15
The role of offsets in Indian defense procurement policy

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Introduction

Since independence in 1947, India has been making strong efforts to build an indigenous capability to achieve the long-term goal of self-reliance in defense production. Between 1958 and 1962 India spent less than 2 percent of GDP on defense. After the Indo-China war in 1962, India's defense expenditure doubled to over 4 percent of GDP. This trend continued in the 1970s and 1980s and then increased significantly from Rs 153 billion in 1990 to Rs453 billion in 1999 in current Indian prices, or from US$8.1 to US$10.5 billion in constant 2000 US dollars.[1] Since the 1960s Indian defense procurement has been influenced by three principal objectives: creating a self-reliant defense industry, reducing the dependence on arms imports, and reducing the foreign exchange burden of arms imports. This chapter examines to what extent India has succeeded in achieving these goals over the last five decades, particularly with reference to offset arrangements. Although India does not appear to have developed a formal offset policy framework, its industrial, science, and technology policies have influenced procurement of weapon systems from foreign sources employing various offset options. Particularly in the defense sector, offsets such as licensed production, technology transfer, counter or barter trade, and long-term credit arrangements have been employed consistently. These offset arrangements are not set out as formal policy declarations, but in practice they have been developed and pursued often and systematically. This makes it possible to evaluate whether defense offsets helped India to achieve its economic and military objectives such as developing a domestic defense industry, reducing the foreign exchange outflow, and reducing its dependence on defense imports. It must be said, however, that very little by way of detailed economic data are available about Indian defense deals. The assessment must therefore be qualitative in nature.

Arms imports and offsets

Over the years, India has established one of the larger defense industries in the developing world. It includes 39 ordnance factories, of which 16 were established before independence, 8 relatively autonomous defense public sector units (DPSUs), and over 50 defense R&D laboratories. Yet, India has also been a major importer of weapon systems (Nugent, 1991). Table 15.3, appended to this chapter, shows the extent of these imports. Between 1947 and 1962, India mostly bought weapon systems off-the-shelf from the UK

and France. In the 1960s India decided to build its domestic arms industry through foreign imports and technology assistance. Between the mid-1960s and mid-1980s, India's defense deals involved both direct offsets, such as licensed production of weapon systems or subsystems or technology transfers, and indirect offsets, that is trade arrangements involving non-defense goods and services such as raw materials, and consumer and industrial goods (Hammond, 1990, p. 7). Most defense deals with the Soviet Union or Russia involved three kinds of offsets, used separately or jointly: (i) licensed production/ technology assistance; (ii) countertrade or barter; and (iii) cheap long-term credit facilities with low interest to finance these deals. Most of the procurement agreements with western countries involved two offset options, namely licensed production/technology assistance and some form of credit arrangements.

Between the 1960s and 1980s, India entered into a number of licensed production agreements. Table 15.3 illustrates this. Except for a small number of procured items from western Europe, most of the major weapon systems were procured from the former Soviet Union and other eastern bloc countries. By 1980, Soviet weapon systems constituted about 70 percent of total imports (Singh, 1990, p. 1081). As the table indicates, this appears to be the situation even in the 1990s. The Indian army is primarily equipped with Soviet/Russian weapons systems. This is also the case for the air force (with few exceptions, such as Jaguar, UK, and Mirage 2000, France, that are currently in service, and a few 1960s generation aircraft such as Gnat fighter and HS 748M AVRO transport, UK). In the case of the navy, although Soviet vessels are predominant, we do find a significant number of ships and weapon systems imported from the UK, including two aircraft carriers (Vikrant and Virat), Leander class frigates, and naval fighter aircraft and helicopters (Sea Harriers and Sea Kings). However, compared to the army and the air force, technology transfers and licensed production arrangements in naval equipment are small.

Licensed production involves different phases, such as assembling of equipment, manufacturing of parts using foreign material, and manufacturing of these parts using local materials.[2] Between the mid-1960s and mid-1970s, India faced serious difficulties to absorb licensed technologies, particularly those involving tanks, aircraft, and naval vessels. The programs faced delays and cost overruns, and resulted in spectacular failures. For example, the Vijayanta tank (a modified 37-ton Chieftain tank of Vickers and Armstrong, UK), which "relied heavily on imported components," was judged "extremely slow" and failed to see action in the 1965 war with Pakistan (Graham, 1984, p. 168). Only in the 1970s did production reach planned levels and unit costs fell. Meanwhile, India found itself compelled to buy Soviet T-55 (1960s) and T-72 (1970s) tanks. Although relatively inexpensive (Graham, 1984, p. 168), this ran counter to the foreign exchange preservation objective of indigenous arms production.

India's effort to locally assemble HS-748 transport aircraft (UK) was a failure as well, and its project to produce Gnat light jet fighter aircraft was only a limited success. Licensed production of MIG-21 aircraft faced serious delays. Through 1972, the foreign exchange expenditure on imported components exceeded the foreign exchange cost had the aircraft been imported in its entirety (Graham, 1984, p. 172). However, the MIG-21 project had a "positive impact on HAL's design and production" and helped "HAL's development of its technical base" (Graham, 1984, pp. 172–173). Subsequently, this

appears to have helped HAL to absorb new generations of Soviet aircraft technologies, such as MIG-23, MIG-27, and MIG-29.

By the mid-1980s, India's policy of building its domestic defense industry through foreign technology imports and licensed production produced significant results. India became nearly self-sufficient in a range of small arms, ammunition, and medium artillery. Under license, it started producing helicopters, combat aircraft, main battle tanks, armored personnel carriers, tactical missiles, and it built frigates. Nonetheless, the industry failed to acquire capabilities sufficient to close the technology gap with developed countries and keep pace with technological change in weapon systems. As a result, India was forced to import latest-generation aircraft and naval vessels from other countries. Its "cherished objective of self-reliance in military technology still remains an elusive dream" (Gosh, 1996, p. 301).

Apart from licensed production, India's favored offset option is its method of payment for imports. Particularly with the Soviet Union and subsequently with other eastern bloc countries, India entered into rupee based trade arrangements to reduce the foreign exchange burden of imports. This enabled India to import arms for rupee-denominated credit which eastern bloc countries spent to import goods from India. The initial arrangement was for 10 years. Subsequently, it became 15 years and longer. For example, a 1980s defense deal with the Soviet Union involved a 15 year loan of Rs13 billion at 2.5 percent annual interest and repayment starting after a two-year grace period (Mehrotra, 1990, p. 23). West European suppliers, although they were willing to offer some form of credit, were generally not interested in rupees. Despite this, India entered into a number of defense contracts involving licensed production, especially with UK companies. For example, India reached an agreement with Vickers Armstrong and Yallow to produce Leander class frigates, with the UK government agreeing to fund the foreign exchange component (Graham, 1984, p. 173). But the benefits to India of the UK credit deals were not particularly significant, and perhaps even negative. For example, a deal to buy the HMS Hermes aircraft carrier was worth £50 million but the final bill, after refitting, was expected to cost India £ 120 million (*Statesman*, 13 April 1986). Similarly, India purchased the Westland helicopter with an aid package of £65 million from the UK government. Subsequently, it turned out to be a big failure technically and financially (*Statesman*, 18 February 1987). Although UK aid appeared to benefit India, in reality it was a subsidy for the British company that was selling the helicopter, as it was facing closure (Ray, 1986).

The offsets associated with the purchase of Mirage 2000 aircraft in the 1980s from France were meant as technological assistance to India to develop its Light Combat Aircraft (LCA) and an indigenous aircraft carrier (*Tribune*, 27 March 1990). But there were criticisms that India had overpaid for the Mirage 2000 deal (Prasannan, 2000). India's contract with Bofors AB (Sweden) in 1988 was the first arms deal with a western country that involved both direct and indirect offsets, that is, countertrade and licensed production. Bofors agreed to license subsystems production in India and buy them back along with other goods. The trade element was expected to be 50 percent of the total contract value of $1.2 billion (Hammond, 1990, p. 124). However, the deal on technology transfer was abandoned after a corruption scandal.

Impact of offsets

Since, with the exception of relatively minor details about particular offset arrangements involving technology transfer or licensed production, comprehensive data are not available for Indian arms imports it is not possible to analyze the impact of offsets in depth. Whether defense offsets have helped India to achieve its economic and defense policy objectives—developing a domestic defense industry, reducing its dependence on foreign arms imports, and reducing the foreign exchange drain—cannot be definitively answered. But a qualitative assessment may be offered.

First, let us consider licensed production and technology transfer. The Soviet Union was the first supplier willing to transfer technology or permit licensed production. This started with MIG-21 aircraft in the 1960s and expanded to include all major army and air force weapon systems. The Soviet Union also provided technology assistance and long-term credit to set up an Indian defense industry. However, it imposed restrictions on licensed production that prohibited India from exporting certain products to other countries. It was also reluctant to provide complete technical information and often failed to inform India, post-sale, on important developments and innovations incorporated into a sold weapon system (Singh, 1990, p. 1086; Mehrotra, 1990, p. 135). Further, Soviet equipment was "quite often saddled with accessories for which [India had] no use" (Singh, 1990, p. 1085). In some cases, the seller charged "fancy prices" on the basis that certain technology transfers were not covered in the original agreement (Gosh, 1996, p. 347). Technology transfers at the level of whole systems worked less efficiently than at component level as sellers tended to withhold core technologies. Also, evidence showed that buyback arrangements as part of technology transfer did not produce the desired results. The defense public sector units faced problems such as high cost of production that affected their competitiveness, and long lead-times that were not acceptable to sellers (Gosh, 1996, pp. 346–47). As Indian civil industry faced a chronic problem in supplying materials necessary for producing advanced weapon systems, the foreign exchange spent on acquiring such materials increased to over 40 percent of total foreign exchange spent for defense imports (Graham, 1984, p. 169).

Although licensed production failed to create the necessary technological capabilities to meet India's desire for advanced weapon systems, it did lead to a significant level of competence in building the Indian defense industry. Defense firms such as Hindustan Aeronautics Ltd (HAL), Bharat Electronics Ltd (BEL), and Mazagon Docks Ltd (MDL) accumulated a high level of technological capabilities and started producing sophisticated weapon systems such as combat aircraft and naval vessels. When negotiating new defense deals, this growing indigenous capacity helped to shift the balance in India's favor, particularly with regard to technology transfers (Arya, 1985; Graham, 1984). For example, an agreement signed between India and Russia in March 1999 includes "weapons that are just being adopted in the Russian Army" itself (Basu, 1999, p. 504). On the downside, the availability of sophisticated Soviet weapon systems at relatively low cost appears to have retarded the growth of indigenous R&D (*The Asian Age*, 9 June 1994).

Other offsets that played a major role in India's procurement of weapons were countertrade and long-term credit. In the case of western countries such as Britain, France, and Sweden, India tried to strike some form of credit arrangement to cover the

foreign exchange burden. However, evidence suggests that such arrangements resulted in increased selling prices (Singh, 1998, p. 61). Unlike western countries, the Soviet Union was willing to sell sophisticated systems on long-term credit with low interest rates and payment in rupee terms. It accepted "offsets in the shape of raw materials," so that a country like India found its offers "too lucrative to dismiss for reasons of quality alone" (Singh, 1990, p. 1088). Between 1971 and 1991, India purchased weapons worth $10.85 billion from the Soviet Union. This included a contract worth $2.56 billion in 1980 and another worth $2.975 billion in 1982. Further agreements, in 1983–84, for naval vessels and aircraft involved credit over 12 years at 2.25 percent interest. India benefitted as "most of these agreements were signed with highly favourable credit terms, often requiring only ten per cent down on purchases, though twenty per cent has been required on aircraft, ship and other short-duration overhaul contracts" (Jacobs, 1991, p. 301). A study by Benoit found that defense imports from the eastern bloc in the 1960s were "not particularly burdensome" because of long-term credits and rupee denominated trade (Benoit, 1973, p. 189).

Defense imports were the most important category of Indian imports from the Soviet Union between the 1960s and 1980s. Therefore, studies about overall Indo-Soviet trade help us to evaluate the effectiveness of the countertrade offset option. Findings of these studies include: (i) rapid trade growth, that is, the creation of new trade by diversifying the composition and direction of Indian exports; (ii) no evidence of switch trade affecting India's exports to hard currency markets;[3] (iii) prices paid for Indian goods were favorable or no worse than those obtained from other countries; (iv) a somewhat strengthened Indian bargaining position to obtain better terms of trade from other countries and multinational companies; and (v) Indian development programs, including defense, benefitted from the import of raw materials and capital goods from the Soviet Union when it confronted acute shortages of foreign exchange. Concerns raised in these studies cover three areas: (i) the prices paid to vendors for imported equipment and machinery were higher than those offered by competing vendors; (ii) about 20–25 percent of India's exports were diversionary, that is, they could have been exported to hard currency areas; and (iii) the rupee-rouble exchange rate since the 1970s was not favorable to India, creating a hidden burden of credit repayment (see, e.g., Gidadhubli, 1983; Singh, 1978; Mitra, 1979; Mehrotra, 1990). But other studies appeared to show that the pricing of imports and diversion of trade were not significant problems, and that the exchange rate problem was subsequeutly renegotiated and an agreement was reached (e.g., Mehrotra, 1990). There was also an argument that, by bartering, India was incurring a foreign exchange opportunity cost (Benoit, 1973, p. 189) but such costs were found to be insignificant, and it was not certain that the Soviet Union would have been willing to accept the types of Indian imports it did accept had it not been for the arms

Table 15.1: Foreign exchange requirements of Indian defense forces and industry between 1950 and 1972 (US$ million-1972)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1950–51	724	50	6.9	9	1.2	27	3.7	86	11.9
1951–52	724	50	6.9	12	1.7	27	3.7	89	12.3
1952–53	718	51	7.1	19	2.6	26	3.6	96	13.4
1953–54	693	36	5.2	23	3.3	25	5.2	84	12.1
1954–55	679	60	8.8	27	4.0	24	8.8	111	16.3
1955–56	642	102	15.9	32	5.0	22	15.9	156	24.3
1956–57	695	144	20.7	35	5.1	23	20.7	202	29.1
1957–58	897	150	16.7	39	4.3	31	16.7	220	24.5
1958–59	827	185	22.4	40	4.8	27	22.4	252	30.5
1959–60	776	210	27.1	43	5.5	24	27.1	277	35.7
1960–61	769	200	26.1	46	6.0	24	26.0	270	35.1
1961–62	838	153	18.3	48	5.7	26	18.3	227	27.1
1962–63	1228	77	6.3	48	3.9	40	6.3	165	13.4
1963–64	1950	123	6.3	76	3.9	62	6.3	261	13.4
1964–65	1765	52	2.9	70	4.0	57	2.9	179	10.1
1965–66	1788	29	1.6	70	3.9	57	1.6	156	8.7
1966–67	1610	107	6.6	72	4.5	50	6.6	229	14.3
1967–68	1579	47	3.0	77	4.9	49	3.0	173	11.0
1968–69	1691	70	4.2	85	5.0	57	4.1	212	12.5
1969–70	1734	77	4.4	93	4.4	52	4.4	222	12.8
1970–71	1804	75	4.2	92	5.1	53	4.2	220	12.2
1971–72	2063	97	4.7	99	4.8	63	4.7	259	12.6
1972–73	1877	101	5.4	115	6.1	52	5.4	268	14.3

Notes: (1) the military budget; (2) direct defense imports including military imports from the former eastern bloc countries; (3) % share of (2) in (1), total defense budget; (4) imports for domestic defense industry; (5) % share of (4) in (1); (6) imports for “civilian” consumption of the military sector; (7) % share of (6) in (1); (8) total foreign exchange requirements of Indian military/industry; (9) % share of (8) in (1), total defense budget
Sources: Terhal (1982, table III) and Deger (1986, table 6.5).

import deals. Likewise, it was not certain that India would have accepted substitute imports from the Soviet Union.

Another Indian goal was that of reducing the foreign exchange burden that comes from importing complete weapon systems. Specifically, the rupee trade arrangements with eastern bloc countries were expected to relieve the foreign exchange burden. A study by Terhal (1982) is one of the few available on the foreign exchange costs of Indian military imports. Table 15.1 is derived mainly from Terhal (1982). Although India gained foreign exchange advantages from offset arrangements, the table shows in column 8 that the total foreign exchange requirements for the Indian military and defense industry more than tripled in real terms between the early 1950s and the early 1970s. This increase is mainly due to increasing requirements of the domestic defense industry which grew tenfold (column 4).

Over the same time period, the foreign exchange requirements for direct import of weapon systems doubled (column 2). (Also see Deger, 1986, pp. 181–184; Terhal, 1981, p. 1996). Terhal estimated that by the late 1960s “the total foreign exchange

Table 15.2: Estimated foreign exchange requirements for direct military imports in India between 1950 and 1972 (US$ million-1972)

	(1)	(2)	(3)	(4)	(5)
1950–51	50	50	–	–	–
1951–52	50	50	–	–	–
1952–53	51	51	–	–	–
1953–54	57	36	–	–	21
1954–55	81	60	–	–	21
1955–56	105	102	3	–	–
1956–57	147	144	3	–	–
1957–58	153	150	3	0.2	–
1958–59	188	185	3	0.4	–
1959–60	213	210	4	0.6	–
1960–61	205	200	6	1	–
1961–62	169	153	17	1.3	–
1962–63	163	77	33	1.9	55
1963–64	258	123	77	3	62
1964–65	171	52	70	6	55
1965–66	179	29	107	12	55
1966–67	357	107	268	18	–
1967–68	126	47	100	28	7

1968–69	201	70	171	45	5
1969–70	162	77	138	53	–
1970–71	108	75	97	64	–
1971–72	243	97	219	73	–
1972–73	205	101	184	80	–

Notes: (1) total value of direct imports; (2) total foreign exchange requirements; (3) total value of eastern bloc direct imports; (4) foreign exchange requirements for eastern bloc direct imports; (5) grants and loans from western countries.
Source: Terhal (1982, tables I and III).

requirements for defense were at least equivalent in value to more than half the Indian import of machinery and equipment" (1981, p. 1996). India's strategy of reducing the foreign exchange burden through increased domestic defense production was not wholly successful. Further, licensed production involved component and material imports that continued to place a significant burden on India (Maheshwari, 2002, p. 190). Although India's arms import strategy led to significant advances in industrial capacity and technology accumulation, ultimately its domestic arms industry failed to achieve parity with the latest in international high-tech weaponry. This made India to remain dependent on direct imports for major weapon systems, thereby increasing the foreign exchange burden (Deger, 1986, pp. 136–138). India's debt burden worsened by the late 1980s and early 1990s. It appears that the repayment burden of defense imports was partly responsible for this.

However, as compared to the burden imposed by direct imports from western countries before the mid-1960s, the foreign exchange requirements of direct military imports from the former eastern bloc countries were significantly lower. Table 15.2 shows that although the overall foreign exchange requirements for direct imports from the eastern bloc increased over the years, the overall foreign exchange burden in the late 1960s and early 1970s was less than that of the late 1950s and early 1960s. The shift toward defense procurement from the eastern bloc started as from the mid-1960s. This suggests that at least the direct imports from eastern bloc countries offered "some relief for the foreign exchange problem" (Terhal, 1982, p. 152). It is quite likely that this burden would have been greater had India relied on direct imports from the west, as by the mid-1960s western grants and loans became insignificant (see table 15.2). Nonetheless, debt service and repayment of liberal credits received from eastern bloc countries, even though payable in Indian rupees, appears to have resulted in a significant burden on the Indian economy. Furthermore, it is likely that the availability of long-term credit from the east encouraged Indian policymakers to approve large scale defense procurement that, over the years, created a permanent economic burden.

In the 1980s and 1990s, India's defense expenditure has grown significantly which likely diverted resources from civilian needs. India suffered from large fiscal deficits as a result of escalating expenditure that consisted of three components: (i) interest payments; (ii) non-plan expenditure (the most important being on defense); and (iii) plan expenditure. According to the *Indian Public Finance Statistics* of 1994, the allocation for the defense forces in 1994–95 (Rs230 billion) exceeded the combined allocation for the

social and welfare areas (Rs223 billion). Capital expenditure for defense for 1994–95 (Rs68.3 billion) amounted to more than the combined allocation for social and welfare areas, education, agricultural services, railways, and post and telecommunication (Rs65.9 billion). As there was no increase in revenue over the years, "diversion of resources from other sectors to the defence sector has apparently taken place over the years" (Gosh, 1996, pp. 379–381). Therefore, it is likely that India has diverted significant foreign exchange from civilian areas to defense, at least for the time period examined here. This would suggest that the growth in defense procurement has created a permanent burden on the Indian economy, despite credits available on liberal terms from eastern bloc countries.

Conclusions

To achieve self-reliance in weapon systems by minimizing foreign dependence, India consistently employed three major offset options (although not formally set out): licensed production/technology transfers, countertrade or barter, and long-term credit arrangements. They were expected to help establish a domestic defense industry capable of meeting India's defense requirements and to reduce the foreign exchange burden. Imports from the Soviet Union constituted about 70 percent of India's total arms imports and involved all three types of offsets. The offset arrangements with western countries were mainly licensed production/technology transfer, and some credit provisions to ease the foreign exchange burden. Although there is some evidence that licensed production and cheap long-term credit retarded indigenous defense R&D, overall they appear to have helped India to develop significant defense industrial capacity and enhance its bargaining position with foreign suppliers today.

However, India failed to create a defense industry capable of supplying advanced weapon systems that would be competitive with western equipment. The technology gap has not closed. Although it was argued that cheap credits may result in increased equipment prices, and appears to be common in western arms deals, this problem is not considered significant for Soviet weapon systems. The countertrade arrangements with eastern bloc countries benefitted India in the short-term by reducing the foreign exchange burden. However, they appear to have been less beneficial in the long-term, as the debt and repayment burden increased. Countertrade does not appear to be an important offset option in relation to imports from western sources. Other offset options such as buyback have not been successful due to inherent constraints in the Indian defense industry. Overall, India's experience with Soviet offsets was positive. It is evident that despite facing unequal bargaining weight, India "acquired weapons from the Soviets in a manner that 'looks out for the best interests' of India" (Jacobs, 1991, p. 301). Since the collapse of the Soviet Union India has had to pay hard currency for all of its defense imports. Evidently, this led to resource diversion, including foreign exchange from civilian needs. India needs to formulate an integrated industrial policy framework by combining offsets, diversification of defense-based industries, and indigenous R&D to reduce its defense-related debt and foreign exchange burdens.

Notes

1. See SIRPI online data base at http://projects.sipri.org/milex/mex_database1.html.
2. See, e.g., Brauer (2002) and literature cited therein.
3. Switch trade: If Russia is paid for arms in Indian commodities, then Russia can export these commodities to hard-currency markets itself, for instance Indian rice via Russia to the UK. This will limit India's direct hard-currency sales to the UK (see Matthews, 2002, p. 199).

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Appendix

Table 15.3: Indian weapon imports and offset arrangements

Weapon system	*Imported from*	*Period*	*Offset arrangement*
Army			
Infantry/special forces			
FN-FAL rifles (7.62 mm)	Belgium	1980s/90s	Not known
Variants of AK-47s	Poland, Bulgaria, Romania, former East Germany	1980s	Not known
V 58 rifle	Czechoslovakia	1980s	Not known
Armored vehicles			
T-90s main battle tank	Russia	2000	$650–750m for 310 tanks+ complete technology transfer+ weapon systems
T-72M1 main battle tank	Former Soviet Union	1980s	Technology transfer; licensed production of over 1100 tanks by 1998
T-55 main battle tank	Former Soviet Union	1960s/70s	Assembled locally
PT-76 amphibious tank	Former Soviet Union	1960s/70s	—
Vijayanta	UK	1965–1984	Licensed production
AMX-13 main battle tank	France	1960s/70s	—
VT-72B armored recovery vehicle	Slovakia (Unimpex s.r.o., Martin)	1994–2000	$122m for 80 vehicles+ licensed production+technical know-how and industrial support to Indian firm BHEL
Infantry vehicles			
BMP-1 and BMP-2 infantry combat vehicle	Former Soviet Union	1980s	Licensed production (100 BMP-2/year)
OT-62/OT-64	Czechoslovakia	1970s/80s	—

Casspir mine protected vehicle	South Africa (Vickers OMC)	1999–2001	165 vehicles+technology transfer, training and spares
Artillery equipment			
130mm M-46 field gun (upgraded to 155mm/39 and 155mm/45 caliber)	Israel (Soltam Systems Ltd)	2001–2003	Guns+initial upgrade in Israel +supply of kits to upgrade locally at Gun Carriage Factory, Jabalpur
155mm Bofors FH–77B howitzers	Sweden (Bofors Weapons Systems)	1980s	Deal was worth $1.3b for 410 guns; planned licensed production was abandoned after corruption scandal
122mm BM-21 MRLS	Former Soviet Union	1980s	Licensed production in India
ZSU-23–2/ZSU-23–4 anti-aircraft systems	Former Soviet Union/ Russia	1980s/90s	—
40mm Bofors L/60 and L/70 AD artillery	Sweden	1980s/90s	Licensed production
Other weapon systems			
Milan/Milan-2 anti-tank missiles	France	1985–1990s	Licensed production
SS-11 anti-tank missiles	France	1971–1983	Deal was worth $7.5m; licensed production
Air Force			
Combat aircraft			
Mirage 2000	France	1980s	40 aircraft+technical assistance for local servicing+ license to manufacture spare parts; new order for 10 aircraft
Jaguar (Versions—IS, IM & IB)	France and UK	1970s–1980s	Licensed production; BAe supplied 40 aircraft
Gnat	UK	1963–1974	Licensed production
MiG-21 (different versions-FL, M, & BIS)	Former Soviet Union	1960s–1970s	Technology transfer and licensed production in India
MiG-23 (different versions—MF, BN & UN)	Former Soviet Union	1980s	—
MiG-25 (different versions—R & U)	Former Soviet Union	1980s	10 MIG-25R and 2 MIG 25U were supplied
MiG-27 ML	Former Soviet Union	1980s	Licensed production
MIG-29 (versions—B Fulcrum—A, S	Former Soviet Union	1980s	Part of a larger deal to buy tank, aircraft and other weapons; $830m was extended in

Fulcrum-C & UB Fulcrum-B)			credits for the deal; licensed production of MIG-29 subsystems and parts
Sukhoi SU-30 MK I flanker	Russia	1996	Originally 40 aircraft were ordered for $1.8b and then 10 more added to that; license production of 140+aircraft+ full technology transfer
Hawk 115 advanced jet trainer	UK (BAE Systems)	2003	66 aircraft ordered at an estimated cost of £lbn; technology transfer+licensed production
Transport aircraft			
Ilyushin-Beriev IL-76MD Candid	Former Soviet Union	1980s	28 aircraft supplied
IL-78/78M	Uzbekistan	2001	Six IL-78/78M in-flight refueling aircraft purchase at approximately $50 million each
Antonov AN-12	Former Soviet Union	1960s–1970s	—
Antonov AN-32	Former Soviet Union	1980s	80 aircraft supplied
HS 748M AVRO	UK	1964–1984	Agreement for assembling
Domier Do-228–101	Germany	1983–1990s	Licensed production
Helicopters			
Mil Mi-8 Hip	Former Soviet Union	1970s	—
Mil Mi-17	Former Soviet Union/ Russia	1980s	40 additional Mi-17 1 B were ordered for $170m in 2000
Mil Mi-25/35	Former Soviet Union	1980s–1990s	Mi-35 deal was worth $172m for 20 helicopters including spares; 15 Mi-25/Mi-35 were purchased from Kyrgyzstan in 1994–95
Mil Mi-26	Russia	1980s–1990s	—
HAL Cheetah (SA315B Lama)	France	1971–1985	Assembly+licensed production
HAL Chetak (Origin-Aloutte III)	France	1964–1990s	Licensed production
PZL-11 Iskra	Poland	1960s/1999	Supplied 50 aircraft from 1968 and additional 12 in 1999
Other Systems			
TRS-2215 surveillance radar	France	1983–1990	Licensed production

AA-2 Atoll air-to-air missile	Former Soviet Union	1968-1987	Licensed production
Navy			
Aircraft Carriers			
INS Vikrant (HMS Hercules)	UK	1961	
INS Virat (HMS Hermes R12)	UK	1987	Deal worth about $74m; life-extension re-fits
Guided missile destroyers			
Type 15 Delhi Class (hybrids of western and Russian technology)	Russia (Severnoye Design Bureau)	1997–2001	Provided design consultancy and technology and imported gas turbines from Russia and Ukraine
Rajput (Kashin II) Class	Former Soviet Union/ Russia	1980–1988	Considerable modifications to Kashin design; modernization by Russia including joint technology development of BrahMos cruise missile
Talwar (Krivak III) Class	Russia	1997–2004	$ 1 billion contract for modified Krivak design with stealth feature vertical launch missile system; involves 130 suppliers from Russia, Belarus, Ukraine, India, UK, Germany, Denmark, and others; involves a number of Indian component suppliers
Guided missile frigates			
Project 17 Nilgiri Class	Russia	2002	Jointly designed by India (Naval Design Bureau) and Russia Sevemoye Design Bureau; design: France (DCN International); project consultancy: Canada (CAE)—overall functional integrator
Type 16 Godavari Class	Mix of western, Russian, and Indian weapon systems	1983–1988	—
Guided missile corvettes			
Veer (Tarantul I) Class	Former Soviet Union	1987–1990s	5 vessels built in the Soviet Union and 8 more vessels built in India through technology transfer; technical assistance from Russia for modification of latest versions
Drug (Nanuchka) Class	Former Soviet Union	1970s	Three vessels built at Leningrad were supplied
Frigates			

Petya II Class	Former Soviet Union	1969–1974	9 vessels supplied
Nilgiri (Leander) Class	UK	1970s–1980s	6 vessels supplied
Corvettes			
Abhay (Pauk II) Class	Russia	1989–1991	Modified for India
Large/fast craft			
Sukanya Class	S. Korea (Tacoma)	1989–1993	7 vessels supplied
Super Dvora Mk II Class	Israel	1998–1999	2 were ordered from Ramta, IAI; more patrol craft (latest version) are produced locally
Osa I and II Class	Former Soviet Union	1960s–1970s	8 Osa H supplied in 1976–77
Magar Class amphibious warfare vessel	UK	1980s–1990s	Produced locally based on Sir Lancelot design
Ham Class minesweeper	UK	1968–1970	Licensed production
Type 773IM Polnochny C/D Class	Poland	1970s–1980s	8 vessels supplied
Submarines			
Nuclear submarine	Russia	1988–2007	India leased a Russian 670 Skat Class nuclear submarine; training Indians to operate and providing technical assistance to design and build five nuclear submarines in India
Project 75: standard conventional submarine—Scorpene Class	France (DCN International)	2001	6 submarines will be supplied + a technology transfer to build the rest in India
Foxtrot Class submarine (Type 641)	Former Soviet Union	1968–1974	8 submarines were supplied
Shishumar (HDW 209) Class submarine	Germany	1980s	4 submarines were supplied; plan for licensed production in India canceled and the contract was terminated
SindhuGosh (Kilo) Class	Russia	1986	Technical assistance to establish medium refit and upgrade facilities in India
Ugra Class submarine tender	Former Soviet Union	1968	
Naval aircraft			

Ilyushin I1–38 MAY	Former Soviet Union	1970	Russia to refit 5 IL-38
SA-316 B Chetak (Alouette)	France	1960s–	20 helicopters were supplied in 1963+licensed production
Dornier DO-228–101	Germany	1980s–	Licensed to be produced in India (HAL)
Tupolev TU-142 BEAR-F	Former Soviet Union	1970s–	Russia (Rosvoorouzhenie) to refit the aircraft
Kamov Ka-28 Helix-A	Former Soviet Union	1980s–	13 aircraft were supplied
Kamov Ka-31 Helix-B	Russia	1999	9 aircraft were supplied at an estimated cost of $207m
Sea King Mk.42A/B/C	UK (GKN Westland)	1973–1980 1985–1990	The 1984 deal was worth $900m for 20 Sea Kings + anti-ship missiles; affected by US sanctions (60% was grounded)
MIG-29K Fulcrum-D	Russia		50 aircraft at $3 0m each will be supplied as part of $ 1.5b Admiral Gorshkov aircraft carrier package
BAe Sea Harrier FRS Mk.51/TMk.60	UK	1984–1999	—

Sources: Ray (1986); Singh (1990); Nugent (1991); Smith (1994); Prasannan (2000); Jacobs (1991); Bedi (2000); *Statesman* (various dates); *The Asian Age* (various dates); *Independent* (4 September 2003); <http://www.bharat-rakshak.com>.