

**The Developing Defense Industrial
Nations: South Korea, Brazil,
India, Taiwan, Australia,
Indonesia, and Singapore**

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COLLABORATION AND DEFENSE INDUSTRIAL PROLIFERATION

During the period 1970-90, several of the developing nations achieved remarkable growth in their defense production capabilities. The expansion of the defense industries has been accompanied by the increasing sophistication of their military products—advanced fighter aircraft, tanks, armored personnel carriers, missiles, and naval craft. Brazil has demonstrated its marketing capabilities by exporting intermediate-level weapon systems to many developing countries as well as to the United Kingdom. The production and R&D capabilities of the developing countries have been augmented by licensed production agreements and other forms of military technology transfer from U. S., Soviet, and European defense companies (see figure 7-1).

This chapter provides an overview of the various methods that the developing nations have used to acquire defense production capabilities. Subsequent chapters (chs. 8-11) examine the defense industries and policies of South Korea, Brazil, India, Australia, Singapore, Indonesia, and Taiwan.¹ These chapters provide a comparison of the differing manufacturing and export capacities of these countries. The analysis also reviews substantially increased involvement by U.S. companies in the defense industrial bases of the developing nations.

Defense production in these countries stems from an amalgam of strategic, political, and economic motivations. Strategic considerations—improved self-reliance, ensured security of supply, regional power aspirations, and local arms races—have often initiated the development of arms industries in the newly industrializing countries. India's extensive military buildup has been tied to its regional arms race with China and Pakistan. Taiwan's development of an indigenous fighter airplane may have been motivated by its desire for self-reliance in view of U.S. refusals to sell it sophisticated aircraft. Indonesia's recent effort to build an arms industry

appears to complement its regional aspirations within Southeast Asia.

Increasingly, economic incentives play an important role in motivating the newly industrialized nations to undertake extensive arms production. These countries argue that indigenous production can lead to cost reductions and potential foreign exchange earnings through exports. Additionally, defense programs are believed to contribute to the civilian economy indirectly by providing spin-offs to other industrial sectors, and by upgrading the skills and productivity of the industrial labor force.

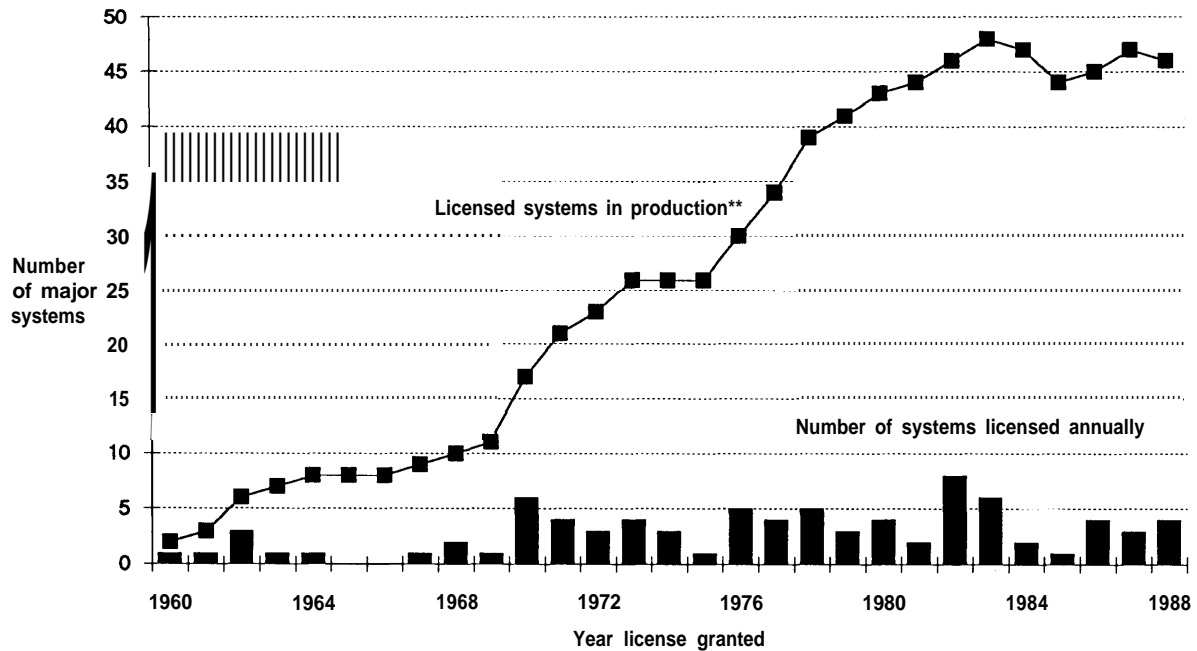
The ability of these states to establish indigenous defense production capacity is conditioned by several factors. Large amounts of capital are necessary to establish such a technologically intensive industry. Massive investments are required to build manufacturing facilities, create R&D centers, and to pay for imports. Additionally, government expenditures, through domestic defense procurement budgets, are often a prerequisite, given the small size of local markets. Australian defense production, for instance, has been severely hampered due to its small domestic procurement budget.

A second component is a diversified industrial base. Defense production, particularly in the aerospace sector, is one of the most complex manufacturing activities, and requires extensive industrial inputs from such sectors as steel, metallurgy, machinery, and electronics. The recent increase in arms production among such defense industrializing countries as Singapore and Indonesians explained in large part by their growing manufacturing capabilities.

A third factor relating to the arms-producing capabilities of developing countries is the status of domestic scientific and educational facilities. As evidenced in the subsequent chapters, the arms industries of India, Singapore, and Taiwan have provided the impetus for the creation of institutions for scientific research and applied technology. However, the majority of the developing countries

¹For an analysis of defense production in the newly industrializing countries see Carol Evans, *Defense Production in the NICs: The Case Studies From Brazil and India* (London: London School of Economics, Spring 1991), *passim*.

Figure 7-1—Estimated Licensed Production of Major Conventional Weapon Systems in Selected Developing Nations,* 1960-88



*Brazil, India, South Korea, Indonesia, Taiwan, Singapore, and Australia.

● "Estimates based on the assumption that an average system is produced under license for 12 years.

SOURCE: Office of Technology Assessment, from data in Stockholm International Peace Research Institute, SIPRI Yearbooks, 1970 through 1990, *World Armaments and Disarmament*.

do not possess advanced R&D programs or institutions for educating technicians and scientists.

Among the developing nations, strong state involvement through direct ownership of the defense industries is frequently a means of ensuring the viability of domestic defense firms. Governments have also provided various fiscal and trade incentives to help both domestic and foreign defense companies reduce their defense production costs. The state-controlled aircraft industries in India, Indonesia, Singapore, and Taiwan are good examples. The Singaporean case also demonstrates that if a country does not have a sizable government or private aircraft industry, it can create one by attracting foreign investment.

The final factor affecting arms production is access to export markets, primarily in the developing world. Arms producing countries like Brazil and Australia, which suffer from bottlenecks created by the high costs of production and the small size of their peacetime domestic requirements, must export to maintain the economic viability of their defense

industries. In fact, the ability of the developing countries to tailor defense production to external demand, and to compete aggressively in the international arms market distinguishes those with long-term production potential.

Most nations with developing defense industries have followed a common process to establish domestic defense production. The acquisition of an indigenous manufacturing capability, or the import of technology or technological know-how, is often a continuation of direct arms imports. Domestic production may begin with the assembly under license of knocked-down weapons and the manufacture of components. Sophisticated equipment, however, continues to be imported. At a more advanced stage, developing countries design and produce their weapon systems domestically, including components, while still relying on imports of the more advanced technologies, for example, avionics.

A number of factors reconfigured the international arms trade in the 1980s. The cumulative effect of these changes has reinforced the arms production

activities of and technology acquisitions by these defense industrializing states. The most important shift was the erosion of U.S. and Soviet market shares in the international arms trade in the face of growing competition from West European defense suppliers.² As one U.S. defense executive noted, “Not only are the numbers of players increasing, but through processes of technology transfer and national commitment, we are finding more aggressive competitors out there.”³ The subsequent emergence in the 1980s of a buyers’ market for arms, and the enhanced technological capabilities of developing arms producers, provided the latter with the additional leverage to secure licensed production and offset agreements. Moreover, transfers increasingly consisted of military technology, not simply the provision of finished military weapon systems.

Licensed production arrangements have been heavily favored by most developing arms producers. In return for the production of proven weapon systems, governments can conserve foreign exchange and upgrade their countries’ technological bases. Licensing is also attractive because of its inherent flexibility. Agreements can be secured to allow for a broad range of manufacturing activities including components, subassemblies, or the production of a complete weapon system and its components.⁴ Of the developing countries considered in this report, South Korea, India, Taiwan, Singapore, and Indonesia have relied extensively on licensed production from foreign companies as a means of acquiring and expanding their defense industrial capabilities.

A second, less frequently used means to acquire defense-related technologies is through joint venture agreements and company-to-company teaming with U.S., European, and increasingly other developing defense industrial nations. The economic advantages of collaborative arrangements are threefold:

1. risk sharing and reduction of technical and commercial processes inherent in the development of new weapon systems;
2. access to partner’s technology and capital resources; and
3. marketing and reputation benefits.

In the past 5 years, defense collaboration has moved into the early research and predevelopment stages with companies cooperating on design, fabrication, and application of advanced technologies. This approach, however, is restricted to relatively advanced arms producers. Brazil’s aircraft industry, for example, has various collaborative international arrangements with Italy’s Aeritalia and Aermacchi as well as with Argentina’s aircraft industry, Fabrica Argentina de Materiales Aeroespaciales.

Another means to supplement a developing country’s defense industrial sector is through subcontracts with large international defense companies. Many U. S.- and European-based companies have established production lines in the countries belonging to the Association of Southeast Asian Nations (ASEAN) to take advantage of their low wages and skilled labor. Companies are also attracted to these countries because their location provides market access in the Far East. The development of arms production programs in the ASEAN states of Singapore and Indonesia has been greatly aided by the defense manufacturing operations of such companies as United Scientific Holdings of the United Kingdom, and General Dynamics of the United States.

Since the 1980s, defense firms have been forced increasingly to provide offsets to secure sales. Although there are many kinds of offset agreements, the most common are direct offsets in which the purchasing country manufactures and supplies components in connection with the purchase of a foreign weapon system. These have stimulated the development of new arms industries, particularly when the foreign company supplies technical data and trains local technicians. The offset arrangements between General Dynamics and Singapore and Indonesia for the acquisition of the F-16 enabled these countries to save foreign exchange and to provide work and valuable production technology for their domestic defense industries. Experience gained in such transactions often leads to future licensed production and even to attempts at indigenous development.

An analysis of defense industrialization in Brazil, India, and South Korea and among several Western

²For data relating to these shifting market shares see Richard Grimmett, “Trends in Conventional Arms Transfer to the Third World, by Major Supplier, 1982-1989,” CRS-90-298-F (Washington DC: Library of Congress, Congressional Research Service, 1990).

³Quoted in Richard W. Stevenson, “No Longer the Only Game in Town,” *The New York Times*, Dec. 4, 1988, p. F7.

⁴Trevor Taylor, “Defence Industries in International Relations,” *Review of International Studies*, vol. 1, 1990, p. 61.

Pacific countries shows differing levels of defense manufacturing and export capabilities. During the 1980s, Brazil ranked first or second (after Israel) in terms of defense production and exports among the developing countries. Building on international collaborative and licensing agreements, Brazil's defense industries became highly diversified and sophisticated producers of military equipment. The Persian Gulf and Middle East states such as Iraq and Libya have been the largest purchasers of Brazilian arms. In the Brazilian case, the acquisition of dual civil and military technologies enabled some Brazilian firms (e.g., Embraer) to compete successfully in the U.S. and European aircraft markets. However, while the Brazilian model has encouraged the defense production activities of other new entrants, it is unlikely to be duplicated successfully. Moreover, the international embargo against Iraq has damaged the export viability of Brazil's arms industry.

India provides a paradoxical example of a country that possesses the largest military-industrial-research complex of the developing nations, and at the same time depends disproportionately on transfers of foreign defense technology. Its failed policy of self-sufficiency (because of overly ambitious attempts to produce sophisticated weapon systems) has necessitated substantial imports from and licensing agreements with the Soviet Union and more recently with West European states.

South Korea's heavy reliance on U.S. foreign military assistance to meet its security requirements and to finance U.S. arms imports is gradually being replaced by collaboration and coproduction agreements with U.S. defense companies. Similar to the experiences of other developing countries with larger defense sectors, the growth of South Korea's arms industry since the 1970s has been closely linked to a strategy that emphasizes the expansion of the shipbuilding, machinery, and electronics industries. However, unlike many of the other developing countries, South Korea has pursued partnership with U.S. and foreign defense firms rather than self-sufficiency. Future government efforts to strengthen South Korea's partnership strategy, such as supplying components to major U.S. aerospace defense firms and increasing defense exports, greatly depend on continued U.S. willingness to transfer military-related technologies.

The Western Pacific countries (reviewed in ch. 11) are also heavily involved in defense industrialization. The development of arms industries in Australia, Singapore, Indonesia, and Taiwan has been conditioned by reductions in security assistance provided by the United States and the United Kingdom, for example, the British decision in 1971 to withdraw its defense forces from Malaysia and Singapore, and the U.S. military withdrawal from Indochina in 1975. Financial and technological limitations have led Indonesia and Singapore especially to concentrate their defense production activities on overhaul, modernization, and international subcontracting, mainly for the aircraft sector. While the juxtaposition of Australia and Taiwan reveals significant differences in strategic priorities, both countries have sought to improve the future self-sufficiency of their arms industries through collaboration with foreign defense firms.

U.S. defense companies are involved in the defense industries of all the Western Pacific nations examined in this report. This involvement includes transfers of technology through licensed production, joint ventures, and direct foreign investment. As a result, the defense industries of the Western Pacific countries are highly import dependent. Nonetheless, these countries are likely to exploit foreign defense companies' growing interest in the Asia-Pacific region and to secure transfers of technologies that will enable them to move from primarily subcontracting and direct offsets into licensed production of finished weapon systems.

The ramifications for U.S. foreign policy arising from defense production and exports by the defense industrializing countries are far-reaching. The relatively unrestrained spread of conventional arms, as well as naval and ballistic missile proliferation, has been facilitated by U.S. and West European technology transfers. International efforts such as the Missile Technology Control Regime will have only limited countervailing effectiveness because of the growth of defense cooperation between developing nations.

Conventional Arms Trade Among Developing Nations

Arms production and exports by countries like Brazil have had an important effect on the growth of defense trade among the developing nations.⁵ As

⁵See Carol V. Evans, "Reappraising Third World Arms Production," *Survival*, vol. 28, No. 2, March/April 1986, pp. 99-118.

discussed in the subsequent chapters, developing countries are increasingly purchasing military equipment and technology from the defense industrializing countries. Many of these recipients are countries that are diversifying their sources of weapons supply in order to circumvent arms embargoes or simply to reduce the influence of their traditional suppliers. Examples of such recipients among the developing countries are Iraq, Iran, and Taiwan.

In addition to military hardware, some developing nations are beginning to transfer the technology and infrastructure necessary to develop defense products. In October 1984, for example, Brazil and Saudi Arabia signed a 5-year military cooperation agreement for the technical training of Saudi workers in weapons assembly and the joint manufacture of the Astros II multiple-rocket launcher. Another important example is the 1984 licensed production agreement between Brazil and Egypt for the Tucano trainer. Of the 120 planes assembled in Egypt, 80 were delivered to Iraq and 40 were retained by the Egyptian Air Force. In both cases, financing was provided by Saudi Arabia through the Gulf Cooperation Council.

This trend in conventional weapons trade among nations of the developing world has significantly undermined control over weapons trade and regional conflicts. For example, the Brazilian Government's ban on arms exports to Iran during the Iran-Iraq war did not deter or prevent Libya—Brazil's second largest arms importer—from supplying Brazilian spare parts to Iran.⁶

Naval Arms Proliferation

As indicated in the chapters that follow, India, Taiwan, and Indonesia have been expanding their naval capabilities through indigenous defense production efforts or through off-the-shelf purchases. Situated along strategic sea lanes or at choke points, each of these countries has arrived separately at the same hardware solutions to their sea-denial defense postures: missile-firing fast attack craft, helicopters, maritime surveillance aircraft, and submarines.⁷

Over the past 10 years, Indonesia and Taiwan have either licensed-produced or purchased fast attack craft and patrol vessels from West German and Israeli sources, respectively. (As discussed later, Indonesia's naval expansion is linked to its monitoring and policing of its Exclusive Economic Zone.) According to the Stockholm International Peace Research Institute:

Many of these craft share the following characteristics: twin propulsion systems for economical patrol with greater speed; . . . sizable and separated storage areas located where they can become magazines; . . . helicopter facilities; communications systems; extensive crew quarters to allow increases in the ship's company if helicopter, anti-submarine warfare (ASW), or electronic warfare (EW) operations should ever be undertaken and hard points for the attachment of equipment such as sonars or missile systems.⁸

In addition, changes in submarine technology have had a profound impact on current naval balances. The development of air-independent propulsion systems for submarines, which could then be armed with a missile capability, could threaten aircraft carriers.⁹ India's lease of a Charlie I-class, nuclear-powered submarine, and its purchases of West German 209, Soviet Kilo and Foxtrot submarines mark a significant jump in India's naval capabilities. India would now be better able to counter the threat it faced in its 1971 war with Pakistan, when the U.S. Navy deployed its Seventh Fleet into the Bay of Bengal. These acquisitions, along with the induction of a second aircraft carrier, have raised concern about India's regional ambitions.¹⁰ Similarly, Indonesia, which is planning to build a large naval base on Sumatra for quick access to the Bay of Bengal, is worried about the Indian Navy.

Missile Proliferation

A relatively new development is the proliferation of ballistic missile programs by the newly industrializing countries. Nine countries possess or are developing indigenously surface-to-surface missiles

⁶Veja, Sao Paulo, Oct. 22, 1986, p. 59.

⁷Commodore K. R. Menon, *Indian Navy*, "Third World Navies React," Proceedings of the U.S. Naval Institute, March 1989, p. 89.

⁸Ian Anthony, "The Naval Arms Trade and Implications of Changes in Maritime Law," SIPRI Yearbook 1988, *World Armaments and Disarmament* (Oxford: Oxford University Press, 1988), p. 275.

⁹Menon, op. cit., footnote 7, p. 94.

¹⁰Ross H. Munro, "Superpower Rivalry," *Time* (International edition), vol. 133, No. 14, Apr. 3, 1989, p. 13.

with ranges of 600 to 2,000 km.¹¹ Central to this study are the countries of Brazil, India, and Taiwan.

In addition to heightening international tensions and further spurring regional arms races (especially in South Asia), these countries' missile programs have prompted concern by the United States, its European partners, and the Soviet Union regarding the potential deployment of nuclear, chemical, or biological warheads. The U.S. response to this missile proliferation was to restrict the export of sensitive technology with the establishment in 1987 of the multilateral Missile Technology Control Regime (MTCR). Seven nations (the United States, the United Kingdom, Japan, West Germany, France, Italy, and Canada) initially agreed to ban the export of complete missiles or components for missiles with ranges of more than 300 km and of payloads over 500 kg.¹²

Nonetheless, as evidenced by India's test of its Agni intermediate-range missile, missile programs continue, despite the restrictions of the MTCR. Ironically, one of the main reasons for the relative failure of the MTCR is the continued assistance by regime members to these countries' civilian space programs. For example, the French-led Arianespace has offered to provide Brazil's space program with Viking rocket engine technology and training for Brazilian technicians.¹³ Similarly, West Germany is reputed to have aided India's missile capabilities by assisting its space research program.¹⁴ Another factor weakening the MTCR is the ready availability of the 300 km Soviet Scud-B and other short- and

medium-range missiles being retired from Soviet and NATO inventories. Various countries, including Iran and Iraq, have sought foreign assistance to modify and extend the range of the Scud-B missile.

Cooperation among the developing nations in ballistic missile technology continues. In 1988, Argentina, Egypt, and Iraq formed a consortium to produce the Condor II ballistic missile. Over the last 5 years Brazil has been actively involved in Iraq's ballistic missile program and has reportedly helped Iraq extend the range of its Scud-B missiles.¹⁵ Israel assisted Taiwan's development of the Hsiung-Feng surface-to-surface missile.

Missile cooperation has also contributed to regional arms races. The sale of East Wind CSS2 missiles in 1988 by China to Saudi Arabia sent ripples throughout South and East Asia. The Saudi deal alarmed Taiwan particularly. China had made a bold inroad into a country with which Taiwan has enjoyed strong diplomatic relations. Furthermore, these missiles were capable of hitting Israel, a country that has provided both Taipei and Beijing with high-technology defense equipment.¹⁶ Doubtless Taiwan's own development of its 1,000 km range missile, Sky Horse, has been spurred by the Beijing's missile sale. India's concern has been more muted as these missiles—though capable of reaching the Indian west coast—are deployed against Iran. Still, as a prominent Indian defense analyst wrote in the *Times of India*, "these developments highlight the need for India to expedite its own missile programs."¹⁷

¹¹"The Missile Race Hots Up," *South*, August 1989, p. IW0

¹²For an overview of the effectiveness of the MTCR, see Janne E. Nolan, "Ballistic Missiles in the Third World—The Limits to Non-Proliferation," *Arms Control Today*, vol. 19, No. 9, November 1989, pp. 9-14.

¹³U.S. Objects to Deal on French Missile Know-How," *Latin American Regional Reports: Brazil*, Nov. 23, 1989, p. 8.

¹⁴John J. Fialka, "Space Research Fuels Arms Proliferation: Indian Missile Suggests U.S., West German Parenthood," *The Wall Street Journal*, July 6, 1989, p. A8.

¹⁵"Cientista & s Arabias," *Veja*, Oct. 3, 1990, pp. 48-50.

¹⁶Nayan Chanda, "The Third World Race for Ballistic Missiles," *Far Eastern Economic Review*, June 2, 1988, p. 22.

¹⁷K. Subrahmanyam, "Chinese Missiles and Indian Security," *Times of India*, quoted in *India Weekly*, Apr. 22, 1988, p. 10.