Chapter 10

The Teeth of the Little Tigers: Offsets, Defense Production and Economic Development in South Korea and Taiwan[1]

Dean Cheng, Asian Analyst, Center for International Studies, Massachusetts Institute of Technology
and
Michael W. Chinworth, Senior Analyst, Asian Technology, The Analytic Sciences Corporation (TASC)

10.1 Introduction

With the end of the Cold War, popular support in most Western countries (especially Europe and the United States) for large military-industrial complexes capable of sustaining a global war effort has receded. As a result, Western defense industries have entered into an extended period of contraction and rationalization, as they support reduced military forces, produce fewer systems overall, and suspend development of new programs. This inevitably will lead to declines in defense industrial capacities in most Western nations, even as various capitals seek to assure sufficient military capabilities to deal with future challenges.

The political and military situation in East Asia, however, is considerably different from that in the West. Asia is likely to remain concerned with defense production and purchases. The end of the Cold War, far from resolving local conflicts, has removed one of the dampening factors on real and perceived ethnic, territorial, historical and even ideological conflicts in the region.[2] Many of these nations view indigenous weapons production capabilities as essential to guaranteeing their territorial integrity, particularly as the United States withdraws militarily from the region.

Beyond the security dimension, however, many Asian states value arms industries as a means of raising the sophistication of their military establishments, and of their economies as a whole. This is particularly true of newly-industrialized countries that have sought to graduate from heavy-industry centered economies into ones focused on higher aspects of technology; arenas related to military power, but with significant technological and financial benefits in their own right. The defense-industrial base is therefore viewed as a means of injecting advanced technologies and their attendant research processes

into an economy, accelerating economic growth. This combination of externally driven threat considerations and internally driven desires for greater economic development, especially into higher technology fields, is likely to make arms industries a continued growth area in many Asian economies.

The United States and other advanced powers have played a critical role in the development of local defense industries, and are likely to remain central in future developments.[3] Local producers have demanded offsets in order to secure more advanced technologies for both military and economic purposes, as well as to gain access to markets for local products that might otherwise not be possible.

Western industry, in turn, generally has acquiesced in this strategy for both economic and political reasons. Economically, offsets have often been the *sine qua non* for landing a contract. This often has resulted in competition among Western corporations to provide increasingly generous offset deals; in some European programs exceeding 100 per cent of the value of the original sale (although the average for South Korea and Taiwan is closer to 48 per cent). Politically, arms sales packages (including not only offsets, but provision of training, maintenance, etc.) have served to strengthen diplomatic and military ties. This has been especially true for transfers from the United States, with Washington's concerns during the Cold War with global containment and regional stability. The political and economic consequences of those offsets — greater R&D and production capabilities in future potential competitors over the long-run — have been acceptable risks in pursuit of this larger politico-military strategy.

The end of the Cold War has upset many of these previous calculations regarding offset packages. Western nations in general, and the United States in particular, increasingly are concerned about the implications for economic competitiveness of earlier defense offset and technology transfer policies. At the same time, however, competition among Western arms producers in Asian markets is likely to increase as their respective domestic markets shrink. This will result in added pressures to sell and license arms technology to Asian buyers, with fewer strings attached, particularly if the former continue to restrain licensing to other countries for economic and security reasons.

Two prominent examples in Asia of these trends are the Republic of Korea (ROK) and the Republic of China (ROC).[4] There are a number of similarities between the two states. Both South Korea and Taiwan are halves of divided states which continue to face significant threats from their alter-egos, insofar as their opposite numbers have never renounced the use of force in pursuit of reunification. Nor is the threat chimerical, as both the Democratic People's Republic of Korea (DPRK) and the People's Republic of China (PRC) maintain substantial military establishments directed specifically towards the ROK and

the ROC respectively; both have also displayed a willingness to use these forces in the pursuit of political objectives.

As a result, the ROK and ROC have developed their military capabilities; this has included heavy investments in their defense industrial capacities in order to ensure an adequate level of defense. Given initial disparities during the 1950s, both the ROK and the ROC chose to pursue policies of matching communist quantity with capitalist quality. Thus, both Seoul and Taipei have placed a premium on possessing leading-edge weapons systems emphasizing advanced technologies to counter substantially larger Communist military establishments.

These technologies, though, have now become the essential sinews of modern economies, including Taipei and Seoul's; thus, the two states perceive a natural synergy between the modern military-industrial complexes necessary to support their respective militaries, and the development of high-tech economies generally. Both Seoul and Taipei have developed plans to reduce reliance on heavy industries (e.g., steel, oil refining, automobiles) and emphasize more high-technology sectors such as aerospace and advanced electronics to assure their own growth — in essence moving up the economic "food chain." As one Korean industry specialist noted, "Asian countries, with their strong economies and bright prospects, are beginning to think that if they are driving things, maybe they should have a piece of the business."[5]

Up to now, technology transfers from the United States — the primary source of both complete systems and component technology — have played a key role in the economic development of both states, as the US sought to support its Asian allies against perceived security threats. While the United States remains interested in buttressing the security of both Seoul and Taipei, it is also much more sensitive to the potential competitive implications of these transfers in both commercial and military industrial sectors. The "lessons" of past cooperative measures with Japan remain vivid. In many US circles, these programs are perceived as having contributed to the growth of a competitor at the expense of American industry. Consequently, relatively generous transfers cannot be presumed in future cooperative military programs with the United States. As both Taiwan and Korea remain committed to their goals of both expanding military industrial capacity and enhancing commercial capabilities through military technology transfers, the two countries may be compelled to look increasingly to other sources of military technology transfers even while maintaining their traditional security ties to the United States. This is a feasible strategy in light of the abundance of new alternatives resulting from changes in global defense industries brought about by the end of the Cold War.

This shift, meanwhile, occurs in the context of potentially dramatic changes in the security and political outlook for both South Korea and Taiwan.

Diplomatic breakthroughs, key leadership transitions, and internal political movements all could take place virtually at any moment in the coming decade, affecting perceptions within either or both countries for the need to pursue military offsets from foreign producers. For example, the ultimate passing of Kim Il Sung from the Korean scene is almost certain to affect the situation on the peninsula.[6] Similarly, reconciliation between the People's Republic of China and Taiwan could take place in rapid order if the political climate radically changes. In the absence of such transformations, however, the countries are pursuing policies to encourage continued production offsets and technology licensing to encourage domestic economic growth, stimulate local defense industries, and secure certain political and diplomatic objectives (although with differences in each theme evident).

This chapter examines the development and possible future prospects of the South Korean and Taiwanese defense industries, with a particular emphasis on the role of technology transfers and military production offsets in building, sustaining and expanding Taiwanese and Korean capabilities. First, it will provide an overview of the defense industrial capabilities of both countries, with a focus on the role of technology transfers, offset agreements and other forms of military cooperation in their development. After establishing this baseline, it will examine anticipated needs and desires in South Korea and Taiwan for the coming decade, with attention on the role of international contributions and participation in these programs. Finally, possible political/diplomatic ramifications of these trends will be examined.

10.2 Republic of Korea

With the end of the Cold War and the Sino-Soviet rapprochement, the Korean peninsula is now the most heavily militarized border in the world. Both the ROK and the DPRK maintain standing militaries of over one-half million each (over a million in the case of the North). Unlike the NATO and Warsaw Pact armies along the old Inter-German border, the forces on both sides have seen action in the course of the Cold War. Not only did the North invade the South in 1950, but Pyongyang has continued to mount armed probes of the Demilitarized Zone, most recently in May 1992. Nor have tensions declined with the end of the Cold War: the furor over North Korea's nuclear program illustrates the continued state of disquiet on the peninsula, as well as its implications for regional and global order.

To offset the North's numerical superiority, Seoul has emphasized close cooperation at all levels with the United States, while pursuing a technologically-oriented defense directed ultimately toward a more autonomous capability. Both

of these efforts have gained impetus since the North has acquired such relatively advanced weaponry as third- and fourth-generation fighter aircraft, ballistic missiles and possible nuclear technology. As the likelihood of substantial American military draw-downs has grown (both under the American East Asian Strategic Initiative as well as the accession of Bill Clinton to the White House), the emphasis has further shifted in favor of an improved, indigenous defense capacity.[7]

10.2.1 Development of the Defense Industrial Sector

As late as 1969 — immediately prior to the announcement of the Nixon Doctrine and the subsequent draw-down of U.S. forces from the region — the ROK had no military industry to speak of.[8] With the decline in the credibility of the American commitment after the promulgation of the Nixon Doctrine, however, the South Korean government began to push for the development of an indigenous defense industrial capacity by establishing the Agency for Defense Development (ADD) in 1970. This was followed by the establishment of the Special Law for the Promotion of Defense Production and Procurement in 1973, which sought to foster a defense industry through such incentives as military draft exemption for engineers and skilled workers, special cost accounting for defense contracts, and long-term low interest loans.[9] The impetus for expanding the local military-industrial base was further increased after the Vietnam denouement and the Carter administration's promise (eventually rescinded) to withdraw all American forces.[10] A special defense tax was approved in 1975 to raise the necessary capital for domestic defense industrial development. In 1978, then-President Park Chung Hee's government enacted the Aerospace Industry Development Act, which was intended to assist and fund the domestic aerospace industry. (That act was replaced by the Aerospace Industry Development Acceleration Act of 1987).[11]

The 1989 Development and Promotion Law for Korean Aerospace Technology established a committee consisting of representative of the Ministries of Trade and Industry, Finance, and National Defense as well as the Economic Planning Board to promote South Korean aerospace development.[12] This was followed by a Special Law for the Defense Industry, aimed at encouraging technology transfer to the fledgling defense industries. Mechanisms enabling technological cooperation and defense production cooperation between Korea and the US also were established as part of the American security relationship with the ROK, including the Technology Cooperation Committee under the ROK-US Security Consultative Meeting, based upon the Data Exchange Agreement signed in 1963, as well as the Scientist and Engineer Exchange Agreement of 1975.

In addition to legislation, Seoul has provided modest funding aimed at improving the military-industrial base. In the 1971-1990 period, the ROK invested $1.2 billion in defense research and development. More recently, the ROK has emphasized the improvement of the Korean arms industry's efficiency and competitiveness. In particular, Seoul has committed itself to easing governmental controls over domestic arms makers. Towards this end, the National Defense Ministry will augment funding to private sector initiatives in research and development.[13]

Even with these efforts, the Korean arms industry still faces substantial hurdles in its efforts to increase its level of sophistication and general capability. In the aerospace arena, for example, there has been a continuing shortage of financial resources despite government investment, a lack of qualified personnel, and an inefficient material acquisition system, all rooted in a relatively low base of experience.[14] Hong Jai Hak, president of the Korea Aerospace Research Institute, suggested, for example, that the shortage of trained R&D personnel in the ROK will hinder any rapid assimilation and absorption of related technologies.[15] For instance, by 1994, the aerospace industry alone will require a base of 2,200 science and engineering college graduates and an additional 1,200 specialists with advanced degrees. The Korean educational system has thus far produced only about 160 experts, and local universities are expected to add only 200 scientists and engineers annually.[16] As a result, the ROK military-industrial complex has been limited in its ability to expand.[17]

Another problem hampering greater development of the Korean defense industry has been chronic under-utilization of the available base. Despite the continued threat posed by the North, Seoul has chosen to commit fewer and fewer resources to defense procurement, as Northern economic crises cripple their apparent ability to wage (and sustain) a war on the peninsula. As a result, the Korean defense industry has seen decreasing government procurements and lower military demand overall (even as it provides a higher percentage of total government procurements). Defense production facilities were operating at an average rate of only 59.9 per cent of capacity between 1984 and 1988, a situation that has not improved.[18] One of the major challenges for Korea's defense industry, therefore, is achieving sufficient economies of scale and lower unit costs of equipment through higher production volumes. Central to this strategy is promotion of arms exports (much of the excess capacity of South Korean plants reflects unfulfilled export production plans).

Seoul has undertaken several measures in order to alleviate these problems. The ROK plans to invest 5 per cent of the defense budget in R&D to help mitigate the effects of these shortages.[19] In addition, it has focused more on expanding arms exports (although most of it has been in small arms sales). By the late

1980s, however, Korean arms exports totalled only $265.6 million annually, a sharp decline from peak sales of nearly $1.2 billion in 1982, and may have been as low as $100 million by the end of the decade.[20] The government is currently counting on orders from Arab states in the wake of the Gulf War to increase that amount substantially.[21]

10.2.2 Current State of the Industry

Seoul's efforts at developing an indigenous arms industry have resulted in some 83 defense corporations.[22] These include 11 in infantry weapons, nine in ammunition, ten in mobility equipment and logistics, 12 in communications, six in warship and naval systems, three in aircraft and helicopters, and 32 in other related areas.[23] Domestic industry has provided about 61 per cent of total government procurement since 1974, amounting to $16.2 billion and involving about 260 items of military equipment. Much of that equipment is licensed from Western firms.[24] Defense now represents an average of about 11 per cent of revenue for companies involved in the military sector, employing about 45,000 people directly (compared with 2.7 million in the United States in 1993).[25] Activities are relatively diversified: aerospace has received special attention, but there is considerable effort directed toward improving production capabilities in land systems, naval systems, electronics and other sectors.

Aerospace technology — Aerospace has seen the most focused development program of all Korean defense industrial sectors. The ROK has had a long-term aerospace industry development plan since the late 1970s, with an initial focus on licensed production of foreign systems, including the F-86, F-104 and F-4, and Seoul hopes to become a major player in the global aircraft industry by 2000. Despite these efforts, however, there is still no wholly indigenous aircraft industry, due to low production volumes. Nonetheless, these programs were sufficient to produce the current base of 17 companies, including six involved primarily in aircraft projects, eight in airframe, engine, avionics, airframe accessories and parts production and the remaining three focusing on aircraft maintenance. There are still, however, less than 100 local aerospace-related subcontractors, and a total of only 3,000 workers employed directly by the aircraft industry in Korea.[26] Daewoo, Samsung and Korean Air dominate the industry.[27] Total investments as of 1990 appear to amount to only $560 million, of which half is committed to industrial infrastructure.[28] Seoul hopes to become a major player in the global aircraft industry by 2000.

It is in light of this developmental history that the ROK has pursued the Korean Fighter Program (KFP), with an emphasis on technology transfer. The KFP program will involve an initial off-the-shelf purchase of 12 F-16s, followed

by 36 aircraft assembled from kits in the ROK and 72 aircraft produced by Samsung. The total value of the package has been estimated at upwards of $3.0 billion.[29] Its significance can be seen when compared to the value of total offsets from the United States to South Korea between 1980 and 1987 of $457.8 million (see Table 1 below for detailed breakdowns). The KFP is seen as a means of expanding local production, broadening the experience pool of domestic workforce and industry beyond simple "metal-bending;" and moving into domestic design and development. It represented the core of the Aerospace Industry Development Plan (AIDP).[30] The importance of technology transfer may be seen in the decision of the ROK to switch from McDonnell Douglas' F/A-18 to the then-General Dynamics, now Martin-Lockheed F-16 as the basis for the Korean Fighter Program. Officials stated that the key reason for the switch was "greater access to technology offered by General Dynamics."[31] The program will include virtually all manufacturing data for the air-frame, as well as offset provisions that will facilitate future South Korean aircraft design, development, and production. The ROK is expected to be involved in the production of the KFP's engines as well. Samsung is expected to begin co-production soon for the P&W F100-PW-229 IPE engine, which will equip the KFP.[32]

The ROK hopes that upon completion of the KFP project (which was to have begun in October, 1994), Korean aerospace firms will have acquired about 80 per cent of the technologies needed for manufacturing F-16s.[33] Indeed, GD

Table 1: Value of Total US Firms' Offset Obligations to the Republic of Korea, 1980–87 (millions of dollars)

SIC Code	Description	Amount $
3721	Aircraft	143.6
3489	Ordnance/accessories	94.2
3812	Search/navigation equipment	35.7
3631	Household cooking equipment	30.6
3511	Turbines	14.8
8611	Business associations	13.7
3728	Aircraft parts	12.9
3559	Speciality industry machinery	12.0
9999	Nonclassifiable	65.6
	Other	34.7
Total		**$457.8**

Source: Office of Management and Budget, Offsets in Military Exports (Washington, D.C.: US Government Printing Office, April 16, 1990), p. 167.

committed itself to assisting Korean production of an indigenous fighter, and was one of the companies pushing for an Aerospace Industry Development Program as a "forerunner to the ROK's indigenous aerospace production projects," involving the creation of a commercial and military aircraft manufacturing base in the ROK.[34] As Kim Yong-Ho, corporate director for GD in Korea pointed out, "there are essentially three areas: manufacturing, management and design and development. KFP can provide advances to each of those three areas, but at quite different degrees in each level."[35]

US government and industry officials acquiesced in this program based on their belief that the ROK will be unable to achieve self-sufficiency in any of the areas of the KFP program involving technology transfers. To ensure this, the US vetoed any transfer of cutting edge technologies, such as complete access to all advanced materials/composites technologies, especially for the "hot" sections of the engine (i.e., the combustion chambers).[36] The United States also denied access to much of the sensitive software technology, especially computer software development related to the radar, the radar-warning receiver, and codes for the on-board computer (the government will permit access to maintenance software).[37] US policymakers also rejected a Korean proposal that the three main Korean aerospace corporations provide an initial 15 per cent of aircraft parts in the second phase, and eventually 50 per cent of all parts in the third phase.

Partly in response to these restrictions, the ROK has continued to express an interest in the Panavia Tornado ECR (Electronic Combat/Reconnaissance) variant, as a possible Wild Weasel.[38] This is in part due to the need for a large, modern aircraft to engage in electronic warfare, but also in order to gain access to the attendant production and weapons technology. In addition, the ROK Air Force has ordered a number of BAe Hawk-100s — light attack/trainer aircraft. (British Aerospace had obtained offset pre-qualification by subcontracting work on Hawk wing sets to Daewoo.)[39] Where the United States views nascent Korean aerospace capabilities with mixed emotions, many European firms apparently see opportunities for aircraft maintenance, parts production and aircraft assembly.[40]

Apart from projects with foreign firms, Seoul is pursuing a number of indigenous programs. One of the most important, but also longest-term, is the indigenous fighter aircraft, currently known as the FXX. The KFP is believed to be the starting point of the FXX, but little is publicly known of the project at the present time.[41] Indeed, it may be premature to discuss a next-generation program so far in advance of the KFP. Meanwhile, Korean industry has begun to explore the possibility of an indigenous trainer for basic training and flight screening to replace their current flight-line of T-41s, in order to expand their expertise before entering into the risky (and highly expensive) FXX project. There also is interest in developing an indigenous primary trainer (the KTX), possibly involving not

only local design and production of the airframe, but also the turboprop engine. Reports indicate continued research into a KTX-2, which would be an advanced jet trainer to replace the T-33 and T-37. As a part of the F-16 offset, General Dynamics was believed to be assisting both ADD and Samsung on the KTX-2.[42] South Korean officials hope that the country will be able to undertake such projects independently by 2000 — a very ambitious time line in light of the time required in developing and manufacturing complicated, large scale systems.

In addition to aircraft, the ROK aerospace effort has involved research in space technology. The ROK in 1978 became the seventh nation to produce a surface-to-surface missiles, and currently produces its own short-range artillery rockets.[43] The ROK is now pursuing development of a mobile surface-to-air missile (SAM) system — the Pegasus program involving the mating of the Thomson-CSF Crotale NG surface-to-air missile system to the Korean Infantry Fighting Vehicle (KIFV) chassis. Thomson is expected to transfer significant technology to Lucky Goldstar, which is charged with developing the missile and seeker systems.[44] This follows the introduction of the Short Brothers Javelin and Matra Mistral short-range air defense missile systems The latter deal, valued at $184.5 million, was the result of a Matra offer of technology transfer in other areas to the ADD and Lucky Goldstar (its local partner). General Dynamics, which had offered the Stinger missile, had been unable to offer sufficiently advanced technology to the ROK due to DOD opposition.[45]

With shifts in global military markets and budgets, the ROK has also begun to show greater interest in gaining access to civil aircraft technology. In the course of McDonnell-Douglas' wooing of Asian aerospace concerns for its aborted MD-12 in late 1991, all three major Korean aerospace corporations dropped their fierce infighting and indicated they would be willing to jointly build the plane's nose or tail section.[46] Meanwhile, Korean Air has become a major sub-contractor on the A330/A340 program.

Overall, Korean aerospace companies, however, remain relatively small scale and limited in expertise. Samsung and KAL, for example, did not begin aerospace production work until 1977. Combined military and civilian aerospace production of the three big Korean companies and about 20 smaller subcontractors reached only $267 million in 1992.[47] While domestic industry has probably been able to move more rapidly along the learning curve as a result of these and other programs, they have not yet been able to leap-frog to a level that enables them to compete directly with major Western producers.

Nor are prospects very good for significant growth in the near-term, as global economic conditions and local inefficiencies force profit margins to decline or even disappear entirely. KAL's aerospace division, for example, has reported operating losses every year since 1986, while Daewoo Heavy Industry's

aerospace division has consistently lost money since it was founded in 1984. Samsung has said that the aerospace portion of its business, too, is in the red.[48] The large idle capacity at all three Korean companies due to over-investment in the 1980s has exacerbated this situation.[49] These losses have moderated the willingness of high level management to continue massive investments into these areas. Nonetheless, Korean aerospace companies will likely try to take advantage of offset requirements to gain access to more advanced technologies, both in design and production. The ROK also may attempt to purchase overseas aerospace corporations or subsidiaries to gain a stronger foothold in these industries. In the meantime, the KFP assumes the role of holding the budding industry together until other opportunities develop.

Land systems — Despite all the attention paid to the KFP program, battlefield small arms continue to be the defense industry's "bread and butter," according to industry observers.[50] The bulk of the ROK's defense industry, which marked its first steps with licensed production of sidearms (the Colt M-16, in 1973) is still geared towards small arms, ammunition and military vehicles. This segment of the industry has gradually expanded to include AFVs.

Production currently centers on the Type 88 or K-1 MBT (formerly known as the ROK Indigenous Tank, or ROKIT), and the Korean Infantry Fighting Vehicle (KIFV), as well as self-propelled guns. The Type 88 is the centerpiece of the ROK armored formations, supplemented by a variety of M-48 series vehicles directly purchased from the United States. Produced by Hyundai beginning in 1985, with substantial assistance from the GD Land Systems Division, it may be the most effective tank on the peninsula.[51] It also provided sufficient technological spinoffs to bolster Hyundai's production of heavy duty trucks, underscoring to those in industry the validity of the concept of military production serving as a stimulus to commercial industry.[52]

The KIFV is a variant on the FMC Armored Infantry Fighting Vehicle (AIFV), which has also been purchased by the Netherlands. Designed by the Special Products Division of Daewoo Heavy Industries, Ltd to operate with the Type 88, the KIFV includes a domestically produced version of the German MAN D-2848M V-8 turbocharged diesel powerpack, coupled to a locally produced UK Self Changing Gears transmission.[53] The KIFV is supplemented by the Fiat-OTO Melara 6614 wheeled APC, license built by the Asia Motor Company.[54]

Other heavy vehicles include the M109A2 self-propelled 155mm howitzer. The M109 is of one of the oldest and arguably most successful Korea-US co-production arrangements, beginning in 1984. It involves cooperation between Samsung Shipbuilding and Heavy Industry and BMY Combat Systems, and production will total some 500 units.[55] Like the KFP program, however, the most crucial components continue to be imported from BMY.

Naval Systems — The ROK Navy, which has historically been the poor relation of the Korean military, has been enjoying a resurgence due to the block obsolescence of many of its surface combatants (which were mostly ex-USN destroyers of WWII vintage) and Japan's naval expansion. Korea's new destroyers, currently known as the KDX, will have a number of new electronics systems. At this writing, it is expected that the vessels' command and fire control systems (CFCS) will be provided by a consortium headed by Atlas Elektronik of Germany, and including Oerlikon Contraves of Switzerland, Siemens Plessey Radar of the UK, and the American firm of FMC. The South Korean participants are Samsung and Goldstar.[56] Samsung Shipbuilding & Heavy Industry will automatically have a major share of any production agreements, especially in the electronics systems, given the very stiff local content requirement.

The ROK has also begun to build a submarine fleet, comprised of six Type 209 submarines, under a licensed production contract from Howaldtswerke Deutsche Werft AG (HDW) of Germany. Five of the submarines will be constructed at Daewoo's Okpo shipyard, with Krupp Atlas Elektronik supplying both the sonar and integrated command systems.[57] The ROK Navy probably will seek an additional six to seven boats of a larger ocean-going type.[58]

To equip these boats, the ROK has sought to produce an indigenous heavyweight torpedo to allow them to engage in both anti-submarine and anti-surface warfare. Reports indicate, however, that this effort, currently led by Goldstar and the Agency for Defense Development, has run into trouble, due in part to inexperience in Korea in the development of such weapons. "Usually offset arrangements connected to foreign procurements are used to bring in technology transfer and coproduction packages," notes one source. That appears not to have been the case with the torpedo program, however.[59]

Support Systems — One of the most important deficiencies in the ROK military and Korean technology is command, control, communications and intelligence (C3I). This weakness has been a primary obstacle to accelerated transfer of Operational Control (OpCon) from the United States to the ROK, since the Korean Army currently lacks the necessary sophistication to observe and fight on the modern battlefield. One effort to improve that situation involves the cooperation of Lucky Goldstar with Matra in the development of the KOREASAT telecommunications satellites.[60]

10.2.3 Role of Foreign Offsets

As can be seen from this brief description of past, current and anticipated programs, foreign suppliers of systems and technology have played a critical role in the growth and development of the Korean defense industry. At present, more

than 80 per cent of the ROK's deployed arsenal continues to be American-made, although in recent years, the US share of equipment procured by the South Korean government has dropped from 90 per cent to just over 50 per cent.[61] Furthermore, according to some estimates, at least 80 per cent of all foreign technology in current Korean weapons systems still originates from the United States, the remainder spread among France, the UK, Italy, the FRG and Switzerland.[62] Similarly, the "two-way street" in defense acquisitions is lopsidedly in favor of the United States. In 1989, for example, Korea purchased $577 million in American defense items, while the US purchased only $91 million in Korean equipment, mostly comprised of spare parts and componentry.[63]

Korean officials are fully cognizant of the past American role in the development of their defense industrial base, not only through the provision of defense equipment, but also through US technical data packages (TDP) provided throughout the 1970s (TDP purchases dropped precipitously after 1982 and ceased in 1986 altogether).[64] Policymakers view these transfers in the context of broader economic development plans, with military technology representing leading edge capabilities that will drive commercial development as well.[65] The Korean Ministry of National Defense recognizes this linkage explicitly, as well as the use of offsets to further the country's economic growth and development objectives:

> In procuring materials from defense industries, items to be purchased through open tenders will be extended to include those that will satisfy not only military needs but also the needs of domestic industry, and which will encourage technological development.
>
> In the case of foreign purchases of military equipment, materials and services, since July 1982 the ministry has been utilizing military offset programs to ask foreign contractors to provide certain benefits in return [for sales or fees] such as technology transfers, licensed part production or buybacks. [In] this way, foreign purchases can be made in an economical and efficient way, and still contribute to the development of domestic industries.[66]

It is therefore not surprising that South Korea remains committed to close military industrial ties with the United States, but is interested simultaneously in broadening its contacts with other nations (as reflected in the growing European share of Korea's overseas purchases) in order to further its economic and political objectives. The Korean government addresses those issues frankly:

> There is no doubt that necessary military weapons and equipment should be developed and produced locally for the development of the nation's defense industry. However, as the weapon systems become more sophisticated ..., local defense industries reach their limits. Purchasing of the expensive weapons from abroad becomes inevitable.
>
> Beginning in 1983, therefore, the ROK government implemented the "offset" system, designed to develop the local defense industry with expensive technology imported from advanced nations, and

to help it export parts and components to the technology exporting nations. In fact, the system has helped improve the financial status of the local defense industries, enhanced the logistics support capability of the ROK military, and contributed to overall national security.

The offset system was originally devised as a defense burden-sharing scheme between the United States and NATO member countries after the end of Word War II. Today, the system has been adopted by many countries around the world. The ROK will continue its efforts to utilize the system to further its national interest.[67]

At the same time, disappointment has been expressed that production of end items has not resulted in the economic/industrial stimulus originally anticipated. Most Korean arms industries remain able to handle only low-tech component production, and are deficient in such areas as industrial infrastructure, composite and advanced material fabrication, and systems integration and advanced electronics.[68] The state of third country export sales reflects these condition.[69]

Economic offsets have not always produced the desired results from Korea's perspective. Between 40 to 50 per cent of total acquisition costs of such production still flows back to US producers, strengthening the position of American companies in the Korean market at the expense of local firms.[70] The current situation therefore is perceived as giving the US a strangle-hold on Korean technology development. Technology transfers have been sufficient to help build only a modest domestic defense industry, and key, advanced technologies — the "good stuff" — are withheld, thwarting further development. Indeed, the American "provide aid and enjoy control" rule, begun with the pressure on the Korean Army to purchase Colt weapons, is a continued irritant in military-industrial cooperation between the two powers.[71] In the case of the Korean Fighter Plane, this was especially galling, as the United States imposed a 30 per cent cap on the value of the offset packages that American corporations could offer the ROK.[72]

The government's preferred solution to this situation is to push for even greater technology transfers from multiple sources — ranging from the United States and Western Europe to Israel — and increased local production of US and other foreign equipment in Korea through expanded cooperative programs, including various offset schemes. "International cooperation," notes one observer, "greatly affects [the ROK's] self-sustaining capacity for defense and makes a substantial contribution to the economic growth of the country."[73] In the Korean view, those transfers must greatly exceed current levels to achieve their desired results.

To promote this objective while maintaining some semblance of international cooperation between Seoul and Washington, the ROK has promulgated a five-prong approach toward military production with regards to the United States. This plan includes calls for:

- industry-to-industry cooperation, especially through the generous licensing of US systems to Korea
- cooperative mobilization
- greater production shares for Korean industry, including not only Korean production of a majority of parts but also buy-backs by the US government
- joint research and development, focusing on overall system development, component design, and transfer of basic research; and
- cooperative marketing in third-country markets, including sales rights for Korean firms.[74]

This last aspect is especially important, as Korean officials argue that only through exports to third countries can sufficient economies of scale be achieved.[75]

If Korean officials desire closer economic links between the two states, however, their American counterparts have evinced far less interest. In the first place, Korea appears to already be at the outer limit of its technological grasp.[76] Indeed, according to one estimate, about 46 per cent of domestic procurement contracts continue to depend on overseas imports of components and parts.[77] As one analyst notes, "Korean defense companies simply cannot digest such advanced systems as in the Korean Fighter because the technology gap is too wide."[78]

Moreover, as noted earlier, neither American government nor business has any desire to spur Korean competitiveness at the expense of US high technology industries.[79] Concerns about cooperating with the ROK have been exacerbated by the fact that Korea has been on an intellectual property rights watch list since May 1989, due to Seoul's poor enforcement of patents and widespread counterfeiting.[80] Such fears have been further strengthened as Korea has made an explicit linkage between military production and economic development, particularly in high technology and advanced industrial sectors. ROK government officials, especially defense planners, openly view the two as intimately related, with the defense industries a primary means of injecting increased technological sophistication into the economy as a whole. At the same time, a technologically-advanced economy helps maintain the military-industrial base, providing an indigenous capacity capable of providing better support for the services. In addition, Washington is less inclined to support generous technology transfers, licensing and production agreements to preserve production at home during a period of contraction in the domestic arms industry.

In response to American concerns, Koreans are quick to emphasize that Seoul is not another Tokyo, a theme that was particularly in evidence during the Korean Fighter Plane debate, although that did not lessen opposition in Washington. Proponents of expanded defense production in Seoul argue that ROK companies can play a role in the American defense industry through

subcontracts on US projects.[81] Many of the Korean proposals are rooted in the country's relatively lower cost labor, which would additionally assist the United States by reducing unit costs, thus saving money for all concerned over the long run. Many Korean defense companies, moreover, continue to believe in teaming with the United States for both political and economic reasons. Greater interdependence, they feel, guarantees continued extension of the US security umbrella, even though much of the incentive behind greater domestic production is due to a decline of Korean confidence in that guarantee. Indeed, some analysts believe that the US will always enjoy an inside track so long as it remains intimately connected with the ROK's defense.

As American wariness has continued, though, Koreans have become increasingly attracted to European suppliers, who have shown a greater willingness to transfer technology to the ROK. As long as the Korean defense manufacturing sector views international cooperation and joint ventures as key to acquisition of advanced technology (as well as to decrease American leverage), the ROK's interest in alternative partners is likely to remain strong.[82]

On the whole, then, offsets have only had a limited effect, in economic terms, for both the ROK and its foreign partners (in terms of creating new competitors, not necessarily in terms of profitability of such relationships, or of their political benefits). The potential advantages to American and European companies of partnerships, and the likelihood of supplying the US market with spare parts production or more advanced development capabilities, remain unclear. At the same time, although the Koreans have demanded particular parts or components, they have shown limited ability to benefit from the transfer of technology *per se*. Indeed, the main economic benefits of technology transfer may lie more in the transfer of general manufacturing know-how rather than specific componentry fabrication techniques.

10.3 Republic of China

Taiwan's experience in indigenous defense production and foreign partnerships offers both similarities and contrasts with South Korea. While external security considerations are similar (i.e., a hostile state possessing military forces that are substantially larger), the Taiwanese approach towards resolving them has been very different due in no small part to the different diplomatic standings of Seoul and Taipei.

The primary focus of the Kuomintang (KMT, or Nationalist government) has been securing the island bastion, as well as scattered outposts, from depredations by the communist regime in Beijing. As an island nation, Taiwan has faced

somewhat different problems from its peninsular counterpart. On the one hand, the difficulties of amphibious warfare has precluded, since the 1960s, much call for a significant American military presence on the island itself (in contrast with the commitment made to Korea). Instead, the KMT regime has enjoyed a somewhat more discreet shield in the form of the Seventh Fleet, which first entered the Taiwan Straits in 1950 during the Korean War, and has since been at least an implicit peacekeeping force separating the two regimes.

With the American shift from Taipei to Beijing during the 1970s, however, culminating in American recognition of the PRC as the "official" China in 1979, the ROC could no longer assure itself of automatic American support in the event of a PRC invasion. More importantly, the possibility of a Communist blockade of the island has always been something of a grey area with regards to an American response. As a result, the ROC's defense strategy has emphasized retaining control of the air and sea space in the immediate vicinity of Taiwan itself. There has also been a growing allocation of resources aimed at ensuring that Taiwan could secure its sea-lanes of communications, with special emphasis on developing a robust ASW capability against China's large (if obsolescent) submarine fleet.

These efforts have become harder as Taiwan's precise diplomatic status remains in doubt. (Taiwan lost its ally in Asia when the Republic of Korea established formal diplomatic relations with the PRC in 1992, severing its ties with Taiwan in the process.) As a major power, the PRC consistently has demanded that political relations with Beijing must come at the expense of severed relations with Taipei. The lack of diplomatic recognition, coupled with potential Chinese retaliation for arms sales to Taiwan, has meant that unlike their Korean counterparts, the Nationalist military's access to complete foreign weapon systems has been much more limited and uncertain. As a result, the ROC has been compelled to develop an indigenous arms industry with much more urgency than the ROK.

Changes in global markets, on the other hand, have made Taiwan more attractive to Western sellers despite the political risks formerly associated with expanded sales. Although justified on security grounds, for example, the US sale of F-16s to Taiwan (reversing a political/military policy of more than a decade) was decided at least in part on economic grounds. With the US Air Force scaling down its orders of the aircraft, risking irritation with Beijing seemed like a small price to pay to preserving thousands of US jobs, even if only for a few months or a year, in the face of a continuing defense build down at home. France's renewed interest in Taiwan's arms market reflects similar thinking and attitudes.[83]

This shift in Western attitudes should provide Taiwan with greater options and alternatives with regard to weapons purchases and offsets in the short term, although structural limitations still constrain industry's ability to move rapidly into autonomous production of high tech, advanced systems.

10.3.1 Development of the Defense Industrial Sector

Like the ROK, Taiwan did not begin development of its military-industrial sector until relatively recently. With the American commitment to Beijing not to provide Taiwan with qualitatively superior weapons (including the Harpoon anti-ship missile), the ROC found itself with no choice but to develop a military-industrial sector. Compounding the problem of initial start-up costs has been the fact that Taiwan, unlike the ROK, has a strict policy banning arms exports.[84] This has obvious implications for achieving economies of scale, and has influenced Taiwan's mix of military and commercial projects with overseas partners.

Moreover, unlike either the ROK or Japan, Taiwan does not possess large-scale industrial conglomerates such as the *chaebol* in Korea or the *keiretsu* in Japan. Instead, the Taiwanese economy is dominated by thousands of small companies. While this has not necessarily affected the development of some industrial sectors (including computers), such a fragmented composition has influenced those areas involving large capital requirements.

As a result, much of Taiwan's defense industrial research has been conducted at government-run institutes, such as the Chungshan Institute of Technology and Science. Established in 1968, the CSITS now employs over 6300 scientific and technological personnel, and over 8500 technicians.[85] The four research institutes and six R&D and manufacturing centers of the Institute are charged with conducting "research, development and design for national defense science and technology."[86]

10.3.2 Current State of Defense Industry

Taiwan remains diplomatically isolated, limiting its access to military sales and credits from abroad. This has not prevented various corporations from continuing sales of dual-use technology to Taiwan. Nonetheless, Taipei still must look primarily to its domestic industry to supply the bulk of equipment for its armed forces. Like Korea, Taiwan has placed emphasis on the aerospace sector for security and economic development. The government's strategy of importing foreign aerospace technology has been more flexible and multi-dimensional, exploring high tech commercial options in addition to the tried and true pattern of military offsets. Naval programs are ambitious, while the attention to ground systems is limited compared with South Korea (for obvious reasons).

Aerospace — One of the highest priorities of the ROC military has been preserving control of the airspace around Taiwan. With the mounting obsolescence of the mainstays of the ROC Air Force (ROCAF) — the F-104 and the F-5 — and Washington's refusal to provide the FX/F-20 follow-on to the F-5, CSITS and the Aero-Industry Development Center (AIDC) began research in

the early 1980s aimed at developing an indigenous fighter. The result was the Ching-Kuo Indigenous Defense Fighter (IDF). The centerpiece of an effort to establish a first-class aircraft production capability, the IDF has such advanced features as wing flaperons, a sidestick controller, head-up display (HUD), and wholly moving tailplanes. (It involves relatively little use of composites, however). In the course of its design, significant effort was also devoted to the development of the powerplant, the F125/TFE1042. This engine is jointly produced by Garrett Engine division and the AIDC. Garrett produces and ships the hot section assembly to Taiwan — including the turbine, combustor and compressor — where they are mated with the fan, afterburner and cases, manufactured by Aero Engine Factory.[87] General Electric has expressed interest in designing an alternative, more powerful engine for the IDF.[88] British Aerospace was also involved in component development.[89]

Despite the strides shown by the ROC military-industrial complex embodied within the IDF (which remains the first indigenously produced Asian fighter outside the PLA Air Force), the Ching-Kuo is, at best, an aircraft with limited performance capabilities. This is hardly surprising, given the Taiwanese aerospace industry's circumscribed experience (total Taiwanese aerospace output in 1989 was only $630 million, mainly involving low-technology items such as valves and fasteners). As a result, the IDF will replace only the F-104s currently in the ROCAF inventory. The new backbone of the Taiwanese flight-line will instead be the F-16, following former President Bush's decision to allow the sale of 150 F-16A/Bs to Taipei. The experience gained thus far, however, will probably be bolstered by anticipated technology transfers from France in the wake of the sale of 60 Mirage 2000-5's (with an option on 40 more.)[90] This will include programming software and data encryption algorithms for the ICMS-2000 integrated countermeasures system.[91]

Taiwanese research in missile programs has been more successful. Although it started later than most other Asian states, the Taiwanese now produce a significant array of home-grown tactical missiles, mainly in the air-to-air and anti-ship categories. These include the Tien Chien (Sky Sword) series of air-to-air missiles and the Hsiung Feng anti-ship missiles. In this regard, Taiwan has benefited from generous technology transfers from other countries, including Israel.[92] This is most visible in the development of the Hsiung Feng anti-ship missiles, which are clearly derived from the IAI Gabriel.

A potentially major stride forward for the Taiwanese aerospace industry, with significant American involvement, is the development and production of the Tien Kung (Sky Bow) surface-to-air missiles system, a Patriot derivative subsumed within the Modified Air Defense System (MADS) and replacing antiquated Nike air defense systems. Under the terms of the $1.1 billion deal,

Raytheon will provide the missile forebody, ground support equipment, training, maintenance, technical support, while Taiwan will provide an indigenously developed aftbody.[93] Additional local improvements will allow the air defense network to interact with existing HAWK surface-to-air missile batteries.

Land systems — Most of the ROC Army's conventional weapons are direct purchases from the United States, including the M109 self-propelled gun. However, Taiwan has deployed a number of M48H "Brave Tiger" main battle tanks (MBTs), which were developed by Taiwan's Armored Fighting Vehicle Development Center, in cooperation with General Dynamics' Land Systems Division.[94] The Brave Tiger is essentially a modified M48 turret, equipped with a state-of-the-art fire control system (including a dual-axis-stabilized gun sight with a thermal-imaging capability akin to that on the M-1 Abrams) mounted atop an M60A3 chassis.

Naval systems — Coastal defenses, particularly if the PRC makes good on its threat to further develop a "blue-water" navy through acquisition of an aircraft carrier, remain a prudent posture in light of Taiwan's security position. The current Taiwanese defense build-up includes a major modernization and expansion of the navy. This includes 12 Oliver Hazard Perry-class frigates under the Kwang Hwa-1 program — all to be built in Taiwan (probably at China Shipbuilding Co.) through a technology transfer agreement with the United States. This will include the acquisition of "the most-sought-after knowhow for the construction of large warships (especially in the field of welding) through a complete technology transfer package."[95] It is not yet clear if the United States will also provide the ROC with its most advanced towed array sonar technology with which to equip the ships.

There currently are reports that the second batch of vessels in the Kwang Hwa-1 program may be altered to fulfil an air defense role. This might incorporate a modified SPY-1 radar system, akin to that installed aboard the Arleigh Burke-class AEGIS destroyers of the USN.[96] The ships are being fitted out with the GE/RCA ADAR-2N phased array radar, the same system used by the ROC Army's Chang Bai air defense system.

In addition, under the Kwang Hwa-2 program, Taiwan is acquiring some 16 Lafayette-class frigates, worth $4.8 billion. The first two to four ships will be constructed in French yards, while the remainder will be built in Kaohsiung shipyards with French assistance.[97] That may extend to weapons integration and personnel training. The command-and-control electronics and sensor package of the Kwang Hwa-2, meanwhile, is understood to be completely in the hands of Thomson-CSF.[98]

Taiwan is also engaged in discussions with the Netherlands for licensed production of diesel submarines, along the lines of the agreement for the Kwang

Hwa series of frigates.[99] The general terms would involve shipping components and technology from Dutch shipwrights to Taiwan for local construction of subs.[100] Multiple factors enter into the sale, but the most relevant here are the potential for production offsets and technology transfers (both of submarines and accompanying weapons systems).[101] In light of declining markets in other countries, Taiwan's negotiating leverage has been enhanced.[102]

Meanwhile, Taiwan remains interested in improving its overall shipbuilding capabilities, with the obvious attendant benefits for military surge production. Despite its overall proficiency at construction of such ships as very-large crude carriers (VLCC's, also known as super-tankers), Taiwanese industry estimates that construction of larger naval combatants could not be accomplished without substantial assistance from foreign ship-builders. An aircraft carrier, for example, would require some 14 years for Taiwan, even with substantial foreign help.[103]

10.3.3 Role of Offsets

As with the ROK, foreign offsets have played a significant role in the development of the ROC's military-industrial complex. In particular, Taiwan has shown interest in acquiring additional experience in systems integration. Thus, Raytheon determined in February 1992 that, with the construction of a missile facility capable of integrating Patriot and indigenous missile components, Taiwan had moved to develop its own integrated air defense system. Raytheon thereupon agreed to license portions of its system to Taiwan, while providing Taiwan with significant technology transfer and the opportunity to test its integration skills through the incorporation of domestically developed components with the Patriot system.[104]

At the same time, Taiwan has also used domestic offsets in order to gain military technology. In particular, Taiwan has dangled the prospect of participation in its multi-billion dollar national development plan to improve the country's civil infrastructure as an incentive for access to modern weapons technology. This approach has been particularly evident in Taipei's policy towards Paris, which has been offered major new contracts in exchange for trouble-free weapons sales.[105]

Meanwhile, like the ROK, the ROC's development strategy, particularly with regards to offsets, is aimed not only at fostering its military capabilities, but also at improving its commercial competitiveness. Thus, with both MADS and a 1989 joint effort with Hughes Aircraft Co. to upgrade the Ten-One air defense system, the Taiwanese sought to enhance the inter-operability of civilian air traffic controllers with military systems.[106] Similarly, the F-16 deal has been questioned in relation to Taiwan's access to technology. Indeed, members of the

KMT, noting that the program would cost at least $4 billion, have already called for conclusion of a technology transfer agreement and co-production of the aircraft.[107] Ting Shou-Chung, a member of the Yuan (Taiwan's parliament), for example, has insisted that "this whole deal has to meet two criteria. One is to meet our defense needs. The second is to build up our aerospace industry."[108] Taiwan had previously announced that it wants aerospace revenue by 2000 to amount to $6 billion, 80 per cent exported.[109]

Unlike the ROK, however, the Taiwanese effort to secure military technology *per se* has been removed from its efforts aimed at acquiring the basis of a more robust (and technologically sophisticated) economy. This is due, in no small part, to Taipei's diplomatic isolation. When the subject of co-production of the F-16 was raised, General Dynamics balked, both due to the past transfer of technology to Taiwan under the IDF program, and because co-production would be inefficient in terms of saving American jobs. Faced with a choice of holding out for a better offsets and technology deal, or promptly acquiring F-16s, Taiwan chose to forego (albeit unwillingly) significant production shares in the F-16 deal in order to secure the aircraft. Taiwan, unlike South Korea, has not always had the option of shopping for the best deal.

This has not prevented, of course, Taiwan, from seeking offsets and coproduction agreements from the civil as well as military side. One of the most hotly debated aerospace topics of 1991–1992 was Taiwan Aerospace Corporation's attempt to acquire a major equity position in McDonnell-Douglas' commercial aircraft business. Faced with chronic losses, McDonnell-Douglas had sought new partners to help current production and finance a new generation of commercial airliners to compete with Boeing and Airbus. TAC, a quasi-government corporation consisting of 11 shareholders representing some of the largest Taiwanese companies, including steel, autos and shipping giants, stepped to the fore, despite a total absence of aerospace experience. The group offered to purchase a 40 per cent equity share for $2 billion, in return for technical training and a testing/certification system for a components industry. That, in turn, would have increased the sales of the current 130 Taiwanese vendors for IDF components (mainly machinings, forgings and castings).[110] As important, better testing and certification would have significantly improved the quality of Taiwanese products, which has proven to be a limiting factor in Taiwan's ability to exploit the current millions of dollars of offsets already incurred. Only by improving them to world-class levels of quality is it likely that Taiwanese components will be willingly incorporated into the products of major multinationals.

The deal ultimately collapsed in May 1992, due mainly to opposition within Taiwan.[111] Members of the Yuan questioned whether the technology gained would in fact be worth $2 billion. Doubts also existed concerning the amount of

technology to be actually transferred. At the same time, elements within the United States also questioned the desirability of such a deal. Although McDonnell-Douglas viewed the transfer as akin to the creation of an Asian version of Airbus Industrie, necessary in an age of hyper-expensive aircraft development costs, it was feared that aerospace would suffer the same fate as automobiles or consumer electronics if technology were transferred to Asian competitors.[112] Such concerns were exacerbated by reports that at least one of the Taiwanese investors had ties to a Japanese trading company.[113] The US government officially expressed concern that advanced military technologies would be compromised through the arrangement (even though DOD has strict regulations segregating military and commercial facilities and governing access to military installations by foreign nationals).[114]

In the wake of the failed agreement with McDonnell-Douglas, the Taiwan Aerospace Corporation has moved to join with British Aerospace PLC to construct jointly the four-engine RJ line of passenger jets and develop the four-engine BAe 146 (which has not generally been a commercial success). In addition, they may jointly develop further a two-engine short-range regional passenger airliner version of the BAe 146. This will involve an initial investment of some $230-$250 million by TAC (of a total investment of $500 million), for which TAC would gain responsibility for 50 per cent of British Aerospace's regional-aircraft production including central fuselage sections, the aircraft's vertical fin, horizontal stabilizer and doors.[115] Taipei has indicated that it expects Taiwan Aerospace, Air Asia Co., an aircraft repair company, and Condor Industry Corp., a maker of valves and auto parts, to be major beneficiaries. Several other companies that currently supply items such as fasteners to foreign auto makers and electronics companies also are expected to be positioned to move into aerospace.[116]

Meanwhile, Taiwanese engineers will participate in research and development. According to British Aerospace, there "will be no charge or limits" on attendant technology transfers.[117] British Aerospace, in return, would not only receive a major infusion of capital, but would reduce the cost of the BAe 146 and RJ parts by at least 20 per cent.[118] It is unclear, however, whether Taiwan can, in fact, fulfil British Aerospace's expectations. At present, Taiwan has no more than a handful of parts suppliers of international standard. The expected savings, therefore, may be no more than wishful thinking.[119] Nonetheless, Taiwan Aerospace Corp. hopes it eventually will be able to construct the entire aircraft fuselage.

Shipbuilding technology transfers through earlier US-Taiwan agreements have been more successful from Taiwan's viewpoint. A tentative understanding with the Dutch RDM shipyard in February 1992 for Taiwanese submarine

construction would have involved technology transfer, training and spare parts, but was aborted when Beijing vigorously protested the deal. In the crowded field of shipbuilding, however, there remain additional potential partners. In the case of submarines, for example, Taiwan can benefit from the desire for sales expressed not only by the Netherlands, but also France and Germany.[120]

10.4 Assessments and Policy Implications: Defense Industries in Taiwan and Korea

Offsets have played a significant role in the development, as well as the increasing sophistication, of both the South Korean and Taiwanese defense industries, albeit to differing degrees in their respective contexts. US policymakers have justified offsets for their common role of binding both states to the United States in particular and the West in general; their impact on the general economy has been more problematic. This section will assess the political role of offsets to date and in the future; their contributions to the growth of defense industries in both countries; their role in overall growth for both economics; and, the policy implications of current trends.

10.4.1 Political Role of Offsets

From the perspective of the West, the raison d'etre of economic offsets has rested not on their economic benefits for the recipient — which usually has been only a secondary consideration — but on the perceived political benefits for the provider. In particular, the United States utilized the transfer of technology as a means of placating both Seoul and Taipei in the course of the Cold War, and especially after the US began to disengage from Asia in the mid-1970s. Washington sought to signal both states that it viewed them as sufficiently important to regional stability that it was willing to provide them with technology. It is no accident that both the Korean and Taiwanese defense industries really took root only in the wake of the Nixon Doctrine.

With the end of the Cold War, the need to preserve political ties through technology transfer has declined. The US has now proven far less amenable to the transfer of technology on security, political or diplomatic grounds, even though the threat posed by the DPRK and the PRC remain. Ironically, with the end of the Cold War, the political tool of technology transfer, which previously involved the flows of advanced technology to the ROK and ROC from the United States and the West, is now being applied by these one-time recipients to such one-time ideological opponents as Russia and China. As the previously

clear-cut dividing lines dissolve, both South Korea and Taiwan are utilizing access to relatively advanced technologies to gain political capital from the former communist giants.

This trend is particularly evident in the case of South Korea. With the end of the Cold War, and the achievement of industrial power status, South Korea appears intent upon making itself a full-fledged player upon the regional stage, rather than remaining simply the focus of great power rivalries and concern. Seoul apparently believes that sales of arms and related technologies, as well as the establishment of a reputation as a major source of technological innovation, will be important elements in its efforts to improve not only its overall security situation, but also in gaining influence and leverage throughout Asia. Towards that end, achievement of a world-class technological base has not only economic, but political and diplomatic ramifications. If Korea is to survive as an economic powerhouse, much less attain its greater political aspiration, the ROK understands that it must develop its indigenous technological prowess. Said one Korean analyst, "I don't think we have design technology, just production technology."[121] It is the gap between the actual state of the ROK economy and the projected targets that worries planners in Seoul and pushes them to develop a more capable arms industry.

With changes in the global political climate, however, Korean options to this end are diversifying. On October 28, 1992, the ROK and Russia initialled a technology transfer agreement spanning a range of technologies, including electronics and aerospace.[122] Russia would benefit from Korean manufacturing capabilities that represent a quantum leap over its current practices. Korea would be able to exploit not only the vast trove of inexpensive raw materials as well as the untapped market for low cost producers; it would also gain access to a storehouse of expertise in a variety of fields in which the ROK is deficient, e.g., aerospace and systems engineering.

There are certain limitations in this teaming arrangement. Nonetheless, the agreement achieves a very important goal in Korea's objectives in its offset/defense production stimulation goals: increased political leverage internationally that can be utilized in Korea's approach towards regional affairs. In conjunction with the provision of massive loans to the former Soviet Union (including one for $3 billion in 1989), Korea's economic policies provide a potential hedge against the ultimate impacts of US withdrawal, including what it sees as increased security vulnerability with regards to China, Russia and possibly Japan. Similarly, Korean efforts to expand economic ties with the PRC — including increased Korean exports to China and conclusion of several economic pacts covering shipping, aviation, taxation and fisheries — were aimed not only at broadening the range of economic relations (and exploiting the vast

potential of the Chinese market), but also were part and parcel of the Nordpolitik policy of Roh Tae-Woo.[123] Economic relations between the two states served as the foundation for the eventual establishment of diplomatic relations as well. Relations with China, in turn, were aimed at further stabilizing the Korean peninsula as a whole, as North Korea's patrons were wooed through economic incentives.[124] A more conventional manifestation of Korea's interest in diversifying its options is the country's negotiations with France for a joint defense technical assistance agreement, and its interest in technology transfer packages involving the European Fighter Aircraft.[125]

Taiwan, on the other hand, represents an altogether different situation. Whereas the Korean strategy is framed by a desire for a regional role — and therefore is driven as much by political-diplomatic factors as by purely technological-economic considerations — Taiwan's posture is influenced by more narrowly defined considerations of security — namely, its ability to defend itself against the PRC. Thus, what Taiwan has focused upon is the acquisition of a foreign aerospace corporation, civil or military, in order to ensure that, even in the event of total isolation, it could produce aircraft on its own to ensure control of the skies. This is hardly surprising, in light of Taiwan's ambiguous diplomatic standing; nor is Taiwan's analogous response of developing an indigenous arms industry in order to safeguard its arms supply.

This is not to suggest that the ROC is not interested in developing a civil-oriented aerospace industry. Unlike the Korean case, however, the Taiwanese appear to be following almost a dual-track approach. Thus, Taiwan's support of domestic industry has not been geared explicitly around its defense production strategies. Instead, Taiwan has pursued more than one approach in its efforts to introduce advanced technologies into its economy to stimulate economic growth and strengthen the industrial base.

10.4.2 Economic Role of Offsets

It is clear that both states are highly motivated by the desire to become even more potent economic competitors, not only of the United States, but also of Japan. By teaming with Russia, Korea has strengthened its leverage against Japan by threatening to gain access to a market Japanese businesses covet, while developing alternative sources of technological inputs to offset Japanese reluctance to transfer advanced technologies. Both results strengthen Korea's negotiating stance with Japan (and, for that matter, the United States and other Western nations as well). For Korean economic planners, such potential benefits outweigh the possibility of more dire results: Russia may prove to be an economic and technological black hole for Korea and other investors. Despite the likeli-

hood of such an outcome, access to Russia remains a central goal for supplementing existing Korean relationships.

Similarly, both Korean and Taiwanese decision-makers have approached European firms for advanced technologies with which to seed their economies. European firms, eager to establish a foot-hold in the lucrative, but traditionally American, markets of East Asia as well as to reduce costs by moving production off-shore, have shown a marked willingness to provide those same technologies. Thus, Taiwan has secured an agreement with Aerospatiale to produce test components. The ROK, meanwhile, is now producing pylons for the British Aerospace Hawk light attack/training aircraft.[126]

US defense industry analysts generally assume that European producers are less concerned about the long term competitive impact of technology transfers, and therefore are more likely to offer generous offset deals to break into these markets at the expense of American producers, who see themselves constrained by policy and political pressures in their offset negotiations. If such is the case, then one reasonably can assume that alternatives for both Korea and Taiwan will multiply in the future (or at least as long as the present excess production capacity and stockpiles of weapons remain in global markets).[127]

It is unclear, however, just how successful these efforts will be. In the first place, the very expense and dimensions of these programs could prove to be their undoing. The KFP program alone, for example, will cost at least $4.2 billion, on top of $10.8 billion in force structure improvements spent from 1985 to 1990. Additional related expenditures, as of mid-1990, could force the government to commit another $23.6 billion through 1995. All this occurs at a time when Korea's continued growth no longer is a certainty.[128] Similarly, the Ching-Kuo fighter program cost Taipei some $10 billion dollars in program development costs. The F-16 and Dassault Mirage 2000-5 programs are likely to incur at least an additional $12.75 billion, significant amounts even to a country with sizable capital reserves.[129] Indeed, these costs have led leaders in both countries to consider greater emphasis on commercial prospects — with foreign partners to share the risks — over military programs for economic development, as indicated by the Taiwan-McDonnell-Douglas tryst.[130]

This is compounded by South Korean and Taiwanese shortcomings relative to Japan, their putative model. This is most marked in the relative lack of depth in the South Korean and Taiwanese economies of both human and economic resources essential to developing their respective economies into world pacesettlers. In both countries, there are deficiencies in both categories even for achieving the far less ambitious goal of creating a sophisticated defense infrastructure. This shortfall of sufficiently trained personnel would appear to be a nearly insurmountable constraint, at least for the foreseeable future.

While Korea, for example, views the F-16 deal as a turning point in its efforts to advance its industry through US technology transfers there is still only a very limited R&D budget. This makes replication of imported systems and components and their replacement with domestically developed alternatives (key elements in Japan's indigenous equipment and technology development programs) far more problematic. Lacking government and private sector research and development investments to further industry knowledge and understanding of advanced systems, it is doubtful if Korea can duplicate Japanese success in the near future, even in those areas where Korean domestic industries may be relatively competitive with US industry. As one Korean defense analyst notes (perhaps with some exaggeration), "It's like university students and junior high school students studying science together. Even if the United States transfers 100 per cent of its technology, we could only absorb about 5 per cent."[131]

Similarly, it is unclear whether Taiwan's industry and government will be able to absorb successfully the technology transfers it assumes will flow from past deals. In many ways, Taiwan is better positioned to develop its overall technological base (as well as defense technological base). In light of its large capital holdings — and despite the absence of large corporate combines — Taiwan has a sufficient technological base to launch limited national projects. In that regard, the IDF displays both the potential and limitations of Taiwanese defense industries. The very fact that it was shepherded successfully from design to prototype to initial operating capability serves as a signal of what the Taiwanese approach of relying on a multitude of small companies, coupled with aggressive national investment, can achieve.[132] The final product, however, fell short of the mark (one Taiwanese industrialist derisively suggested that "IDF" stands for "I don't fight.").[133]

The limited technological success of the IDF indicates that Taiwanese industry already could be at the saturation point in terms of its ability to absorb additional technology. This is compounded by the need to preserve military surge capacity while maintaining a civilian base, forestalling maximum exploitation of the available human and technological resources, and preventing a shift from military production to joint commercial facilities that would enhance the cross-fertilization of military and commercial know-how.[134] In addition, the government still lacks a comprehensive agenda that articulates specific goals and objectives behind the range of projects under consideration, other than the hope to build its aerospace capabilities. The absence of focused objectives, some observers feel, will impede the development of a comprehensive strategy, à la Japan, that would promote targeted development of key sectors.[135] (In examining Asian defense industries, Japanese defense contractors themselves note the importance of stimulating commercial sectors sufficiently to ensure recipients for technology transfers and spinoffs from military programs. Many of those

same observers predict a greater shift to commercial projects from military programs in the near future.)[136] Even Korean President Kim Yong-Sam, in discussing the global "technology war," has noted the importance of formulating a more comprehensive technology management strategy for the post-Cold War era that links defense and commercial technology development.[137]

Finally, the very success of the Japanese model of aggressive negotiations with key industrial and political allies, and comprehensive implementation of a national vision which is itself supported by thorough and specific plans for stimulation of various segments of the key sector, means that Western nations will have greater reason to look at Taiwan cautiously; nations will not be as blithe in their transfers of technology as the United States was with Japan during the 1950s and 1960s. Western experience with the Japanese model has ensured that technologically advanced states will be far more wary in their licensing and co-production agreements. In conjunction with the end of the Cold War, which removed the political urgency of offset policies and technology transfer, the era of generous offset policies was over, at least with regards to the United States. Countervailing this caution, however, are the simple economics of excess capacity that force defense dealers to look to promising markets for new sales.

10.4.3 Policy Implications

United States' policies governing military offsets to South Korea and Taiwan have centered on loss of sensitive technologies to unfriendly third countries and the stimulation of potential competitors in military and/or commercial production. Several other policy and business implications emerge from present and anticipated trends in offsets to these countries as well as other Asian nations in general. They center around three major issue areas.

Offsets and the development of effective defense forces — We have noted that both Taiwan and South Korea are interested in promoting the development of indigenous defense research, development and production capabilities in part due to the fear of US military withdrawal from the Asia/Pacific region. At issue in this response, however, is the question of whether such policies further undercut political support in the United States for US deployments in the region, thereby making such concerns self-fulfilling predictions. We have argued elsewhere for the need to continue the US presence in Asia.[138] Policymakers in affected countries, weapons and technology purchasers, and defense firms themselves, must address the implications of their sales and licensing activities in the region in this context. Aggressive marketing behavior in one respect could contribute to regional security problems if arms purchases and licensing arrangements lead to perceptions in the West that the need to station

forces for regional stability is no longer warranted due to the size of local military forces. Should such a development take place before either country has capable military forces and sufficient domestic production capacity, however, it could leave one or the other more vulnerable to local security risks than currently is noticeable. (By the same token, straightforward arms purchases by Korea and/or Taiwan provide the US with additional reasons to support those regimes.)

An additional concern is that unfocused diversification of suppliers for Korean and Taiwanese systems could lead to such a disparity in equipment compatibility that it would undermine defense capabilities. This argument often is used by US producers to justify continued relations, but it does contain a measure of truth (even while appearing self-serving). Even when equipment is purchased from single sources such as the United States, compatibility problems are immense. When vendors multiply, those problems only become more complicated.

US and European interests and competition in Asia: competitive and proliferation implications — It is clear that the United States and many European nations have different attitudes toward licensing advanced weapons technology to Taiwan and Korea. In part, this is due to differing perceptions of local development capabilities (as well as those that come from different positions in the markets; European producers may be more aggressive and generous in their licensing offsets because they want to make more headway in Taiwanese and Korean markets). This also can be attributed to divergent views on the security impact of such transfers. US firms perceive European companies as being less concerned over the loss of technology to unfriendly powers. Without entering into debate over the effectiveness of technology transfer controls, we will note for now that to a certain degree technological diffusion is inevitable. A single nation — or group of nations — will find it difficult if not impossible to monopolize all militarily relevant technologies. Moreover, technologies identified with major power status — automobiles, nuclear weapons or semiconductors — inevitably will be the target of concerted development efforts. Targeted technology control regimes may have been successful in denying or restricting access to the most highly advanced and critical military technologies to unfriendly powers. Attempting to deny access to all advanced technologies in the name of preserving the few truly critical items, however, is dubious.[139]

Similar arguments can be made when discussing the commercial impact of technology transfers and offsets. The more important point, however, is the underlying infrastructure and indigenous absorption capabilities of technology transfer recipients themselves. The comparison of the "little tigers" to Japan, for example, is highly flawed. Neither South Korea nor Taiwan, at present, constitutes the same degree of economic competitiveness embodied within a Japan that possesses not only first rate technology diffused throughout its economy,

but a depth of economic, human and research resources that the ROK and ROC are still in the process of developing. Moreover, as noted previously, Tokyo benefited from a far more relaxed trade and technology transfer environment than either Seoul or Taipei are likely to witness, due in part precisely to the Western experience with Japan. Therefore, while not discounting competitive concerns as out of hand, we are not inclined to be overly concerned with the economic impact of military technology transfers and offsets on commercial and broad economic development (company-to-company licensing arrangements in commercial sectors, however, might be another matter).

From a policy perspective, the more important consideration is whether the United States and European nations, by pursuing competitive sales efforts in Asia, are unwittingly contributing to the potential for a regional arms race. The constraints that minimize the potential for either Korea or Taiwan to compete extensively with Western nations in third country military markets also reduce the likelihood of either nation becoming a regional military threat. However, other nations in Asia may be less sanguine about the long term implications of these trends and, accordingly, could devote greater resources to military assets, thereby contributing to regional instability and tensions. At least one major report on the spread of defense production capability and regional arms races has concluded that expanded offsets to other nations produce dubious benefits for the US defense industry as a whole while contributing to "a dangerously armed world."[140]

In response to competitive sales pressures from European firms in Asian markets, the new Clinton administration has announced its support for US defense companies in international markets (and it should be noted, of course, that the United States is the largest seller of arms in the world without such support). Deputy Secretary of Defense William Perry has indicated that "we should not only be willing to sell equipment to foreign countries, but [be] willing to help [industry]. The government should be willing to help [sales] in certain limited ways provided that we can assure sales [do] not risk proliferation of weapons of mass destruction, particularly nuclear technology, and we are not aggravating an unstable region in which regional wars are likely."[141] That posture — a step toward more active support for industry in contrast with the "hands off" approach characterizing earlier administrations — leaves sufficient room for US defense companies to sell and license their technologies to Asian nations, Korea and Taiwan in particular. Despite encouragement from Perry for defense firms to diversify into commercial fields, short term pressures are such that defense marketeers will focus on immediate defense related sales prospects over long term, and more dubiously attainable objectives of diversification.

Effectiveness of offsets in building local defense industries — As presently pursued, offsets to Korea and Taiwan have had limited impact in fulfilling larger plans for becoming self-sufficient producers across a range of systems

(much less becoming global players in high tech industries). This apparent failure could be attributable to overly ambitious plans by central governments, as well as a measure of naivete in understanding the dimensions of domestic resources needed to fully exploit such transfers. There is no doubt that domestic capabilities have grown in both Taiwan and Korea as the result of technology licensing, production buybacks and other forms of offsets to these nations. However, offsets have not resulted in anything approaching the creation of global competitors in a vast range of systems (not disregarding successful export sales to date by either country in commercial areas), nor are they likely to in the immediate future.

This does not suggest that virtually any and all Western technology should be divulged to Korea or Taiwan without fear of the potential consequences. Structuring future offsets to move from finished product assembly backwards to component design to conceptual R&D would allow the maximum preservation of technological leads for Western nations, while garnering political capital and hard sales from cooperation. Few developing states or newly-industrialized countries can absorb or fund the entire infrastructure required for the effective exploitation of an entire industrial sector. As important, however, preserving R&D is essential in order to retain a thorough understanding of the trajectory of technological developments. Nowhere is this more important than in the area of military industries, in light of the likely consequences in the event of failure to retain cutting edge military technologies. As many military technologies, however, are now spun-on from the civilian side, rather than the reverse process, preserving R&D capabilities in military industries frequently means promoting dual-use technological research.

Such a measured, controlled use of offsets (and technology transfer programs in general) is far more likely to produce optimal patterns of trade and industrial development with the more developed economies of Taiwan and South Korea, and with such longer-term prospects as members of the Association of Southeast Asian Nations (ASEAN). At the same time, it is also less likely to garner negative reactions among the recipient states, maximizing the political as well as economic benefits to be gained from such programs.

10.5 Conclusions

A major lesson of recent technological development in the military arena is that states that have determined that their national security is at stake will commit significant resources in order to attain the weapons they view as necessary to preserve that security. Offsets have played a major role in the development of the military-industrial complexes of the countries examined, although not to the extent that either hoped. They have contributed to the sophistication of these

one-time Third World economies, but their impact on economic development and growth remains debatable.

Offsets by themselves are insufficient to overcome structural deficiencies within the economies in question. The human resources constraints in both countries, coupled with limited technological capabilities, have prevented greater expansion of the two nations' overall levels of economic development to degrees that transfers of technology alone cannot yet overcome.

It is in this regard that much of the Western concern that both the ROK and the ROC may soon become economic behemoths along the lines of Japan are overstated. Japan, at the end of the Second World War, although devastated, nonetheless retained sufficient sophistication within its infrastructure that, upon the infusion of sufficient capital, it could be rejuvenated. Both South Korea and Taiwan, on the other hand, have been compelled to develop their current technological levels from far lower bases. While their accomplishments over the last two decades are all the more astonishing for the degree of advancement, nonetheless, there are inherent limitations in such economies.

This is not to suggest that the ROK and the ROC do not represent potential economic challenges to the United States and the West in the future; both have made dramatic economic progress, and their respective growth in international trade indicate their commercial capabilities. Indeed, the near-exponential growth in technological capabilities and standards in both economies would warn against too complacent an attitude. It does not pay, though, to overestimate their capabilities.

At the same time, unrestrained offsets raise serious policy and security issues that must be addressed before resulting in conditions similar to those in the Middle East in earlier decades. It is not in the best interests of Asia or the West to contribute to unrestrained growth in military production in the Asia/Pacific region, even though certain legitimate security concerns remain for both South Korea and Taiwan. Failure to address the policy impact of these programs could undercut their short term benefits while making their long term consequences intolerable.

Appendix I[142]

The Korean aerospace industry is dominated by three corporations: Samsung Aerospace, Korean Air, and Daewoo Heavy Industries.

Samsung Aerospace — Samsung Aerospace was founded in August, 1977 as Samsung Precision Industries. The group has focused on the production and overhaul of engines. The company assembles the GE J85 engine, as well as CFM56, LM2500 and F404. It is currently engaged in the co-production of the

PW4000 turbofan, with Pratt & Whitney. Samsung is also engaged in the manufacture of wing and fuselage components. It has produced and exported both of the latter, as well as stringers for use in large commercial aircraft. One of Samsung's main export contracts involves the production of 5,000 fuselage stringers for Northrop, for incorporation into Boeing aircraft. It is also under contract to produce stringers, doors and crown frames for the Boeing 747 and 747 passenger liners. In addition, it is engaged in building engine nacelles, and other components for McDonnell-Douglas, Lockheed, Grumman and MBB.

Samsung is also a 2 per cent participant in the development of the Pratt&Whitney 4000 engine for large wide-bodies airliners. In the helicopter area, Samsung is supplying the airframes for the Bell 412 and 212 models. In other aerospace areas, Samsung developed a successful rocket propulsion system for the Kooryong multiple rocket launcher. It is also the partner with Thomson-CSF for the Pegasus mobile SAM system.

The company also is exploring a joint venture with the ex-USSR. Central Aviation Hydromechanics Institute on glass fibres and other types of composite materials for aircraft.[143]

Korean Air — Korea Air's aerospace division was established in 1976, at Chinhae. It includes the Korea Institute of Aeronautical Technology as its R&D branch. Its plant has a floor space of some 2 million square feet. Among the contracts being undertaken there are wing-tip extension and flap-track fairing production for the Boeing 747. In addition, it is under contract with Douglas Aircraft Company and Hawker De Havilland for sheet metal assemblies for the nose caps and bonded panels. In addition, Korean Air has been responsible for the assembly of F-5 fighters for the ROKAF.

Korean Air is responsible for licensed production of the MD-500 helicopter, and currently supplies main rotor blades and fuselage parts to McDonnell Douglas Helicopter. It is also engaged in the licensed assembly of UH-60P Black Hawk helicopters as well as their GE T700-701C engines.

Daewoo Heavy Industries — Daewoo's first advanced aircraft contract was in 1944 with General Dynamics to supply fuselages, cockpit panels and ventral fins for the F-16. Since then, it has delivered part assembly sections for the Boeing B-737 and B-767, as well as the B-767SUD airframe assembly. It has been awarded the contract as well to build the wings and pylons for BAe Hawks (possibly in addition to those destined for the ROKAF), the nose compartment and tailcone for the Hawker de Havilland Dash 8 commuter aircraft. Had the US not cancelled the aircraft, Daewoo would have supplied 125 wings for the P-7 maritime patrol aircraft (the projected successor of the P-3). The company is also committed to providing fuselages and other components for the Dornier 328.

In the helicopter area, Daewoo will provide the hub assembly for the Bell 212 and 412 as well as the nose module and lower structures of the Westland Lynx. It will also participate in the construction of the H-76 Eagle HX utility helicopter and the BO-105 LOH/CB. Daewoo also is engaged in the production of the H-76 helicopter, in a 50-50 joint venture with Sikorsky/United Technologies believed to be worth at least $200 million annually. Daewoo Heavy Industry is responsible for parts and components manufacture, as well as early assembly. Daewoo Sikorsky then completes assembly and also test flies the resulting aircraft. It is also co-developing a new light helicopter, the KH-101 and KH-121, with MBB.

Daewoo also is engaged in aerospace R&D, which is believed to absorb some 3 per cent of sales revenue.

Other Corporations — The Sammi group, which manufactures steel for the defense industries, has entered into a joint venture with Agusta Aerospace of Italy for the assembly of SF-600 light planes, A-109 helicopters and S-211 trainer jets.

Hyundai Precision and Industrial Corporation is considering establishment of a sister company dedicated to the aerospace area. Hyundai in 1989 assembled a BK-117 helicopter, and is believed to be interested in developing private helicopters. It also has acquired technology from Japan's Kawasaki Heavy Industries.[144]

Appendix II

Presidential Statement on Military Offsets Policy, April 16, 1990

"The President announced today his Policy on Offsets in Military Exports. This responds to the requirement under the FY 1989 National Defense Authorization Act, Section 825, 10 U.S.C. Sec. 2505.

The President stated that the United States Government is committed to the principles of free and fair trade. Consequently, the United States Government views certain offsets for military exports as economically inefficient and market distorting.

Mindful of the need to minimize the adverse effects of offsets in military exports, while ensuring that the ability of US firms to compete for military export sales is not undermined, the President has established the following policy:

- No agency of the US Government shall encourage, enter directly into, or commit US firms to any offset arrangement in connection with the sale of defense goods or services to foreign governments.

- US Government funds shall not be used to finance offsets in security assistance transactions except in accordance with currently established policies and procedures.
- Nothing in this policy shall prevent agencies of the US Government from fulfilling obligations incurred through international agreements entered into prior to the issuance o this policy.
- The decision whether to engage in offsets, and the responsibility for negotiating and implementing offset arrangements, resides with the companies involved.
- Any exception to this policy must be approved by the President through the National Security Council.

The President also noted that the time has come to consult with our friends and allies regarding the use of offsets in defense procurement. He has, therefore, directed the Secretary of Defense, in coordination with the Secretary of State, to lead an interagency team to consult with foreign nations with a view to limiting the adverse effects of offsets in defense procurement. This interagency team will report periodically on the result of these consultations and forward any recommendations to the National Security Council."

Source: Office of Management and Budget, Offsets in Military Exports (Washington, D.C.: US Government Printing Office, April 16, 1990), pp. 23–24.

Appendix III

Economic Data: Republic of Korea and Republic of China (Taiwan)

Background Information
(all data for 1991 unless otherwise indicated)

	ROK	ROC
Population	43.0 million	20.5 million
Annual growth rate (%)	0.9%	1.1%
Nominal GDP (US$)	$264.9 billion	$175.7 billion
Nominal per capita GDP (US$)	$6154	$8590
Major exports	Chemicals (3.3%) Manufactured goods (52.4%) Machinery/transport equipment (37.8%) Metal manufactures (4.0%)	Textile products (20%) Electrical machinery (21%) Plastic articles (8.7%)
Major imports	Machinery/transport equipment (34.3%) Food/live animals (5%) Chemicals (11.6%) Mineral fuels/lubricants (12.4%)	Crude oil (5%) Capital goods (16%) Consumer goods (11%) Ag/indus raw materials (67%)
Major trading partners	US Japan Hong Kong Germany Canada	US Europe Japan Hong Kong

Selected Economic Indicators: Republic of Korea and Republic of China

	Consumer Price Index		Wholesale Price Index	
	ROK	ROC	ROK	ROC
1989	119.92	106.1	103.17	94.9
1990	130.21	111.4	107.47	94.3
1991	142.77	116.2	113.26	94.5
1992*	153.45	121.2	117.90	92.3
1993*	163.45	125.7	122.50	94.6
1994*	173.42	129.9	127.03	96.8

Base year: ROK: 1985 = 100; ROC: 1986 = 100
*Forecasts

	Nominal GDP (US $billions)		Real GDP (US $billions)	
	ROK	**ROC**	**ROK**	**ROC**
1989	212.97	146.86	223.59	149.72
1990	244.04	157.01	244.05	157.01
1991	282.97	175.71	264.63	168.52
1992*	306.39	207.03	283.39	180.70
1993*	348.36	235.17	304.58	193.74
1994*	407.36	275.61	327.43	207.03

	Gross Domestic Product	
	ROK	**ROC**
1989	118.70	104.7
1990	131.35	108.7
1991	145.53	113.1
1992*	158.48	116.5
1993*	168.75	120.7
1994*	178.85	125.0

Base year: ROK: 1985 = 100; ROC: 1986 = 100
*Forecasts

	Exports of Goods/Services		Imports of Goods/Services	
	ROK	**ROC**	**ROK**	**ROC**
1989	105.27	86.8	90.14	86.8
1990	110.66	89.0	95.83	88.9
1991	114.61	89.4	99.17	86.4
1992*	120.91	85.2	106.71	81.7
1993*	128.53	87.1	113.64	83.4
1994*	136.93	89.3	121.60	87.5

Base year: 1985 = 100
*Forecasts

	Trade Balance		Current Account Balance	
	ROK	**ROC**	**ROK**	**ROC**
1989	4.60	16.21	5.06	11.38
1990	–2.00	14.93	–2.17	10.87
1991	–6.98	15.69	–8.73	12.01
1992*	–5.91	13.55	–7.23	7.05
1993*	–5.23	11.05	–4.77	4.99
1994*	–5.58	9.55	–4.19	3.35

Note: FOB-FOB basis in US$billions

	Unemployment Rate (per cent)	
	ROK	**ROC**
1989	2.56	1.57
1990	2.44	1.66
1991	2.29	1.52
1992*	2.43	0.75
1993*	2.48	0.05
1994*	2.51	–0.28

*Forecasts

	Manufacturing Wage Rate (US$)	Annual Change (%)	Manufacturing Wage Rate (US$)	Annual Change (%)
	ROK		**ROC**	
1989	3.25	36.3	3.63	25.8
1990	3.71	14.0	4.09	12.5
1991	4.18	12.8	4.54	11.2
1992*	4.70	12.3	5.39	18.6
1993*	5.18	10.3	6.07	12.6
1994*	5.69	9.8	7.07	16.5

*Forecasts

	Unit Labor Cost (US$)	Annual Change (%)	Unit Labor Cost (US$)	Annual Change (%)
	ROK		ROC	
1989	169.03	22.2	104.12	3.2
1990	186.31	10.2	107.35	3.1
1991	204.47	9.7	105.94	–1.3
1992*	213.86	4.6	109.16	3.0
1993*	229.14	7.1	110.44	1.2
1994*	234.81	2.5	111.97	1.4

Base Year: ROK: 1895 = 100; ROC: 1986 = 100
*Forecasts

	Productivity	Change (%)	Productivity	Change (%)
	ROK		ROC	
1989	127.37	2.2	121.5	5.6
1990	135.01	6.0	127.0	4.6
1991	142.13	5.3	133.8	5.3
1992*	147.89	4.1	140.6	5.1
1993*	154.40	4.4	147.9	5.2
1994*	161.36	4.5	155.3	5.0

Base Year: ROK: 1985 = 100; ROC: 1986 = 100
*Forecasts

	Manufacturing Index	Change (%)	Manufacturing Index	Change (%)
	ROK		ROC	
1989	119.63	0.0	118.96	3.1
1990	130.31	8.9	118.12	–1.9
1991	138.90	6.6	126.67	7.3
1992*	144.85	4.3	132.30	4.5
1993*	150.06	3.6	138.97	5.1
1994*	156.68	4.4	145.71	4.9

Base year: ROK: 1985 = 100; ROC: 1986 = 100
*Forecasts

Endnotes

1. The authors would like to thank the following individuals for their comments and other inputs to this chapter: Arthur Alexander, Samuel Dash, Robert Downen, Alex Gliksman, Larry Niksch, Kazuo Ohmura, and Gregg Rubinstein.

2. For example, the most recent white papers of the Japan Defense Agency are cautious about potential instability in the former Soviet Union, and signs of continued militancy by North Korea and the People's Republic of China (See Japan Defense Agency, **Defense of Japan 1991** (Tokyo: Japan Times Co., Ltd., 1991), **Defense of Japan 1995** (Tokyo: Japan Times Co., Ltd., 1995), and Barbara Wanner, JEI Report, No. 33B, August 28, 1992, p. 4.) The Republic of Korea sees potential threats in the emergence of Japanese military power, in addition to continued threats posed by China and North Korea. (See Ministry of Defense, **Defense White Paper 1991–1992** (Seoul: Ministry of Defense, 1992)). Taiwan — and much of the Western world — remains concerned about possible attempts by the PRC to forcefully reunite Taiwan with the mainland (for example, see "Containing China," **The Economist**, July 29, 1995, pp. 11–12).

   For additional discussion of Asian perceptions of the threat environment, see Michael W. Chinworth and Dean Cheng, "The United States and Asia in the Post-Cold War World," **SAIS Review**, Vol. 11, No. 1, Winter-Spring 1991, pp. 73–91; Kiichi Saeki, "Post-Cold War Asia-Pacific Security," **Journal of Japanese Trade and Industry**, Vol. 12, No. 3, June 1, 1993, pp. 46–47; Korea Institute for Defense Analyses, **The Korean Journal of Defense Analyses** (various issues, particularly Vol. 4, No 2, Winter 1992, special issue on nuclear security); and, Research Institute for Peace and Security, **Asian Security 1994–95** (London: Brassey's, 1995) and earlier volumes.

3. We will define offsets broadly in this chapter to include licenses, production offsets, buybacks of spare parts, coproduction and any financial, technological or manufacturing consideration offered in return for a purchase of an advanced weapons system from abroad. Our definition, however, does not include barter, countertrade, or business development offsets such as development of tourism facilities in return for arms purchases because they have not been a regular feature of offset agreements with Korea and Taiwan.

4. In this article, we will use the terms Republic of Korea, Korea and South Korea interchangeably, as well as Republic of China, ROC and Taiwan interchangeably. In addition, we will refer to both entities as separate states for practical purposes, recognizing the diplomatic and legal considerations that otherwise might dictate against such usage.
5. Susan Carey, "Korean Companies Seek Broader Role in Aerospace," **Asian Wall Street Journal Weekly**, August 31, 1992, p. 12.
6. Kim Il Sung died on July 8, 1994.
7. Asia's apparent sensitivity to the issue might have been heightened precisely because of the parallels between the former Georgia governor cum president Jimmy Carter and his political successor, Bill Clinton. "Editorials React to U.S. Defense Spending Cuts," Foreign Broadcast Information Service, FBIS-EAS-93-025, February 9, 1993, p. 43, quoting **Korea Times** editorial of February 9, 1993; "Link to Asian Security Viewed," Foreign Broadcast Information Service, FBIS-EAS-93-025, February 9, 1993, p. 43, quoting **Korea Herald** editorial of February 9, 1993.
8. The Nixon doctrine contained three main principles: 1) the United States would honor its treaty commitments; 2) the U.S. would continue extending its nuclear umbrella to important allies; and, 3) the U.S. would provide aid and military assistance to Asian allies, with the expectation that those countries would be more responsible for manpower needs in meeting local defense needs. The Ford administration subsequently attempted to mitigate the impact of that policy by reaffirming U.S. troop commitments in Asia, particularly in South Korea. See William E. Berry, Jr., "Republic of Korea," Chapter 12 in Douglas J. Murray and Paul R. Viotti, eds., **The Defense Policies of Nations: A Comparative Study** (Baltimore and London: The Johns Hopkins University Press, 1989), p. 407–409; U.S. Department of State, **Department of State Bulletin**, Vol. 61, No. 1574, August 25, 1969, p. 143; Report to Congress, Richard Nixon, "U.S. Foreign Policy for the 1970s: "A New Strategy for Peace," February 18, 1970.
9. Dr. Dong Joon Hwang, "Industry: Into a New Era," **Jane's Defence Weekly**, November 16, 1991, p. 965.
10. Berry, p. 408–409. Candidate Carter's ideas were promulgated in Policy Review Memorandum 13 and Presidential Decision 12 in May 1977. The plan called for a draw down of all 32,000 troops in Korea over a four to

five-year period, retaining air and naval support. Less than one combat battalion ultimately was removed from Korea due to opposition in Korea and the U.S. Congress.

11. The Korean government remains quite clear on the perceived linkage between the need to stimulate domestic defense industries and the possibility of a U.S. withdrawal from the peninsula, noting that "the ROK is faced with the issue of US troop reduction or withdrawal in the 1990s, and the ROK-US military relationship is expected to undergo some changes. Under this situation, the ROK has no alternative but to continue its efforts to develop its own defense industry, which is a cornerstone for self-reliant defense." Republic of Korea, Ministry of National Defense (Seoul: Ministry of National Defense, 1989), **Defense White Paper 1989**, p. 163.

12. Kim Nak-Hieon,"Korea Starts to Fly High," **Asia Technology**, August 1990, p. 36.

13. David Silverberg, "Seoul Shifts Emphasis to Private-Sector R&D," **Defense News**, November 25, 1991, p. 10.

14. "Major Hurdles Seen for Korean Aerospace Development," **Pac-Rim Defense Marketing**, Vol. 1, No. 10, November 26, 1990, p. 1.

15. Terrence Kiernan and David Silverberg, "Technology Control Issues Cloud U.S.-S.Korea Relations," **Defense News**, September 7, 1992, p. 36.

16. Machmud Banjamin, "South Korea's Aerospace Industry," **Asian Defence Journal**, December 1990, p. 82.

17. The Ministry of National Defense (MND) has attempted to mitigate these shortages in the short term by allowing selected defense companies to utilize up to 15,000 designated military personnel annually in plant production. See Ministry of National Defense, **Defense White Paper 1991–92** (Seoul: Ministry of National Defense, 1992), p. 245.

18. Dr. Paik Young Hoon, President, Korea Industrial Development Institute, "ROK-US Defense Industry Cooperation: Past Achievements and Future Tasks." Speech before the Fourth Annual ROK-US Defense Industry Conference, July 16, 1990, San Francisco, California; Berry, **The Defense Policies of Nations**, p. 411; U.S. Congress Office of Technology Assessment, **Arming Our Allies: Cooperation and Competition in Defense Technology**, OTA-ISC-449 (Washington, D.C.: U.S. Government Printing Office, May 1990), p. 112.

19. Dr. Dong Joon Hwang, "Industry: Into a New Era," **Jane's Defence Weekly**, November 16, 1991, p. 967.

20. Hwang, "Industry: Into a New Era," p. 967; U.S. Congress, Office of Technology Assessment, **Global Arms Trade: Commerce in Advanced Military Technology and Weapons**, OTA-ISC-460 (Washington, D.C.: U.S. Government Printing Office, June 1991), p. 134–135. In at least some cases, most notably the sale of M-16 rifles, these arms exports have been in direct contravention of American wishes, one of the reasons for long-term American concerns about its military technology relationship with the ROK.

21. Korean participation in the Gulf War, including the dispatch of medical and air transport units, was predicated in part on the assumption that such an "investment" would "bear fruit" in the post-war period. See, for example, Pak Mu-chong, **The Korea Times**, February 1, 1991, p. 2, in FBIS-EAS-91-022, February 1, 1991, pp. 27–28.

22. Hwang, "Industry: Into a New Era" p. 965.

23. U.S. Congress, Office of Technology Assessment, **Global Arms Trade**, Chp. 8: "The Defense Industry of South Korea," p. 131–132.

24. U.S. Congress, Office of Technology Assessment, **Arming Our Allies**, p. 112.

25. Republic of Korea, Ministry of National Defense, **Defense White Paper 1989**, p. 166; U.S. Department of Defense, Office of the Comptroller, **National Defense Budget Estimates for FY 1993**, p. 137.

26. Kim Chae Su, Managing Director, Samsung Aerospace Co., Ltd., " ROK-US Cooperative Programs: KFP and HX." Speech before the Fourth Annual ROK-US Defense Industry Conference, July 16, 1990, San Francisco, California.

27. See Appendix for additional details on these three companies.

28. Banjamin, "South Korea's Aerospace Industry," p. 80.

29. The total cost for the program was revised to $4.2 billion in 1990 and rose to $5.2 billion by early 1993, despite shifting to the "less expensive" F-16. See Terrence Kiernan, "Lockheed Reassures Koreans on KFP," **Defense News**, February 22–28, 1993, p. 11.

30. Kim Chae Su, July 16, 1990 speech.

31. Korean officials initially determined that the balance of cost versus technology gains made the F/A-18 more attractive, but U.S. demands for a cap on offsets minimized these potential benefits (See **Wing Newsletter**, "Korean Air Force Selects McDonnell Douglas F/A-18," Vol. 23, No. 1, January 3, 1990). The U.S. government estimated the value of the F/A-18 package at $3.45 billion in 1990 (U.S. Department of Defense, "Korean Fighter Program Fact Sheet," February 7, 1990).

    An alternative explanation has been suggested that remains under investigation at this writing. As part of a larger reform of the military, the Korean government is looking into allegations that bribery of high officials in the previous regime by General Dynamics led the Ministry of National Defense to side with the F-16. See Terrence Kiernan, "South Korean Officials Investigate F-16 Purchase," **Defense News**, Vol. 8, No. 17, May 3–9, 1993, p. 1, 44.

32. David F. Bond, "South Korea to Buy 120 F-16C/Ds, Reversing Plan to Order F/A-18s,"**Aviation Week and Space Technology**, April 1, 1991, Vol. 134, No. 13, p. 30; Shim Jae Hoon, "Air Pressure," **Far Eastern Economic Review**, April 11, 1991, p. 12; Leopold, "S. Korean Modernization," p. 22; J.R. Wilson, "Fighting for a First," **Jane's Defence Weekly**, December 7, 1991, pp. 1120–1122, and J.R. Wilson, "Korea Scrambles Fighter in Time," **Interavia Aerospace Review**, February 1992, p. 48. Other technology transfers and offsets sought by Seoul included provision of a BVR missile (e.g., Sparrow or AMRAAM), an improved performance engine, ASPJ and LANTIRN — thus making the F-16s the equivalent of Block 50 level.

33. "New Korean Budget Paves Way for Budding Aircraft Industry," **Defense Marketing International**, Vol. 14, No. 17, August 21, 1992, p. 2.

34. Banjamin, "South Korea's Aerospace Industry," p. 82.

35. Wilson, "Korea Scrambles Fighter in Time," p. 48. The Martin Lockheed position on these issues is unclear at this writing, although there were no indications by Lockheed that it would have any less of a commitment to these objectives with its assumption of the program from General Dynamics.

36. David Silverberg, "S. Korea Banks on Technology," **Defense News**, November 25, 1991, p. 3.

37. Damon Darlin, "Technology Transfer Issue Snags U.S.-Korea Accord on Fighter," **Asian Wall Street Journal Weekly**, May 14, 1990, p. 3.

38 Wild Weasels are dedicated electronic warfare aircraft tasked with killing enemy SAM platforms.

39. David Saw, "Security in an Era of Change — The Republic of Korea," **Military Technology**, November 1991, p. 25.

40. James Heitz Jackson, "Exports: A Vicious Circle?", **Jane's Defence Weekly** (International Edition), May 5, 1990, Vol. 13, No. 18, p. 872.

41. The ROK press has suggested, however, that the FXX time-frame would be about 2010. "New Korean Budget Paves," p. 2.

42. The status of such assistance is in doubt with the sale of GD's aircraft division to Lockheed, however. Saw, "Security in an Era," p. 25. Lockheed's subsequent merger with Martin Marietta further clouds the situation.

43. This is believed to be based on the Nike-Hercules SAM, which the United States had provided the ROK during the 1950s and 1960s. In addition, it is believed that the State Arsenal Pusan may have developed an improved version of the Honest John rocket, but it is unclear what the status of that system is. Mike Howarth, "Defending the Republic of Korea," **International Defense Review**, February 1986, p. 195.

44. Saw, "Security in an Era," pp. 17–18.

45. Steve Glain, "Seoul Turns to Europe for Arms as Pentagon Guards Technology," **Wall Street Journal**, May 6, 1993.

46. Carey, "Korean Companies Seek Broader," p. 1.

47. Of that output, $177 million was exported, however. Carey, "Korean Companies Seek Broader," p. 12.

48. Carey, "Korean Companies Seek Broader," p. 12.

49. Carey, "Korean Companies Seek Broader," p. 12.

50. "Defence Industry Develops," **Jane's Defence Weekly**, August 8, 1992.

51. Saw, "Security in an Era," p. 16.

52. Author interviews with Hyundai executives, Seoul, Republic of Korea, May 1990.

53. Christopher F. Foss, "South Korean KIFV Family Detailed, **Jane's Defence Weekly**, January 11, 1992, p. 42.

54. Howarth, "Defending the Republic," p. 195.

55. "BMY Combat Systems Wins Howitzer Contract," **Asian Defence Journal**, September 1990, p. 114. In addition, the ROK appears intent upon gaining access to advanced ammunition technology, including Extended Range FB-Base Bleed rounds, for its 155mm systems (which include a large number of towed guns as well).

56. Robert Karniol and Joris Janssen Lok, "Atlas Is 'Chosen' in KDX Controversy," **Jane's Defence Weekly**, July 3, 1993, p. 7.

57. "Naval Forces Expanding," **Jane's Defence Weekly**, November 16, 1991, p. 969.

58. According to press reports, South Korea plans to deploy seven diesel attack submarines by 1997. The subs have a cruising range of 7,500 miles and a crew of 39. See Terrence Kiernan, "S. Korean Navy Eyes New Fleet of 7 Subs," **Defense News**, Vol. 8, No. 21, June 7–13, 1993, p. 12.

59. "South Korea's Torpedo Programme Falters," **Jane's Defence Weekly**, July 3, 1993, p. 13.

60. "$200 Million Matra Mistral Order for South Korea," **NATO's Sixteen Nations**, 1, 1992, p. 87.

61. George Leopold, "S. Korean Modernization to Test U.S. Relations," **Defense News**, September 30, 1991, p. 22; Steve Glain,"Seoul Turns to Europe for Arms as Pentagon Guards Technology," **Wall Street Journal**, May 6, 1993.

62. Thalif Deen, "South Korea's Growing Industrial Strength," **Jane's Defence Weekly**, July 29, 1989, p. 162.

63. Kiernan and Silverberg, "Technology Control Issues," p. 36. The Korean government is clear in intentions to expand business in overseas markets, declaring that "to overcome limited domestic demand and defense budget constraints, the defense industry has no alternative but to turn to overseas markets. By actively attracting repair and maintenance orders from abroad, local defense industries have attempted to enhance their operation rates." Republic of Korea, Ministry of National Defense, **Defense White Paper 1989**, p. 167.

64. Col. So Byung Min, Defense Industry Bureau, Ministry of National Defense, Republic of Korea, "Technological Cooperation Between the ROK and US Defense Industries and the Government's Role." Speech before the Fourth Annual ROK-US Defense Industry Conference, July 16, 1990, San Francisco, California.

65. Young-Ok Ahn, "The Impact of Technology Transfer on National Security and Economic Development," in National Defense University, **Economics and Pacific Security: The 1986 Pacific Symposium** (Washington, D.C.: U.S. Government Printing Office, 1987), pp. 130–144.
66. Republic of Korea, Ministry of National Defense, **Defense White Paper 1992** (Seoul: Ministry of National Defense, 1992), p. 209, 211.
67. Republic of Korea, Ministry of National Defense, **Defense White Paper 1989**, pp. 167–168.
68. "Major Hurdles Seen for Korea," p. 1.
69. Berry, **The Defense Policies of Nations**, p. 412.
70. Col. So Byung Min, Defense Industry Bureau, Ministry of National Defense, Republic of Korea, "Technological Cooperation Between the ROK and US Defense Industries and the Government's Role." Speech before the Fourth Annual ROK-US Defense Industry Conference, July 16, 1990, San Francisco, California.
71. Yu Yong-won, "British Planes in the Sky, German Submarines in the Sea — Korea's Weapons Sources Diversify," **Chugan Choson**, April 22, 1990, p. 34, in FBIS-EAS-90-089, May 8, 1990, p. 22.
72. Kiernan and Silverberg, "Technology Control Issues," p. 36.
73. Dr. Paik Young Hoon, President, Korea Industrial Development Institute, "ROK-US Defense Industry Cooperation: Past Achievements and Future Tasks." Speech before the Fourth Annual ROK-US Defense Industry Conference, July 16, 1990, San Francisco, California.
74. Dr. Paik Young Hoon, speech, July 16, 1990.
75. Col. So Byung Min, speech, July 16, 1990.
76.. Jee Man Won, "Where Should the Korean Military Go?"
77. Hwang, "Industry: Into a New Era," p. 967.
78. Kiernan, "S. Korea Aims," p. 29.
79. Korean analysts note that Japan has spoken of the potential "boomerang" effects of technology transfers to Korea in a vein similar to American concerns over creating "second Japans." See Young-ok Ahn, "The Impact of Technology Transfer on National Security and Economic Development," in National Defense University, **Economics and Pacific Security: The**

1986 Pacific Symposium (Washington, D.C.: U.S. Government Printing Office, 1987), p. 143.

80. Kiernan and Silverberg, "Technology Control Issues," p. 46.
81. Terrence Kiernan, "S. Korea Aims to Energize Industry," **Defense News**, November 4, 1991, p. 29.
82. Terrence Kiernan, "Seoul Courts Europe Arms Makers," **Defense News**, March 9, 1992, p. 4.
83. Giovanni de Briganti, "France Promises Asian Arms Sales; China's Ire Looms," **Defense News**, Vol. 8, No. 20, May 24–30, 1993, p. 1.
84. "IDF Fighter Program Provides Catalyst for Advanced Manufacturing Capability," **Aviation Week and Space Technology**, April 27, 1992, p. 39.
85. "Develop Advanced Weapons and Establish a Three-Dimensional Defense System", Chung Kuo Shih Pao, February 18, 1992, p. 9, in FBIS-CHI-92-038 February 26, 1992, p. 61.
86. "Develop Advanced Weapons and," p. 61.
87. Stanley W. Kandebo, "Taiwanese Fighter's F125 Powerplant to Begin Accelerated Cycle Program," **Aviation Week and Space Technology**, April 27, 1992, p. 42.
88. Bill Sweetman, "GE Aims Engine at Taiwan's IDF," **Jane's Defence Weekly**, November 2, 1991, p. 803. The F125/TFE1042 has a 0.45:1 bypass ratio, weighs 1360 pounds, can develop 6060 lb. of dry thrust. GE's proposed upgrade would increase dry thrust to 8000 lb, improving the thrust:weight ratio of the IDF (which currently is outclassed by the new MiG-29s of the PLA Air Force).
89. "Kokubo Kara, Keizai Yusen e," **Nihon Keizai Shimbun**, October 11, 1992.
90. Edmond Dantes, "Taiwan's Military Build-UP", **Asian Defence Journal** February 1993, p. 20.
91. Ibid.
92. U.S. Congress, Office of Technology Assessment, **Global Arms Trade**, p. 128.
93. David Hughes, "Taiwan to Acquire Patriot Derivative," **Aviation Week and Space Technology**, March 1, 1993, p. 61; Barbara Opell and David

Silverberg, Taiwanese May Soon Coproduce Patriot," **Defense News**, Vol. 8, February 22, 1993, p. 1.

94. "Taiwan Unveils 'Brave Tiger'," **Jane's Defence Weekly**, June 30, 1990, p. 1283.
95. Anthony Leung, "Charting the Taiwanese Sea Lanes," **Military Technology**, March 1992, p. 32.
96. Leung," Charting the Taiwanese," p. 32.
97. Julian Baum, "Steel Walls," **Far Eastern Economic Review**, July 9, 1992, p. 11.
98. Leung, "Charting the Taiwanese," p. 35.
99. Julian Baum, "Prepare to Surface," **Far Eastern Economic Review**, Vol. 156, No. 5, February 4, 1993, p. 10.
100. Julian Baum, "Prepare to Surface," p. 10.
101. Paul Lewis, "Weapons May Seal Taiwan Sub Buy," **Defense News**, March 1–7, 1993, p. 3, 29.
102. That leverage was indicated by the fact that the Netherlands had to adjust its policies restricting arms sales to Taiwan in order to allow such extensive technology transfers. A worsening outlook at the time for general employment at Dutch shipyards also was said to be a contributing factor. See Giovanni de Briganti, "Dutch, Germans May End Taiwan Arms Ban," **Defense News**, November 30, 1992, Vol. 7, No. 48, p 1, 2.
103. Baum, "Steel Walls," p. 10.
104. "Taiwan Missile Efforts Bolstered by Raytheon," **Aviation Week and Space Technology**, March 8, 1993, p. 20. For a regional comparison, see Raytheon's dealings with Japan on the Patriot and its licensed production agreement with the Japan Defense Agency, in "Patriot and Air Defenses," Chapter 3, pp. 67–95, in Michael W. Chinworth, **Inside Japan's Defense: Technology, Economics and Strategy** (New York: Brassey's (US), Inc., 1992).
105. Julian Baum, "A Foot in the Door," **Far Eastern Economic Review**, September 17, 1992, p. 12.
106. David Hughes, "Taiwan to Acquire Patriot Derivative," **Aviation Week and Space Technology**, March 1, 1993, p. 61; Barbara Opell and David

Silverberg, Taiwanese May Soon Coproduce Patriot," **Defense News**, February 22, 1993, p. 1.

107. Baum, "A Foot in the Door," p. 13.

108. Baum, "A Foot in the Door," p. 13. Lockheed, at this writing (prior to its merger with Martin Marietta), has responded with a modest $60 million offset package proposal. Barbara Opall, "Lockheed Proposes Offset in Taiwan F-16 Buy," **Defense News**, Vol. 8, No. 17, May 3–9, 1993, p. 3, 44.

109. Chris Brown, "Douglas Venture Kickstarts Taiwan," **Interavia Aerospace Review**, January 1992, p. 38.

110. There were also reports that TAC was interested in acquiring the Convair division of General Dynamics, the chief contractor for the MD-11, in order to boost its aircraft assembly and construction background. See Chris Brown, "Douglas Venture Kickstarts Taiwan," **Interavia Aerospace Review**, January 1992, p. 38; "IDF Fighter Program," p. 40.

111. Jeremy Mark and Susan Carey, "With British Aerospace Accord, Taiwan Resumes Effort to Boost Aircraft Industry," **Asian Wall Street Journal Weekly**, September 28, 1992, p. 3.

112. David E. Sanger, "Overtures to Asia Pose Risk for U.S. Aerospace Industry," **The New York Times**, November 18, 1991, p. D1.

113. One of six private sector investors is affiliated with the Japanese trading company Mitsui & Co., Inc. Some U.S. critics of the deal saw it as a Trojan horse by which Japanese industry could gain a stronger foothold in the U.S. aircraft industry. "Taiwanese Premier Orders Review of MacDac Deal," **Defense Marketing International**, Vol. 3, No. 25, December 13, 1991, p. 1.

114. U.S. General Accounting Office, "Issues Raised by Taiwan's Proposed Investment in McDonnell Douglas," GAO/NSIAD-92-120, February 1992.

115. "Fly British," **The Economist**, September 26, 1992, p. 33.

116. Jeremy Mark, "Collapse of McDonnell Deal Prompts Taiwan to Focus on Developing Aircraft-Parts Industry," **Asian Wall Street Journal Weekly**, August 3, 1992, p. 17.

117. Paul Proctor, "Taiwan, Britain to Push RJ Buildup," **Aviation Week and Space Technology**, October 5, 1992, p. 36.

118. Paul Proctor, "Taiwan, Britain to Push, p. 36.

119. Mark and Carey, "With British Aerospace Accord," p. 3.

120. Julian Baum, "Prepare to Surface," p. 11.

121. Carey, "Korean Companies Seek Broader," p. 12.

122. "South Korea Turns to Russia to Help Build Competitive Aerospace Industry," **Aerospace Daily**, Vol. 164, No. 30, November 13, 1992, p. 240; "Seoul, Russia Agree on Technology Cooperation," FBIS-EAS-93-105, June 1, 1993, p. 20. South Korea also will establish three or four research institutes in Russia by the end of 1993 as part of a broad technology cooperation agreement. In addition, technical personnel exchanges will commence: 200 Russian researchers will reside with Korean firms, universities and research institutes during the first year of the agreement. That number will expand to 250 in the second year. A total of 79 Russian technology development projects will be transferred to South Korea for commercialization. Conversion of Russian military plants to civilian facilities also will take place under the agreement. Western firms of course, have similar opportunities. See Daniel Sneider, "Russians Team With West Firms," **Defense News**, Vol. 8, No. 22, June 14–20, 1993.

123. "Seoul Stresses Economic Cooperation With PRC," FBIS-EAS-90-010, January 15, 1993, p. 30.

124. The teaming of Korea and Russia also allows the ROK to compete more effectively in the political arena against Japan. By leapfrogging Japan's technology transfer policies, as well as insulating itself from potential constraints imposed by the United States, Seoul effectively can declare economic independence from both Tokyo and Washington, thereby removing itself further from the shadow of its two economic patrons. In light of generally negative Korean perceptions of Japan — stemming from economic frictions relating to their trade imbalance, Japanese technology transfer policies, and historical grievances — the political message implicit with this step is very clear: if Korea cannot gain the acquiescence of its major technological and political patrons, it is prepared to pursue alternative approaches.

    It is reasonable to assume that in this more fluid environment, Japan also is fully cognizant of the military applications and implications of its transfers of high technology to other nations with relatively advanced manufacturing and development capabilities. Korea's concern over Japan as a

military threat in the region is fully reciprocated on the part of Japan toward Korea. See, for example, Ted Holden, Laxmi Nakarmi, and Bruce Einhorn, "How Japan Keeps the Tigers in a Cage," **Business Week**, August 17, 1992, NO. 3279, pp. 98 ff.

The posture of the South Korean government is a longstanding one. See a discussion of attitudes toward global and regional technology transfers in Young-Koo Cha, "Technology Transfer in the Pacific Basin: A Korean Perspective," in National Defense University, **Pacific Regional Security: The 1985 Pacific Symposium** (Washington, D.C.: U.S. Government Printing Office, 1988), pp. 161–177.

125. Giovanni de Briganti, "France Promises Asian Arms Sales; China's Ire Looms," **Defense News**, May 24–39, 1993, p. 1; Edmond Dantes, "British Industry Seeks Wider Customer Base in Asia, **Defense News**, May 13, 1991, p. 10.

126. Paul Proctor, "Pacific Rim Aerospace Companies Expand Ties to European Aircraft, Engine Firms," **Aviation Week and Space Technology**, Vol. 133, No. 10, September 3, 1992, p. 81.

127. Steve Glain, "Seoul Turns to Europe for Arms as Pentagon Guards Technology," **Wall Street Journal**, May 6, 1993.

128. "South Korea Seeks Strengthened Military Before Expected U.S. Force Withdrawal," **Aviation Week and Space Technology**, Vol. 132, No. 22, May 28, 1990, p. 26.

129. Paul Beaver, "Taiwan Keeps Fighter Aircraft Options Open," **Jane's Defence Weekly**, January 16, 1993, p. 14.

130. "Kokubo Kara, Keizai Yusen e," **Nihon Keizai Shimbun**, October 11, 1992.

131. Atsushi Komori, "'Kokusan' de, Sangyo Kodoka," **Asahi Shimbun**, November 11, 1992.

132. Carey, "Korean Companies Seek Broader," p. 12.

133. Atsushi Komori, "'Kokusan' de, Sangyo Kodoka."

134. "Venture May Divert Funds from IDF," **Aviation Week & Space Technology**, September 28, 1992, p. 23.

135. "Taiwan Seeks to Build Aerospace Industry," **Wall Street Journal**, November 6, 1989, p. B-81.

136. Atsushi Komori, "Miyu Tenkan no Michi o Yokei," **Asahi Shimbun**, December 7, 1992, p. 13.

137. "Kim Yong-Sam Urges Linking Defense, Industrial Technology," Foreign Broadcast Information Service, **Daily Report: East Asia**, FBIS-EAS-93-111 (June 11, 1993), p. 23.

138. Michael W. Chinworth and Dean Cheng, "The United States and Asia," pp. 73–91.

139. For a broader discussion of technology control regimes, see National Academy of Science, **Balancing the National Interest: U.S. National Security Export Controls and Global Economic Competition** (Washington, D.C.: National Academy Press, 1987).

140. U.S. Congress, Office of Technology Assessment, **Global Arms Trade**, p. 13–16.

141. David Silverberg, "Perry Backs Limited Aid to Boost U.S. Arms Exports," **Defense News**, Vol. 8, No. 21, June 7–13, 1993, p. 24; editorial, "Guarantee the Loans," **Defense News**, June 21–27, 1993, p. 18. It is difficult to avoid commenting on the irony of this situation as well. Just as the U.S. government is attempting to economize on federal expenditures through DOD procurement budget reductions, it also will be increasing export subsidies for the very firms impacted by these reductions.

142. Information included in this section is derived primarily from "Major Hurdles Seen for Korean Aerospace Development," **Pac-Rim Defense Marketing**, Vol. I, No. 10, November 26, 1990, pp. 1–4; Machmud Banjamin, "South Korea's Aerospace Industry," **Asian Defence Journal**, December 1990, p. 80; and, Kim Nak-Hieon, "Korea Starts to Fly High," **Asia Technology**, August 1990, pp. 36–37.

143. Chu Ho-Sok, "ROK Aviation Industry Ready to Take Off," **Maeil Kyongje Sinmun**, August 29, 1991, p. 12, in FBIS-EAS-91-194, October 7, 1991, p. 41.

144. Chu Ho-Sok, "ROK Aviation Industry Ready to Take Off," p. 40. For additional information on specific contracts and/or their dates of completion, see Machmud Banjamin, "South Korea's Aerospace Industry,"**Asian Defence Journal**, December 1990, pp. 83–84.