.--The United States is faced with an immediate necessity of providing weapon systems, production arrangements, and financial terms which can compete with those offered by its foreign

*This information was obtained from discussions with DOD/U.S. industry personnel.

competitors. Furthermore, lest the United States think that her allies would never deal with countries considered unfriendly with the U.S., the following examples should dispel that misconception.

In January 1968, England and the USSR signed a five-year agreement to share technological and scientific capabilities. The sharing will involve aviation technology and may lead to licensing arrangements. At the same time, Rumanian officials were touring British plants in hopes of obtaining aircraft contacts to build up their aircraft industry. (10:22) These examples should tend to show that prior relationships, world objectives, obligations, or similar involvements between allied nations are not always considered, or remembered, when it comes to international competition. And, there may be a trend for the European countries to find new markets for their equipment--from sources other than their allies.

The Proposal of a Common Defense Market

By 1965 the developing arms production capability in Europe led the U.S. Government to realize that Europe no longer needed to depend upon the United States for its military equipment. In fact, these countries were able to join together in a common cause--the production of military

hardware. Since these arrangements could also be beneficial to the United States, the U.S. Government made plans to cooperate with its European allies in the international arms market.

In May 1965, Secretary of Defense Robert S. McNamara proposed the creation of a Common Defense Market within the North Atlantic Treaty Organization (NATO) for purposes of joint development and production of arms. The United States' optimism for the creation of the Common Defense Market was reflected in a remark by Henry J. Kuss of the Defense Department: "In the next 10-20 years we will see a harmonization in Allied military requirements and products to an extent not ever seen before in this field." (63:37-40)

The British Viewpoint

The European countries viewed the proposed Common Defense Market with a great deal of suspicion for various reasons, not the least of which was a statement by Secretary McNamara that the Market was to be a tool of U.S. State Department policy. (63:37) Also, the cancellation of the Skybolt missile project raised British suspicions of U.S. intentions; and the one-sided package arms deal involving American F-4s and F-111s confirmed these suspicions--that

the United States' reluctance toward reciprocal benefits would carry over in a common defense market arrangement.

(20:41-46)

But the largest obstacle to British participation in the Market was the Buy-American Act, which in effect forced British firms competing for contracts in the U.S. market to quote prices that were too low for profits to be realized. Since there was no guarantee that the Buy-American Act would be rescinded once the Common Defense Market was established, the British viewed the Market as but a continuance of American policy--meaning one-sided arrangements. Thus, in preference to the proposed Common Defense Market, the British placed greater faith in European coproduction/codevelopment programs which had already achieved some degree of success. (20:41-46)

The French Viewpoint

The French also viewed the proposed Common Defense Market with suspicion, primarily because of its attachment to NATO. In the mid-1960s, NATO had selected the French Breguet firm to produce a maritime patrol aircraft, the Breguet-1150 Atlantic, for the member countries of the treaty organization. After production, only France and Germany fulfilled their purchase obligations. Since a

U.S.-designed aircraft, the Lockheed P-3B, was in competition with the Breguet-1150 for sale and/or production in Europe, it was felt that U.S. influence persuaded the other countries to cancel their 1150 requirements. (79:61; 45:32)

The French also feared that membership in the Market would mean adoption of U.S.-designed and developed weapons--even with European production. This was not the sort of technology France was seeking, since she already had a viable aerospace industry and had achieved success in European coproduction programs. Thus, France had little use for the Common Defense Market. (79:59-62)

The Italian Viewpoint

Italy viewed the Common Defense Market as a plan to dilute what little technology the Europeans possessed. Because of the large technological lead already held by the United States, domination of the Market by the U.S. was feared. If the Europeans were to participate in the Market, Italian industry recommended that the Europeans concentrate on the strong areas of European development--that of helicopters, Mach 3 supersonic aircraft, and V/STOL aircraft. It is evident that the Italians viewed the Common Defense Market as an arena which would pit European industry directly against that of the United States--an atmosphere not conducive to the interchange of technology. (34:74-80)

Rejection of the Common Defense Market

The European rejection of the Common Defense Market indicates a suspicion of U.S. intentions and a preference for European collaboration in international arms production projects. The views of the European nations would likely have been quite different, if they had had a lesser level of technological capability at the time the proposal was introduced. However, the European nations had been developing their technology; they wanted their own manufacturing capability, their own weapons produced by their own workers in their own industries. Thus, they expressed an overriding reluctance in joining the Common Defense Market and being tied to U.S. domination in the field of weapons production.

This discussion of the Common Defense Market and its causes for rejection clearly reveals the current attitudes of America's allies throughout the Free World. They increasingly desire a significant role in the production of today's military hardware--the era of U.S. domination in the international arms market has ended. This is the situation that must be recognized and dealt with by both U.S. Government and industry, if the United States is to continue to be a leader--or even a major producer--in the arms market of today.

International Weapons Development Efforts

The American domination of the sales market in military equipment has been described as definitely declining--the current objective in the international arms market is coproduction, or interallied cooperation in weapons manufacturing. Now the question is: "What is the next phase of international weapons procurement?" The answer is already apparent. Tomorrow's method of satisfying weapon requirements is codevelopment--international collaboration in military hardware development.

The nations of the Free World will not be content to simply produce a weapon system of another's design--the producer must also be the designer and the developer. Although this is not a new concept, the emphasis to date has primarily been on developing strong and capable industrial and technological bases. The following review will illustrate the shifting emphasis toward increased developmental capabilities, and will also reveal that the United States lags behind the other Free World countries in collaborated development and production programs.

United States Codevelopment Efforts

The United States has been involved in but a few codevelopment projects, the two largest of which were the U.S./German V/STOL aircraft and the U.S./German MBT-70 programs.

U.S./FRG V/STOL.--In late 1965, the Governments of the United States and the Federal Republic of Germany agreed to study the possibility of developing a vertical and short take-off and landing (V/STOL) tactical fighter aircraft. The V/STOL was to perform as an air-to-ground fighter, carrying out such missions as interdiction and close air support. It would be valuable for close-in suppressive fire when conventional aircraft could not operate because of bad weather or unfavorable terrain. Other operational capabilities were also to be considered, such as a wide-range of conventional armament, the capability of carrying nuclear weapons, flight range, etc. (30:19)

Once it was determined that an aircraft of the V/STOL type did have military usefulness, arrangements were made between the two countries to enter into the definition of the development phase. Six aircraft companies, four in the United States and two in Germany, were selected to make proposals on design for the V/STOL. Fairchild-Hiller in the United States and Entwicklungsring Sud, GmbH in Germany were subsequently designated to carry out the program. These companies formed a partnership (EWR Fairchild International) to be managed by a team of representatives from each firm. (13:12)

A single program management office was established in the United States and a development/production office was established in Germany, with personnel from both countries represented at each location. This single program management was a unique feature of the U.S./FRG V/STOL program--heretofore, such offices had been established in each of the participating countries. A single aircraft design was the ultimate goal of the development office, but difficulties arose when the two countries could not agree to the configuration and design of the aircraft. Thus, the U.S./German preliminary evaluation of the program, requiring six months and \$6 million, ended with the project being terminated.

(13:12; 104)

Although not definitely known, the principal reasons for the project termination probably were the monetary constraints experienced by both countries and the fact that the United States had never fully decided upon an operational requirement for the aircraft. (13:12)*

Despite the program's termination, one real, tangible benefit was gained. The United States found that by following

*Germany is continuing its efforts to design and develop--and produce--a V/STOL aircraft; and private U.S. industry is also investigating the possibilities of such an aircraft, both for commercial use and military use. The U.S. Air Force is carefully observing these efforts.

a single manager concept, many of the management problems confronting other codevelopment projects were avoided. Thus, from a controlling and directing standpoint, the limited experience gained from the V/STOL project will be highly beneficial in future codevelopment ventures. (117)

The cost of the failure to complete the V/STOL codevelopment program cannot be fully measured at this time in terms of lost technology or other benefits, but one probable result will be the greater difficulty for the United States' engaging in similar future projects. An important observation that can be considered is that the United States lost an opportunity to share the cost of developing, and ultimately producing, an aircraft of the V/STOL type. It would probably cost a single country approximately \$600 million to develop the V/STOL studied by the United States and Germany. Although a dual development arrangement would be more costly in total funds (the U.S./FRG project estimated at \$700-\$800 million), the shared costs would be on' \$350-\$400 million for each participant--considerably less costly than independent development. (105)

U.S./FRG MBT-70.--On 1 August 1963, the United States and the Federal Republic of Germany agreed to develop the Main Battle Tank-1970 (MBT-70). The reasons why the United

States and Germany entered into the codevelopment of the MBT-70 were that the U.S. wanted a follow-on to its M-60 family of tanks and Germany wanted a follow-on to its M-47 series tanks.* After some discussion, the two countries agreed to a cooperative development/production tank program whereby both of their objectives could be combined into a single effort. Thus the formulation of the MBT-70 codevelopment project was finalized. (64:53; 108)

The MBT-70 program was managed by both a United States Program Manager and a German Program Manager--comprising a Program Management Board. Production lines were to be established in both countries, thus allowing both the United States and the Federal Republic of Germany to develop the capability to manufacture either partial or complete tanks. The overriding condition for the production was that any part, whether produced in the U.S. or in Germany, would be interchangeable with the same part manufactured by the other's production facility. (54:24; 108; 68:39) The agreement between the two governments further provided that the

*Prior to the agreement to combine her efforts with the United States, Germany had been developing a follow-on tank, the Leopard. She continued to develop and produce the Leopard, principally to be used as a military sales item. (108)

cost sharing for the development/production program would be on a fifty-fifty basis. (64:53)

The progress in developing the MBT-70 has not been completely satisfactory, either to the United States or to Germany. The program has encountered numerous problems, in funding (the prototypes are costing much more than originally estimated), standardization of manufacturing, disagreement as to configuration and design, type of armament to be used, selection of the engine to be installed, and others. Because many of these problems have not been resolved, the decision to enter into the production of the MBT-70 is still pending. Thus, the program remains as a codevelopment project and is not yet a coproduction program. (108)

No Record of Successes.--Although United States participation in still other codevelopment programs could be discussed, no major efforts to develop and produce military hardware in conjunction with other countries has thus far been completed. This serious condition requires close examination by the leaders of Foreign Military Sales activities. A continued lack of success or less than smooth accomplishment of these programs will tend to discourage involvement in future codevelopment efforts by not only foreign countries in conjunction with the United States but by U.S. companies themselves.

Foreign Codevelopment Programs

Anglo-French Jaguar.--The first major European aerospace codevelopment program was the Anglo-French variable-geometry fighter aircraft--the Jaguar. While this program did involve codevelopment, the ultimate goal was coproduction. Discussion of this fighter codevelopment project will illustrate points of disagreement common to any coproduction effort--either U.S. or foreign. The requirements outlining the need for a weapon system are often the greatest obstacles to contract signatures. In this case, the French wanted a high-altitude dash capability with an action radius of 750 nautical miles for its air force and also a separate carrier version for its navy, while the British wanted a strike/reconnaissance aircraft with a radius of 650 nautical miles. The development costs unexpectedly jumped from \$280 million to \$420 million for each partner. (88:31)

Agreement was finally reached to produce five basic versions including: (1) a single-seat tactical support aircraft for the French Air Force, (2) a two-seat trainer for the Royal Air Force, (3) a two-seat trainer for the French Air Force with a different cockpit arrangement and equipment, (4) a single-seat tactical aircraft for the French Navy, and (5) a single-seat tactical aircraft for the Royal Air Force.

In January 1968, the British and French Governments submitted a joint order for 400 aircraft, in which production deliveries were scheduled for 1970 for the French Air Force and 1972 for the Royal Air Force. (28:20-21)

The Anglo-French Jaguar aircraft is seen as a replacement for the Lockheed T-33, the Hawker Siddeley Gnat, the deHavilland Venom, the Hawker Siddeley Hunter, the Dassault Mystere 4, the Republic F-84, and North American's F-86 and F-100. The overall production now involves some 1,000 aircraft, and the British and French hope to ultimately export 5,000 units. (32:37; 28:20-21)

A ready market has been found for the Jaguar. The Germans are examining the possibilities of entering into the coproduction program, but have not yet established a firm policy decision because of the failure of the U.S./German V/STOL program. The British would rather enter into a separate coproduction program with Germany because of the French non-support of NATO. (11:58) Belgium, too, is interested, anticipating that up to 100 Jaguars could be used by the Belgian Air Force. One reason for Belgium's reduced buy of the French Mirage V aircraft in February 1968 was its desire to keep channels open for the Jaguar program. (6:32; 7:57)

MRA-75.--One of the most recent and controversial European codevelopment programs is the Multi-Role Aircraft-1975 (MRA-75). Negotiations for this program have been so complex that questions as to who will take part, the configuration, management structure, cost, and numbers required still have not been resolved even though negotiations began in 1967. Like the Anglo-French Jaguar, the MRA-75 is being developed and produced by allied governments, excluding the United States. Initial negotiations involved the Federal Republic of Germany and the Netherlands. It was hoped that the MRA-75 would replace the Lockheed F-104 and the Fiat G-91 aircraft. The price ceiling was \$2.5 million per unit which could drop to \$2 million per plane with a production run of 700-1,000 units. (36:26&32) Eventually, interest was shown by Italy, England, Belgium, and Canada. At this point, four different configurations were desired: (1) an air superiority fighter, (2) a ground attack fighter-bomber, (3) a high-speed interceptor, and (4) an interdiction fighter. (60:226)

In September 1968, the United Kingdom, West Germany, Italy, and the Netherlands signed a memorandum to open discussions on finalizing the MRA-75 contract. Belgium refused participation because of other aircraft purchases and

the possible Jaguar coproduction agreement; and Canada withdrew because of a shortage of funds and a desire to re-examine its procurement policies. (31:35) The debates intensified in October 1968 because of a disagreement as to who should have project leadership. The West Germans insisted on centralizing the project management in Munich. England wanted a loose decentralized management organization with design authority at the British Aircraft Corporation's Warton facility. With Germany having the largest requirement--500 aircraft against 150 for England, 175 for Italy, and 50-100 for Holland--it was unlikely that Germany was going to yield leadership. (57:22) Germany, Italy, and Holland were concerned over England's past record in cancellation and funding of purely British projects. Unless a compromise was to be reached, it was predicted that the aircraft would be built using French or U.S. technology in a German or Dutch industrial base. (52:40) Public opinion in England, arising from nationalistic attitudes and the need for more jobs, made it difficult for England to yield to Germany's leadership wishes. (115:29)

Germany was tempted to abandon the MRA-75 as a result of the confusion developing over project management and also because it had received an offer from Avions Dassault

concerning coproduction of the French Mirage G2.

Messerschmitt-Boelkow-GmbH was offered full rights and all technical data on the G2. Dassault was prepared to license the German company and its Italian and Dutch partners and to limit its own participation in the production effort to twenty-five per cent--thus allowing the majority of the work to be accomplished by the other three parties. Delivery could have been started in 1975. (38:35)

At last, after much deliberation, in April 1969, Italy, the Netherlands, England, and West Germany formed Panavia Aircraft GmbH, a consortium with headquarters in Munich to develop, produce, and market the MRA-75. Senior executives from all four parties involved were assigned on a full time basis. Germany's leadership seemed assured. (72:24)

Even with the agreement to proceed with the development and production of the MRA-75, details have not yet been finalized and it is possible that one or more of the countries may withdraw. Although the MRA-75 case is typical of the internal complexities that occur when a multi-national development and production effort is attempted, foreign governments are, nevertheless, dedicated to the development of their own manufacturing capabilities--even in the light of adversities such as those just described. Furthermore,

the French attempt to draw prospective customers into its arms market is quite apparent--and many times quite successful. This is an excellent example illustrating the growing competitiveness in the international arms market today. If successful, the MRA-75 program could mean even larger programs of this type in the future between foreign countries--without the participation of the United States.

(38:35)

Tactical Missiles.--In the mid-1960s, France's Nord Aviation and Germany's Boelkow GmbH began the trend toward joint European development and production of tactical missiles. Since then, there has been joint development of scores of tactical missile programs throughout Europe, including the recent Anglo-French Martel air-to-ground missile. The latter program has two versions: one with a television eye and the other with an anti-radar capability. These missiles are expected to be used on the Buccaneer, Nimrod, Atlantic, Mirage III, and the Jaguar aircraft.

(66:29; 53:95)

Wave of the Future

Discussions could continue on the successful codevelopment with follow-on coproduction of military equipment programs involving the allies of the United States. The

point to emphasize is that many of these efforts are being successfully carried out. This statement cannot be made of the United States' attempts to engage in codevelopment projects--at least not at this time. Each of the foreign examples just discussed illustrate, despite the coordination and nationalistic problems, that the foreign countries--particularly the Europeans--are willing to codevelop as a prelude to coproduction. In fact, it is the rule rather than the exception to share in the development of systems before entering into the production phase.

This discussion should also vividly illustrate the contrasting reluctance of the United States to deal on an equal basis with its foreign partners. This marked difference in the two approaches--one willing, the other reluctant--to joint arms ventures must be recognized and addressed by responsible government officials if the United States is to maintain its position of leadership among its allies and the free nations of the world.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

During recent years, especially since 1964, the complexity of the United States' Foreign Military Sales program has undergone major changes in its role in Military Assistance. During the period of 1950-1964, the United States enjoyed its dominant position as the Free World's supplier of military equipment. Today, this position is being challenged by nations allied to the United States, whose emerging status in the international arms market is making it imperative that U.S. industry and the United States Government review the present methods and policies relating to America's involvement in the world's arms market.

Following the damaging or destroying effects of World War II, the technological and industrial bases of most allied countries were insufficient to permit these nations to engage in the manufacture of military equipment. Thus, foreign governments were forced to rely upon the United States as the source of defense hardware. During the years

after the war, the foreign governments devoted a great amount of effort in establishing more stable economies, increasing their technical and industrial capabilities, and improving their positions as producers of military equipment.

The United States played a significant role in the development of the capabilities of its allies in achieving an independent status in the Free World's arms market. The initial involvement, on the part of the United States, consisted primarily of engaging in coproduction arrangements with various foreign countries. Because the United States was manufacturing military hardware which the foreign countries desired to produce, these coproduction programs were negotiated with relatively little difficulty. Since then, the manufacturing capability and level of technology of the allied countries have been improved to the point that they can now effectively compete with the United States in the international arms market.

No longer does the United States enjoy its former position of being the Free World's leading arms producer. Nations such as France, Germany, Italy, and Japan are capable of offering weapon systems comparable with those produced by American industry. This competitive trend in

the international arms market is resulting in a decreasing market for sales of U.S.-designed weapon systems. Furthermore, the capability of the United States to enter into international weapon production programs is becoming increasingly more difficult in the face of the growing competition.

The establishment of a production capability by U.S.'s allies has led to the desire of these nations to participate in the design and development of future weapon systems. Thus, codevelopment, or international collaboration in weapons development, represents the path which the participants in tomorrow's arms market will follow.

In view of the rise of technology, the increase of the industrial bases, the improvement of economics, and the growth of nationalism enveloping the United States' allies, the United States must give serious attention to its present attitudes regarding involvement in the international arms market. Too much emphasis continues to be placed on the direct sale of U.S. military hardware--too little emphasis is being given to the United States' participation in the coproduction/codevelopment of weapon systems. Such a position is exemplified not only by the scarcity of new, major U.S.-designed weapon systems competing in the world's arms market, but also by the increasing trend toward

international weapons development and production efforts which do not involve U.S. participation.

Unless the United States--both its Government and industry--immediately recognizes its lessening influence in international weapons production ventures, this nation faces severe curtailment in its participation in the world's arms market.

Conclusions

The main proposition of this thesis must, unfortunately, be answered in the affirmative--the United States has been losing, is losing, and will continue to lose international arms contracts until the United States is prepared to compete with foreign firms on an equal basis in the area of coproduction/codevelopment. The following answers to the research questions serve to prove the validity of the conclusion reached concerning the main proposition of this thesis:

1. Coproduction/codevelopment does increase the availability of technology to the countries involved. In fact, the acquisition of technology is one of the most important reasons for entering into coproduction/codevelopment from the viewpoint of the foreign firm. The United States is reluctant to enter into coproduction/codevelopment agreements with the zest of the foreign firms--one reason being the desire to keep the technology within the United States. As a consequence, the foreign firms are forming consortiums, mergers, and other agreements suitable to guarantee the transfer of this technology.

2. Controlled standardization of coproduced military hardware does improve interchangeability of parts on the end item of equipment, an aspect of coproduction which is particularly advantageous in defense alliances such as NATO. For instance, the total parts interchangeability of the coproduced M-113 armored personnel carrier is indicative of the success that may be achieved under controlled standardization.

3. Questionnaire responses by U.S. defense firms indicated that net production costs in a coproduction program are usually higher than would have been the case in a single production program because of duplication of the many coproduction activities. However, the cost to the individual countries in the partnership are generally lower because of expanded requirements. The individual development costs, as projected in the U.S./FRG V/STOL program, were also lower, although the total development costs were estimated to be higher than they would have been in a single development program. Higher net production and development costs are not serving as a deterrent to active foreign participation in coproduction/codevelopment programs--the rewards more than offset the higher costs.

4. Coproduced military weapon systems do result in more flexible defense if there is a high percentage of interchangeability of parts. This is true because common defense items mean reduced logistic support requirements and more than one source of supply. The trend toward European coproduction programs may prevent the United States from supplying the arms to these alliances in the future unless a greater willingness is forthcoming by the United States to participate in coproduction/codevelopment programs.

5. Coproduction does not have a greater effect on reducing the balance of payments deficit compared to direct military sales. However, as indicated in Chapters II, III, and IV, the difference between the two programs is not as great as many critics believe. Depending upon the terms of the agreement, much of the investment may be returned to the United States in the form of purchase of goods and services. Additionally, a coproduction program may lead to expanded markets thus even further reducing the difference between

coproduction and direct sales. Finally, the reluctance of former customers, as well as potential customers, to make a direct purchase may leave no alternative other than to seek coproduction agreements. Thus a slight balance of payments gap between the two programs may have to be accepted to obtain a share in the international market.

6. American industry is being hampered in its international arms competition by unfavorable policies and regulations affecting coproduction/codevelopment programs. Concern for the balance of payments problem has encouraged creation of unfavorable legislation affecting the overseas investments and credit procedures often necessary to successfully compete in the international arms market. The U.S. defense firms do not have the same rapport with the U.S. Government as do the foreign firms with their governments. Other political reasons for this non-support of U.S. defense firms should not be discounted, but they were not discussed in this thesis. Positive actions by the U.S. defense industry on its own behalf have served to lessen many of the negative effects of unfavorable policies and regulations.

7. The current organizational emphasis within the Department of Defense does not promote successful U.S. participation in coproduction efforts. As was indicated in Chapter V, the DOD organization is not oriented to the present trend toward coproduction or the future trend toward codevelopment. In fact, the emphasis remains on direct sales. The DOD turns to coproduction and/or codevelopment only when the direct sale cannot be successfully negotiated.

Recommendations

Specific Recommendations

During the course of this research study, it was stated that specific recommendations would be made concerning areas of the United States' Foreign Military Sales program which

require special attention or emphasis if the United States is to continue as a major participant in international weapons production programs.

Department of Defense Organization.--A reorganization within the Department of Defense should be undertaken. At the Assistant Secretary of Defense (OASD) level, the office responsible for negotiating sales and the office responsible for carrying out approved programs should be integrated into a single agency. This agency should have separate divisions for (1) direct military sales and (2) codevelopment and/or coproduction activities. The military departments i.e., Air Force, Army, and Navy, should also be reorganized along the lines prescribed for OASD.

Emphasis Within the Department of Defense.--A redirection of emphasis within the Department of Defense toward the United States' involvement in foreign military sales should be undertaken. Specifically, the United States should actively seek out and engage in coproduction and/or codevelopment programs with its allies.

U.S. Industry/Government Relationship.--Fewer restrictions should be imposed on U.S. industry by the United States Government to allow industry greater freedom in seeking out and negotiating coproduction/codevelopment programs.

Availability of Marketable Weapon Systems.--Emphasis should be given to increasing the number of weapon systems available for coproduction in the international arms market.

Participation of MAAGs.--Greater emphasis should be given to utilizing the Military Assistance Advisory Groups in identifying areas where coproduction ventures may prove profitable to the United States.

Recommended Areas for Further Study

1. The feasibility of fostering equality of opportunity among U.S. defense firms competing for international coproduction/codevelopment contracts should be investigated. Foreign firms presently have a competitive edge since the foreign government often selects a domestic firm and fully supports it against all competition. Thus the feasibility study should focus on U.S. Government support of the competing U.S. firms against foreign competition.
2. The active legislation governing the Foreign Military Sales program should be reviewed to determine the effects which such laws have on restricting the United States' participation in the international arms market. Obviously, in view of the trends now developing in weapon system production, many laws are out-dated and do not allow, nor encourage, U.S. participation in this market.
3. The current organization of the DOD's military activities should be studied to determine if a more effective structure might be formed to carry out the United States' involvement in international arms development and production programs. Presently, separate agencies are often responsible for development and production--but the trend now is toward an integration of such actions. Therefore, to allow a manageable transition from development to production, the need exists for a realignment of responsibilities within the Defense Department.

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The United States finds itself in the position of exercising decreasing influence on the international arms market. For such reasons as pride and nationalism; the growth of economies, technological and industrial bases -- the United States' allies are favoring negotiating coproduction/codevelopment contracts rather than direct sales contracts. This thesis shows the unmistakable trend toward coproduction/codevelopment and the increasing independence on the part of the United States' former buyers. The United States must willingly compete for multi-national coproduction/codevelopment programs, even though recognized as being less economically desirable, if its position in today's changing arms market is to be maintained.			
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