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TECHNOLOGY TRANSFER AND THE FSX:
EFFECTS ON U.S./JAPANESE RELATIONS
THESIS

Peter C. Leahy
Captain, USAF

AFIT/GCM/LSM/89S-8

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TECHNOLOGY TRANSFER AND THE FSX:
EFFECTS ON THE U.S./JAPANESE RELATIONSHIP

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 Contract Management

Peter C. Leahy, B.A.

Captain, USAF

September 1989

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Acknowledgements

I extend my deepest thanks to Dr. Craig Brandt, my thesis advisor, for his guidance and support. I am also very thankful to my wife, Kristine, for her love and encouragement during this effort.



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Abstract

The purpose of this study was to examine the role that technology transfer assumes in the relationship between the U.S. and Japan. The objective of this thesis is to determine if U.S. policy should look not only at the transfer of technology to help maintain its strategic military interests with Japan but to see if U.S. economic interests should play a more significant part in the technology transfer decision.

The study found that U.S. policy is broadening its focus so that both military and economic interests are examined when transferring technology to Japan. The study found that the FSX agreement between the U.S. and Japan was one of the reasons for this shift in U.S. policy.

TECHNOLOGY TRANSFER AND THE FSX:
EFFECTS ON U.S./JAPANESE RELATIONS

I. INTRODUCTION

This thesis documents the role technology transfer assumes in the relationship between the United States and Japan and how Japan's next generation fighter support aircraft, the FSX, has further defined that role. Since the end of World War II Japan and the United States have had a strong economic and military relationship. The transfer of technology has played a large role in the evolution of this relationship.

Background

The design, development and production of aircraft came to a halt in Japan at the end of the Second World War. The Japanese aircraft industry was disbanded until 1952 when the Japanese Air Defense Force was established and began overhauling North American F-86 and Lockheed T-33 aircraft for the U.S. government (42:2). Prior to this it neither developed, built or overhauled any aircraft. The repair and maintenance of U.S. aircraft was Japan's initial focus for their aircraft industry because there was no Japanese demand for civil or military aircraft. Even after the industry was re-established it was barred from exporting military aircraft (18:11). While the Japanese did produce a limited

number of aircraft it mostly built licensed production aircraft. Japan continued along this path through the 1960s and 1970s license producing the F-104, F-4, P-3C, and F-15. These programs have provided the Japanese Air Self Defense Forces (JASDF) with the bulk of their aircraft (18:2).

These coproduction programs have served both U.S. and Japanese interests. Coproduction has been encouraged by the U.S. Department of Defense as a means of promoting U.S.-allied standardization and interoperability and improving military readiness by expanding our support capability. U.S. industry also pushed for it to stem the competition U.S. suppliers began to feel in the 1960s from European competition (18:4). Indeed, these coproduction programs have served Japan's domestic industrial policy which calls for the development of an industrial base that produces high technology equipment while expanding the employment base (42:6). These defense programs have not only provided aircraft to Japan's self-defense forces but they have also assisted Japan in developing a modern aircraft manufacturing capability. This modern production capability has allowed the Japanese aircraft industry to enter the commercial aircraft sector as a subcontractor on commercial aircraft programs such as the McDonnell-Douglas DC-10, MD-80, and Boeing 747, 767 and 7J7.

The bulk of Japan's aircraft production however is still geared towards producing military aircraft. The mainstays of aircraft production are the 187 F-15 fighters

and the 100 P-3C anti-submarine aircraft which are currently being manufactured under license for deployment with the JASDF. Despite Japan's acquisition of the process technology and production expertise to produce aircraft, it still lacks the skills necessary to design, develop and produce a modern jet fighter or commercial transport. Japan's attempt to acquire these skills and its potential impact on the aerospace industry (military and commercial) which is dominated by U.S. companies is the focus of much of the controversy surrounding the FSX (25).

Problem Statement

The relationship between the two countries has evolved from a lopsided economic, political, and military relationship that followed WW II to one where Japan and the U.S. are economic equals. While Japan's political influence is not as great as that of the U.S. it is increasing as Japan's economic power increases. Japan has replaced the U.S. as the world's largest creditor and with it some of the influence associated with being the world's biggest banker. However, Japan's military capability is not nearly as great as its economic or political power. The problem is that the U.S. in maintaining its national security objectives continues to transfer military technology to Japan to maintain its strategic interests there. However this technology also has commercial applications. Some members of the U.S. legislative and executive branches noting the

that this continued transfer of technology will not only continue to erode America's competitiveness in world markets but also create future competitors in the arms export markets.

Research Objective

The primary task of this thesis is to determine if the U.S. policy should look not only at the transfer of technology to help maintain its strategic interest in Japan by helping the Japanese Self Defense Force maintain a credible military force, but to see if U.S. economic interests should play a more significant part in the technology transfer decision.

Research Questions

The basic foundation of the study is built around the evolution of U.S./Japanese cooperation on defense matters. Japan is no longer a down and out country struggling to get on its feet. Today, Japan is one the most modern industrialized countries in the world.

1. As Japanese competitiveness continues in world markets, often at the expense of American goods, should the U.S. view its economic interests in a more strategic manner?

2. Should the U.S. reconsider its policy of transferring technology to Japan? Are the military interests of the U.S. such concern that U.S. interests are ignored when transferring technology to Japan?

3. Should the U.S. tie its economic interests to its military interests in its relationship with Japan. If so how and is the FSX agreement an attempt by the U.S. to satisfy both military and economic interests?

These research questions were used to guide the research effort. The methodology used to research and answer these questions is discussed in the next chapter, Chapter II. Chapter III examines the background of technology transfer in the context of the U.S./Japanese relationship. Chapter IV analyzes the most recent U.S./Japanese bilateral military agreement, codevelopment of the FSX and the issues embodied in the agreement. The fifth chapter contains a discussion of the findings from the research and conclusions and recommendations based on the research. The appendix contains information which will provide the reader with supplemental information to better understand the material contained in the body of the thesis.

Scope and Limitations

This scope of this thesis is intended to give the reader a background in the U.S./Japanese relationship in the context of the technology transfer issue between the two countries. This background will provide the reader with the information necessary to review the analysis of the FSX agreement presented later. This thesis will examine only the technology transfer issue and how it affects the U.S./Japanese relationship.

Due to the limitations of time and funding only personnel in the major government agencies knowledgeable in U.S./Japanese relations, technology transfer, and the FSX were interviewed. Additionally, in order to allow for maximum access and use by potential readers, this thesis is based on information acquired from unclassified sources only.

Definition of Terms

A comprehensive list of definitions is contained in Appendix A (Glossary of Terms) to assist the reader.

II. Methodology

Introduction

This chapter describes the methodology used to examine the subject of technology transfer between the United States and Japan as it applies to the FSX. The major dimensions of the research were identified through an exploratory review of literature enabling the author to clearly identify the research problem. Once the major dimensions of the research were identified and the problem statement was clearly defined a formal research design was developed. The research design for this thesis involved the development and implementation of a data collection plan followed by an analysis of the data and finally conclusions and recommendations drawn from the data analysis. In this chapter, the methodology will be described so the reader will understand how the research was conducted and how the research objective was attained. This methodology will also provide the means to answer the research questions that are set forth in Chapter I.

Data Collection Plan

To meet the research objective and answer the research questions, a data collection plan was necessary. The data collection plan was a two-pronged approach which consisted of, a survey of applicable literature and identifying and interviewing experts knowledgeable in the areas of

technology transfer between the U.S. and Japan and the FSX agreement. The formal research design consisted of a literature review and unstructured interviews.

Literature Review

To insure that a thorough literature review was conducted, the literature review was broken up into each of the following elements that make up the topic of this thesis: technology transfer, U.S./Japanese relations, and the FSX. These areas were broken out as follows:

1. Technology Transfer. At this level information was obtained on technology transfer including the types of technology transferred and some of the mechanisms commonly used to transfer technology. Emphasis was placed on U.S./Japanese programs. To gain a better understanding for the major issues affecting U.S./Japanese technology transfer it was necessary to understand what kind of technology is transferred and the process by which it is transferred.

2. The U.S./Japanese Relationship. For this element literature was reviewed on past and present agreements involving the transfer of technology between the U.S. and Japan and their impact on current trade issues and defense burden sharing.

3. The FSX. Literature was reviewed on the most recent military cooperative agreement. Literature on the FSX was reviewed to identify the technology transfer and trade issues surrounding this particular program.

Defense Technical Information Center (DTIC) and Defense Logistics Studies Information Exchange (DLSIE) searches, supplemented by personal library searches provided much of the information for elements one and two above. The information for element three, the FSX was obtained primarily through personal interviews and discussions with experts on the subject matter. The interviews were supplemented with additional personal library searches conducted by the author. Briefly literature sources were obtained from:

1. Personal library searches.
2. DTIC and DLSIE searches.
3. Congressional hearings and reports.
4. Information from U.S. Government agencies; Departments of Defense, Commerce, and State.
5. Reports and speeches from industry pertinent to the subject matter.
6. Information from the Government of Japan and Japanese industry.
7. Information from the printed media.

Interviews

Initially, interviews and discussions were conducted to find other sources to aid in developing a larger knowledge base and to scope out and refine the thesis topic. These interviews and discussions were conducted with Air Force Institute of Technology (AFIT) faculty members, Air Force Systems Command personnel located at the Aeronautical Systems Division F-16 systems program office and numerous telephone conversations with other members of the Department of Defense. Additionally members of the Departments of State and Commerce were contacted as well as

members of the defense industry and their associated trade organizations. Finally, discussions with Congressional staff officers and personnel from the Japanese embassy were conducted. These interviews and discussions were held to identify those sources that were most knowledgeable in the subject area.

Personal interviews were then conducted so that the depth and detail of the information gathered could be maximized. All interviews were conducted in person in Washington D.C. during the week of 13 February 1989 in the respective offices of the interviewees.

Due to the breadth and scope of the subject matter an unstructured interview method was adopted to maximize the information obtained and allow the author the opportunity to pursue areas of significance in the subject matter that heretofore had not been identified. The interview approach included conducting general interviews in which the issues of technology transfer and the FSX and their relationship to U.S./Japanese relations was outlined before beginning the actual interview. While some structured questions were used, a more open "give and take" discussion allowed a better opportunity to investigate more deeply into the subject area through the use of follow-up questions.

Guidelines and questions for the interviews were developed from information gathered during the literature search along with research questions developed thus far using the research objectives as a guide.

Data Analysis

The data collected through the interviews and literature searches is qualitative. The analysis of the data does not require the use of any statistical techniques. Rather, the data will be assessed and evaluated using nonquantitative means in the form of personal judgment by the author based on his research and knowledge of the subject area. Based upon the analysis of data conclusions and recommendations are drawn.

III. Literature Review

Chapter Overview

This chapter presents the results of the literature review. Due to the breadth of the technology transfer issue this thesis is confined to the technology transfer in the aerospace industry only. This literature review provides the background necessary for the reader to understand how Japan and the U.S. came to their present policy positions and concerns as they relate to the agreement to develop and produce the FSX. This literature review relied on documentary material in providing the facts.

Introduction

To understand the technology transfer issue it is necessary to understand the motivations on why governments transfer technology and why governments try to acquire it. A government must also understand the implications of transferring technology on its military and economic systems and how technology and its transfer affects the interrelationships amongst these systems. The importance of this relationship was stressed by President Reagan's statement in his January 1988 U.S. National Security Strategy which said that "America's economic strength sustains our other elements of power (military, political, socio-psychological)... Our national security and economic strength are indivisible" (41:4,7). While this defined

America's overall security and economic goals in 1938, it is not a concept that is unique to America only but to all nations which have the intention of becoming a prosperous nation or wish to remain so.

America's economic strength lies in its wealth of ideas and innovation that produces technology that is sought by other nations. The United States uses this technology as a means to meet its national security objectives and commitments. In the case of Japan the U.S. uses its technology to enhance the defense capability of Japan so that it is better able to share the burden of protecting the sealanes around Japan and the Western Pacific from possible Soviet aggression (36). This "giving away" of technology to meet mutual security objectives has brought into question technology's role and value in this bilateral relationship and the degree to which it is mutually beneficial to both countries.

History/Background

The Japanese have had a long history of manufacturing aircraft under license. In 1910 Japanese military officers went to Europe to find suitable aircraft to produce. By 1913 Japan was producing Maurice Farman biplanes under license. By 1921 the Japanese were producing various aircraft including Sopwiths, SPADs, Curtisses and Wrights. Japanese design was heavily influenced by the Europeans. Europeans worked in Japan to assist in design efforts. Over time the Japanese gained enough knowledge,

experience and technology, to make "Japanese only" aircraft (42:2). Japan's most successful design effort came in 1937 when Mitsubishi designed the carrier based fighter known as the "Zero". This design was so successful that it took the U.S. until 1943 to design and produce a superior fighter, the F6F "Hellcat".

For seven years after WW II Japan built no airplanes. The Japanese aircraft industry was born again in 1952 when the Japanese government conditionally permitted aircraft research and production. Because there was no demand in Japan for either military or civil aircraft, the aircraft industry concentrated on overhaul and repair of U.S. military aircraft. With the establishment of the Japanese Defense Agency (JDA) in 1954, the demand for military aircraft began (18:11).

This demand for military aircraft was filled when the Japanese began licensed production of the American F-86 and T-33 military aircraft. The two countries worked out arrangements where the countries would sign MOUs at the government level and then the aerospace companies would work out the details of transferring the technology necessary for production. In addition to transferring the production technology the U.S. under the Military Assistance Program (MAP) contributed funds to pay for a percentage of the production costs of producing American aircraft in Japan (42:2). Under this program the Japanese licensed produced the F-86, T-33 and F-104. These funds were terminated in 1964

and Japan has since assumed the entire cost of producing aircraft under license from U.S. aerospace companies (18:11). Table 1 provides a partial listing of the military aircraft Japan has coproduced.

Table I*
Fighter Aircraft Coproduced in Japan

Type	Number	Year
T-33	210	55-59
F-86	300	55-61
F-104	200	62-67
F-4	138	72-81
F-15	187	81-?

* Japan is also currently producing 100 P-3C aircraft, a highly sophisticated multi-engine antisubmarine aircraft. (42:2)

Despite the termination of aid from the U.S., Japan's aircraft industry has continued to grow in both its size and technological sophistication producing some of the most sophisticated military aircraft in the world today. While these programs have provided aircraft to Japan's self-defense forces members of Congress have charged that it has also assisted Japan in developing a modern aircraft manufacturing capability not only for military aircraft but civil aircraft as well. They feel the U.S. is giving Japan the technology that will enable them to compete with American manufacturers in the civilian market (18:2). While it is true that Japanese aerospace companies are now subcontractors on civilian aircraft programs such as the McDonnell-Douglas DC-10, MD-80 and Boeing 747, 767 and 7J7 the extent to which military licensed production programs

have helped the Japanese get these subcontracts is not clear (42:2). The merits of this argument will be discussed later in the chapter.

U.S. Reasons for Transferring Technology

The U.S. Government in the past has looked at the transfer of military technology to Japan as means of meeting mutual security interests in the Western Pacific. This transfer of technology has often taken place in the form of licensed production agreements of military aircraft. In this type of agreement the U.S. has signed agreements with Japan to have a U.S. contractor establish a production facility in Japan to produce U.S. designed aircraft. In return for the tooling and technical assistance provided by the U.S. contractor, the Japanese contractor would pay R&D recoupment costs and royalty and technical assistance fees.

Through licensed production of military aircraft the Department of Defense also an opportunity to improve U.S. readiness through expansion of their technical and military support capability and promote U.S. allies' standardization and interoperability of military equipment (18:1).

While DOD had been encouraging coproduction as a means of promoting U.S.-allied standardization and readiness as well as meeting mutual security interests, U.S. industry was also pushing for it for economic reasons. Industry's reason for this was to lower costs to the U.S. DoD by spreading the R&D costs over more production units. The more units built the lower the R&D recoupment cost attached to each unit.

Other key motivations to collaborate and transfer technology for the U.S. include:

1. Expanding the market of the product.
2. Establish a positive trade balance.

Japanese motivations to collaborate include:

1. Job creation.
2. Strengthen national technology base.
3. Support high technology and defense industries (31:51-2).

The transfer of process (manufacturing) which is the knowledge, skills and equipment necessary to produce an item is the most common form of transfer between the U.S. and Japan (25; 28:19-20). Despite the benefits the question of whether it is good for the U.S. economy, specifically the U.S. industrial base is not clear.

Arguments Against Tech Transfer

Despite the military and economic advantages to using the same aircraft, there are, however, disadvantages to collaboration for both the U.S. and Japan. For the U.S. along with the transfer of its technology also goes the liability of assisting another nation to become a competitor with American products (31:52-3).

The transfer of process technology to Japan under licensed production agreements involves the creation of production capabilities overseas. Critics charge that when process technology is transferred overseas it not only affects U.S. economic power through the erosion of U.S. jobs

and production capacity but military power as well. They contend that military power is dependent on economic power. The U.S. is not only creating competition for our industries but is teaching other countries to manufacture a superior product which could someday be used against the U.S. on the battlefield (34:IV). While this scenario has yet to occur they point to South Korea which agreed to license produce the M-16 rifle for the R.O.K. Army only but once it acquired the capability it sold M-16s to countries all over the world despite U.S. efforts to stop them (50:52).

The concern in U.S./Japanese relations is not only the question of the creation of another competitor in Japan but also Japan's use of the technology. The process technology from coproduction agreements being transferred for military items between the U.S. and Japan also has wide commercial applications which can be used to help Japan develop a commercial aircraft industry (18:1).

The GAO published a study in 1982 to determine if military coproduction programs with Japanese were aiding in the development of a civil aircraft industry. While Japan is forbidden from transferring U.S. origin arms or technology this does not include U.S. manufacturing (process) technology and knowhow developed by the Japanese in next generation equipment. The GAO said:

The release of know-how is an irreversible decision. Once released it can neither be taken back nor controlled. The receiver of know-how gains a competence which serves as a basis for many subsequent gains. (18:9)

So while the U.S. can control what Japan does with the products it produces under license it can't control how it applies this process technology to other technology areas. DoD regards these decisions for using similar aircraft as opportunities to strengthen the bonds with allies. These opportunities have not as effective as the DoD has hoped. For instance, when the Japanese wanted to coproduce the F-15 DoD said that the Japanese would have an aircraft that is interoperable with U.S. aircraft. Over time however configuration control was not maintained because of U.S.-and Japanese-only modifications to the aircraft and interoperability in the U.S.' view was diminished while Japan maintained it was sufficient.

The U.S. and Japan view interoperability differently. The U.S. wants maximum interoperability which is achieved by an outright buy of equipment off-the-shelf from the U.S. that has common parts and training. In contrast, Japan views interoperability as using common radar mounts, wing roots, fuels and communication frequencies. Interoperability to the Japanese is a domestic design using common fuels and frequencies (42:6). These same viewpoints on interoperability and the challenges associated with overcoming the different viewpoints were brought out in the FSX program and will be discussed in Chapter IV.

The GAO contends that the Japanese aircraft industry has emerged from a coproduction arrangement to a point where the U.S. is trying to stay involved to slow Japan's march.

towards dominating the aircraft industry, a position the U.S. has long had and a sector of the U.S. economy that provides jobs and technology (18:v). Lt. Col. Rigsbee, editor of the Air Force Journal of Logistics, says the U.S.

must convince Japan that true interoperability of our forces is important and that cooperation is a two way street. A smaller world economy with over capacity in aerospace production depends on cooperation not competition. Japan must not take a self-centered view of the world. (42:8-9)

Japanese Reasons for Developing Aerospace

The islands making up Japan have few natural resources. The Japanese must import food for its people and fuel for its economy. These types of resources are essential to a nation's survival. Because Japan does not possess them in great enough quantities to sustain it, it depends on others to provide them. Japan sees the development of a technology base as the development of a national resource it can use to trade for the natural resources it lacks. The Ministry of International Trade and Industry (MITI), acknowledging the scarcity of Japan's national resources, points out the advantages of international technical cooperation in achieving its aim of developing technology as a national resource (35:24). Japan has used the acquisition of new weapons for its self-defense to achieve this aim (35:24). Japan has three alternatives available to it in acquiring new weapons for its self-defense forces:

1. Design and produce its own systems.
2. Buy off-the-shelf from another country.

3. Enter into codevelopment and/or coproduction
arrangements with another country.

To design and produce their own systems requires a lot of time at a high cost and an enormous amount of expertise. Japan does not possess all of these variables in sufficient quantity to produce the kind of product it is seeking for itself. It did not want alternative two because in it's efforts to obtain its national goal of maximum self-sufficiency found no utility in that approach. So they chose alternative three (18:4).

Japan supports a domestic industrial policy of full employment and establishing a national technology base, so transferring technology by codevelopment and coproduction agreements to Japan is always preferred to an outright Foreign Military Sale (FMS) buy. This helps Japan achieve its policy which it pursues even at the expense of having to pay more to produce it in Japan. Going one step further, if Japan has the alternative of domestic design and production, it will choose it over licensed production (42:6).

Licensed production gives the Japanese access to advanced U.S. technology allowing the Japanese industries a minimum of R&D investment. However the MITI believes that to establish a technology base Japan must develop its own aircraft industry so that there design engineers can get the experience they need to apply state of the art technology they are acquiring (25). The Japanese strategy for the 21st

century according to its 'visions' reports calls for Japan to be world leader in aerospace (42:5).

The key objectives of Japan and other purchasing countries when entering into military coproduction agreements are to (1) enhance hi-tech employment base, (2) develop future export industries, and (3) increase their military self-sufficiency. To reach these objectives DoD estimates that it costs Japan 2-3 times more to make a product themselves than purchase it from U.S. production lines. Japan considers the costs acceptable in pursuing their national goal of establishing technology development as a national resource (18:ii). Japan not only pays for the tooling necessary to produce items but the licensing and technical assistance fees to the U.S. company that developed the original equipment. Other causes for the high cost of in-country production is that the Government of Japan defense needs are smaller, production runs are smaller and more inefficient (18:ii).

Japan saw coproduction as an alternative to expand its high technology industrial base while becoming more self-sufficient in military supplies and equipment. They could acquire advanced technology without the risks and time penalty of self development that would expand and enhance its economy toward a more high-tech orientation while becoming self-sufficient in maintaining its forces (18:4).

The knowledge and experience gained from the coproduction of U.S. military planes is assisting Japan in

the development of a hi-tech based export industry by enhancing its production and engineering experience base. The military aircraft the Japanese are producing encompass advanced information systems, composites, electronics and systems integration. This type of technology applies to both the military and civilian aircraft areas in which Japan is actively acquiring technology. A MITI official states "that development and manufacturing techniques of both military and civilian aircraft are closely related and technological spin-offs can be applied to both" (18:11). This is readily apparent by reading Japanese trade journals in which companies openly advertise that their business is founded on alternative applications of foreign technologies such as the following example "WAKO... seeks to sell in the Japan market commercial applications that are spin-offs of sophisticated foreign aerospace technologies" (51:69).

In addition to developing an ability to design and produce an aircraft, the Japanese are confident of their ability to support the aircraft they produce with their own manufacturers. The Japanese have developed an infrastructure to supply parts for both military and civil aircraft along with the management and labor experience in aircraft production (18:11,12; 12).

Japan's quality is used as another reason for licensed production in Japan. Japan believes the quality of its manufacturing is superior in defense products as well as consumer products. While the quality of Japanese consumer

products are well known, U.S. industry and DoD officials were surprised at the quality of the manufacturing in the Japanese defense products. It was as if they were unaware that traditional Japanese quality found in consumer products applied to defense products as well (12).

Military Coproduction Role in Japanese Economic Development

MITI is assisting in the development of Japan's aircraft industry as part of its overall industrial restructuring and development policy that favors high-technology export industries. Japan seeks to develop its aircraft industry because

technological innovations in the aircraft industry, electronics, communications, alloy and composite materials production and processing are considered mutually complementary. Aircraft production represents an integration of these new technologies.
(18:13)

Developing its aircraft industry will aid Japan in becoming a technology innovator in the hopes of making technology innovation a national resource.

Since 1963, MITI has directed the industrial goals and policies of Japan within the general framework of its "visions" reports which are prepared every ten years. The 1980 MITI vision report describes the strategy and steps necessary for Japan's transition from its present mode of technology exploitation and product improvement to the more creative mode of technical innovation. Military coproduction agreements and the FSX codevelopment program represents an attempt by the Japanese to move in this

direction. The Japanese strategy for developing an aircraft industry is:

1. Establish consortia of Japanese aircraft manufacturers for developing and producing new aircraft.
2. Enter into international joint ventures with U.S. and European producers already established in the world markets.

3. Provide government financing for aircraft R&D.

With this government, industry and international cooperative arrangements approach, Japan seeks to overcome many of the obstacles it faces in developing an indigenous aircraft industry (18:iii). This commitment to technical innovation expresses a deep conviction that Japan's future economic security is linked to the commercial success resulting from high technology innovation and basic R&D, its national resource (35:24).

MITI is charged with overseeing the conversion of Japan's economy from one that is a technology exploiter to one that is a technology innovator. MITI's influence in Japan's is evident in Japan's defense sector. MITI exercises a large measure of influence over the coproduction decisions on military aircraft. While the Japanese Defense Agency (JDA) selects an aircraft that meets mission requirements, MITI evaluates the impact of any decision on the domestic industry. While JDA ultimately decides whether to import or license produce foreign military aircraft, MITI guidance and recommendations influence such decisions. MITI

personnel are assigned to JDA's equipment bureau. MITI's interest in developing and expanding the industry is well served by JDA coproduction programs (18:15; 48:19).

Decisions made in the United States to allow the coproduction of U.S. military aircraft as well as encouraging international commercial joint ventures also help contribute to Japan's achievement of its goals. By allowing the transfer of technology to Japan it enables Japan to enhance its aircraft technology and production base by utilizing proven U.S. aircraft R&D and production knowhow. Often this advanced technology transferred through military programs has commercial applications. For example composites, avionics, instrumentation and propulsion technologies have commercial applications. Weight reduction, fuel efficiency are concerns to military and civilian aircraft alike. In Japan, a GAO study team in 1982 observed

that production of F-15 and civil aircraft parts occurred on the same equipment and production lines. And that military and civil aircraft parts are mixed throughout the production process. (18:15)

The GAO study concluded that Japan's civil aircraft production reaps benefits from the advanced processes and technology used in military coproduction (18:15).

Toward this end, MITI recognizes the value of the F-15 and P-3C programs and commercial joint ventures provide to expanding the technological base, provide demand to retain and expand a hi-tech labor force. MITI has stated that

technological developments of both civil and military aircraft mutually supplement and complement each other, because development and manufacturing techniques are similar for both regardless of the differing performance requirements. (18:15)

In the case of the F-15, coproduction of F-15s in Japan contributed to the modernization and expansion of Japan's aircraft industry (31:60).

Japan wants more defense cooperation with the U.S. but only in the interest of building a self-sufficient defense industrial base. Continued access to U.S. technology through codevelopment projects with U.S. industry would further Japan's goals of self-sufficiency in defense and technological innovation (35:37).

In a time of skyrocketing costs for defense products and shrinking defense budgets, the strategic importance of technology cooperation is growing. Both the Japanese industry and government seem interested in cooperating with the U.S. to develop technology. The U.S. Defense Science Board suggests the U.S. enter into these agreements only if it is a mutually beneficial two way street. The U.S. decision to cooperate with the Japanese should be based on where they will be technologically in a decade not where they are now (35:17). The U.S. should not be so eager to give something to the Japanese without receiving something of equal technological value in return.

U.S. industry wants to explore cooperative development of technology further. However the U.S. fears building a strong competitor in aerospace. The Japanese have made

advances in technologies that possess both military and commercial applications. Japan has taken the lead in some technology areas and through government support is maintaining or expanding that lead enabling them to fulfill their national goal to be technologically innovative.

Japanese companies in their efforts to make self-sufficient defense economical will consider exchanging dual-use technology for U.S. defense technology if it is mutually beneficial and their technology is used only for defense and no other purposes. Japanese concerns about selling dual use technology to U.S. industry are:

1. Is it economically practical if it is used on defense items alone where R&D will not be fully recouped.
2. Using technology for other than its stated purpose
3. Gaining access to U.S. requirements and planning so that they can effectively compete in U.S. programs.
4. The red tape and complexity of the U.S. defense procurement system (35:40).

The Japanese are concerned that sharing this dual-use technology with the U.S. on weapon systems could get the technology of the weapon system classified and be limited and subject to export controls. This would not allow Japan to take advantage of the commercial applications of the technologies. Because these technology transfers ultimately affect competitiveness the conditions under which they are transferred are important (31:70).

Due to the high cost of developing and producing aircraft, aerospace companies are binding together to reduce the risk sharing costs and technical expertise. Japan faced with limited demand and a still small production base is interested in these consortia because it helps them gain additional technology transfer, developing its own markets and gradually penetrating exporting markets (18:16).

However there are risks when cooperating in a joint venture. While the venture itself may succeed the strategy of the gaining country may not. This can occur when the major aerospace companies, in seeking to maintain their technological lead, limit the transfer of technology, thus denying the newcomer necessary skills to enter the market. However the gaining company will be more successful if it specializes in certain technology areas but it does this at the risk of losing out on its ability to design and produce aircraft. Japan may employ this method through the oversight and direction of MITI by having individual companies specialize in certain areas of technology and through collaboration and technology sharing, the national industry as a whole will achieve its objective of being able to design, develop and produce a modern aircraft either while building the infrastructure to support the industry (31:46).

U.S. Policy Shifts

The U.S. has always maintained a policy of separating trade from defense. But with the escalating trade deficit

with Japan, the U.S. is increasingly being forced to lump the two issues together.

In the past the U.S. has been far ahead of the world in technology development and technology transfers have always flowed in one direction from the U.S. to Japan. The U.S. has considered its technology development capability as its economic comparative advantage. However Japan has become its equal in many technology areas (18:ii). The United States Trade Representative (USTR) coordinator for aerospace trade policy believes that it is essential that, in joint defense projects or technology transfer programs with Japan,

we take into account the potential immediate and long-term impact on the Japanese civil aircraft industry and our market position in that sector, an industry that is a technology driver. (18:18)

Officials from DoD, Commerce, Treasury, Labor as well as industry officials have voiced their concern over economic implications of military coproduction agreements with Japan. These concerns have grown even stronger with the recent agreement to codevelop the FSX with Japan. Concerns are centered around future competitiveness of U.S. industry, balance of trade, employment levels and weakened defense production base. In 1988 the Aerospace Industries Association (AIA) said U.S. aerospace companies led all U.S. manufacturing in the balance of trade with the world while providing 1.2 million jobs (31:15, 19). Many people do not want to jeopardize this position.

While DoD does try to examine the economic impact of coproduction agreements, it does not have the expertise to

assess the effects coproduction agreements have on the U.S. technology-based comparative advantage. While DoD and State are expert in assessing the military and political concerns confronting them, neither possesses the expertise to assess the economic impact these coproduction agreements have on the U.S. economy. The GAO report concluded that other government agencies such as Commerce, Labor, Treasury and the U.S. Trade Representative should be allowed to participate in the assessment to determine the economic implications of these coproduction agreements (13:iv).

Until the FSX controversy occurred, no mechanism existed to assess the economic implications of technology transfers to Japan. Ideas in the past have included a resource unit within the Office of the Secretary of Defense (OSD) to assist the military departments in such matters and facilitate policy level coordination within and outside DoD before U.S. commitments to other countries are made (18:21).

While the U.S. is considering modifying its policy that presently allows DoD and State free rein in negotiating military coproduction agreements, the U.S. has also begun efforts to reduce its defense burden in the Western Pacific. The U.S. is pushing Japan to increase defense spending and take on a greater security role in the Western Pacific. This in turn is forcing the Japanese to create a larger defense market. Japan has begun to assume a greater role in the defense of Japan and the Western Pacific. Japan has increased its defense spending acquiring more sophisticated

equipment. Table 2 provides some indication of the defense spending growth.

Table II
Defense Budget Growth

	% of GNP	in 1983 \$	
1970	0.79	2.4B	Avg. annual real
1983	0.98	11.8B	increase of 6%
			(35:21)

The consequences of a encouraging Japan to assume a greater role in the defense of the Western Pacific are not yet fully known. As Japan spends more of its budget on defense the incentive to keep costs down will increase. To keep costs down the Japanese may look to exporting its arms in a manner the U.S. does in its efforts to keep the cost of its equipment for DoD down. Although the Japanese have a policy banning arms exports, U.S. industry is concerned with the potential of Japanese industry competing in the arms export market. One Commerce Department official and several Congressional staffers agreed that it was just a matter of time before Japanese companies jumped into the multibillion dollar arms trade (6; 14; 26). However a State Department official predicted it would not happen within the next ten years. He surmised that such a departure from national policy would bring down the ruling Liberal Democratic Party (LDP) which has held power for the last 34 years (38).

Another consequence of U.S. policy in having Japan assume a greater burden of the defense in the Western Pacific according to a DoD official is a loss of influence

by the U.S. over the Japanese military. This greater security role coupled with Japan's defense industrial goal of maximum self-sufficiency will only accelerate this process of an independent Japanese military free from U.S. influence (36).

Japanese Policy Shifts

While the U.S. continues to try to understand the military and economic consequences of a policy of transferring technology through coproduction agreements with the Japanese, they were also in the midst of change. Japanese policy on arms transfers is based on the Three Principles of Arms Exports and Policy Guidelines on Arms Exports which was issued in 1967 and stipulates that; "arms exports will not be permitted to

- A. Members of the Communist bloc.
- B. Countries under U.N. sanctions.
- C. Countries involved or likely to be involved in international conflicts (35:47).

Up until 1983, Japan had interpreted this policy very narrowly not exporting any military technology or hardware to any country. In 1983 the U.S. and Japan signed a technology transfer agreement, commonly referred to as the Nakasone initiative which allowed the transfer of military technology to the U.S. (35:48).

The Nakasone initiative was heralded as the start of a two way street for technology transfer between Japan and the

U.S.. Technology would be transferred in both directions rather than just from the U.S. to Japan as historically been done through coproduction agreements. While the Nakasone initiative had a great impact on allowing military technologies to be exported to the U.S. there were some problems.

The military technologies listed in the 1983 transfer agreement were of little interest to the U.S. The U.S. felt that the items the agreement included were of relatively low sophistication and were not worth trading for. Table 3 provides a sample of some of the items that Japan included in the 1983 agreement.

Table III
Items Included in
the 1983 Agreement

firearms and cartridges
ammunition and launch equipment
explosives and jet fuel
explosive stabilizers
military vehicles and parts
anti-submarine and torpedo nets
searchlights
helmets
armor plate and bullet jackets
(35:30)

U.S. industry did not consider Japanese military technology to be Japan's leading edge technology. U.S. industry's reason for this claim was that very little Japanese R&D talent and funding went into developing military technology. Table 4 shows the relative amounts of R&D spent on defense for both the U.S. and Japan.

Table IV
United States and Japan
Government R&D Expenditures for Defense
as a Percent of Total R&D Funding

	1984	
United States	66.0	
Japan	2.8	
	(31:55)	

In Japan, defense unique R&D is supported by the JDA only. The government defense R&D lab (there is only one) in 1984 was given a budget of approximately \$250M (35:33). The Japanese in effect devote little effort to defense only R&D. However dual-use technology which are commercial technologies which have defense applications is supported by MITI, the Science and Technology Agency, and civilian agencies and receives the bulk of R&D funds (35:42).

The dual-use equipment that the U.S. is most interested in was not clearly spelled out in the 1983 agreement and therefore subject to interpretation of what is and is not dual-use technology (35:30). Interpreting the agreement has been done on a case by case basis between agencies of the two governments for specific technologies. Some of the Japanese dual-use technology of current interest to U.S. industry is listed in Table 5.

The potential benefits to U.S. industry and defense would be the acquisition of useful technology at less cost and time than developing them in house. Another benefit would be the establishment of long term cooperative business relationships with Japanese companies (35:55).

Table V
Dual-Use Technologies of
Current Interest to the U.S.

Gallium-Arsenide Devices	Electro-Optical Devices
Microwave Integ Circuits	Flat Displays
Fiber-Optic Comm	Composite Materials
Ceramics (Engines, Electronics)	Rocket Propulsion
Artificial Intelligence	Millimeter-Waves
Production Technology	Computer-Aided Design
Image Recognition	High-Temperature Mat'ls
	(35:55)

In Japan however, there are business concerns about the profitability of sharing technology that is commercially applicable with the U.S.. These concerns have continuously arisen since the agreement was signed and most recently becoming an issue in the FSX debate. Japanese companies are concerned that dual-use technology transferred to U.S. companies for incorporation into defense products might also be applied to enhance the commercial products U.S. companies are developing.

The relationship between the countries industries must rely on an element of trust if collaboration is to truly work and grow. Japanese willingness to share its own technology of commercial value will critically affect the success of U.S./Japanese collaborative efforts (31:65). While the U.S. military has transferred technology which represents the best the U.S. has to offer in terms of R&D funds expended, the Japanese have been reluctant.

U.S. Industrial Concerns

In the past U.S. equipment and technology has been made available to Japan under the Mutual Defense Assistance

Agreement between Japan and the United States of America" (MDA) concluded in 1954 (23:51). Under these agreements U.S. firms have had little control over the transfer of military technology abroad. The transfer of military technology under the MDA was made on a government to government basis. These agreements in effect set up an agreement to provide the recipient country the technology to produce American designed weapons. These agreements in which one U.S. aerospace executive said "we were paid to give them everything we had" (18:12) has allowed the Japanese to develop a domestic industrial base. Each subsequent agreement further strengthened the Japanese industrial base.

These military coproduction programs, which were largely foreign policy decisions had economic repercussions which were not fully appreciated. Coproduction of military items created competitors for U.S. manufacturers because they led to the development of specialized skills which competed directly with U.S. subcontractors at the second and third tier (31:44).

Acquisition of specialized skills through coproduction has been pursued by many other countries as well. For example there are over ten different countries producing or assembling components of the F-16. To meet national economic objectives governments have initiated policies fostering the development of domestic aerospace because of the role aerospace has in developing the high technology industrial base and jobs, as well as meeting security interests.

By now it is clearly understood that the U.S. by transferring its military technology could improve Japanese defense capabilities by putting more advanced U.S. technology into Japan's defense through cooperative programs. U.S. technology in Japan's defense promotes Rationalization, Standardization and Interoperability (RSI). RSI is improved by the utilization of common requirements, equipment and logistics support. Through this technological cooperative approach the U.S. would broaden its relationships with Japan and remain a participant in Japan's defense growth and its policies (25; 35:52). Pentagon officials insist that this is one of the most important reasons for previous coproduction agreements and why it is so important that the FSX agreement be approved.

The potential problem of increased technical cooperation is that the U.S., like the Japanese are also concerned that technology may be used for other things than just enhancing mutual security. Furthermore cooperation in the development and production of weapon systems conflicts with national economic and military interests. These conflicts are boiled down to two issues technology transfer and maintaining the industrial base (31:8). The U.S. must strike a balance between the two issues. To overemphasize and overcorrect one issue at the expense of the other could damage its export economy or threaten the very existence of a domestic industrial base.

While restraints should be maintained on technology that is truly critical to national defense the transfer of technology must be allowed to occur because if the U.S. is going to be allowed to compete in the global economy the terms of trade demand it. Excessive control that limits the transfer of U.S. technology when the availability of foreign technology already exists damages the U.S. industries competitiveness without deriving any national security benefits (39:5). Excessive control of technology can cause the loss of U.S. sales overseas and has prompted foreign countries to form consortia that deny U.S. industry participation. They have done this because in the past the U.S. has have vetoed third country sales of equipment containing U.S. technology with on again off again restrictions (39:5). Industry groups such as the Aerospace Industries Association (AIA) believe a more realistic approach to is one that operates at multilateral control through the Coordinating Committee for Multinational Export Controls (COCOM). The U.S. is not the only possessor of high technology. AIA believes tech transfer is an essential and desirable ingredient of international trade stimulating innovation and technical progress. Access to foreign technology is now more important than ever to the U.S. economy and the defense establishment. The U.S. Trade Representative believes

technology cannot be hoarded in today's competitive world. We should sell yesterday's technology where possible to gain funds to invest in tomorrow's. We

must stay ahead in technology development -- that's where the strength of our industrial economy lies.
(18:40)

The U.S. needs a system to prevent the flow of its comparative advantage to its economic competitors. The U.S. must not give up (sell) its technological advances unless it makes it obsolete by newer advances.

The U.S. however must weigh the benefits of promoting collaboration in the interest of RSI and reduction of redundant capacity through technology transfer. The U.S. must balance it with the political sensitivities of strengthening or weakening U.S. relationships with its allies (34:7).

Perhaps a successful method in controlling the transfer of technology while preserving the U.S. industrial base and its competitiveness might be accomplished through industry to industry joint ventures (31:37). The flexibility of a joint venture allows more of the production to remain in the U.S. generating domestic jobs contributing to the trade balance when products are exported. With joint ventures, companies have the opportunity to expand their markets while allowing themselves to maintain more selective control over technological assets versus licensing. Joint ventures also allow companies to share the development costs (risks). In a joint venture, a technologically advanced company can impart its technology as it desires keeping what they are leaders in and transferring the rest to the gaining company in return for

something beneficial to its own long term interests (31:37). In Boeing's joint ventures with Japan for instance, Boeing allows Japan access to certain technologies for the aircraft the wings of the Boeing 767 for example but not all of the other technology embodied in the aircraft.

In the aerospace industry U.S. firms are often the leaders in systems engineering, software design, integration and marketing. A joint venture would represent the transfer of skills to partners. The issue becomes the amount of skill passed to the partner. Do these skills represent state of the art, are they production skills only or the design and management skills necessary for the transition from design to production. These last capabilities provide the recipient with the greater overall expertise enhancing the partners ability to develop aircraft in the future (31:46). Experienced aerospace companies naturally tend to structure the joint venture so that they increase or retain their lead in key technology areas. Some members of Congress believe that the FSX agreement will transfer these last key areas to the Japanese with the result of having traded away our comparative advantage in the world market.

Joint ventures tend to impact at the subcontractor level where the tradeoff the major aerospace companies trade away U.S. subcontractor work so the major can retain its own skills (31:47). Despite the loss however joint ventures help avoid protectionist trade policies and barriers to markets because they dilute the national characteristics of the

product. The joint venture permits access to a foreign market by clouding the national identities associated with the structure of a joint venture. The FSX will be an aircraft that is truly devoid of representing any one countries technology. This type of arrangement can slow the desire for a nationalistic trade policy (31:47).

Toward this end the U.S. should develop a comprehensive policy on technology transfer not only with Japan but the world. It should begin by coordinating the efforts of all agencies within the government. It should then establish one branch as executive agent for all departments that looks at the economic and military consequences of technology transfer (34:10).

It is evident that the U.S. and Japan will increasingly be forced to cooperate in the future as each faces the reality of too many defense requirements and too few dollars. International arms collaboration is the self interest of possessing a capability to develop arms independently but also cooperating to produce them efficiently and economically. "International collaboration has been defined as the pursuit of national ends through international means" (31:59-60). The U.S. must measure cost versus gains in cooperation. More cooperation and less competition will help the two countries achieve their economic and military objectives. The benefits of this increased cooperation must be weighed but the U.S. must consider this:

Japan's defense industry will grow with or without U.S. help because Japan's continued development reflects industrial and Government intentions to achieve political, economic and military concerns common to all countries. A negative U.S. posture on cutting off Japan by not cooperating would only delay but not stop its growth. (35:51)

A protectionist trade policy by the U.S. would not force Japan back to relying on the U.S. for its technology development. The Defense Sciences Board believes Japan will meet its goal of technological innovation because the technology momentum, resources, Government commitment, and public support are in place. Japan has the capability to develop a self-sufficient defense industry base. Since 1962, Japan has itself produced over 80% of its defense materials and equipment with exceptions in aircraft and missile systems. From this base Japan would be able to become a major competitor in many fields. Japan intends to and will become a major competitor in aerospace, space and related electronics (8:11; 35:59).

IV. The FSX

Background

The Fighter Support Experimental (FSX) aircraft program is an attempt by the Japanese to upgrade the capabilities of the Air Self Defense Force (ASDF) in protecting Japan's sea lanes. Japan intends to replace its aging F-1 aircraft with another weapon system that will provide protection of its sea lanes well into the next century. In the Japanese "New Mid-Term Defense Program" which was approved in September 1985, Japan originally considered three options for acquiring the FSX: modifying F-4s; buying an aircraft off-the-shelf; or designing and developing their own aircraft.

The modification of the F-4s is considered only a slight possibility because Japan plans to upgrade 93 of the 129 F-4EJ fighters in the inventory. Of that 93, 17 F-4EJs will be converted to reconnaissance versions leaving less than 80 aircraft for conversion to FSX fighters. In accordance with Japan's new "big squadron" policy where one squadron will comprise 24 aircraft, approximately 100 FSX aircraft are necessary to maintain three squadrons, including reserves. It is evident that there are not enough F-4s to consider this a viable option (1:32).

Japan's second option to buy foreign aircraft off-the-shelf is not considered a strong possibility. The candidates to fulfill the FSX role are the Tornado, F-18 and F-16. The technology of these aircraft will be ten to

twenty years old by the year 1997 approximately when the FSX is scheduled for deployment. In addition to that is the fact that the Japanese have not bought an off-the-shelf aircraft since the 1950s. It is also uncertain whether these aircraft will be able to meet the major performance requirements for the FSX aircraft, see Table 6. Although these requirements were established as guidelines subject to interpretation rather than strict "requirements" none of these aircraft can meet more than two of these "requirements". Indeed these "requirements" have become a part of the controversy surrounding the FSX aircraft and will be discussed later.

Table VI
FSX Performance Parameters

1. 450 nm of combat radius. Flying at very low altitude carrying four ASM-1 anti-ship missiles and two IR-homing missiles.
2. Mach 0.9 speed at sea level with payload.
3. Air to air mission, FSX should be capable of carrying four "Sparrow" type missiles and four "Sidewinder" type missiles.
4. Twin-engined. Over 1 thrust-to-weight ratio.
(1:32)

It is clear that both the Japanese government and industry preferred domestic development. There is some evidence to indicate that the requirements were written so that they favored domestic development of the FSX (1:32; 48:19). Despite these challenges United States aerospace companies and European companies continued marketing their

off-the-shelf fighters to win the FSX contract. For the next three years of negotiations the Japanese fought to preserve domestic development by blocking options being presented by the European consortium, Panavia, General Dynamics and McDonnell-Douglas. Despite the requirements that favored the domestic option, none of the fighters of the foreign countries could meet the requirements needed for the FSX's principal role of defending Japan's sea lanes (1:32).

The Defense Security Assistance Agency (DSAA) which assisted U.S. aerospace companies in marketing their aircraft to Japan had one main goal, to provide Japan the best defense at the least cost which meant selling them a U.S. production aircraft. DSAA looked at the FSX as strictly a defense issue in which they sought to aid Japan in maximizing its defense at the least cost (25).

The Japanese in wanting to maintain an aerospace engineering base rejected the U.S. and European offers to buy aircraft off-the-shelf. The last time the Japanese had developed and produced an entire aircraft was 20 years ago with the F-1 and reasoned they would lose their ability to develop aircraft if they bought the FSX off-the-shelf (36). DSAA accepted this argument that Japan as a sovereign nation had a right to determine its defense needs and how it would meet them, and the U.S. had to respect that decision (7).

The Japanese based their assertion of being able to develop a world-class fighter for use in the mid-1990s as a

result of a study conducted by the Japanese Defense Agency's R&D institute and Mitsubishi done in the fall of 1985. The study concluded that it was essential that the Japanese develop the FSX domestically if they had any hope of developing a competitive aircraft industry. American aerospace industry experts agreed that without design and manufacturing development experience Japan would not realize its goal of developing a national resource based on technology innovation (48:19).

To keep Japan from going it alone then Secretary of Defense Caspar Weinberger initiated the idea of codeveloping the FSX. It would include an American airframe modified with Japanese parts. Weinberger told the Japanese that developing an indigenous aircraft would offend Americans, pushing the countries towards a trade war (8:18-19). It would also be incredibly expensive for the Japanese to design a new aircraft from scratch, a cost estimate from the Secretary of Defense's office of Program Analysis and Evaluation (OSD/PA&E) said the development of the FSX would cost three times as much as the Japanese had estimated (7). An indigenous fighter would also jeopardize interoperability and demonstrate to the world, especially the Soviet Union, that these two economic powers could not cooperate.

The Japanese then tried to redefine the codevelopment using a Japanese design with some American parts added (48:19). The U.S. pressed the issue of codevelopment based on a U.S. airframe. With the trade deficit between the U.S.

and Japan widening, \$52 billion in 1986 and Congressional anger rising over Japanese trade practices, Japan relented and agreed to co-develop the FSX based on the American F-16 design that would include Japanese designed avionics and wings (19:10).

The MOU was signed by Lt. Gen. Charles Brown, director of the DSAA and Masaji Yamamoto, director general of the Japan Defense Agency's Bureau of Equipment. The MOU was considered a trade success for the U.S. because the Japanese government and industry had wanted to build an indigenous aircraft on its own with little or no help from the U.S. As result of the negotiations the U.S. would get 40 percent of the \$1.2 billion development plus royalties and R&D recoupment costs for transferring the F-16 technology to Japan. In addition the U.S. would also get access to new technology developed by the Japanese (27:48).

DOD and the State Department saw it as a success because it met three main criteria;

1. A key ally and protector of vital sealanes would acquire a better aircraft than it could develop on its own:

2. At a time of shrinking defense budgets and a growing trade imbalance with Japan, U.S. companies stood to gain between \$2 billion and \$5 billion in development and production work:

3. At little or no cost the U.S. would tap into any technologies developed by Japan for the FSX (27:49).

Despite DoD's claim that the agreement was a success the Commerce Department and Congress were less enthusiastic. The vagueness in the wording of the MOU and its lack of guarantees on amounts of workshare and technology transfer brought back memories of previous agreements with the Japanese. Congress feared the FSX had the potential of causing irreparable damage to one of America's last high technology industries.

In previous agreements between with the U.S. and Japan any ambiguity was ironed out through the use of secret "side letters". Members of Congress and the Commerce Dept. maintained that these side letters have hurt the U.S. in past agreements. Clyde Prestowitz says side letters are not worth the paper they are printed on. In 1983, he negotiated an agreement on semiconductor chips between the two countries. The key to the whole deal was a chairman's note, a confidential side letter to the agreement. This side note called for Japanese users to treat the U.S. suppliers the same as the domestic ones. When the boom for the chips slowed, these arrangements were ignored, and the U.S. supplier market share fell even lower than it had been before the agreement. Since the chairman's note was confidential neither the public in Japan or the U.S. were aware of it and never knew of a commitment at all (40:33). The failure of this agreement led to the conclusion of yet another agreement in 1986 when the Japanese reportedly committed to let U.S. suppliers have 20 percent of the

market. However two years later U.S. shares in the Japanese market has fallen while the Japanese government insisted that the side letter did not guarantee a percentage but rather an effort to assist U.S. companies to achieve it (27:50). Senator Dixon (D-IL) said

our whole history has shown that we always do poorly in these arrangements with Japan. And there is concern that the FSX will lead to Japan's ultimate domination of the commercial aerospace market; which is their intention and their ultimate goal. (27:49)

The Bush Administration responded to Congressional concerns in asking for safeguards in the deal. The number of Congressmen expressing their sentiment both for and against it is significant in and of itself because it indicates American priorities are shifting to economic and trade issues. The Administration is not trying to crush Japan's aerospace ambitions or force Tokyo to buy a U.S. plane off the shelf, although buying the FSX off-the-shelf was the Commerce Department's original position which partly precipitated the Administration's reevaluation of the deal. Rather President Bush decided to reopen the agreement and press Japan for safeguards, including a clearer understanding of what the U.S. would gain from the project and what technology should the U.S. withhold (19:44).

The Administration's willingness to reopen negotiations to clarify the details of the agreement and obtain specifics on workshare and technology transfer signified a departure from previous joint military projects. It marked the beginning of a new get-tough era in U.S. relations with its

trading partners. The Administration now considers U.S. industrial competitiveness to be as essential as tanks or missiles to American security (19:44). Says Clyde Prestowitz a former U.S. trade negotiator with Japan, "trade is defense" (19:44). This new beginning was clearly illustrated when at one point during the negotiations to modify the agreement the Japanese ambassador was summoned to the State Department where he was met by the secretaries of State, Defense and Commerce as well as President Bush's national security advisor (15:2).

These events have surprised the Japanese who thought the FSX was agreed to on favorable terms with the the U.S. (21). The FSX agreement restricts the Japanese government from using FSX technology for commercial uses and restricts exports to third countries. The Defense Production Committee (Japan's big business group) thought it so favored the U.S. that while urging continued joint defense technology projects with the U.S., it wants Japan to ensure that future technology products be free of U.S. restrictions (22:4).

The Japanese government was deeply divided over whether to accept the United States' tough, no-compromise position. These follow-on negotiations to modify the deal have revolved around two basic issues- a guarantee of a U.S. share of production and mutual access to technology. The division pits Japan's foreign ministry against its defense agency who also represent Japan's industrial's interests.

The foreign ministry wants to accept the U.S. deal for fear that collapse of the deal would further damage already deteriorating U.S.-Japanese relations. The foreign ministry believes that it is not worth risking this relationship for the sake of aircraft. Defense officials however insisted on concessions from the U.S. saying the deal is one-sided (49:1).

It seems the foreign ministry prevailed over the defense ministry and industry interests. In April President Bush announced that a new modified FSX agreement had been reworked with the Japanese. What finally emerged as the FSX agreement is essentially what the U.S. wanted. Indeed it goes beyond expectations in both work share and technology transfer, 40 percent of the \$1.2 billion in codevelopment and 40 percent production. While the military technology of Japan is inferior it was the dual-use technology embodied in the wing and radar subsystems that U.S. companies were most interested in. American companies are interested in the production process of the gallium arsenide chips that are a key part of the radar. As for the wing, while U.S. technology in composites is equal to or ahead of the Japanese, it is the production process for creating the wing in a single piece that American companies want (48:19).

Despite the assurances of the Administration to Congress, many were still skeptical that the deal was in the best interests of the U.S.. This skepticism was apparent when the Senate on May 16, 1989 approved the deal with Japan

of the FSX by a vote of 52 to 47. The close vote reflected the doubts by many in Congress and the perception of unfair Japanese trading practices in all markets that allow Japan to prosper in the face of a growing trade deficit.

The Senate also voted 72 to 27 to approve a resolution by Sen. Byrd (D-WV) that wants the Bush administration to firm up the concessions it said it received from the Japanese. The resolution calls for a guarantee of a production share for American firms while keeping critical engine technology in the U.S. (4:6).

The White House viewed the Byrd resolution as an attempt to set preconditions on the President when negotiating with another country limiting his ability to conduct negotiations (45:26). While some viewed the events leading up to the FSX deal as overt Japan bashing others saw it as setting a precedent for future agreements with Japan and other countries such as South Korea which is proposing coproduction of the F-16. Some members of Congress believe maybe Japan should develop its own FSX. They believe Japan does not care about the price they pay for the plane as long as they get the design and manufacturing experience which indicates that economic aspects are Japan's number 1 priority while defense is the number 2 priority. Some members of Congress feel that if the Japanese were really concerned with defending Japan they would have bought F-16s off-the-shelf so they could maintain interoperability with U.S. aircraft while obtaining delivery faster (14).

The FSX deal may not only signal a new 'get tough' policy for the U.S. in its trade relations but also the way it views military cooperative programs. The Commerce Dept. has used the FSX issue and recent legislation to make itself a primary participant in the development of any future high-tech initiatives or joint ventures. In order to ensure that some assessment is made of the economic effects of defense-related MOUs, Sen. Bingaman (D-NM) introduced an amendment to the 1989 Defense Authorization Act that requires the DoD to consult with the Commerce Department before signing new MOUs (46:3). Commerce's role may further be strengthened if proposed legislation is passed to make the Secretary of Commerce a member of the National Security Council where the FSX deal was finally deliberated for an administration position on the FSX (27:51).

The involvement of the Commerce Department in defense cooperative agreements and the joining of economic issues with defense issues marks a significant departure from previous U.S. policy. Says Rep. Les Aspin (D-WI.), chairman of the House Armed Services Committee 'this is the emergence of an entirely new concept of national security. It embraces economics and competitive, commercial relations' (19:10).

In testimony before the House Committee on Foreign Affairs the Secretary of Commerce Robert Mosbacher said:

I am convinced that it is possible to proceed with defense cooperation agreements such as the FSX without compromising our economic security, as long as we are careful to promote both objectives. The two goals need

not be mutually exclusive...From this time forward, the industrial base aspects of proposed defense cooperation projects with other nations will be weighed along with the defense considerations to ensure that such projects are in our national interest. Our nation cannot be strong militarily if it is not strong economically. The process established by the president for balancing these interests will help us ensure that the defense cooperation projects we enter into with other countries-such as the FSX project with Japan-are in the economic and military interests...of the United States. (33:32)

The FSX venture has become the focus for U.S. concerns about fair trade, defense burden-sharing and the transfer of technology. U.S. negotiators are insisting that American companies get the tooling, technology and do the work for the wing, seeing this as a major test of Japanese willingness to cooperate. Possibly the most important part of the debate is how the U.S. should treat its ally and economic competitor. The issue is whether the U.S. should hold its aggressive trading partners at arms' length in terms of transferring military technology or for the sake of common security give them the technology (27:46).

The FSX is also important because it now puts the U.S. on the path toward redefining the boundaries of responsibility and building a consensus on technology transfer and international joint ventures, says Rubinstein a former State Department and Defense official "We need to get smarter with the Japanese, we have to establish stricter lines of technology flows in both directions and that the era of the giveaway is over. In principle to do that you have to get the economic agencies more involved." The outcome of the FSX controversy could be a more coherent trade policy (27:51).

Arguments for FSX Cooperation

Despite the outcry from Congress and the Commerce Department to do so, few believed the U.S. could actually sell jet fighters off-the-shelf to Japan. Japan had a long history of coproducing U.S. fighters, moreover with the Soviet Union as its neighbor occupying islands claimed by Japan coupled with the long shipping lanes separating it from its nearest allies, Japan would be foolish not to want to establish its own aircraft production base (27:49-50). Because the Japanese needed a plane with a larger wing to carry a greater payload and take off and land on short runways while providing greater maneuverability a new aircraft had to be developed. No country could offer an off-the-shelf aircraft that met the requirements. Additionally it should be noted that no industrialized country has bought the F-16 off-the-shelf in 10 years. All F-16s are coproduced in one form or another (20:8). For the U.S. to expect the Japanese to buy the F-16 while countries like Greece and Turkey coproduce at least some part of the F-16 is naive. Joel Johnson, Aerospace Industries Association (AIA) vice president international, says the Indians, Swedes and Brazilians are developing their own aircraft why shouldn't the U.S. expect the Japanese to (24).

This realization that very few sales of aircraft are direct off-the-shelf buys necessitates a change in the sales strategy of aerospace companies. Aerospace companies

will look increasingly to cooperative arrangements to sell their high technology as an end product. Harlan Ullman, an analyst with the Center for Strategic and International Studies (CSIS) says

U.S. high-technology business will inevitably suffer if they are not allowed to make money on their second-generation technology through global sales arrangements such as the FSX. (27:50)

The FSX represented the first time a major U.S. aerospace company had agreed to codevelop an aircraft with its foreign partner as the prime. Japan would not only fund the entire cost of development but General Dynamics, the F-16 manufacturer would share in an agreed upon development and production share each approximately 40 percent. The Japanese technology resulting from this development would flow back to the United States (27:49). Joel Johnson, of AIA stated

the only difference between the FSX deal and one the U.S. proposed to the Europeans for the European Fighter Aircraft (EFA) is that the U.S. would have had to fund a major portion of the development costs and we would have claimed that a victory. (27:50)

Secretary of Defense Cheney said the deal as it is now structured would provide more than \$2 Billion and 22,000 jobs for the U.S. (13:11). Cheney insisted in Congressional testimony that U.S. manufacturers will gain access to superior technology through the joint development of the proposed fighter.

Suggestions that the Japanese have nothing in which we would be interested underestimates Japanese technological capabilities... and denies our defense industry the synergistic benefit of technological cooperation. (3:9)

When President Bush announced on April 28, 1989 that an improved agreement had been reached on the FSX aircraft. He pointed out that the U.S. will get contracts, jobs, favorable trade flow, while keeping U.S. superiority in commercial and military aviation (47:3,42).

Economic interests aside, for defense purposes the U.S. gets a stronger Pacific ally possessing an aircraft that would complement U.S. military aircraft. Also U.S. codevelopment and coproduction of the FSX would help the U.S. maintain influence over the pace of growth of Japan's aerospace and defense industries. If the Japanese had gone it alone or with another partner it might have encouraged Japan to take a more independent military posture (32:7).

Arguments Against

The critics claim that the U.S. should have pushed for an off-the-shelf buy of an American jet. President Reagan and Ambassador Mansfield should have lobbied hard for it. Rep. Richard Gephardt (D-MI) chairman of a House task force on trade and competitiveness says

the Japanese government has correctly pointed out that its deeply in Japan's self-interest to bring its trade deficit with the U.S. down if it wants to retain free access to this market, and the best way to do that is to buy an American aircraft off-the-shelf. If we can't sell Japan jet fighters, what can we sell them? (27:49)

With a U.S. budget deficit distorted by a \$55 billion trade imbalance in 1988, the possibility of a showdown with Japan over burden-sharing and trade practices was inevitable. There was pressure from Congress for President

Bush to put Japan on its list of unfair traders under the 'Super 301' provisions of the new trade law. According to Democratic Senator Jeff Bingaman, Chairman of the Senate's Armed Services Committee Subcommittee on Defense Industries and Technology

Some of the frustration surrounding the FSX is an outgrowth of the fact that we've left it to DoD to negotiate these arrangements. There's a feeling that defense officials are too anxious to accommodate our allies for purposes of strengthening our common defense. DoD still approaches such security arrangements with a mindset developed when the U.S. was the dominant economic power... We now have some major competition among our allies both in the Far East and in Europe and we don't have the luxury of dealing with them in anything but a business like way. (27:48)

The U.S. has hurt itself in the past by emphasizing the strategic side in such negotiations while the Japanese emphasized the economic side (27:51). They note how the JDA equipment bureau has members of MITI on their planning committees that influence how military programs will affect the Japanese industrial base. Some members of Congress believe the United States has to give up its altruistic outlook towards its allies which it developed under the Marshall Plan and look at them as equals.

The Defense Department which negotiates the military coproduction agreements believe that honoring their commitments to treaties for mutual defense against the Soviet Union is the big overall issue. They believe that Congress and Commerce have reduced our security responsibilities to the argument of linking trade with defense by telling Japan if you do not cut your

surplus, we will not honor our part of the treaty and you will not get defended (36).

A growing number in Congress and the public at large see the economic issues, trade balances and deficits as the big broad picture facing the U.S.. They feel that it is both the State and Defense Departments that must adjust especially in light of the lessening tensions in East-West relations (26). A recent poll of Americans showed the relative importance of trade versus defense when Americans rated Japanese competition as a greater threat to U.S. security than the Soviet military (26). The priorities of the U.S. while shifting from defense to economic issues has led to increased focus on DoD's pre-eminent role in negotiating international joint ventures and their management of them.

In the backdrop of a rising trade deficit with Japan and U.S. losses in other market areas, the FSX has become a stand for commerce and USTR against DoD and State on how future technology-sensitive trade deals and joint ventures are conducted (27:46). These departments are now working out a new relationship that now has DoD and State share its power and responsibilities with other government agencies when negotiating military joint ventures and tech transfer agreements.

Despite this new approach to assessing the economic impact of the FSX deal on the U.S., Congress continues to regard Japan suspiciously. The Congressional complaint is

that the U.S. has a manufactured product that meets Japan's needs and would be far cheaper than a Japanese-built version. Congressional opponents of the FSX deal believe Japanese leaders should spend some of their ever growing trade surplus on the U.S. fighters (20:8).

Senator Jesse Helms (R-NC) called the Japanese effort to build the FSX, rather than buy the F-16 from us "pure protectionism" and stated "they skinned us real bad in December 1941, and they are skinning us with the FSX" (5:5). Helms went further saying

The FSX program is a bad deal for America...The FSX will be the laboratory and training ground for the design, production, avionics and other engineering talent necessary to build a world-class Japanese civilian aircraft industry. (16:6)

This type of sentiment captures somewhat the mood and frustration of dealing with Japan that Congress experiences, and how it often boils over to emotional outbursts.

Senator Helms was not alone in his attack on the FSX deal. Senate Joint Resolution 113 introduced by Sens. Alan Dixon (D-IL), Alphonse D'Amato (R-NY) et al. was introduced to prohibit the sale. Senator D'Amato called the sale "Pearl Harbor without bombs" (44:1). Under the terms of the Arms Export Control Act, which governs arms transfers, both houses of Congress must pass resolutions of disapproval within a 30 day period to an arms sale. In the past, when such resolutions have been approved, the president has vetoed them, thus requiring two-thirds votes in both houses to override the veto (44:46).

Senator Robert Byrd (D-WV) introduced Senate Joint Resolution 123 which approves the FSX deal with reservations. In resolution 123 it requires that each transfer of "technology, defense services, and defense information" by the U.S. to Japan be subject to Congressional disapproval under the terms of the Arms Export Control Act. The U.S. share of the total value of coproduction must be at least 40 percent including the value of manufactured spare parts and other support items which are part of the FSX weapons system. The Byrd resolution also prohibits the transfer to Japan of critical engine technologies "including, but not limited to, hot section and digital control technologies" and prohibits the retransfer of the FSX or its major subcomponents. The GAO must report on implementation of the U.S./Japanese MOU. The Byrd resolution would require approval of arms sales versus the current procedure which allows Congress to disapprove a sale (43:3).

Secretary of Defense Cheney's argument for the deal was countered by a GAO report on Japanese technological capability which said the United States is "superior to Japan" in the composites technology needed to produce the wing for the FSX. The report also said that the U.S. is probably ahead in radar technology. The GAO called the Japanese design of the FSX wing a "high risk strategy that was rejected by the U.S. in the 1970s because of cost and risks. It said U.S. manufacturers possess an expertise in advanced composites

superior to Japan with a demonstrated and proven capability in production. While the U.S. has a proven production process for composite wings; it is inefficient. The U.S. makes composite wings but does it layer by layer, drilling holes in the composites which can become the source of fuel leaks. The U.S. is interested to see if the production process Japan has developed where you can make the entire composite wing without drilling and in a much less labor intensive manner can actually be done (15:2).

On the question of radar the GAO was less specific citing a paper prepared by the Air Forces' Wright Research and Development Center that said Japan needs to develop radar for the FSX to catch up with U.S. technology. The paper indicated that Japan appears to have less experience than the U.S. and lacked vital knowledge in terms of defining module experience. While it said it doubted any significant technology flow would result from the FSX agreement it concluded that U.S. knowledge of Japanese radar is limited because the data is proprietary and classified (3:9,13).

Despite the guarantees of the Bush administration this agreement has touched off what James Auer, the Pentagon's former special assistant for Japan calls 'Japanphobia'. Some Congressmen warn that Japan will use the technology for other than its intended use. Others say that the accord would enable Japan to grab future orders from U.S. aircraft and electronics manufacturers. Says Frank Carlucci, former

secretary of defense to President Reagan the controversy reflects an "irrational fear of Japan's technological prowess... The FSX is one issue in which fear of Japan's competitiveness is shaping U.S. policy" (29:16).

V. Conclusions and Recommendations

Introduction

This chapter provides concluding remarks on the role technology transfer has played in U.S./Japanese relations especially the FSX. This chapter will focus on the research questions and objective discussed in Chapter I to show how the research provided in Chapters III and IV met the objective and answered the questions. To reiterate, the objective of this research was to determine if U.S. policy should look not only at the transfer of technology to meet its mutual defense interests with Japan but also U.S. economic interests as well. To meet this objective an extensive literature review was conducted along with personal interviews. This thesis presents an overview of technology transfer between the U.S. and Japan with emphasis on the impact both countries recent decision to codevelop the FSX has on the relationship. The last section of this chapter provides recommendations for future research in this area.

Conclusions

Chapter III of this thesis dealt with the evolution of the U.S./Japanese relationship and the role technology transfer played in it. Chapter IV dealt more specifically with the FSX aircraft and its importance in present and future U.S./Japanese relations regarding technology

transfer. In this section the research questions will be repeated followed by a summation of the findings of the research, thus enabling the reader to follow the author's conclusions more easily.

Research question 1. As Japanese competitiveness continues in world markets often at the expense of American goods, should the U.S. view its economic interests in a more strategic manner?

The United States emerged from World War II as the only industrialized country whose industrial base not only remained intact but grew enormously. The rest of the world recovered from the war and started the long process of piecing back together their economic infrastructure. To counter the emerging Soviet threat the U.S. supplied Japan and Western Europe the tools under the Marshall Plan and Military Assistance Program (MAP) to accomplish this task. These countries in time recovered developing their own industrial base and no longer needed to rely on the U.S.. While our allies' view of the world changed as they became self-reliant, the U.S. continued to view itself as the dominant and benevolent partner to its allies, transferring its technology to them to counter the Soviet threat.

Today with lessening tensions with the Soviet Union, members of Congress as well as the public no longer see the Soviets as the only U.S. threat. In the face of the American deterioration of its once dominant economic position in the world, Americans see the economic rise of

other industrialized nations as much a threat to America's security as the military one. The economic rise of our allies particularly Japan's has been most spectacular. America's economic position has deteriorated relative to Japan's and continues to do so. Americans have reacted to this change by demanding that the U.S.' economic interests receive more attention by the government to protect its economic position. The U.S. economy and the preservation of the standard of living should be top priority when the government reviews and executes its national strategy.

Research question 2. Should the U.S. reconsider its policy of transferring technology to Japan to satisfy its defense interests only? Are the military interests of the U.S. such an overriding political concern that U.S. economic interests are ignored or not fully realized when transferring technology to Japan?

The U.S. must reconsider its policy of transferring technology especially military technology to Japan in the interest of defense only. The military technology of the U.S. is a national resource. The U.S. spends a large percentage of its R&D funds on developing military technology much the same as Japan does to develop its commercial technology. Technology is seen by American industry and military as the edge America needs whether competing in the marketplace or on the battlefield. The Japanese understand the importance of this edge and are striving to shift their economy from one that is a

technology exploiter to one that is a technology innovator, a position the U.S. presently occupies. Technology development is the lifeblood of American competitiveness in the world market. This is clearly demonstrated in its military technology development which is considered the best in the world. In the FSX negotiations some feared the Japanese would go in with the Europeans to codevelop the aircraft but that was quickly dismissed because they knew the Japanese wanted only the best military technology and that was American.

To transfer this technology without fully evaluating its impact on the U.S. economy and its competitiveness would be to assume that no other nation is capable of developing technology of equivalent sophistication and that the relative economic positions of all countries are fixed relative to each other. Knowing this to be false, the U.S., when transferring its technology, must look after its economic interests which are tied to technology development. This must be done if the U.S. wants to preserve its economic viability.

The Administration in reviewing the FSX agreement and spurred on by legislation initiated by Congress has begun to recognize the importance of technology and how its transfer may affect the U.S.' economic viability to compete in the global economy. With the introduction of the Commerce Department into the process of concluding military technology transfer agreements, the U.S. has modified its

policy so that the U.S. will now be able to better assess the effect these agreements have on the economy.

Research Question 3. Should the U.S. tie its economic interests to its military interests in its relationship with Japan? If so how, and is the FSX agreement an attempt by the U.S. to satisfy both military and economic interests?

The U.S. can satisfy both its economic and military interests in its relationship with Japan, and the FSX agreement represents the U.S.' efforts toward that end. The FSX agreement will allow the U.S. and Japan to work together to build an aircraft in which neither country's industry will dominate the project. The FSX represents the end of an era where the U.S. in the interest of mutual defense has handed over its technology to Japan but neither asked for nor received anything of equivalent technological value in return.

The U.S. concluded the agreement based on the realization that Japan has achieved economic and technological parity and that mutual defense interests can be supported and economic interests protected when conducting negotiations at "arms length". While the U.S. realizes that its military technology is a valuable commodity sought by the Japanese as well as others, it should not give up the technology until it is made obsolete by newer advances. The U.S. now recognizes Japan has something to offer the U.S. and that these agreements can be

concluded in manner in which neither military or economic are emphasized over the other.

The U.S. however must be careful in redefining its policy of how it concludes military technology transfer agreements that it does not hold its ally hostage because they are its economic competitor. To tell Japan that we would not honor the MDA treaty unless they open up their markets for American products or export fewer cars would only drive the Japanese towards a more independent military posture and show the U.S. to be an unreliable ally. However if the U.S. negotiates with the Japanese to transfer technology in an "arms length" manner in which both economic and military interests are represented the Japanese could only respect the U.S. for adopting a policy that is similar to theirs in which they have representatives for military as well as economic interests present.

Recommendations

The United States should recognize the ability of other countries to develop technology that is competitive with its own. By this recognition it should continue the policy it has embarked on negotiating and accepting agreements only when they are in the best interests of the U.S. militarily and economically.

The Executive branch should establish a formal procedure for evaluating requests for the transfer of technology that can draw on the expertise of all the

Departments of the Executive branch including DoD, State, Commerce, the U.S. Trade Representative, Labor and others. This organization must be streamlined to give it the flexibility act and react to meet military committments and changing market conditions. For its export market to survive U.S. industry must be allowed to trade its technology, but it is up to the government to measure the costs versus gains before the sale or agreement is signed. To continuously re-open negotiations after the agreement was signed as was done in the case of the FSX will cause U.S. allies and trading partners to see it as unreliable and make them think twice entering into future agreements.

The following are just a few of the subject areas where further research could be useful:

1. Has the DoD and State established a power sharing arrangement with other departments in negotiating technology-sensitive transfer agreements? Authority for previous military technology transfer arrangements in the form of coproduction programs resided with the Defense Department, do they share that authority or has it been redelegated to another Department or agency?

2. Has the tough no-compromise position taken by the U.S. in the FSX agreement been used with other allies in similar agreements?

3. Do a follow-up to the FSX agreement. How was it implemented? The final agreement was considered a success by the Bush Administration because of the workshare

percentages and technology flowback provisions. Have these been realized or is it still considered a one way street? Have the Japanese been cooperative? Has the U.S. made a serious concerted attempt to obtain the technology or are they just waiting for the Japanese to send it to them?

The FSX agreement has reshaped the U.S.' outlook towards technology transfer agreements with the Japanese. It is hoped that the reader has become more aware of the Japanese/U.S. relationship as it pertains to technology transfer and how the FSX has played a part in it. Some of the arguments for and against technology transfer to Japan were discussed as well as arguments for and against the FSX agreement. It provides the reader with an understanding of the evolving relationship between the U.S. and Japan, some of the complexities involved, and the importance technology transfer and the FSX agreement will have on future cooperative agreements and the U.S./Japanese relationship in general.

Appendix A. Glossary of Terms

Critical Technology consists of:

- a. Arrays of design and manufacturing know-how (including technical data);
- b. Keystone manufacturing, inspection and test equipment;
- c. Keystone materials; and
- d. Goods accompanied by sophisticated operation, application, or maintenance know-how that could make a significant contribution to the military potential of any country or combination of countries that may prove detrimental to the security of the U.S. (also referred to as Military Critical Technology) (10:7-21).

Coordinating Committee for Multinational Export Controls (COCOM) was established in 1949 to serve as the forum for Western efforts to develop a system of strategic export controls. It is composed of the U.S., the United Kingdom, Turkey, Portugal, Norway, the Netherlands, Luxembourg, Japan, Italy, Greece, France, the Federal Republic of Germany, Denmark, Canada, and Belgium. COCOM has three major functions. First, it establishes and updates the precise technical definitions of military relevant products and technologies that should be controlled. These are grouped into three lists: 1) military or munitions; 2) atomic energy; 3) dual-use or industrial/commercial. Although COCOM control lists are not publicly available, they form the basis for national controls lists administered by each member government. Corresponding U.S. lists are: 1) Munitions List; 2) Nuclear Control List; 3) Commodity Control List. Second, COCOM reviews individual members' requests to permit shipment of specific embargoed items to proscribed countries when the risk of diversion to military use is sufficiently small. Finally, COCOM member countries coordinate their export control administration and enforcement activities. COCOM is a strictly voluntary arrangement and is not legally binding on its members. COCOM decisions on what can be exported must be unanimous (9:102; 37:7).

Coproduction the selection and joint production by two or more governments of a certain system or end item. Coproduction enables an eligible foreign government to acquire substantial "know-how" to manufacture or assemble, repair, maintain, and operate in whole or in

part a selected weapon, communication or support system, or an individual military item (30:98).

Dual-use Technology is technology which is primarily for commercial purposes, but which also has potential for military application (37:1-17).

Foreign Military Sales (FMS) The selling of military equipment and services to friendly foreign governments and international organizations under the authority of the Foreign Military Sales Act of 1968, as amended. Includes cash sales from stocks of the DOD, DOD credit sales, and DOD guaranties covering the private financing of credit sales of defense articles and defense services (30:99-100).

Infrastructure a term generally applicable for all fixed and permanent installations, fabrications, or facilities for the support and control of military forces (30:101).

Interoperability is the ability of systems, units, or forces to provide service to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together. Interoperability is a subset term of rationalization (10:7-8).

Know-how is a peculiarly American term, which is receiving growing acceptance in international contracts. It is a generic term, embracing everything that is necessary to implement the licensing objective exclusive of patents and trademarks. Included may be trade secrets, manufacturing processes and techniques, specifications, charts, formulae, drawings and blueprints, marketing techniques, and professional advice. The list is non-exhaustive. Essential to the value of know-how is that it not be readily known or available to the public (10:7-8).

License Technical Assistance Agreement (LTAA) Agreement between persons or entities, private or governmental, to furnish technical assistance and information about arms, ammunition, and implements of war listed in the International Traffic in Arms Regulations (30:102).

Logistics is the science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with:

- a. design and development, acquisition, storage movement, distribution, maintenance, evacuation, and disposal of material;
- b. movement, evacuation, and hospitalization of personnel;
- c. acquisition or construction, maintenance, operation, and disposal of facilities; and
- d. acquisition or furnishing of services. Or; the phase of military operations involving procurement, delivery, storage, shipment, and scheduling of military supplies, including personnel (2:401).

Memoranda of Understanding are documents that express mutually agreed statements of fact, intentions, procedures and parameters for future action and matters of coordination. These documents may or may not be legally binding under international law but the conditions of the arrangement are politically and morally binding. The wording in such documents is usually non-mandatory (2:441).

Military technology or military related technology refers to technology solely designed for defense application and used in defense equipment, and commercial technology which is incorporated into defense systems or utilized as defense equipment in its own right (dual-use technology) (10).

Rationalization is any action that increases the effectiveness of allied forces through more efficient, and effective use of defense resources committed to the alliance. Armaments collaboration is a crucial feature of rationalization. The terms standardization and interoperability are, in a sense, subsets of rationalization (10:7-8).

Security Assistance are group programs authorized by the Foreign Assistance Act of 1961, as amended, and the Arms Export Control Act of 1976, as amended, or other related statutes by which the U.S. provides defense articles, military training, and other defense related services, by grant, credit or cash sales, in furtherance of national policies and objectives (11:B-9).

Standardization is the process by which member nations of NATO achieve the closest practicable cooperation among forces, the most efficient use of research, development and production resources, and agree to adopt on the widest possible basis the use of:

- a. Common or compatible operational, administrative, and logistics procedures;
 - b. Common or compatible technical procedures and criteria;
 - c. Common compatible or interchangeable supplies, components, weapons, or equipment; and
 - d. Common or compatible tactical doctrine with corresponding organizational compatibility.
- Standardization is a subset term of rationalization (10:7-8).

Technical Data is classified or unclassified information relating to defense articles and defense services. This involves information of any kind that can be used, or adapted for use, in the design, manufacture, repair, overhaul, processing, engineering, development, production, use, operation, maintenance, modification, or reconstruction of defense articles or defense services; or of any technology which advances the state-of-the art of articles on the U.S. Munitions List or establishes a new art in an area of significant military applicability in the U.S.. The data may take a tangible form, such as a model, prototype, blueprint, drawings, photographs, plans, instructions, computer software and manuals or operating manuals; or they may take an intangible form such a technical service or oral or visual interactions. This does not include information concerning general scientific, mathematical or engineering principles. (17:7-22).

Technology is the technical information and know-how that can be used to design, produce, manufacture, utilize, or reconstruct goods, including technical data and computer software, but not the goods themselves (10:21).

Technology Transfer is the process of transferring, from the industry in one country to another or between countries, technical information relating to the design, engineering, manufacturing and production techniques for hardware systems using recorder or documented information of a scientific or technical nature. It does not normally include the transfer of common reference documentation such as military

standards, specifications, handbooks or commercial counterparts of these documents (10:7-17).

Transfer Mechanisms are the means by which technology, goods, services, and munitions are transferred. The following list is an example but not all inclusive.

- a. Commercial and government sales.
- b. Scientists, engineers, students, and academic exchanges.
- c. Consulting agreements.
- d. Licensing and other data exchange agreements.
- e. Codevelopment and coproduction agreements.
- f. Commercial proposals and associated business ventures.
- g. Trade fairs, exhibits, airshows, etc.
- h. Sales to third party nations.
- i. Multinational corporation transfers.
- j. Clandestine or illegal acquisition of military or dual-use technology or equipment.
- k. Dissemination of technical reports and technical data, whether published or by oral or visual release.
- l. Smuggling (10:7-23).

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[REDACTED] [REDACTED]
[REDACTED]

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GCM/LSM/89S-8			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics		6b. OFFICE SYMBOL (If applicable) AFIT/LSM	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology Wright-Patterson AFB OH 45433-6583			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code)					
			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.
11. TITLE (Include Security Classification) Technology Transfer and the FSX: Effects on U.S./Japanese Relations					
12. PERSONAL AUTHOR(S) Peter C. Leahy, B.A., Capt, USAF					
13a. TYPE OF REPORT MS Thesis		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1989 September	
15. PAGE COUNT 92					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Military Cooperative programs U.S./Japanese Technology Transfer FSX		
FIELD	GROUP	SUB-GROUP			
05	02				
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Thesis Advisor: Craig M. Brandt Assistant Professor Department of Logistics Management Approved for public release: IAW AFR 190-1. <i>Larry W. Emmelhainz</i> LARRY W. EMMELHAINZ, Lt Col, USAF 11 Oct 89 Director of Research and Consultation Air Force Institute of Technology (AU) Wright-Patterson AFB OH 45433-6583					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL Craig M. Brandt, Assistant Professor			22b. TELEPHONE (Include Area Code) (513) 255-4149		22c. OFFICE SYMBOL LSM

UNCLASSIFIED

The purpose of this study was to examine the role that technology transfer assumes in the relationship between the U.S. and Japan. The objective of this thesis is to determine if U.S. policy should look not only at the transfer of technology to help maintain its strategic interests with Japan but to see if U.S. economic interests should play a more significant part in the technology transfer decision.

The study found that U.S. policy is broadening its focus so that military and economic interests are examined when transferring technology to Japan. The study found that the FSX agreement between the U.S. and Japan was one of the reasons for this shift in U.S. policy.

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