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THESIS

**AN ANALYSIS OF POLITICAL AND ECONOMIC
FACTORS THAT IMPACT SUSTAINMENT OF THE
JAPANESE DEFENSE INDUSTRY**

by

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June 2002

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SUSTAINMENT OF THE JAPANESE DEFENSE INDUSTRY**

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ABSTRACT

The Japan Defense Agency (JDA) is under pressure to reduce its procurement costs. As a result, the Japanese Defense Industry (JDIB) receives fewer orders from the JDA. The customer for the JDIB is, in essence, limited to the JDA due to the country's unique circumstances. The Japanese government has tried to help the JDIB in various ways. The Japanese government has created demand for the JDIB through high procurement costs, and the JDIB has maintained defense divisions and improved its technological expertise.

The research goal is to identify some key political and economic factors to allow the JDIB to continue. This thesis describes the characteristics of the JDIB and the current circumstances surrounding the JDIB, and evaluates factors that influence continued development and sustainment of the JDIB. Subsequently, this thesis concludes with recommendations that would enable the JDIB to continue in a new environment.

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I. INTRODUCTION

A. PURPOSE

This research will be useful to Japanese government officials and corporate decision-makers within the Japanese Defense Industry Base (JDIB) in formulating an overall management strategy for the Japanese Defense Industry in the 21st century. The research goal is to identify some key political and economic factors to allow the JDIB to continue in the current environment.

B. BACKGROUND

Defense-related expenditures for FY01 total 4.9388 trillion yen, a 17.1 billion yen increase over the previous fiscal year but real growth, taking into account price increases and other factors, is zero and this trend of almost zero growth in defense spending, has been observed since FY94 and is expected to continue into the near future.

The Japanese Defense Industry has been developing and producing acceptable quality of equipment for the Self Defense Forces (SDF). The systems arming the SDF that develop and produce the equipment have been supported economically and politically and are willing to support a costly yet modest defense industry not dependent on exports for survival. However, the Japanese Defense Industry Base is currently facing severe hardships due to the end of the Cold War and prolonged economic difficulties, and therefore, must change the way it does business.

In addition to economic difficulties lasting almost a decade, the policy limiting defense spending to less than 1% of Japan's GDP also makes the situation in the JDIB more difficult. It is impossible to expect defense spending to increase dramatically.

C. RESEARCH QUESTIONS

1. Primary Question

- What political and economic factors contribute to the continuance of the JDIB?

2. Secondary Questions

- What are the main characteristics of the JDIB?
- What are the political and economic factors that enable or inhibit growth of the JDIB?

- What management strategy should be employed to sustain the JDIB?

D. SCOPE AND LIMITATIONS

The scope will include an analysis of the relationship between the Japanese government and the JDIB as well as an analysis of the impact of political and economic factors on continuing to maintain the JDIB.

First, this thesis examines the status of the JDIB, and then researches which factors will contribute to the continuance of the JDIB. This thesis describes the characteristics of the JDIB in order to define it.

The scope will not include an in-depth analysis of Japan's constitution nor an in-depth analysis of Japanese politics. It might, however, be necessary to mention constitutional or political issues during these analyses, but this thesis will not focus on the details of such issues as they are too complicated to consider.

E. RESEARCH METHODOLOGY

The methodology used for researching this thesis will consist of the following:

- Conduct a literature search of books, magazine articles, journals, the World Wide Web, and other library information resources
- Conduct a review of existing government and industry organizational designs to identify roles and relationships among key defense industry stakeholders, e.g. the Japan Defense Agency
- Evaluate current domestic political and economic policies that impact the strategic direction of the defense industry
- Conduct a review of the past performance of the defense industry to identify any recurrent constraints that have precluded/inhibited the development of the JDIB
- Evaluate the impact of identified constraints on the future growth and direction of the JDIB

F. ORGANIZATION OF STUDY

Chapter II outlines the characteristics of Japan's defense industry and the unique industrial environment encompassing the industry. This chapter examines the impact of a severely restricted defense export market and the small profit margins associated with domestic production. This chapter also discusses the history of the JDIB, structure, and the relationship between the JDIB and government agencies. The focus of this section is to highlight some of the difficulties in maintaining the JDIB under current political and

economic conditions. Chapter II provides the groundwork for further discussion on the continuing evolution of the JDIB and the possible need for industry restructuring to allow it to continue.

Chapter III will describe the environmental changes in Japan since the end of the Cold War, and examine the situation currently faced by the Japanese defense industry and general trends in the international defense industry. This chapter will examine the influence of the U.S. counterparts on the JDIB and examine the affects of "*Kokusanka*" (domestic production) on the overall growth of the Japanese defense industry. This chapter will also consider the long-term effects of steady-state defense spending and the disincentives this type of spending creates for the JDIB.

Chapter IV examines the current political posturing holding the Japanese defense industry in essentially a "zero-growth" state. This chapter also examines the apparent contradiction between the zero-growth policy and a desire to maintain autarky in the defense production of defense systems. This chapter also examines present sources of defense acquisition including the involvement of international defense firms. An examination of the FS-X case is undertaken to explore the consequences of improperly structured projects that involve also co-production and international cooperation. This chapter concludes with an examination of the management strategies that may facilitate the continuance of the JDIB in the 21st century.

Chapter V, Conclusion and Recommendations, are presented based on the study.

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II. CHARACTERISTICS OF THE JAPANESE DEFENSE INDUSTRY

A. INTRODUCTION

The Japanese defense industry base (JDIB) has been facing rapid changes due to the end of the Cold War and prolonged economic difficulties. The Japan Defense Agency (JDA) had been able to accept high procurement costs from contractors because its expenditures were justified by the rationale that the Self Defense Forces (SDF) must be well equipped to protect the country from the threat of the former Soviet Union. In addition, continuous Japanese economic growth led to the expansion of defense expenditures which also allowed the JDA to buy relatively expensive Japanese made weapon systems.

When the former Soviet Union collapsed, the situation surrounding the JDIB and the JDA began to change. This required the JDA to establish new justifications for defense expenditures and Tokyo's explanations for the continuing military requirements in an uncertain region have been less persuasive and more vague because of uncertainty and instability. [Ref. 1]

The decade long economic slump has also affected defense expenditures. The increase in the defense budget was 0.3 percent in FY2001, 0.0 percent in FY00, and -0.2 percent in FY99. However, real growth, when taking into account price increases and other factors, is zero and this trend of almost zero growth in defense spending has been occurring since FY94 and is expected to continue into the near future. [Ref. 2]

This chapter will provide the groundwork for further discussion and will define the JDIB, focus on the characteristics, history, and structure of the JDIB and examine the relationship between the JDIB and government agencies. Finally, the factors that tend to prohibit the growth of the JDIB are also examined.

B. CHARACTERISTICS OF THE JDIB

1. Three Principles on Arms Export (TPAE)

The TPAE was established in 1967 with the goal of preventing further international conflict. [Ref. 3] The Japanese government has revised sections of the TPAE several times as the international situation changed. The TPAE, in its current form, states that "arms" exports to the following countries or regions is not be permitted:

- communist bloc countries
- countries to which the export of arms is prohibited under United Nations resolutions
- countries which are actually involved or likely to become involved in international conflicts [Ref. 4]

When discussing the TPAE, it is necessary to understand that these policies constrained the activities of companies both implicitly and explicitly. Japanese companies do not allow their defense products to be exported because of the TPAE.

Basically, the TPAE prevents Japan from exporting armaments, and from sharing defense technology with any nation other than the United States. [Ref. 5] From the point of view of private companies, it might be natural for them to look at overseas markets to make profits as they have done for commercial products. However, because of these policies, the market for their products is limited to the JDA.

There is another issue regarding the TPAE that is needs to be discussed. The boundaries for technology between military and commercial use has become vague. Exporting weapons in and of itself is clearly prohibited, but to define what is a weapon and not a weapon at a component level is difficult. For example, a game machine, Sony's Playstation 2, was initially classified as a weapon by the Japanese government and subject to export restrictions because the dual 128 bit processor technology, one for the instruction code and one for graphics processing, could be used as components in missile guidance and other high tech military applications. [Ref. 6] This decision was finally rescinded but illustrates how difficult it is to differentiate between what a weapon is and is not.

2. Less Competition among the JDIB

The JDIB has produced a wide range of land, sea, and air systems but the number of firms capable of meeting the demands of the JDA today is so limited that competition over defense contracts is very rare. Listed below are the twelve leading companies remaining in terms of defense contracts.

- Mitsubishi Heavy Industries, Ltd. (ships, military vehicles, aircraft, missiles)
- Kawasaki Heavy Industries, Ltd. (ships, aircraft)
- Ishikawajima-Harima Heavy Industries, Co., Ltd. (ships, engines)
- Mitsubishi Electric Corporation (electronics, missiles)
- Toshiba Corporation (electronics, missiles)
- NEC Corporation (electronics)
- Fuji Heavy Industries, Ltd. (aircraft)
- The Japan Steel Works, Ltd. (artillery)
- Komatsu, Ltd. (small arms/ordnance, military vehicles)
- Hitachi, Ltd. (electronics, military vehicles)
- Oki Electric Industry Co., Ltd. (electronics)
- Daikin Industries, Ltd. (small arms/ordnance)

These twelve companies, including the so-called "heavy" industrial firms and several of Japan's largest electronics manufacturers, account for approximately 95 percent of the JDA's acquisition budget. [Ref. 7] The companies that appear on this list vary each year, but the top six companies regularly appear on this list. The reason that limited numbers of firms are awarded contracts is simply because only those companies are able to supply products to the JDA.

For example, there are three firms capable of producing aircraft on the aforementioned list. However, each of them produces different kinds of aircraft. Mitsubishi Heavy Industries (MHI) has produced a series of fighter aircraft such as the F-4EJ, F-15J and F-2, for the Air SDF (ASDF), while Kawasaki Heavy Industries (KHI) mainly supplies relatively large, multiengine aircraft such as the P-3C, to the Maritime SDF (MSDF) and C-1 to the ASDF. Fuji Heavy Industries (FHI) is capable of producing small aircraft and it has manufactured aircraft for training. As a result, no competition

exists among their products for the JDA. One of these companies usually becomes the main contractor and the others support production as subcontractors. As for the recently introduced F-2 aircraft, its production follows this same rule. MHI, the main contractor and KHI and the FHI, the subcontractors, have been taking part in this project.

In the case of the construction of combatant ships, there are several companies used as contractors such as MHI, KHI, Ishikawajima-Harima (IHI), Mitsui, and Hitachi Zosen. However, they have received orders from the JDA based on their production capacities and therefore, competition over defense contracts is less likely to occur.

Moreover, for some specific equipment, only a few companies, and sometimes only one, have been awarded contracts from the JDA. The Japan Steel Works, Ltd. is typical in this case and this firm is the only one that produces artillery including guns on naval combatants. In addition, submarines are constructed by one of two shipyards, and only one small arms producer exists in Japan.

3. Firm's Low Dependency on the Defense Demands; Major Roles Played by Firms

Within the major companies that contract with the JDA, defense production accounts for a relatively small portion of their overall business. The reason is that most of Japanese companies' defense contractors are multifaceted companies which mainly produce civilian goods. [Ref. 8] Tables 2.1. and 2.2. show that top ten defense contractors in Japan and U.S.

Table 2.1. Top 10 Contractors in FY (Japan). [From: Ref. 9]

Rank	Company	Dependency on Defense Contracts (%)	Total Sales (in Billion Yen)	Sales to the JDA (in Billion Yen)
1	Mitsubishi Heavy Industries, Ltd. (MHI)	11.4	2,453.8	279.7
2	Kawasaki Heavy Industries, Ltd. (KHI)	14.0	944.7	132.2
3	Mitsubishi Electric Corporation	4.1	2,705.0	112.1
4	Toshiba Corporation	1.5	3,505.3	53.8
5	Ishikawajima-Harima Heavy Industries, Co., Ltd. (IHI)	6.7	804.0	53.5
6	NEC Corporation	1.1	3,784.5	42.6
7	Komatsu Ltd.	8.4	441.4	37.1
8	Hitachi Zosen Corp.	9.6	358.5	34.4
9	Nissan Motor Co., Ltd	0.9	2,997.0	27.3
10	Japan Electronic Computer Co., Ltd.	8.5	299.7	25.5
Total		4.4	182,939	7,983

Table 2.2. Top 10 Companies in Defense Revenue. [After: Ref. 10]

Rank	Company	Revenue from Defense (%)	2000 Total Revenue (US million \$)	2000 Defense Revenue (US million \$)
1	Lockheed Martin Corp.	71.10	25,329.00	18,000.00
2	Boeing Co.	33.1	51,321.00	17,000.00
3	Raytheon Co.	83.1	16,895.00	14,033.00
4	General Dynamics Corp.	63.2	10,356.00	6,542.00
5	Northrop Grumman Corp.	73.5	7,618.00	5,600.00
6	United Technologies Corp.	15.5	26,583.00	4,130.00
7	TRW Inc.	23.3	17,200.00	4,000.00
8	Honeywell Inc.	12.8	25,000.00	3,200.00
9	Science Applications International Corp.	39	5,900.00	2,300.00
10	Newport News Shipbuilding	98	2,070.00	2,028.60
	Total	40.8	188,272.00	76,833.60
--	Mitsubishi Heavy Industries, Ltd.	15.2	24,118.80	3,672.70

The average defense sales among those top ten companies account for only 4.4% of their business while it is approximately 40% for the major defense firms in the United States. However, the roles played by those companies are essential to development and production because Japan as a state does not possess R & D and production capabilities. In other words, the JDA expects the JDIB to be a supplier continuously while the JDIB is not relying a great deal on defense sales.

To cope with the current situation, each company has moved toward restructuring including dismissing employees in the defense division and the merger of affiliated companies. The merger activity involving more than one company, however, has only occurred except for the merger of the shipbuilding sectors of IHI and KHI. Defense technology and equipment require special skills not found in civil industries, and redeployment is thus an extremely difficult process. It is also extremely difficult for technicians to revert to defense-related work after being redeployed to other activities. Redeployment can thus lead to the dispersal of technical work forces. [Ref. 11] In order to sustain the JDIB it is necessary to maintain a production and a technology base simultaneously.

C. HISTORY OF JDIB

The history of the JDIB can be divided into three phases. The first segment is the post World War II establishment of the industry. Next, the industry moved into a recovery period in an effort to reestablish capability in defense production. Finally, the

industry sought international cooperation while remaining true to the policy of *kokusanka* whenever possible.

Before and during World War II, Japan's industrial base for military production had been mainly composed of two kinds of enterprises. One was arsenals run by the Imperial Navy and Army, and the others were conglomerates represented by Mitsubishi. Such groups had produced a variety of weapons to meet demands during the war.

After World War II, Japanese industry had to rebuild almost all industrial capabilities including the defense industry. Since the occupation authorities had banned activities related to armament production, Japan had to wait until 1952 to resume defense production, when the United States Forces in Japan needed to repair and maintain their equipment to carry out the war on the Korean peninsula. The Korean War (1950-53) provided both huge resources to the Japanese economy and a chance for Japan to rearm.

Note that the time when the Japanese government decided to establish the SDF is almost same time when tensions between countries in the Far East Asia had increased due to the Cold War between the United States and the Soviet Union. That is, Japan's defense requirements became motivated primarily by the threat of the Soviet Union's substantial force structure in the region.

As a result, the SDF were established in 1954. At that time, the SDF used weapons rented from the United States government and the remnants of the imperial forces. The JDA started efforts to arm the SDF with domestic products almost simultaneously. As domestic production increased, the portion of the U.S. made or designed equipment among the SDF decreased, but this basic composition, the coexistence of domestic and U.S. made equipment, still exists by virtue of the U.S.-Japanese bilateral security relationship.

It must be noted that armament production was suspended for almost a decade from 1945. (Japan resumed producing naval combatant in 1953, and aircraft in 1954.) [Ref. 12] The Japanese armament industry could fulfill the military demands at a basic level by themselves before the suspension. But what the JDA and managements of private companies both recognized larger was how difficult it was to resume production

once it began again. This production learning factor still influences the arguments supporting the need for maintaining the JDIB as well as the *kokusanka*.

Although Japan resumed its defense production, the SDF depended greatly on the United States for suppliers and technology transfer. These technology movements across the Pacific were motivated by the U.S. intention to prevent the spread of communism in East Asia. Although these technology transfers were carried out in the form of (free) loans, FMS, and licenses, licensed production has provided perfect opportunities for Japanese companies to acquire advanced military products and process technologies. For example, licensed production of a variety of U.S. military aircraft types has contributed to the development of a core of Japanese companies skilled in diverse aspects of aircraft production. These programs have also stimulated critical industries such as electronics and materials through generous technology transfers. [Ref. 13]

Under the U.S.-Japan Treaty of Mutual Security, the Japanese government could focus on economic development. This government attitude allowed the Japanese businesses to concentrate their efforts on producing commercial products. As a result, the Japanese economy revived remarkably, and firms became major exporters of commercial products by manufacturing high quality products. The important thing is that technologies developed for commercial use were applicable to defense products, and made it possible to produce quality equipment for the SDF.

By the 1980s, however, as Japanese companies improved skills and the U.S. showed the tendency of protecting sophisticated technologies from flowing out to foreign countries, the preference for *kokusanka*, autonomy in defense production, became evident. Since the JDA, originally, has emphasized the importance of a rapid emergency supply, and has expressed the fear of vulnerability [Ref. 14] caused by excessive dependency on foreign suppliers, the promotion of *kokusanka* was a persuasive argument. Up to this time, Japan grew to be a major global economic and financial power, and Japanese companies emerged as major exporters of commercial products backed by improved technological capabilities. This also positively led to preferring *kokusanka*.

The program that sought independent development of a replacement for the aging F-1 fighter, known as FS-X, was the most typical example of *kokusanka*. This program

was a way to reduce dependency on the United States for leading-edge military technologies and strengthened the country's defense industrial base. [Ref. 15] This program finally evolved to co-production by Japan and U.S. firms, and ended, literally, the one-way technology transfer that was going on for decades. However, Japan is still dependent on several U.S. made technologies. Some of the major equipment, such as aircraft, have been produced under licenses from U.S. companies.

D. STRUCTURE OF JDIB

The loss of single companies can now remove an entire commodity from the JDIB. This is the commonly employed rationale for those who claim it is important to maintain the JDIB, as a limited number of companies participate in defense production and most are both defense and commercial manufacturers. This also occurs because many specialized companies became involved in a major program and collaborate to accomplish production.

Even if this industrial base disappears, the impact on the national economy would be slight because defense orders have consistently accounted for only 0.3 to 0.4 percent of the total production of Japan. [Ref. 16] The issue at hand is the retention of companies that have supplied weapons to the JDA and skilled labor.

Japan's defense budget in 2000 was around US \$45.5 billion. [Ref. 17] However, the procurement budget is only about 18%. [Ref. 2] Japan's defense spending is unlikely to increase in the near future because Japan has limited its defense budget to one percent of the GDP, and because of the economic slump that has been going on for more than ten years.

The JDIB is composed of both the leading companies and numerous small and medium sized associated companies. It also includes suppliers of food, garments and medical supplies. In the case of major equipment procurement, there are some contractors and many subcontractors; it has been stated that the number of companies participating programs exceeds 1,000, with about 70-80% being medium and small-sized businesses. For example, 1,140 firms were involved in the production of the F-15J.

However, only a few firms can play "key" roles in defense contracts. Only a small number of companies are capable of producing aircraft, naval combatant ships, tanks, and

artillery. As shown in Table 2.1, MHI, the top contractor, defense sales make up about 11% of its total sales. For other major companies participating in defense contracts, this figure is much lower and is estimated on average to be 4.4% of total production.

These companies often maintain cooperative relationships within the industry by virtue of their particular specialties. For example, in the aerospace industry, which consists of MHI, KHI, IHI, and FHI, all except FHI are able to produce aircraft engines. But, IHI is usually the main contractor when doing business with the JDA. As for the airframe industry, all firms except IHI supply the JDA with aircraft, but only MHI has been the main contractor for fighter aircraft, KHI for multi-engine, large aircraft such as the P-3C, and FHI for small training planes. Even though one company wins any contract, production is carried out in a collaborative manner. In the F-2 program, MHI is in charge of the front part of the fuselages and right wings, as well as the final assembly; KHI produces the center fuselages and engine access doors; and FHI supplies the tail assemblies; radar domes and air-intakes.

Defense contractors are integrated with the commercial sector at the individual company level and are also integrated with other firms. This integration suggests that it is a crucial sustaining element of the JDIB. This also suggests that it is difficult to keep companies as potential contractors. Except for ammunition and aircraft producers, which have no other customers and depend on JDA demands almost 100 percent and 62.7 percent respectively (1997) [Ref. 18], it is hard to assume that current contractors will maintain their defense production capabilities without any incentive.

E. RELATIONSHIPS BETWEEN THE JDIB AND GOVERNMENT AGENCIES

1. Japan Defense Agency (JDA)

The JDA, established to defend the country, is recognized as an administrative organization in charge of the three services of SDF (Ground/Maritime/Air SDF), while the SDF is an arms organization. The JDA, unlike the U.S. DoD, is not a full-fledged ministry. It is an agency that reports to the Cabinet Office. The SDF is literally the JDIB's only customer. The JDA has a policy of placing importance on domestic development and production, or the so-called kokusanka because the JDA is seriously

fearful of the potential vulnerability of relying on foreign suppliers. Thus, the JDA's procurement considerations include:

- Suitability to the plan of operations
- Ease of improvement, upgrade, maintenance and supply
- Maintaining and securing production and technological bases
- Technological risks
- Cost effectiveness
- Effects on employment and income [Ref. 3]

There is the commonly accepted idea among Japanese that a country's defense capability is based on that country's own industrial power and primarily its manufacturing capacity. Consequently, the existence of a sound defense industry is thought to be major precondition for securing an adequate defense capability. [Ref. 2] This idea also drives a movement for promoting the domestic production of weapons.

Since the JDA does not have any state-owned arsenals since being established, all production of a trial product in defense technical study development is consigned to a commercial R & D base. To incorporate existing or developing technologies, JDA makes the most of its attached institute called the Technical Research and Development Institute (TRDI). TRDI is the sole organization of the JDA that conducts defense related RDT & E, but the budget allocated to R & D is limited to approximately three percent of the total defense budget. Therefore, it is difficult to expect TRDI to conduct all required studies. Consequently, TRDI's strategy is to stretch its relatively modest resources by cultivating promising technologies already under development in the private sector. [Ref. 13] Thus, the activities in TRDI are primarily test and evaluation of existing technologies rather than R & D in the usual sense.

The procurement decision-making process in the JDA does not seem to reflect the SDF's opinions directly, but rather, one affected by external factors. Officials from other ministries often are in charge of the internal bureaus, which is a major component of the JDA. For example, the Bureau of Finance, which develops the Defense Agency budget and establishes spending priorities for the Defense Agency and the SDF, is likely to be headed by officials from the Ministry of Finance (MOF). Officials from the Ministry of Economy, Trade and Industry (METI) are frequently assigned to the Bureau of

Equipment. In the context of this thesis, the relationship between METI and JDA is important in understanding the JDIB.

2. Ministry of Economy, Trade and Industry (METI)

There are also some other government offices that influence defense production. One important player is the Ministry of Economy, Trade and Industry (METI, formerly known as the Ministry of International Trade and Industry -MITI). METI, which has responsibility for securing and promoting national wealth, and play the key role in the development of policies on industry and international trade. As a result, it maintains strong connections with the industrial world, and is likely to focus on the sustainment and growth of domestic industries as a whole.

The MITI used to administer the Agency of Industrial Science and Technology, (AIST) and promoted advanced technology development. As a result of the reorganization of the central government enforced at the beginning of 2001, though, AIST became an independent organization. It still oversees 15 laboratories and serves as the base of technological innovations, as well as for their numerous original research projects. Those laboratories have supported the R & D in advanced technologies, that are hardly ever done by private companies, but which contribute to the development of superior technologies employed in commercial products. Technology usually moves from commercial to defense products-the so-called “spin-on”. The role played by these METI related institutes is not negligible in prompting these technical development processes.

The METI has affected the JDIB in another aspect. In Japan, due to the Law for Enterprises Manufacturing Aircraft and the Law for Manufacturing Weapons and Munitions, companies engaging in activities articulated under the aforementioned laws must obtain permission from METI and provide details such as location, ownership, type of technologies used, and capitalization. METI’s Aircraft and Defense Products and Space Industry Division exercises oversight of the production of all aircraft and parts, as well as munitions and weapons. These two laws remain the primary legislative concerning defense procurement in Japan. [Ref. 14]

The METI also controls arms exports based on the Foreign Exchange and Foreign Trade Law. In the case of exported arms or equipment to be used in military actions, the

law requires export licenses to all destinations. In addition, "arms" trades mediated between foreign countries by a Japanese agent require the permission of the METI. [Ref. 4]

3. Evaluation of JDIB by the Government Agencies

Both the JDA and the METI organized a meeting for the study of defense industrial and technology bases. In its report published in November 2000, this meeting emphasized the following aspects that the JDIB should maintain:

- Technologies and production capabilities that make it possible to provide equipment such as MBT, combatants, aircrafts, and missiles fitting the characteristics of national land and condition
- Technologies and production capabilities that make it possible to provide equipment, for example, cipher codes, which cause difficulties in terms of security if imported
- Maintenance, repair, and supply capabilities that assure existing defense abilities are fully performed
- Urgent supply capabilities in case of emergency
- Technologies difficult to obtain from importing due to security issues
- Bargaining power
- Deterrence as a potential defense capacity caused by holding flexible production capabilities [Ref. 19]

This report also mentions “spin-off”, or technology flow from defense to commercial fields, and “spin-on”, and claims that by virtue of dynamic technology circulation between defense and commercial fields, defense technology contributes significantly to the advancement of the technology level of Japanese companies. This evaluation of the JDIB is common in the government offices concerned, and leads to the rationale that stresses the importance of keeping the JDIB.

4. JDIB and Government Offices

Although the JDA and the METI understand the JDIB as an area to be protected, actual practices appear different, because not only has the portion of sales from defense market been very low but also the R & D expenditures have been covered by the commercial sector itself. As for R & D expenditures, in 1999, the central government and public organization invested 326 billion yen which was only merely 9.3 percent of the total R & D expenditures in activities conducted by the private entities, while companies

injected 10.8 trillion yen -- 87.0 percent of the R & D expenditures. [Ref. 20] Since these figures include all R & D activities, it is obvious that the amount allocated to the JDIB is very limited.

However, the R & D expenditures of defense companies seem eventually to be recouped by production contracts. In 2001, 78.9 percent of procurement contracts, on a monetary base, are awarded on a discretionary basis or without competition, and 12.7 percent are given through limited competition. [Ref. 21] In general, the prices or bids are supposed to be determined by the market price. However, it is difficult for products made specifically for the JDA to be compared with the prices of others in the commercial market. In that case then, it is understood that the contracts have a profit margin of about 10 percent, and costs are calculated on a cost plus basis.

Consequently, Japanese business leaders did not view the JDA as simply another market. Rather, the defense budget was considered a means of raising the general level of technological expertise of Japanese business. [Ref. 14] For the JDIB, the government offices concerned are those that have provided the opportunities for both R & D, production, and test and evaluation of their products while the JDIB, especially for the JDA, has been a source that supplied the required equipment consistently. Thus, it is possible to state that there is a mutually beneficial relationship.

F. FACTORS THAT INHIBIT GROWTH OF THE JDIB

It can be said that Article 9 of Japan's constitution is the basic factors instructing the size of the JDIB. It says that

aspiring sincerely to an international peace based on justice and order, the Japanese people forever renounce war as a sovereign right of the nation and the threat or use of force as means of settling international disputes. In order to accomplish the aim of the preceding paragraph, land, sea, and air forces, as well as other war potential, will never be maintained. The right of belligerency of the state will not be recognized. [Ref. 22]

This "no-war" clause not only keeps Japanese companies from exporting defense products, but also creates and legitimizes pacifist sentiments among the Japanese people. Moreover, the JDA must purchase defense systems from the defense-oriented infrastructure. In other words, buying existing "off-the-shelf" items involves difficulties for the JDA. Although the JDA has introduced a variety of weapons, some of them were

modified so as not to violate the spirit of the Constitution. For example, F-4EJs for the ASDF do not have some attack systems and inflight refueling capabilities because such equipment is incompatible with the “self defense” philosophy.

1. Three Principles on Arms Export (TPAE) as Constraints

TPAE is accepted as a policy that the Government of Japan shall not promote "arms" exports, regardless of the destinations. In February 1976, the Japanese government announced the collateral policy guideline at the Diet session that "arms" exports to other areas not included in TPAE will be also restrained to conform with Japan's position as a peace-loving nation. [Ref. 4] Arms and equipment for arms production subjected to TPAE are listed on the Export Trade Control Order:

(1) Firearms and cartridges to be used therefore (including those to be used for emitting light or smoke), and accessories thereof (excluding rifle-scopes), as well as parts thereof.

(2) Ammunition (excluding cartridges), and equipment for its dropping or launching, and accessories thereof, as well as parts thereof.

(3) Explosives (excluding ammunition) and military fuel.

(4) Explosive stabilizers.

(5) Directed energy weapons and parts thereof.

(6) Kinetic energy weapons (excluding firearms) and equipment for their launching, as well as parts thereof.

(7) Military vehicles, and accessories thereof, and bridges for military use, as well as parts thereof.

(8) Military vessels, and hulls and accessories thereof, as well as parts thereof.

(9) Military aircraft and accessories thereof, as well as parts thereof.

(10) Anti-submarine nets and anti-torpedo nets as well as buoyant electric cable for sweeping magnetic mines.

(11) Armor plates, military helmets, and bullet-proof jackets, as well as parts thereof.

(12) Military searchlights and control equipment thereof.

(13) Bacterial, chemical and radio-active agents for military use, as well as equipment and parts thereof for dissemination, protection, detection, or identification thereof.

(14) Biopolymers for detection and identification of chemical agents for military use and cultures of cells for production thereof, as well as biocatalysts for decontamination and degradation of chemical agents for military use and expression vectors, viruses or cultures of cells containing the genetic information necessary for production thereof.

(15) Equipment and parts thereof for the production or testing of military explosives.

(16) Equipment for the production or testing of arms, as well as parts and accessories thereof. [Ref. 23]

The METI controls Japan's arms exports based on the Foreign Exchange and Foreign Trade Law. Those who intend to export arms and equipment for listed arms production require export licenses to all destinations. In addition, arms trades mediated between foreign countries by a Japanese agent need the permission of the METI. [Ref. 4]

However, these principles do not completely prohibit exporting arms to foreign countries. In 1983, the Japanese Cabinet approved the comprehensive position of the Japanese Government regarding the issue of transfers of “military technologies.” As a result, the transfer of military technologies to the United States is not subject to TPAE. It is important to note that neither Japanese laws nor TPAE prohibit exports of weapons or weapons technologies to the United States.

The most significant impact caused by TPAE on JDIB is that the market would be limited only to JDA. Technically, the Japanese government has allowed companies to export defense products, but it is unlikely there is a need for Japanese made weapons in the United States. Generally, lack of export market, emphasis on indigenous production creates higher prices for JDA's acquisition efforts. Since the Japanese government makes the JDA possess the minimum necessary defense capability, and removes the opportunities of exporting arms from private firms, arms production is done in small batches, though wide ranging. To make matters worse, in Japan's defense procurement system, contracts are awarded annually to continue or expand work on ongoing projects. The amount of equipment purchased each year is relatively small. For example, in

FY2000, 18 type-90 tanks, three UH-60JAs, one 4,600 ton class Destroyer, and nine F-2s were ordered. As a result, there are no economies of scale, for suppliers, thereby increasing costs.

Given the current budget trends, the domestic market will not expand in the near future, and will probably shrink since JDA will not bear the increasing procurement costs for weapons made in Japan. This also deprives them of opportunities for R & D, production, and test and evaluation. Originally, major Japanese contractors had highly integrated their commercial and defense sectors and did not usually depend on defense sales. To cope with declining opportunities in the defense sector, it is likely that private firms will shift their resources from defense to commercial sectors, which is considered a loss of JDIB.

2. Pacifist Sentiment

Many Japanese believe in peace, regard wars as absolutely evil, and refuse any idea or item related to wars. This strong pacifist sentiment emerged from Japan's World War II defeat. This emotion is based on regret for experiences during the war and tends to restrict military activities. Consequently, the Constitution prohibits the SDF having offensive equipment, such as the bombing capability for fighter aircraft. Moreover, companies that supply various weapons to JDA are very sensitive to the “negative” image of defense business. Military affairs remind the Japanese of the negative images of Japanese conduct during World War II.

Japanese businesses tend not to openly mention that they are involved in the defense business. When looking at the web sites of major contractors, it is rare to see words or pictures relating to defense equipment. This may not only be because their defense sales account for a tiny part of their business, but also revealing JDA business may harm the image of a company.

This implies that Japanese companies may hesitate to export their products and technologies to foreign countries, even if not banned. They would also be concerned that their technologies used in products would appear in third countries via the United States, which is excluded from TPAE. For companies, the advantages or benefits of exporting their equipment rarely exceed the disadvantages. Those disadvantages include penalties

under the Foreign Exchange and Foreign Trade Law and harsh attention from the mass media.

Japan's mass media usually has completely supported peace and encouraged anti-military feelings. For example, the media, when discussing U.S. military bases in Japan, and especially those in Okinawa, has taken a consistently negative position. All things related to military or defense issues, including arms and arms exports, are not excepted. It is easily expected that once a TPAE violation is revealed, the firm may have to face intense mass media campaigns. This would result in jeopardizing their commercial sales.

Arms exports may help spread costs over large production runs. However, this choice is still too risky, even though the serious attention paid to defense or military issues had relaxed as time passes. In the future, because of the increasing sophistication of weapons and the importance of commercial technologies in weapons, the expectations for Japanese companies to provide such technologies may also increase. In that case, this pacifist sentiment would be the strongest deterrent to the production of defense items by Japanese firms.

G. SUMMARY

The JDIB has increasingly been a source of defense equipment for the SDF. As a result, the activities of the JDIB have been directed by political rather than economic factors. The Japanese government (JDA) has procured equipment primarily from the JDIB while prohibiting the export of defense related products. To meet all the requirements of the JDA, Japanese companies have become specialists in their areas in the industry, and the development and production of weapons systems for the SDF have been conducted based on a cooperative relationship within the JDIB.

Some major companies are usually awarded defense contracts. Reflecting the specialization of each company, it is difficult to observe competition in the JDA's procurement processes. Major defense contractors are usually leading companies in commercial products, and defense production accounts for a relatively small portion of their overall businesses. Since the Japanese government is not capable of developing and producing defense equipment, the roles played by these major companies are essential in fulfilling the government's preference for indigenous products.

After World War II, the Japanese government endeavored to develop a small domestic defense industry. To obtain the required technologies, the Japanese government takes advantage of production under licenses from U.S. companies. These technological transfers from the U.S. have facilitated not only arming the SDF but also accumulating and improving the technological expertise of Japanese companies. To the JDIB, defense contracts are more than just a business. The defense budget was considered a means of promoting their technology level. Thus, the Japanese government has been able to provide incentives to Japanese companies to do business with the defense sector.

III. EVOLUTION OF THE JDIB

A. INTRODUCTION

The JDIB has been facing challenges, resulting from budget constraints, and resulting from efforts to reduce the budget deficit during decade-long economic slump. Consequently, orders from the JDA have continued to decrease, and the JDIB no longer has the opportunity to engage in the defense production that has contributed to the improvement of both commercial and defense technologies.

Kokusanka, or domestic production, has been the most influential strategy in allowing the JDIB to learn new production processes. This is by no means limited to the defense industry. Rather, this seems to be the standard strategy in promoting industrialization. The Japanese government historically emphasizes the importance of technology, and has promoted indigenous production in entire industries. For example, it has been stated that Japan would be able to produce almost any kind of industrial products within approximately 20 years after opening the country to foreign trade in 1868. Now, however, this *kokusanka* strategy seems to be at a crossroads.

Since the Japanese government banned the export of defense products abroad to all but the United States, and the unit costs of equipment are likely to be stabilized at a high level, the purchasing power of the JDA is accordingly less deflated. Although the JDA appears to still maintain the *kokusanka* strategy by asking the JDIB to cut costs, it will be difficult to maintain domestic production capabilities.

There is some new movement in the JDIB, though it can hardly be called dynamic. In addition to the cost reduction efforts of individual companies through restructuring, some companies became involved mergers of defense production divisions. Moreover, some companies started to collaborate with U.S. companies in order to reduce costs associated with R & D. It seems difficult for Japanese companies to amalgamate with foreign companies due to Japanese legislation. However, international collaboration is likely to be a trend in the JDIB.

This chapter will describe the environmental change in Japan pursuant to the end of the Cold War, and examine the current situation faced by the Japanese defense

industry. This chapter also examines the affects of *kokusanka*, or domestic production, on the overall growth of the Japanese defense industry.

B. EVOLUTIONARY ENVIRONMENT OF THE JDIB

1. Changing Needs for the SDF and the New Mid-Term Defense Program

Since the end of the Cold War, the environment for Japan and the JDA has changed drastically. Namely, the Soviet Union is gone and the SDF, created to protect the country from this threat, still remains. Thus, the primary rationale for the SDF has disappeared and the Japanese government is faced with having to justify its existence.

After the Cold War, ironically, the Japanese have experienced a state of unrest. The Japanese have had territorial disputes over the Takesima Islands with South Korea and the Senkaku Islands with China, and experienced tensions over both islands in the mid-1990s. The relationship between China and Taiwan is also a Japanese security concern. Moreover, not only has North Korea launched missiles toward Japan, but also, its ambitions to have nuclear weapons have been a serious concern for Japan. The JDA and SDF are expected to cope with these new kinds of missions as well as those regional stability issues. Also, Japan has experienced number of natural disasters such as the Kobe earthquake, subway gas attacks by a radical cult [Ref. 24] and interception of suspicious boats [Ref. 25] during the 1990s. No other organization could deal with these situations. Strictly speaking, the JDA also could not carry out such unforeseen events effectively, and but attracted considerable attention because of its ineptitude.

The new Mid-Term Defense Program (MTDP, FY2001-2005) mentioned the significance of improving capabilities to cope with a wide variety of attacks, and also to upgrade and enhance disaster relief. The MTDP also mentions that measures to establish a highly reliable networking environment, various command, control and communication systems and information security throughout the SDF will be given priority and promoted through the active use of information technology to keep up with much intense and speedier warfare, higher-performance weapons and electronic attacks (cyber attacks) against an information system. All of these are possible because of the rapid evolution and diffusion of information technology. [Ref. 26] However, this MTDP appears to

allocate resources inappropriately based on a concept generated during the Cold War era, and will not result in a drastic transformation of the SDF.

Total outlay for this five-year program is approximately estimated at 25.16 trillion yen. The new program includes two 13,500-ton destroyers (DDH) with a flat deck for helicopter operations, four aerial refueling tankers, and development programs for maritime patrol (PX) and transport aircraft (CX). The modernization of the IT systems is also included in this program. Major equipment to be acquired during the MTDP is shown in the following table.

Table 3.1. Major Programs, Mid-Term Defense Plan (MTDP), JFY 2001-05. [From: Ref. 27]

<i>Area</i>	<i>System/Program</i>	<i>Units; Five-Year Costs</i>
Ground defense capabilities	Type 90 MBT	91 units; ¥73 billion
	MLRS	18 units; ¥40 billion
	Armored vehicle	129 units; ¥20 billion
	Transport helicopter CH-47JA	7 units; ¥30 billion
	HAWK improvement kit	0.25 groups; ¥20 billion
	New medium-ranged SAM	1.25 groups; ¥80 billion
Maritime defense capabilities	Destroyer	5; ¥540 billion
	Guided missile destroyer DDG with latest Aegis system	2 units; ¥80 billion
	Helicopter destroyer DDH	2; ¥200 billion
	Submarines	5; ¥260 billion
	Anti-submarine helicopter SH-60J	39 units; ¥240 billion
	Airborne mine countermeasures helicopter MH-53E	2 units; ¥10 billion
Air defense capabilities	F-15 modernization	12 units; ¥30 billion
	F-2 support fighter	47 units; ¥490 million
	Transport helicopter CH-47J	12 units; ¥50 billion
	Tanker transport	4 units; ¥90 billion
	BADGE system modernization	¥25 billion
IT network	Defense information infrastructure (tri-service computer integration program)	¥25 billion
	Common operating environment	¥5 billion
Research and development	Fixed-wing maritime patrol/ASW P-3C and C-1 transport replacements	¥340 billion
	New main battle tank	¥50 billion
	Theater missile defense	¥3.7 billion (JFY 2001 only)

2. Budget Trend

In the near future, it will be difficult for Japan's defense expenditures to increase for two reasons. One is ongoing fiscal reform, and the other is the psychological ceiling tied to strong pacifist sentiments.

Before entering the current decade-long economic slump, the Japanese economy achieved superb growth. The average real GDP growth rate reached 5% in the 1970s, and 4% in the 1980s. In the early 1990s, the Japanese economy entered a recession. Although the economy seemed to improve from 1993 to 1996, the Japanese economy once again slowed down due to failures in financial institutions and economic turmoil in Asia.

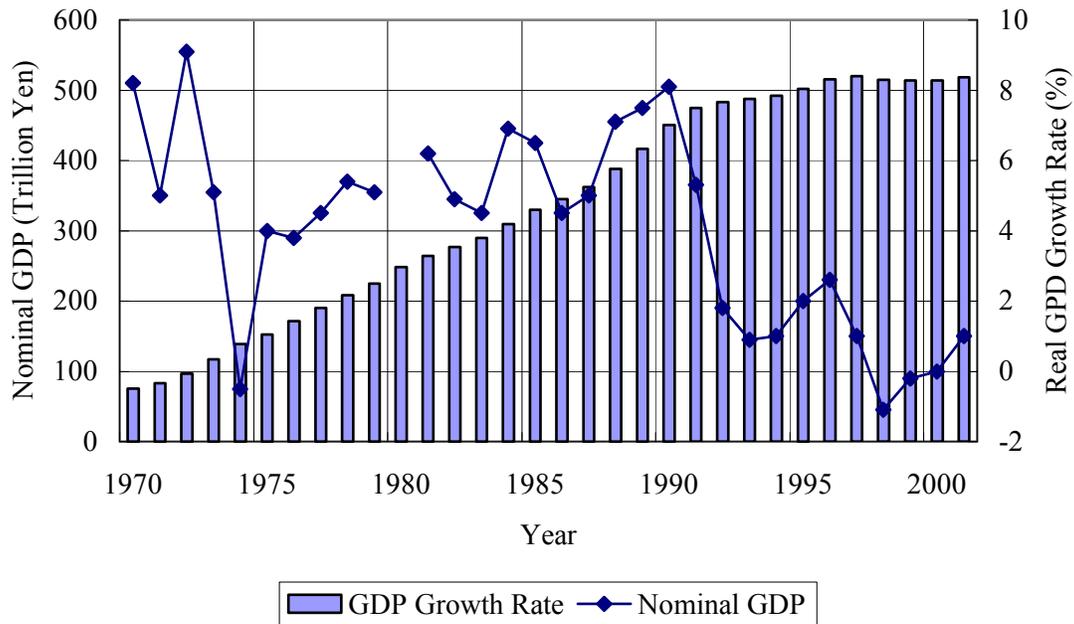


Figure 3.1. Nominal GDP and Real Growth Rate. [After: Ref. 28]

The Japanese government has taken several measures to help the economy recover from the recession. To promote fiscal efficiency and qualitative improvement, since the Ministry of Finance (MOF) claims that all expenses have been thoroughly examined and coordinated without exception, every expenditure, therefore, is likely to be reduced in every category.

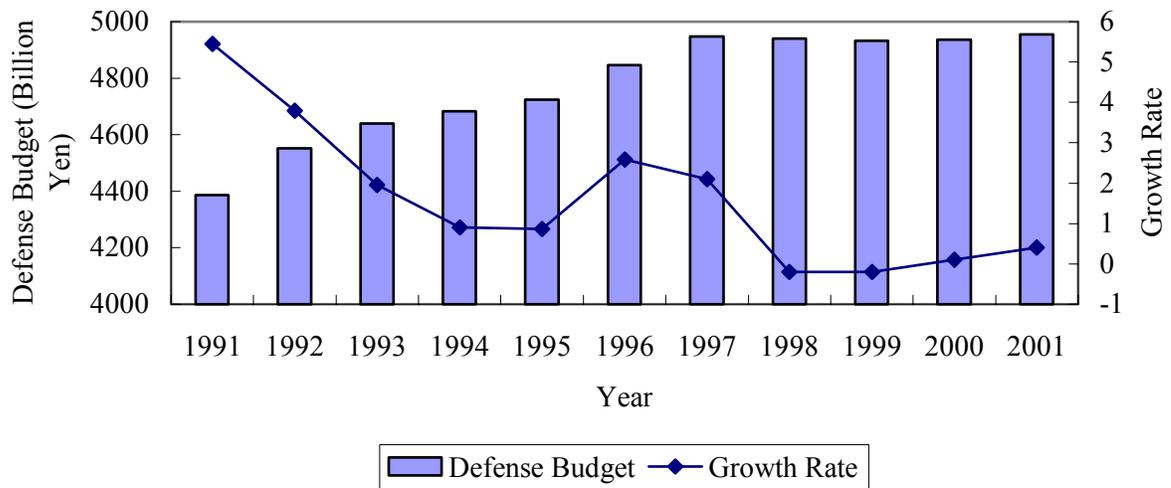


Figure 3.2. Defense Budget and Growth Rate. [After: Ref. 2]

Although the defense budget had grown smoothly with Japan's remarkable economic development, as shown in Figure 3.2, defense expenditures have almost flattened since 1997. This is mainly because the Japanese economy remains stagnant. A ceiling, which reflects the Japanese government's policy by not threatening neighboring countries, also contributes, to some extent, to this trend. The Japanese government had placed a ceiling of 1% of the gross national product on defense expenditures since 1976. This ceiling was discontinued in 1987 but the amount of defense expenditures in the GDP remains 1% or somewhat less.

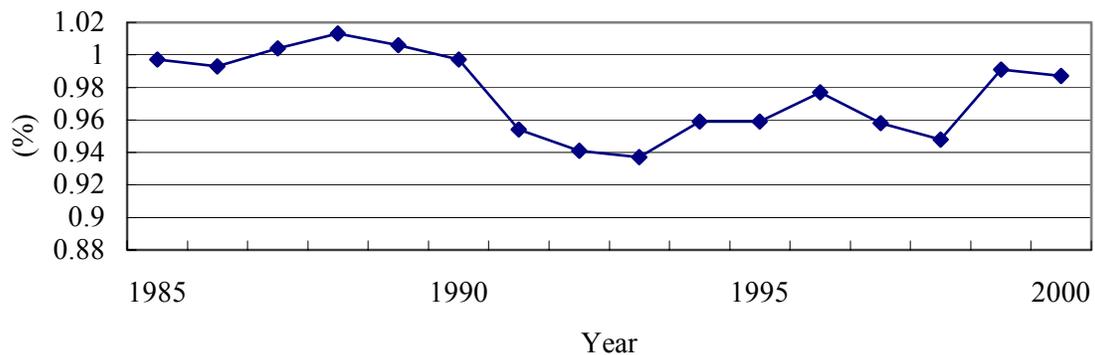


Figure 3.3. Ratio of Expenditures to the GDP. [After: Ref. 29]

Although the Japanese government does not have a definite limit on defense spending, it is unlikely to drastically increase defense spending due to both domestic and international feelings toward the SDF.

In addition to a “zero-growth” defense budget, expenditures for front-line equipment are decreasing. Dividing defense expenditures into two categories, logistics and front-line equipment, a trend can be seen. The portion of expenditures for front-line equipment in total has decreased since 1992. Front-line equipment includes aircrafts, ships, tanks, artilleries, missiles, and ammunition. Logistics is R & D, equipment repair, and facilities maintenance.

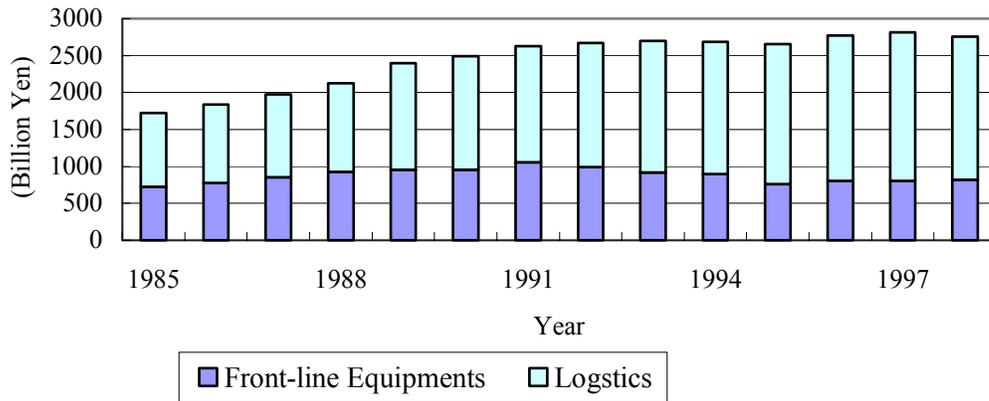


Figure 3.4. Expenditures from Front-Line and Logistics. [After: Ref. 29]

3. Procurement Reform

The JDA has continued its efforts to cut its costs associated with defense equipment to adopt a declining budget and a rise in unit prices due to the sophistication of weapons. The JDA recognizes that in the current situation, it is essential to reduce equipment costs in order to maintain the required level of defense capability. Therefore, the JDA has implemented procurement reform by focusing on its procurement systems and organization. This reform included:

- Review of the Defense Agency's standards and specifications
- Promotion of R&D that is useful to reduce life-cycle costs
- Structuring of an efficient defense production framework

- Improvement of the procurement system and its implementation
- Reduction of maintenance and repair costs through such measures as an improvement in efficiency in various systems
- Promotion of CALS (Continuous Acquisition and Life-cycle Support)

As a measure to reduce procurement costs, the JDA required suppliers to reduce production costs by 10% in three years starting in 1999 while introducing a "cost reduction incentive system." This incentive system offered 50% of the actual cost reduction after examining the contractors' proposal for reducing costs for materials and engineering methods. To enhance cost reductions through this incentive system, the JDA is planning on relaxing conditions. To ensure transparency and fairness in the procurement of equipment and services, and to establish efficient procurement and supply systems, the JDA claimed that it would promote procurement and acquisition reforms such as strengthening market principles. [Ref. 2]

C. INFLUENCE OF "KOKUSANKA"

Kokusanka has been effectively nurtured by the JDIB. This strategy also protected the JDIB from international competition in the defense sector. Traditionally, the JDA has considered that the recovery of the lost defense production base would take a long time and a lot of effort because of the specialized technology accumulated through the experience and facilities required. Consequently, it is becoming increasingly important to maintain and secure defense production and technological bases within the country. In addition, since the Constitution includes a no war clause, it has been difficult to field "off-the-shelf" equipment from foreign countries.

This strategy causes at least two problems. One is the high cost of production, and another is the quality of the equipment. Due to *kokusanka*, only Japanese companies are allowed to become suppliers in many cases. Japanese companies are not permitted to export defense products and are not able to realize economies of scale. Moreover, since each company specializes in particular products, competition is unlikely to occur.

Table 3.2. Unit Price Comparison. [After: Refs. 21, 30, 31, and 32]

Item	Quantity	Total Cost (Mil. Yen)	Unit Cost (Yen)	Value in US \$ (\$1=125 Yen)	U.S. Counterpart's Unit Cost (US \$)	
Type 89 Rifle(5.56mm cal.)	2937	1,004	341,845	2,735	586	M-16
Machine gun(5.56mm cal., MNUMI)	174	477	2,741,379	21,931	4,087	M249 SAW
Submachine gun (9mm cal.)	100	30	300,000	2,400	894	MP-5N (cal. 9mm)
Tank (Type-90)	18	13,600	755,555,556	6,044,444	3,100,000	M-1
MLRS(M270)	9	13,200	1,466,666,667	11,733,333	9,600,000	MLRS
UH-60JA	3	7,900	2,633,333,333	21,066,667	8,000,000	UH-60
F-2	9	87,000	9,666,666,667	77,333,333	19,000,000	F-16
F-15	0		12,000,000,000	96,000,000	33,000,000	F-15

Table 3.2 shows the comparison of unit costs purchased by the JDA in 2000 and the unit costs of the U.S. counterpart. This table definitely indicates that the purchasing power of the JDA is deflated by the *kokusanka* strategy. Although the JDA's equipment is not necessarily identical to the U.S. counterpart, it is possible to reduce procurement costs if the JDA renounces *kokusanka* and compromises on specific capabilities.

There is always skepticism about Japanese made weapons' quality, since Japan is not engaged in combat now. Besides weapons produced under licenses, weapons are designed and produced based on limited operational knowledge. An example follows regarding the performance of indigenous equipment. When minesweepers were dispatched to the Persian Gulf after the Gulf War, the equipment did not work well. The actual experiences of Japanese minesweepers rested exclusively with Explosive Ordnance Disposal (EOD) activities. They usually disposed of sea-mines that were scattered by Allied forces during World War II. Since the missions were only carried out in Japan's coastal waters, they did not know about problems with their equipment. However, as they encountered a new environment and a new threat, the minesweepers

revealed the need for more capable equipment. This implies that it is difficult to consider all anticipated situations without experiencing them, and therefore, weapons made in Japan may be of inferior quality compared to similar items produced by other countries.

Those issues in terms of high cost and quality are from a user's viewpoint. Given affordability or cost performance under a shrinking budget, *kokusanka* does have negative aspects. However, examining this matter from a producer's point of view reveals favorable aspects. First, *kokusanka* allows producers to accumulate technologies. This is very clear in the aerospace industry.

Major companies in the aerospace industry, such as MHI, KHI, and FHI, have been subcontracted for foreign commercial aircraft companies such as Boeing and Airbus. This subcontracting proves that these Japanese firms have relevant technologies, at least in part, to produce world-class aircraft. This is attributed mostly to the *kokusanka* strategy. These companies have never experienced major commercial aircraft development, except for the YS-11s, which were designed and produced by the Nihon Airplane Manufacturing Corporation (NAMCO). Therefore a special entity was created by MITI to develop the YS-11. [Ref. 33] The YS-11 was produced from 1964 to 1972. This is the only project that offered Japanese companies a chance to develop and produce commercial aircraft.

In contrast to other fields in the defense industry, the aerospace industry greatly depends on the demands from the JDA. In another words, they have accumulated technologies and skills needed to produce aircraft through manufacturing defense products.

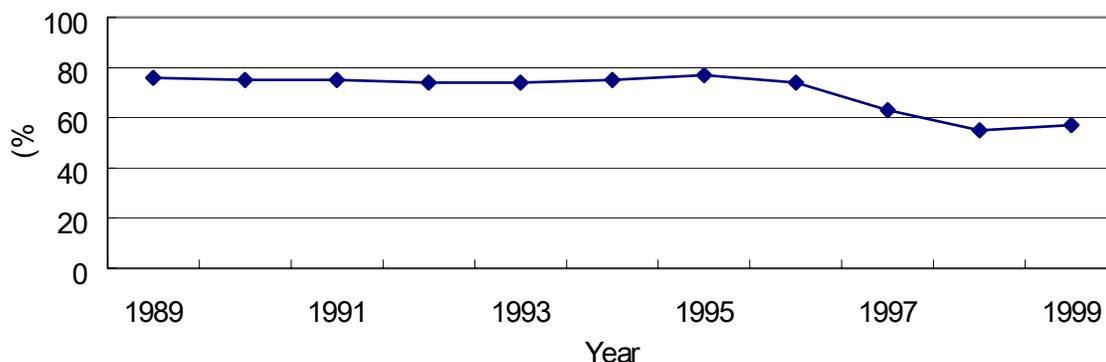


Figure 3.5. Aerospace's Dependency on JDA. [After: Ref. 30]

While dependency has declined recently, more than half of its production is still for the JDA. Moreover, since the production of the F-2 has initiated a development program for the PX and CX, this dependency may increase in the future.

To achieve autonomy, Japan has made the most of licensed production. The Japanese recognized licensed production as a means to obtaining the desired technologies for aircraft production, and expected the technologies to diffuse throughout the economy. The Japanese also consider licensed production to be a form of *kokusanka*.

Table 3.3. Major Licenses Production Programs. [After: Ref. 30]

Year, Production started	Program	Licensor	Units
1955	F-86F	North American	300
1956	P2V-7	Lockheed	48
1961	F-104J	Lockheed	230
1969	F-4EJ	McDonnell Douglass	140
1972	HU-1H	McDonnell Douglass	133
1981	F-15J/DJ	McDonnell Douglass	194
	P-3C	Lockheed	105
1983	AH-1S	Bell	89
1984	CH-47	Boeing	61
1988	SH/UH-60J	Sikorsky	132
1994	UH-1J	Bell	76

Table 3.3 shows major licensed production programs. The very first program was the production of the Bell 47 and began in 1953. Many of the programs were designed for

defense production. Thanks to those programs, Japanese companies have made steady progress in technologies even though the domestic market for the industry remains small scale and there was almost no chance to develop aircraft. They have been involved in several international co-production projects since the 1980s, and they are highly regarded in terms of the quality of their product by contractors.

The example of *kokusanka* in the aerospace industry, has provided opportunities for Japanese companies to learn “know-how” by producing U.S. designed advanced equipment. Consequently, this strategy contributes to the improvement and enhancement of their level of technology, and strengthens industrial competitiveness.

D. IMPACT OF DEFENSE BUDGET EXPENDITURES ON JDIB

To deal with declining budgets, the JDA revised resource allocations and postponed the start of some programs. The JDA’s efforts also include considerations whether commercial products could be substituted for defense equipment, and also reducing orders for new equipment. Table 3.4 shows that the volume of procurement has declined since the 1990s. On the other hand, companies are countering this by rationalizing management practices and improving efficiency in ways such as personnel reassignment and a reduction of capital investment. [Ref. 3]

There is another challenge facing contractors. Although each MTDP project has a scale of procurement in the course of the program, the plan is subject to review if necessary after three years within the total amount of funding set forth in this plan, taking into account the international situation, technological trends, economic and fiscal conditions and other factors in and outside Japan at the time. [Ref. 26] Consequently, the projected number of systems procured is likely to be reduced. This makes it impossible for companies to set up stable production plans and difficult to allocate resources appropriately.

Business in the JDA used to be beneficial to companies. A business leader said, "We have to go value-added, and all that is left is space and defense." These companies envision commercial spin-offs from defense production, and they fear that they may miss out on new developments if they are not at least peripherally involved in the defense

business. They believe defense will drive innovations in areas such as electronic components. [Ref. 34] This comment describes well how Japanese companies looked at defense projects. Previously, as the Japanese economy continuously grew, defense expenditures, (which was limited to 1% of GDP) also kept expanding.

Now, however, while companies still maintain an interest in “spin-offs” from defense technologies, some defense industry businesses that staying in the defense business is impossible under the existing system, and some are contemplating the possibility of completely withdrawing from the defense sector. [Ref. 18]

Table 3.4. Mid Term Defense System. [After: Ref. 29]

Services	System	Mid Term Defense Program (MTDP)				
		FY91-95		FY96-00		FY01-05
		Initial	Adjusted	Initial	Adjusted	Initial
Ground Self Defense Force	MBT	132	108	96	90	91
	MLRS	36	36	45	45	18
	Armored Vehicle	218	193	168	157	129
	Anti-Tank Helicopter	20	18	4	3	--
	Transport Helicopter	14	12	12	9	7
Maritime Self Defense Force	Destroyer	10	8	8	7	5
	Submarine	5	5	5	5	5
	Fixed Wing Aircraft	8	5	--	--	--
	Anti-Sub/Patrol Helicopter	36	31	37	37	39
Air Self Defense Force	Fighter Aircraft	42	29	51	49	47
	Transport Aircraft	3	1	--	--	--
	Transport Helicopter	2	2	6	4	12
	Trainer Aircraft	90	68	59	54	--
Total Amount Allocated to Defense-Related Expenditures (Trillion Yen)		22.75 (FY90)	22.17 (FY90)	25.15 (FY95)	24.24 (FY95)	25.16 (FY00)

In addition to shrinking orders, the JDA's consideration for acquiring commercial substitutes may make defense business less attractive. This lessens expectations of companies can improve their technical expertise through defense system development.

What Japanese companies have done so far is mainly internal restructuring such as a retrenchment of defense divisions and an amalgamation of affiliated companies but movements toward consolidation are rare. As for mergers, two of the shipbuilders', IHI and Sumitomo Heavy Industry marketing and design sectors, were merged into Marine United Inc. in 1995. IHI also took over the defense and aerospace division of Nissan Motor Co. Ltd. in 2000. Nissan has been carrying out its restructuring plan to achieve growth, improve profitability, and reduce debt. Nissan sold its defense division so that it can concentrate its resources in other areas. Japanese companies are usually less dependent on defense business, so reducing orders from the JDA does not, to a great extent, affect their business. However, they are also suffering from money-losing businesses affecting their prime businesses due to Japan's prolonged economic slump. Nissan's case proves that withdrawing from the defense sector is one of the options when companies mull over reinforcing their core business.

On the other hand, the current situation creates an incentive to cooperate with U.S. companies as a means of improving their competitiveness and technological capabilities. Japanese businesses have been interested in cooperation with the United States through programs employing cutting-edge technologies such as TMD. [Ref. 11] Recently, the Mitsubishi Electric Co. (MELCO) allegedly announced a partnership with Lockheed Martin. [Ref. 35] They will develop missiles, radar and other defense equipment and share technologies. Since companies involved in a partnership can expect not only an improvement in the level of technology but also a reduction in costs associated with R & D, this movement toward partnerships will increase.

E. SUMMARY

The SDF's mission has been changing since the end of the Cold War. New missions are planned to cope with attacks waged in various forms including an event such as the subway gas attack and cyber attacks, and upgrade and enhance disaster relief capability. As a result, the JDA is required to have new equipment to accomplish new missions while maintaining the weapons systems currently in use.

However, the defense budgets remain stable. In addition to this “zero-growth” trend, expenditures for front-line equipment have been slowly decreasing. On the other hand, since *kokusanka* is an expensive approach to weapons development, the purchasing power of the JDA is deflated by this strategy. In order to address this situation, the JDA has made efforts to reduce procurement costs by requiring suppliers to cut production costs and reducing the volume of procurement.

The JDA is practically the JDIB’s smallest and only defense buyer. Thus, the flat defense budget directly influences the JDIB. Japanese companies are curtailing the defense division, and merging affiliated companies in order to adjust to decreasing orders from the JDA. In an effort to reduce costs, a company will collaborate with a U.S. company. This movement intends to keep costs down as well as improve the level of technology. The number of companies choosing partnership with U.S. companies is likely to increase.

IV. FACTORS THAT INFLUENCE CONTINUED EVOLUTION AND SUSTAINMENT OF THE JDIB

A. INTRODUCTION

The difficulties the JDIB is encountering appear to stem from external factors, such as the current curtailment of the defense budget, the export ban on defense products and kokusanka. The Japanese government historically maintains the policy that keeps the SDF minimum scale in order to not threaten neighboring countries. At the same time, the government expects the JDIB not to play a major role in the world defense markets.

The decreasing defense budget clearly makes it difficult to maintain the JDIB in traditional ways, such as the JDA allocating a certain amount of the procurement budgets to purchase costly indigenous products instead of prohibiting the export of defense equipment. This chapter examines the apparent contradiction between the zero-growth policy and a desire to maintain autarky in the defense production of major defense systems as well as the current sources of defense acquisition including the involvement of international defense firms.

Co-development and co-production of weapons systems with the U.S. is a potential method of reducing the JDA's procurement costs. However, the FS-X program has been the only major program. Unfortunately, almost all participants poorly regard the FS-X program. This chapter seeks an appropriate method of co-production and international cooperation by examining the FS-X case.

The JDIB has made efforts in response to the JDA's requirements to reduce the unit costs of equipment. However, the market for the JDIB is, in essence, limited to the JDA because of the JDIB's current system. Consequently, continuous cost reduction requirements may remove the incentive for the JDIB to remain in the defense business. This chapter concludes with an examination of management strategies that may facilitate the continuance of the JDIB.

B. POLITICAL ASPECTS OF SUSTAINMENT OF THE JDIB

There is a conflict between pursuing international peace and sustaining the JDIB. In reference to the former, the Japanese government has used the TPAE and strictly

controlled arms exports. The Japanese government has also utilized the kokusanka strategy for further indigenous weapons development and production capabilities. When considering how to sustain the JDIB, it is essential to clearly state how the Japanese government applies the TPAE to technology transfer to the United States. In other words, the JDIB will not survive without reconsidering the application of the TPAE.

The JDIB has been nurtured with the kokusanka strategy, so that Japan is able to keep the importation of defense equipment to a minimum, based on defense industry being critical to the security of the country. Thus, the Japanese government has accepted expensive and lower quality weapons systems made in Japan. However, the JDIB currently must face tighten constraints caused by shrinking defense budgets.

The Japanese government has given fiscal reform first priority, and has not made any efforts to sustain the JDIB. The JDA, rather, decided to consider commercially available substitutes for equipment designed specifically for defense use. Thus, the importance of the JDIB in the defense market is declining. If companies in the JDIB are not able to make enough profit, the possibility exists that the incentive to have defense divisions may disappear.

At this stage, obviously the TPAE constraints, while asking the JDIB to produce almost all the requirements, has caused considerable concern. Thus, the current downturn of the Japanese economy might serve as a catalyst to revise the TPAE. The TPAE prevents Japanese companies from exporting weapons and components, and eliminates economies of scale in defense production. However, these principles reflect Japan's position as a peace-loving nation. [Ref. 4] Put differently, the TPAE is likely to be applied based on political reasoning, not economic considerations.

Although no one in the Japanese government or industry wants to completely eliminate the three principles governing weapons exports, there is a movement that calls for the Japanese government to be flexible concerning the application of the TPAE. The Defense Production Council (DPC) of the Japanese Federation of Economic Organizations (Keidanren), a private and non-profit economic organization representing virtually all branches of economic activities in Japan, proposed making Japan's arms export restrictions more flexible. [Ref. 15]

An interesting fact representing the state of current technology can be demonstrated. North Korea's "Yugo" class submarine, which the Korean navy captured off the coast of Korea, consisted of over 1,958 items, and 287 of these were made in Japan. All of the electronic items, which constituted essential parts of the submarine, were made in Japan, and were diverted from non-military Japanese products. [Ref. 36] This example proves that some products designed for commercial markets can easily be modified as components for a weapon system with minor modifications. Thus, the distinction between commercial and military components is nebulous. Japanese companies have many advanced technologies, which are applicable to both commercial and defense products, and even electronic appliances contain such technologies.

Therefore, Keidanren, considered to be representing the JDIB, fears that once the Japanese government strictly applies the TPAE, their businesses will suffer severely, since it will no longer be possible to export products containing advanced technologies to any country. In addition, Japanese policymakers worry that U.S. transfers of systems to third countries based in part on Japanese technologies constitute arms exports by Japan as defined by the TPAE. [Ref. 15] Thus, Japanese firms are prevented from attempting to transfer technologies.

The TPAE also works as a barrier to the development of a company-based technology cooperation framework while the Japanese government admits the transfer of defense technology to the United States. Under the current interpretation of the TPAE, it appears to violate those principles of exporting products produced by U.S. firms that incorporate technologies developed by Japanese companies. In this case, Japanese companies are not able to expect any benefit from co-development with the United States.

The METI uses a particular definition for arms: specifically designed parts, accessories and finished products used by military forces and directly employed in combat. Those items are listed in the export trade control order [Ref. 4] In addition, when using the TPAE, all products exported from Japan not to be used as commercial products are considered to be arms, which are likely to include commercial items modified for defense applications. It is forbidden, on account of this, to export them to the United States unless a security treaty is concluded. Items in question, whether they fall under

such arms categories or not, will be judged objectively based on shape, features and other technical aspects regardless of end use. [Ref. 4]

In this sense, to facilitate the continuance of the JDIB, the Japanese government is required to provide certain considerations. Given the strong pacifist sentiment among the Japanese people, it is hard to expect the Japanese government to lift the TPAE or revise it in the near future. Therefore, flexible interpretation of the TPAE would be the most practical approach. If Japanese companies are allowed to export defense-related products more openly, they would be able to freely conduct business with U.S. counterparts. Consequently, it is possible that the costs of products manufactured by the JDIB would decrease due to economies of scale.

C. MAJOR SOURCES OF DEFENSE ACQUISITION

The weapons systems used by the SDF are procured mainly from five sources which are divided into two categories. One is domestic production and the other is imports. As for domestic production, the production of domestically developed systems (*kokusanka*), co-developed systems, and licensed production fall into this category. Two methods of imports are imports through commercial channels and FMS (Foreign Military Sales).

As shown in Table 4.1, each method has both advantages and disadvantages. However, from the standpoint of the Japanese government, domestic production appears to be preferred to imports. Furthermore, domestic development, which allows domestic manufacturers not only to increase technological expertise but also to keep production lines open and skilled labors employed, would be the best of the three methods of domestic production.

Table 4.1. Advantage/Disadvantage of Major Sources of Defense Acquisition.
[After: Ref. 3]

Category		Advantage(s)	Disadvantage(s)
Domestic production	Domestic Development	Suitable for the plan of operation Contribute to sustainment of production and technology base	Technological risks Expensive
	Co-development	Contribute to sustainment of production and technology base Small technological risks	Rather expensive
	Licensed Production	Small technological risks Quickly procurable Contribute to sustainment of production and technology base to some extent	Difficult to improve
Imports	Commercial Import	Inexpensive in general No technological risk Requires shorter time for acquisition	Difficult to improve
	FMS		No contribution to sustainment of production and technology base to some extent

Table 4.2. The Change of The Sources of Procurement (Trillion Yen). [After: Refs. 2 and 37]

Year	Domestic Production (A)	Import (B)	FMS (C)	Military Assistance Program (D)	Total (E)E=A+B+C+D	Ratio of Domestic Production (A/E)
1950-57	241.5	9.5	2.5	356.9	610.4	39.6
1958-60	278.9	10.9	16.8	140.5	447.1	62.4
1961	70.2	6.3	6.0	26.1	108.6	64.2
1962-66	578.1	42.4	38.2	49.7	708.4	81.6
1966-71	1282.9	66.2	47.8	3.3	1400.2	91.6
1972-76	2155.8	100.1	61.7	0	2320.6	93.0
1977-80	3086.9	139.2	289.4	0	3513.7	88.1
1981-85	5946.6	324.3	433.9	0	6704.6	88.2
1986-90	8067.2	379.9	468.6	0	8915.8	90.5
1991-95	8657.4	534.5	472.5	0	9664.5	89.6
1996	1872.5	93.8	54.1	0	2020.4	92.7
1997	1847.9	117.3	37.6	0	2002.7	92.3
1998	1734.4	112.7	34.8	0	1881.8	92.2

In the early period of the SDF, the U.S. government supplied many ships and aircraft. They were provided as free loans through the Special Far East Command Reserve Program of U.S. Far East Army; this program later migrated to the Military Assistance Program (MAP). The total came to 44.9% of total equipment procurement between 1950 and 1961. MAP was decreased gradually as the Japanese defense production systems were established. Japan received the last weapons under MAP in 1965. On the other hand, Japan had begun to produce naval combatants in 1953, and aircraft in 1954. In 1970, the Japanese government adopted “The Basic Policy for the Production and the Development of Equipment in the Domestic Industries”, and accelerated the research, development and production of defense equipment. [Ref. 12]

The ratio of indigenous products has been almost 90% since the late 1960s. However, in reality, many of the major systems are composed of licensed products. While much equipment for the Ground Self Defense Force (GSDF), such as tanks and armored vehicles, have been developed and manufactured by the JDIB, the development of more sophisticated and complicated systems, such as aircraft and missiles, have greatly depended on the technologies transferred from the U.S. In other words, the truth of the matter is, the JDIB does not have enough capabilities to fulfill all the requirements of the JDA; this is most evident in the development of complex weapons systems, such as the Multiple Launch Rocket System (MLRS), the AWACS airborne early warning system, F-

2 fighter aircraft, and the AEGIS guided missile cruiser. All of these are either being produced through licenses, imported, or jointly developed with the U.S.

The JDA has faced tighten budget constraints since the mid-1990s. This constraint may increase the motivation to pursue less expensive procurement methods, such as off-the-shelf purchases, and cost sharing through joint development and production with the U.S. The current Mid Term Defense Program indicates that indigenous products are the first priority. The JDA announced that, with regard to procurement sources, such as an aircraft or a naval combatant, the JDA has attached great importance to domestic development from the viewpoint of developing the defense industry. However, the JDA will promote imports to keep supply costs down. However, the tendency to field domestic products will continue for a certain period of time unless the JDA conducts a fundamental revision of the SDF structure because, in general, defense programs mature over a long period.

D. THE CASE FOR INTERNATIONAL COOPERATION

The Japanese and U.S. governments created a group known as the Systems and Technology Forum (S&TF) in 1980. The purpose of this forum is to facilitate cooperation between the U.S. DoD and JDA in the development of defense technologies. Although technology transfer from the U.S. to Japan has ordinarily been in the form of licensed productions, the S&TF creates new mechanisms for the transfer of technology between two countries.

The Japanese government also decided in 1983 to pave the way for the transfer of its military technology to the United States as an exception to the Three Principles on Arms Exports. [Ref. 2] Technology transfer to the United States began with a portable SAM technology and construction technology for U.S. naval vessels. The FS-X program is also considered a part of technology transfer. In addition, the S&TF has spawned the nine programs listed below.

Table 4.3. Collaborative Technology Projects. [From: Ref. 38]

Program	Years	Cost	Description
Ducted Rocket Engine	1992-present	\$30 million	Five-year program between the U.S. army and Japan's Technical Research and Development Institute (TRDI) developed and ground tested a flight-weight ducted engine.
Advanced Steel Technology	1995-2001	\$35 million	U.S. Navy-TRDI project developed new methods for welding high strength steels
Fighting Vehicle Propulsion Using Ceramic Materials	1996-present	\$26 million	U.S. army Tank-automotive and Armament Command and TRDI project aims to develop diesel engine technology for vehicles
Eye-Safe Laser Radar	1996-2001	\$20 million	U.S. army Communication and Electronics Command-TRDI project developed and tested a demonstrator multifunction eye-safe laser radar system capable of 3-D imaging
ACES II Ejection Seat Modification	1998-2002	\$50 million	U.S. air force-Japan Air Self Defense Force project developed a modification kit for ACES II pilot ejection seat.
Advanced Hybrid Technologies	1998-present	\$18 million	U.S. Air Force, USAF Research Laboratory, Japan Propulsion Defense Agency and TRDI are conducting research and exploratory development of advanced hybrid rocket engine.
Shallow Water Acoustic Technologies	1999-present	\$4.5 million	U.S. navy-TRDI project aims to improve understanding and prediction of shallow-water acoustic signal properties.
Ballistic Missile Defense Technology Research	1999-present	\$210 million	Requirement analysis and design for anti-ballistic missile components. A potential application is the future SM-3 Block II missile.
Low Vulnerability Ammunition	1999-present	\$1.4 million	U.S. Army and TRDI program seeks to develop low cost, reduced sensitivity energetics for use as propellant in artillery systems.

Although it is possible to say that the S&TF has been beneficial, unlike the FS-X project, S&TF activities focus on individual interests to suit the occasion. The dialogue on common interests in defense requirements and cooperation on future acquisitions evident in NATO has been all but absent between the U.S. and Japan. [Ref. 39]

The United States and Japan are now considering restructuring the S&TF. Both countries intend to revamp this framework so that it can enable broader cooperation. Although both countries have utilized the S&TF as a framework for cooperation narrowly focused on research and development, “one goal of the reorganization is to establish regular communication between military personnel from both countries responsible for outlining new weapon requirements.” [Ref. 38] By establishing such a framework, it is expected that both countries will be able to recognize the common requirements as early as possible.

There is another issue to be considered. It is hardly possible to consider the JDIB in this framework. The JDIB should play a major role in cooperative technology transfer.

The reasons are, first, the constraints imposed by Japanese legislation and policy; second, a lack of structure to encourage companies to join cooperative projects; and finally, the lack of incentives to share technologies. As for the constraints, the risk that core businesses might be jeopardized always exists. As regarding structure and the lack of incentives, if the Japanese government does not take the initiative, Japanese firms will hardly benefit from cooperative programs. To Japanese companies, technologies are valuable products derived at their own expense. The lack of an appropriate structure for promoting participation by Japanese companies may weaken technology transfer programs, since the main R & D efforts are undertaken by commercial entities sponsored by those companies.

E. LESSONS LEARNED FROM THE FS-X (F-2) CASE

1. Background

The production of the FS-X (F-2) is the result of the first joint fighter development program between Japan and the United States. The program began with the signing of a Memorandum of Understanding between the Japanese government and the United States. Although the F-2 was developed through cooperation between Japan and the United States, the fighter was to be used exclusively by the Japan Air Self Defense Force. The program was completely funded by Japan. The F-2 (FS-X) was developed by Mitsubishi Heavy Industries which was the main contractor. KHI, FHI, and Lockheed Martin were principal subcontractors.

In 1981, the JDA started a development program to replace the aging F-1 fighter, which was produced by MHI. This program, reflecting *kokusanka* strategy, basically was intended to develop the next-generation fighter aircraft on its own, except for the engines. However, by late 1986, as a result of a lot of pressure from the United States, the program shifted in modifying the F-16.

By the 1980s, Japanese had recognized some challenges regarding licensed production which included:

- The U.S.'s attitude of protection of sophisticated technologies
- Licensing in which the licensor becomes dependent on the licensee
- Licensing which makes upgrading difficult

Each of these arguments reflects that licensed production inhibits autonomy.

The Japanese industry has produced a variety of weapons under license. However, this was by no means a method for obtaining advanced military products and technologies. As Japanese companies were convinced that they were capable of producing fighter aircraft, Japanese companies and policy makers felt a desire for “pure” *kokusanka*. This movement toward achieving autonomy resulted in the controversial FS-X (F-2) program.

The FS-X began to be examined when Japanese companies started to join international co-production programs for commercial aircraft. The Japanese aerospace industry had proven that it had obtained a certain technology level through various licensed production programs. For Japan, this was a chance to end the dependency on the United States for defense technologies and reinforce the domestic defense industrial base.

However, from the U.S. standpoint, allowing Japan to produce fighter aircraft was not necessarily preferable. The U.S. aerospace industry felt that the emerging military aircraft supplier might ruin the U.S. advantage in commercial aircraft and increase competition in the market. The U.S. government expressed a concern about the widespread proliferation of sophisticated weapon systems. In addition to those concerns, the link with trade problems made matters worse. At that time, since a huge trade imbalance existed between the U.S. and Japan, Japan’s desire to develop indigenous fighter aircraft was strongly rejected in the United States.

The first FS-X (prototype) was rolled out and made its first flight in 1995. The Japanese congress approved the production program in mid 1996. The deployment of the F-2 began in 2000 and the Japanese government plans to field 130 F-2s.

2. The Result of FS-X Program

There is no doubt that the FS-X program helped to strengthen Japan's aerospace industry. Thanks to this program, the Japanese obtained valuable design and systems integration experience applicable to other aircraft projects. Through the program, Japan was able to make the most of domestic design concepts and technologies by modifying the F-16 drastically. Both U.S. and Japanese officials admitted that Japan's aircraft engineers are improving their skills by designing and developing the FS-X fighter aircraft. [Ref. 40] In this sense, this program contributes, to some extent, to improving and

enhancing the level of Japanese technologies, and to strengthening their industrial competitiveness.

On the other hand, the United States gained not only economic benefits but also advanced technology. As for economic value for the United States, it is said to be an estimated \$4.1 billion, which is approximately a 40% of the share if the Japanese fully implement the planned production of 130 aircraft. At the same time, Lockheed Martin, which is one of the subcontractors, has transferred composite design and manufacturing processes from MHI. Lockheed Martin officials indicated that tooling techniques from the F-2 program are being applied to the Joint Advanced Strike Technology program [Ref. 41]

Both Japan and the United States benefit from this program. However, in general, the public does not hold the FS-X program in high regard. Both sides are frustrated because they were not able to obtain what they expected from this program because of a lack of communication in defining common interests. Thus, the Japanese wanted to maximize modifications to the base line F-16, while the United States sought a cooperatively developed FS-X based on a minimally modified base aircraft. Moreover, since the United States used the transformation of required technologies, for example, engines or source code, as a way to obtain a compromise from Japan, the experience of co-development of the FS-X, ironically, strengthens the case for technological autonomy. As a result, a feeling that Japan was forced into a joint program by the United States was popular among Japanese at that time. A JDA official recalled “I thought nothing could be done until we possessed the requisite technological capability ourselves.” [Ref. 42]

Most of the trouble seems to have resulted from the different interests of the two countries toward the program. Since little common interest existed, a national security issue was biased, in large part, by economic concerns--a mentality that “they” obtained more than “we” did. The underestimation of the United States of how serious Japan was about *kokusanka* also contributed to this problem. Unlike today, Japan’s growing economy made the Japanese confident that they could produce indigenous fighter aircraft. Even under the current severe economic conditions, Japan is still persisting in *kokusanka* as seen from its decision on development of the PX and CX.

Before this program, both countries had concluded the technology transfer agreement in 1983. Consequently, Japan decided to release its defense technology to the U.S. as an exception to the TPAE. The FS-X case was a test of the agreement as well as the first major joint development program. Different from other research projects, this program endeavored to generate the prospects of a ready application, which seems too large in scale and complicated to manage without mutual understanding and experience.

The following issues warrant attention to so as to avoid the conflicts associated with joint programs in the future. First, every party concerned must define their interests in equipment and technology before the programs are begun. In the case of the FS-X, differences in interests caused disputes and resulted in unpleasant feelings. Second, a “big picture” attitude must be taken that technology transfers during programs will reinforce the technological expertise of both countries. Given a decreased market for defense equipment, technological exchanges will result in benefits to the defense industries of the two countries.

F. MANAGEMENT STRATEGIES THAT FACILITATE SUSTAINMENT

The Japanese government, rather, should make more of an effort to emphasize the positive aspects of technology transfer to the United States in order to lessen the sensitivity of the Japanese public on this issue. Historically, the Japanese government has been indecisive about defense matters due to the no-war clause in the Constitution. As a result, many Cold War defense practices continue today. However, political leadership has rejected making a positive statement that would enable Japan to revise such old practices. Thus, the Japanese government and most policy makers have hesitated to alter their practices.

To sustain the JDIB, the TPAE and *kokusanka* must be revised. The JDIB is suffering as a result of current policies. Indeed, some defense industry businesses are saying that it is impossible to do business under the existing system with JDA efforts to reduce procurement expenditures. [Ref. 18] The external conditions affecting the JDIB, such as the TPAE, *kokusanka*, and the declining budget, are extremely burdensome. The TPAE eliminates potential business opportunities in foreign markets. *Kokusanka* requires scarce resources to be spread unnecessarily over a wide range of weapons systems in order to fulfill the needs of the SDF. At the same time, the decreasing defense budget

requires the JDIB to cut the unit price of equipment while reducing the level of production. Thus, it is clearly impossible to maintain the JDIB while all these negative factors affecting it.

Given the ambiguity of commercial vs. military categories, the TPAE is not necessarily effective in preventing proliferation of weapons. On the contrary, it becomes obvious that the continued use of the TPAE is harming not only the JDIB but also the core businesses of Japanese companies. Given the strong pacifist mentality among the Japanese public, the TPAE is likely to continue. At the same time, because defense production is not the core business for Japanese companies, unnecessary and unfavorable criticism associated with defense matters may seriously damage their main businesses. It is hard to imagine that Japanese companies would export products and technologies indiscriminately even if the TPAE were lifted.

It is to be expected that the market for the JDIB is likely to increase where technology transfer with the United States is concerned. If Japanese companies actively do business with the United States, the unit costs of equipment for the JDA may decrease to some extent. A secondary effect may be the increase in interoperability between the SDF and U.S. forces. To promote this transfer of technology, the Japanese government, at least, must not stretch the interpretation of the TPAE. If at all possible, the Japanese government should announce that export destined for the United States is not restricted. This policy should indicate commercial items suitable for defense applications with minor modifications for defense applications.

G. SUMMARY

The JDIB is composed of private companies but the Japanese government controls almost all JDIB activities. Those who intend to produce aircraft and weapons must obtain permission from the government and the products are principally supplied to the JDA. It is not clear whether the JDIB can export any defense related products and comply with the TPAE. Since the TPAE has not been clarified, Japanese companies cannot be confident that their products are categorized as commercial. Once an item is categorized as not for commercial use, that item may not be exported.

At the same time, there has been a framework to facilitate the development of defense technologies between Japan and the United States. However, the main players are government organizations in both countries. Given that almost all Japanese defense technologies are developed by the JIDB, some measures to encourage Japanese companies to join such frameworks must be created. Otherwise, they will remain hesitant to participate in cooperative technology projects due to the bitter experiences of the FS-X program. It goes without saying that the Japanese government must state the goals and then convince Japanese companies that international cooperation reinforces their technological expertise.

To enable the JDIB to survive, the Japanese government must revise the TP AE and *kokusanka*. The TP AE eliminates business opportunities in foreign markets. At the same time, given the vagueness in the distinction between commercial and defense technology, the TP AE may limit the commercial export activities of Japanese companies. With the reduced volume of JDA procurement, a burden is placed on the JDIB. Japanese companies are expected to maintain defense production capabilities regardless of profits. The Japanese government must therefore understand that the current system may severely damage the JDIB.

V. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter summarizes all the studies conducted in the previous chapters. It also contains the conclusions, recommendations, and areas of further research that should be considered with regards to the JDIB and its sustainment.

B. CONCLUSIONS

The JDA's purchasing power is deflated by the *kokusanka* strategy. Since the budget of the JDA is closely tied to the national GDP, it is difficult to expect that defense expenditures would increase drastically under the current economic situation. To keep up with expanding requirements, the JDA must reconsider its weapons systems. The recent MTDP shows the need for new capabilities to cope with this new environment. When looking at a purchase list in the MTDP, the items to be procured in the near future are not very different from those of the Cold War era.

The JDA is reducing the volume of procurement. As a result, the product opportunities for the JDIB become smaller and smaller each year. This situation undermines the rationale for attracting Japanese companies to engage in the defense business. In other words, companies do not have opportunities that may contribute to their technological expertise. Given that Japanese companies are not dependent on defense business, and they are also facing difficulties in the commercial sector due to the economic slump in other countries, withdrawal of companies from the defense sector is a possibility.

The JDA also strives to reduce unit costs through procurement reform. Those efforts are focusing solely on domestic factors. However, it is not certain whether those efforts will lead to a significant decrease in costs. Or, since the high prices of defense equipment in Japan are generally regarded to be a result of domestic production, it is natural to think that such efforts will not provide drastic cost reductions. Rather, Japanese companies may leave the defense sector due to the loss of incentives.

The development program to replace the P-3C patrol aircraft and C-1 transport aircraft is listed on the current MTDP. Thus, the JDA has not completely abandoned its

kokusanka strategy even though *kokusanka* is an expensive approach to weapons development. Although the JDA plans to hold down unit costs by sharing some components between the two aircrafts, it is very unlikely that the JDA will be able to achieve its objective on costs since the total number of aircraft to be procured is still small. The JDA has approximately 100 P-3Cs and 30 C-1s. Given this number, their replacements will almost number 130.

Although there is a framework that attempts to promote technological cooperation with the U.S., it has not led to a major cooperative program thus far. Instead, the experience of both countries was the FX-S program. This program caused disputes due to a lack of dialogue in the early stage of this Japanese originated program, differences in interests, and so forth. Many points needed to be resolved in this program. On the contrary, cooperative programs provided by the ST&F appear to be very successful. These programs are small and less complex when compared to the FS-X, focus on specific interests, and unlike the FS-X program, are for research and development. Thus, the outcomes from these programs are less likely to be incorporated into a system to be fielded immediately after the completion of the program.

It must be noted that the Japanese arms export control policy raises a complicated issue in the technological cooperation between Japan and the U.S. Since the Japanese government prohibits the export of arms to any country, Japanese companies are reluctant to fully commit to international technological cooperative programs. This policy eliminates the opportunity to share the costs of weapons systems development and production with another country. International cooperation in the defense sector seems to be the obvious trend since many countries are suffering from a decrease in defense budgets. In other words, indigenous productions of large-scale weapons systems are becoming unrealistic.

Given recent decrease in the budget, maintaining the JDIB seems to be difficult under the current TPAE and *kokusanka* strategy. While the JDA may not be able to continue to order various items with enough volume when asking to keep costs down, *Kokusanka* requires Japanese companies to allocate a certain amount of resources to non-core businesses in order to maintain production capabilities. At the same time, the

markets for the JDIB are basically limited to the JDA. Thus, the defense business for Japanese companies would turn into an unnecessary business rather than an odd business. To avoid such a situation, the Japanese government needs to revise and adjust its posture on defense production.

C. RECOMMENDATION

1. Diversification of Procurement Source

It is inconsistent with reality to fulfill all JDA requirements from the JDIB as was done in the past. It is true that having defense production capabilities domestically alleviate the vulnerability caused by dependency on foreign suppliers. But it is also proved through the example of *kokusanka* that indigenous production is costly since there are no economies of scale. Therefore, The JDA must think of foreign suppliers as one alternative source of procurement without continuing *kokusanka* as a prime source of procurement. As national security is viewed based on an international framework, it is practical to purchase “off-the-shelf” equipment at reasonable prices. Relaxing *kokusanka* strategy may lead to a large reduction in costs. Then, the required funds to maintain some critical defense industrial activities could be financed. The JDA should closely examine to what extent defense production should be accomplished by the JDIB.

2. Lowering the Barrier

The Japanese government must create a structure that enables companies to engage in international cooperative programs. It is clear the most current constraint is the TPAE which makes defense business with foreign countries risky. To lower the barriers to engaging in such activities, Japanese government (METI) should take into account the benefits of technology exchanges with the U.S. and interpret the TPAE in a flexible manner. Export of commercial products incorporating a technology that can divert defense products with minor modification is not restricted and may encourage industry-industry collaboration.

D. AREAS OF FURTHER RESEARCH

To encourage Japanese companies in Japan-U.S. technological cooperation, the following issues should be considered.

- Technology transfer and the protection of intellectual rights of private companies

- The benefits the U.S. defense industry base gain through technological cooperation with Japan
- The effects on the U.S.-Japan security alliance for technological cooperation

LIST OF REFERENCES

1. Giarra, Paul, and others, *Japan, 1997 Strategic Assessment - Flashpoints and Force Structure*, Institute for National Strategic Studies, Fort McNair, D.C.
2. Japan Defense Agency, *Defense of Japan*, [www.jda.go.jp/e/index_.htm].
3. Iwata, Norio, "*Procurement Policy and Defense Industry in Japan*", DISAM Journal of International Security Assistance Management, Wright-Patterson AFB, Summer, 1999.
4. The Ministry of Foreign Affairs of Japan, *Japan's Policies on the Control of Arms Exports*, [www.mofa.go.jp/policy/un/disarmament/policy/].
5. Kwatnoski, Richard, *U.S. Defense Acquisition Community Cooperates with Pacrim Nations - A Surprising International Success Story*, Program Manager Magazine, Defense Systems Management Collage, Mar-Apr 1995.
6. Associated Press, April 12, 2000.
7. Bureau of Industry and Security, U.S. Department of Commerce, *Pacific Rim Diversification and Defense Market Guide*, [www.doc-bxa.bmpcoe.org/iddma-guides-pacrim.html].
8. U.S. Congress, Office of Technology Assessment, *Arming Our Allies: Cooperation and Competition in Defense Technology*, OTA-ISC-449 (Washington, DC: U.S. Government Printing Office, May 1990).
9. Japan Defense Agency, *Syuyou Bouei Kigyuu no Bouju Izondo* [<http://www.jda.go.jp/j/library/delibe/bo-san/tyukan/si-01.htm>].
10. 2001 Defense News Top 100, Defense News, [www.defensenews.com/home.php].
11. Hineno, Yutaka, *Challenge for the Japanese Defense Industry*, Keidanren, Japan, Nov 1994 [www.keidanren.or.jp/english/policy/pol017.html].
12. Shigemura, Masahiro, *Japan-U.S. Security Arrangements and Mutual Exchanges of Equipment and Technology*, Defense Research Center, Tokyo, 2001.
13. U.S. Congress, Office of Technology Assessment, *Global Arms Trade*, OTA-ISC-460 Washington, DC, June 1991.

14. U.S. Congress, Office of Technology Assessment, *Assessing the Potential for Civil-Military Integration: Technologies, Processes, and Practices*, OTA-ISS-611 Washington, DC, Sept 1994.
15. Wanner, Barbara, “*American, Japanese Defense Industries Explore Expanded Cooperation*”, JEI Report No.32, Japan Economic Institute, Aug 22, 1997.
16. Wilborn, Thomas W., *Japan’s Self-Defense Force: What Dangers to Northeast Asia*, Strategic Studies Institute, May 1, 1994.
17. Secretary of Defense, *A Report to the United States Congress*, March 2001 [www.defenselink.mil/pubs/allied_contrib2001/index.htm].
18. Hattori, Akira, *Reconstruction and Rationalization of the Japanese Defense Industry*, Paper Presented at ECAAR Panel, ASSA Annual Meetings, Boston, Massachusetts, 8 Jan 2000.
19. Bouei Sangyou Gijutu Kiban Kenkyu Kai, *Bouei Sangyou Gijutu Kiban no Iji Ikusei ni Kansuru Kihonteki Houkou*, Japan, Nov 2000.
20. Statistics Bureau and the Statistics Center, *Research and Development Expenditures*, Tokyo [www.stat.go.jp/english/index.htm].
21. Central Contract Office, JDA [<http://www.jda-cco.go.jp/>].
22. The Constitution of Japan.
23. The Ministry of Foreign Affairs, *Arms and Arms Production-related Equipment Listed as Item 1 of the Annexed List 1 of the Export Trade Control Order* [www.mofa.go.jp/policy/un/disarmament/policy/annex1.html].
24. EmergencyNet NEWS Service, "Terrorist Attack" in Tokyo, Emergency Response & Research Institute [<http://www.emergency.com/japanatk.htm>].
25. The New York Times, Japan Intercepts Two Boats That May Be North Korean, March 24, 1999.
26. Japan Defense Agency, *Mid Term Defense Program* [www.jda.go.jp/e/pab/wp2001/youyaku/by1303000000.htm].
27. U.S.-Japan Technology Forum, Center for U.S.-Japan Studies and Cooperation, Vanderbilt Institute for Public Policy Studies, Nashville, Tennessee, May 2001.
28. Ministry of Finance Japan, Main economic, Tax, and Government Indicators.
29. Hand Book For Defense 2000, Japan, 2000.

30. The Society of Aerospace Companies (SJAC), *Aerospace Industry Database 2001* [www.sjac.or.jp/about_dt/data_bas.htm].
31. Center for Defense Information, *2001-2002 Military Almanac*, Washington, D.C.
32. Military.com, *Equipment Guide* [www.military.com].
33. Mercado, Stephen C., *The YS-11 Project and Japan's Aerospace Potential*, JPRI Occasional Paper No.5, Sept 1995 [<http://www.jpri.org/jpri/public/op5.html>].
34. Vogel, Steven K., *New Weapon Label: Made in Japan*, Bulletin of the Atomic Scientists, Jan/Feb 1990 [<http://www.thebulletin.org/issues/1990/jf90/jf90vogel.html>].
35. Spacedaily.com, *Mitsubishi, LochMart Plan Defense Tie Up* [www.spacedaily.com/news/japan-melco-lm-00a.html].
36. Matsuura, Takanori, *Japan's Arms Export Control Policy*, Defense Research Center, Tokyo, 2000.
37. Bouei Nenkan, Bouei Nenkan Kankokai, Japan.
38. Defense News, Apr 29-May 5, 2002.
39. Rubinstein, Gregg A., *Armaments Cooperation in U.S.-Japan Security Relations, United States-Japan Strategic Dialogue: Beyond the Defense Guidelines*, CSIS.
40. General Accounting Office, *U.S.-Japan Cooperative Development: Progress on FS-X Program Enhances Japanese Aerospace Capabilities*, 1995.
41. General Accounting Office, *U.S.-Japan Fighter Aircraft: Agreement on F-2 Production*, 1997.
42. Katsumata, Hidemichi, *Dream of Domestic Jet Fighter Realized*, Daily Yomiuri On-Line, [www.yomiuri.co.jp/ties/ties017.htm].

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