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paper 36

Changing Times? India's Defence Industry in the 21st Century

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India's Defence Industry in the 21st Century

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1. Introduction

1.1 Trends in the Global Defence Industry

Factors influencing the defence industry

The global defence industry[1] has undergone profound changes in recent years. Changes in demand for military weapons and equipment, the allocation of resources for national security, national and international security priorities especially by major states, among others, have affected the defence industry in many ways. While the Cold War era witnessed a massive military build-up by many countries, thus fuelling demand for this lucrative sector, the immediate post-Cold War period witnessed just an opposite scenario. Demand for military equipment went down during the late 1980s and early 1990s. Budgetary allocations for security sectors fell. Military downsizing occurred. In just a period of half-a-decade, roughly from 1987 to the early 1990s, the defence industry witnessed a different scenario[2] and shrank considerably. It had to shift priorities to adjust to the new

1 In the absence of a common definition and in the presence of a set of terms that almost denote the same meaning, like 'arms industry' and 'military-industrial complex' (MIC), a generally accepted term 'Defence Industry' is used here. Defence industry is referred to as an industrial unit or a set of units devoted to the production of military weapons and services for national security forces of the producing country. It also involves exports of such weapons and services for any buyer country or countries that (whose military forces) may intend to use them for national security purposes. Trade of these weapons and services involves state actors only.

2 Data on military expenditure, arms production and other factors affecting defence industry are published periodically and extensively by institutions like the Stockholm International Peace Research Institute (SIPRI), Arms Control and Disarmament Agency (ACDA), International Institute for Strategic Studies and others. For a broad description of trends in arms production and defence-industrial developments in the 1990s, see, Elisabeth Skoens and Reinhilde Weidacher, 'Arms Production', in *SIPRI Yearbook 2002: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2002) pp. 323–370. Data on conversion and disarmament activities are published extensively by the Bonn International Center for Conversion (BICC). For a comprehensive description of trends in disarmament and conversion see: 'Summing up Disarmament and Conversion Events: Change and Continuity after September 11', *Conversion Survey 2002: Global Disarmament, Demilitarization and Demobilization* (Baden-Baden, Germany: Nomos Verlagsgesellschaft, 2002), pp. 13–20.

environment. In brief, since the end of the Cold War, the defence industry has faced numerous challenges from all quarters.

Most of the decline in the volume of arms production took place during the early and mid-1990s. During this time, significant down-sizing, rationalisation and diversification (primarily into dual-use and civilian production) were witnessed in the defence-industrial sector. Mergers and acquisitions during the 1990s resulted in the creation of a few giant companies like Boeing, Lockheed Martin, British Aerospace, Northrop Grumman, EADS, and others. This also resulted in many smaller companies either having to merge with big ones or having to shift their priorities toward civilian production, thus leaving the defence sector. Defence industries of major countries like the United States and of Western Europe were affected most during this period although countries like Russia, Israel, South Africa, Brazil, India, and others were also affected.

Arms reductions during the 1990s were extensive and fetched a sizeable 'peace dividend'. It was desirable that such a decade of disarmament should have been extended. However, as evidence suggests, indicators of disarmament and conversion now show stagnation; in many cases even a reverse trend toward a strengthening of military postures are witnessed. A decade of cuts in military expenditure ended in 1998/99 when it went up again. The upward trend in military expenditure is likely to continue in future. The 11 September 2001 terrorist attacks in the United States are likely to result in a major shift in defence-industrial developments because of their impact on security requirements at national and international levels. But this is not to suggest that the upward trend in military expenditure was a product of such an unfortunate event. This trend had already started in the late 1990s, primarily because of increased military spending by countries like the United States and regions like the Middle East and South and East Asia.

A decade of cuts in military expenditure ended in 1998/99

In this changed scenario, the defence industry seems to gear up to meet new challenges. As procurement budgets have started to swell again and are likely to stay that way, new opportunities are expected for the defence industry. In fighting terrorism, additional defence programmes initiated by countries like the United States will most likely change the structure of the defence industry[3]. While it is expected that giant weapons producers, especially in the United States, are likely to benefit most from the on-going 'War on Terror', national defence industries elsewhere are also likely to reorient themselves to meet future challenges. In

[3] *Conversion Survey 2002*, Note 2, pp. 17–18.

brief, the global defence industry, after a period of significant downsizing and rationalisation, is likely to enter into a phase of renewed attention. Demand for smart weapons, increased emphasis on military technology including investment in R&D, growing demand for aerospace and cutting-edge technology products, are all likely to boost defence-industrial activities in many parts of the world.

1.2 India's Defence Industry

Trends in global defence industry have impinged India in many ways. India's defence industry has witnessed significant changes since the end of the Cold War. In the 1990s, changes in both institutional and policy spheres became more prominent. The most far reaching change that has occurred in recent years in India's defence-industrial sector is related to its opening up to the market. Long protected as a closed sector, India's defence industry has now opened up for private participation. As if this was not enough, it is also showing enough willingness to become an exporter and dares to venture into the competitive global arms market. How far it will succeed in its objectives is examined elsewhere, but changes are certainly a product of and response to the contemporary changes in the global industrial defence scenario. At the same time, it is also showing willingness to diversify its range of products, which not only include modern weapons systems but also technologies for wide and popular civilian uses. The Indian defence-industrial sector targets the national, and even global, civilian market to sell its products, especially in the fields of civilian space, medical, and electronics. Thus conversion through diversification has been witnessed in many areas of defence production in India.

Changes in India's defence industry since the Cold War

India's defence industry has come a long way from being at the lowest end of the production spectrum, catering to the maintenance and repair and overhaul of imported weapons, to a stage where it can boast of designing and developing a range of state-of-the-art weapons systems. Half a decade of defence-industrial experience in India shows that while it started from scratch, it has been able not only to learn and absorb various stages of production intricacies but also produce complex systems that are primarily an indigenous activities. Another important factor is that the Indian defence industry has produced various weapons systems under licenses acquired from various foreign sources. Although the first Prime Minister of India, Jawaharlal

Nehru, believed in 'self sufficiency'[4] in arms production, which became a policy mantra for subsequent years, it had to be supplemented by what is roughly called 'self-reliance in defence'[5]. Self-reliance does not preclude accessing external sources for technology and systems, or external help in any stage of the production cycle. It is the degree of dependency on external sources that is tested in the case of India's quest for self-reliance. India opted to choose an incremental path, in which it was necessary to continue to meet urgent requirements through imports while striving hard on achieving indigenous capabilities in defence production. Both policies continued till the late 1980s and many of the components of both still continue till today.

The 1990s witnessed a series of far-reaching initiatives in the field of national security, of which defence industry was a critical component. The creation of six Special Task Forces to reform major aspects of national defence co-ordination and management, under the Chairmanship of the then Defence Minister in 1994 may effectively be considered as the first major step after a long time to initiate and implement much-desired reforms in the defence-industrial sector. This was followed by a series of intensive interactions between various organs of the armed forces, government departments and institutions like the Confederation of Indian Industries (CII). The 'Army-Industry Partnership'[6], a partnership between CII and the Indian Army to get acquainted with each other's needs and to facilitate channels of communication between the armed forces and the private industry, was a result of this process and, in turn, led to other co-operative initiatives. Events like India's nuclear tests in mid-1998 and the Kargil conflict in mid-1999 provided grounds for an intense debate on various aspects of India's national security. Also, as a by-product of the current disinvestment programme, which is primarily aimed toward lessening or wiping out government control and responsibilities in state-owned public enterprises in India, the debate on a reform of the defence industry got a major boost as demands for a privatisation of and private participation in this hitherto closed sector grew more in tune with the changing times.

India's quest for self-reliance

4 Interview with K. Subrahmanyam in New Delhi.

5 For details, see, K. Subrahmanyam, 'Self-Reliant Defence and Indian Industry', *Strategic Analysis*, Vol. XXIV, No. 7, October 2000, pp. 1221-43.

6 This initiative was quite productive which led the CII to initiate a collective effort to influence changes in the defence-industrial sector. Interview with Mr. S. Sen, Dy Director General, CII, at New Delhi.

In January 2001, the Government of India initiated a series of major initiatives that, among others, included Foreign Direct Investment (FDI) up to about 26 percent and full private participation in certain sectors in the defence industry[7]. This policy indeed marks a critical departure from the past. Followed by this, the Group of Ministers (GoM) Report on 'Reforming the National Security System' was made public in early 2001. This laid stress on reforms in all-encompassing aspects of national security, of which changes sought in higher defence management emphasised the need to create specific institutions like the Defence Acquisitions Board[8] to adapt and facilitate changing needs of the defence industry.

Major initiatives

While these far-reaching institutional and policy-oriented changes have been underway for quite some time especially since the early 1990s, the demand for private participation has assumed significance in recent years. In such a scenario, analyses of India's defence-industrial sector and policies have become critically important to understand the complex web of linkages that determine national policies in the defence-industrial sector. This, in turn, needs a closer look into the past performance of the defence industry, lessons learnt and a peep into the likely future course.

1.3 Research Objectives

The objectives of this paper are primarily four-fold. First, the paper will examine critical aspects of defence-industrial policies adopted by India in the past and link those to performance. It will examine the factors that have influenced India's defence production and their co-relationship with policies and decision-making in this sector. Second, the paper will examine the main

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7 See, 'Guidelines for Licensing Production of Arms and Ammunitions', Press Note No. 2, Issued by Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, Government of India, 4 January 2001. Private participation and FDI in the defence sector are allowed in select sectors that the Government of India may decide from time to time. Although sectors like ordnance are open for private participation, the Government of India has not yet come out with any clear picture as to where one can invest or participate.

8 Many other institutional changes have also been sought in national security. For a detailed report on major recommendations in the field of defence production see: 'Reforming the National Security System', Recommendations of the Group of Ministers, Government of India, February 2001, pp. 110–112.

trends during the 1990s, during which major policy changes occurred. It will critically examine the impact of such policy changes. Third, the paper will examine the contemporary scenario. Fourth and last, it will look into future problems and prospects. The last two are essential in understanding the intricacies involved in India's defence-industrial strategies and are expected to give some clues related to the future course of action in this sector.

Some of the major queries that will be examined here are: Why a quest for self-reliance in the past? Has the policy of self-reliance paid off? If not, what are the options for the future? Why the changes in defence-industrial policies during the 1990s? Are the objectives achievable? What are likely options for the future? Does it have scope for more diversion, thus leading to conversion through the increase in civilian production, in future? The paper will invariably try to find answers to these queries, although not necessarily in the same order.

1.4 Methods and Sources

The paper will follow a general descriptive-analytical approach. The scope of the paper is limited somewhat to policy analyses due to constraints in the availability of information. This is because India's defence industry has long been a 'closed' sector and thus been under exclusive government control. It is only in recent times that it has opened up, thus leading to an availability of information in a low to medium scale. The paper will also follow a historical method whereby it will emphasise linkages at policy- and decision-making levels to performance, and this is important in understanding the nature of development that this sector has undergone for the past half-a-century. Available data on specifics will be evaluated. Emphasis will be on an evaluation and interpretation of data from primary (especially government) sources. In brief, the overall approach will be descriptive and analytical.

Research objectives

Literature on the subject is scarce. At international level, the study of India's defence industry has attracted very little attention. The same is true at national level. Barring a few books, written by scholars like K. Subrahmanyam, Air Marshal Samir Sen, Major General Pratap Narain, Chris Smith, WPS Sidhu, and others, substantial work is not evident on this subject. Occasional research papers by G. Balachandran, Rahul Roy-Choudhury, Ajay Singh and others have also focused on limited themes. Secondary and tertiary sources are scarce. This paper relies heavily on available primary and secondary sources. It also gives emphasis

on reports from tertiary sources like daily news papers and weekly magazines. Primary sources, however, constitute the most important component of this study. Annual Reports (published by the Ministry of Defence, Government of India), Annual Reports of major Defence Public Sector Units (published by respective organisations), periodic reports published by the Comptroller and Auditor General of India, Parliament Secretariat and similar other reports constitute primary sources for this endeavour. Select interviews with senior government officers, analysts and industry-watchers have been taken into account.

2. India's Defence Industry: A Historical Overview

2.1 Looking into the Post-Independence Era

Pre-independence

The pre-independence (pre-1947) defence-industrial infrastructure in India was limited. It generally catered to the lowest spectrum of defence production—repair and overhaul of imported weapons systems. The then ruling British followed a policy of retaining strategic capabilities for themselves while allowing the native Indians to assist in the tactical dimensions, confined to minor works in most endeavours. An example of this policy is evident from the fact that while the Royal Air Force retained the strategic elements like the bomber force and used their own formations, the Indian Air Force (IAF) was left with only tactical elements—supporting them with secondary and tertiary roles that mainly included repair and similar minor works[9]. The Walchand Aircraft Factory (WAF) in Bangalore was wholly engaged in repair and maintenance of aircraft at that time. From March 1942 till the end of World War II, it was employed for the servicing of American aircraft and was managed, for part of this period, by the US Air Force[10].

Mazagaon Docks (Mumbai) and Garden Reach Shipyards (Calcutta) similarly existed prior to India's independence to repair warships. However, apart from such single air or ship industrial units, India's defence-industrial capacity during times of pre-independence mainly consisted of what is known as Ordnance Factories (OFs). These factories had been set up primarily to supplement land-based weapons and equipment produced in Britain. Before 1947, there were 16 OFs, all located on Indian

9 Ajay Singh, 'Quest for Self - Reliance', in Jasjit Singh ed., *India's Defence Spending: Assessing Future Needs* (New Delhi: Knowledge World, 2001), p 127

10 Col. R. Rama Rao (Retd.), *Self Reliance and Security : Role of Defence Production* (New Delhi: Radiant Publishers, 1984), pp. 124-25.

territory. The gun and shell factory at Cossipore (near Kolkata), established in 1801, an ammunition factory at Kirkee of 1889, a rifle factory at Ishapore of 1901, a gun carriage factory at Jabalpur of 1904, and others were built mainly to produce for the British forces. During World War II, possible threats to the sea lanes of communication in the Indian Ocean and requirements of the allied forces in the region, made it necessary to double the number of factories during this time. The filling factory at Khamara and the light machine gun factory at Hyderabad were amongst such new factories. In brief, pre-partition Indian defence-industrial capacities were confined only to a supplementary role and were placed at the lowest end of the production spectrum.

Post-independence

Post-independence, the Indian leadership wanted self-sufficiency in every sphere of activity. This objective was obvious because India was never allowed to develop industrial competencies. The same objective was no different in the field of defence production. Right from the first Prime Minister Jawaharlal Nehru, every successive Indian leader sought self-sufficiency in defence production. The need to establish a comprehensive defence-industrial infrastructure thus constituted a primary objective of the political leadership. Right from the beginning, India's industrial policies emphasised 'core' industries to be taken care of by the central government and others by the states. Defence industries, considered as critical national assets, obviously came under the exclusive control of the central government. The first Industrial Policy Resolution of 1948, consequently revised under the Second Five-Year Plan in 1956, made it clear that core industries, including munitions, aircraft, shipbuilding, iron and steel, heavy machine tools, heavy electrical plants, atomic energy and similar others were to be placed under exclusive central government control. During this period, many industrial units related to these fields were established under the strict supervision of the central government, known as 'basic' (Schedule A) industries[11]. The Defence Science Organisation was also established during this period to take up the challenge of undertaking R&D activities. As demands for defence R&D grew, this organisation paved the way for the creation of the Defence Research and Development Organisation (DRDO) in 1958, which to-date remains the most important contributor to India's defence R&D activities. It has got nearly 50 laboratories, spread all across the country, and other scientific establishments and

[11] Ron Mathews, *Defence Production in India* (New Delhi: ABC Publishing House, 1989), p. 51

institutions like the Council of Scientific and Industrial Research (CSIR).

Ordnance Factories (OFs) ...

At independence, India's defence-industrial production was mainly coming from the existing 16 OFs. These factories were engaged in the production of low technology items like small arms and ammunition, mines and other explosives. Their cumulative value of production was estimated at roughly US $7-8 million during the time of India's independence. Despite the first India-Pakistan War (1947/48) and the need to boost defence-industrial production, no new factory was built during the first decade (1950s)[12]. It was during the late 1950s that the need to construct more factories was contemplated. It is also during this time that peace time civilian production in defence industries was emphasised, especially by the then Defence Minister, V. K. Krishna Menon. The policy of production for civilian markets was primarily aimed at maintaining operational capacities during slack periods of demand as well as keeping the level of productivity high by the manufacturing units[13]. By the end of the 1950s, the number of defence-industrial units almost remained the same. The production from these ordnance factories was still geared to low-technology items.

... and Defence Public Sector Units (DPSUs)

Apart from OFs, and various defence science and technology establishments, the Indian government also created a number of production establishments to take care of various productions in the field of defence. These, like others, were under the exclusive control of the government although they were created as corporations, commonly known as 'Defence Public Sector Units' (DPSUs). There are eight DPSUs in the country, devoted to the production of different military systems and components. They are: Hindustan Aeronautics Limited (HAL), Bharat Electronics Limited (BEL), Bharat Earth Movers Limited (BEML), Mazagaon Dockyard Limited (MDL), Garden Reach Shipbuilders and Engineers Limited, Goa Shipyard, Bharat Dynamics Limited (BDL) and Mishra Dhatu Nigam Limited (MDNL). Both, DPSUs and OFs, are administered by the Department of Defence Production under the Ministry of Defence. Both sets of industries have their own research and development units although the overall R&D activities are met by the DRDO. Bharat Electronics Limited (BEL) was the first DPSU, established in 1954, to manufacture electronic equipment primarily for the defence sector. Over the years, more than half of

12 Major General Pratap Narain (Retd.), *Indian Arms Bazaar* (New Delhi: Shipra Publications, 1994), p. 67

13 Note 12, p. 67

BEL's overall production has turned into products for the civilian market. And it is not the only production entity that has changed that way.

In the post-independence period, till the war with China in 1962, India's defence-industrial base was too weak to take the responsibility of all defence needs. The self-sufficiency model had been adopted since the beginning but as years passed and demands for security grew, India found it difficult to create an industrial base as it was hit primarily by two important factors – lack of sufficient funding and access to modern defence technologies. The Indian leadership was aware of these two problems but they also had a number of other issues to handle. The country was just independent, had already fought a war with Pakistan, did not even have a rudimentary industrial base, and faced numerous nation-building and socio-economic problems. independence, found it pragmatic to follow a policy of controlling critical industries, including defence, though this is widely debated now. Although both defence and non-defence critical industries were under exclusive state control, the former—due to their strategic importance—became a 'closed' sector. The leadership also desired and pursued what is commonly known as comprehensive industrialisation. This meant that more and more big industries emerged to cater to needs that were vast, like steel, coal, mining, etc. Thus, big state-owned companies like the Steel Authority of India Limited (SAIL) was established. This was also evident in the defence sector where large industrial units were created to cater to the demands of the vast armed forces.

Self-sufficiency and its drawbacks

As mentioned, the two problems of lack of investment and access to technologies became acute as the defence industries expanded, making many units perform below par. Also, investment pattern in this sector was not uniform. Critical establishments like the Hindustan Aeronautics Limited (HAL) and DRDO received more funds than others, such as OFs[14]. The ever-growing demands of the armed forces and the problems in the defence sector in meeting those led many to criticise existing policies followed by the then ruling party. The government, in turn, was hard pressed for funds that were essential and was aware of long-term returns for investment in the defence sector. In brief, policies to maximise production in order to attain self-sufficiency in the defence sector although they were considered far-sighted, did not match expectations, thus leading to further constraints.

[14] Interview with a senior government official.

2.2 From Self-Sufficiency to Self-Reliance

The chimera of self-sufficiency in defence production was in fact realised from the beginning, and was complemented by the concept of self-reliance after a few years of persistence and failure. Self-reliance, as far as India was concerned, meant—apart from its own production base for support—a degree of dependence on reliable foreign sources for access to technologies, supply of components and complete systems. This, in turn, was debatable as foreign partners to achieve such long-term self-reliance were not forthcoming during the first few years as the West was considered to be unreliable both for military and political reasons[15]. India tested self-reliance by meeting urgent and immediate demands through imports from abroad while simultaneously striving for indigenous capabilities in defence production. The west European weapons systems, primarily British, French and Swedish, were considered first choice in the Indian arsenal during the first few years; however, after the 1962 war with China, many western countries along with the United States were reluctant to co-operate with India which made a major adverse impact on India's defence production activities. The post-War scenario witnessed a slow entry of the Soviet Union as a major supplier, the position is still retained by its successor Russia.

Self-reliance ...

The post-1962 scenario was marked by utter confusion in the decision-making circles, which in turn impinged the defence industry. India was humiliated in the war with China and thus started looking into its existent defence-industrial capabilities and found to its horror that all was not well. For example, the Indian Air Force (IAF) needed a high-altitude supersonic interceptor against the threat of the B-57 bomber of Pakistan (supplied by the United States) and the Tu-16 bomber of the Chinese Air Force (supplied by the USSR). The requirement especially assumed a serious dimension after the war with China, when India looked outward and found out that only three fighter aircraft worth-considering were available in the market. India neither wanted to buy the British Lightning nor the Soviet MiG-21, and preferred the American F-104. This system was already supplied by the United States to Pakistan and despite repeated efforts India could not obtain it. India's effort to upgrade the existing HF-24 to supersonic capability was not considered by the Americans, either. It was at this time that the USSR came to India's rescue when they not only decided to supply the MiG-21 and other

[15] Interview with K. Subrahmanyam in New Delhi.

weapons but also gave a go-ahead for license production. India's quest for self-reliance got a major boost through this license production arrangement[16]. This was indeed a turning point in India's self-reliance activities. The Soviets proved to be a trusted friend whose military supplies constitute more than 70 percent of India's total weapons acquisitions now. This friendship immensely benefited India's defence industry as it improved many notable weapons systems and components from this experience. In brief, India's self-reliance model in defence production was given a life lease by the Soviets.

.... and license production

After 1962, India sought to make up for the lacuna as well as boost defence production to match requirements. New ordnance factories were planned and established during the next three decades. The number of OFs thus grew to thirty-five by the mid-1980s. And, by the mid-1990s, it had reached thirty-nine. The fortieth ordnance factory (at Nalanda, in the state of Bihar), started in 1999/2000, is expected to be established by 2005/06[17]. These OFs were established in different parts of the country: Ten of them cater to materials and components, ten for weapons, vehicles and equipment, ten for ammunition and explosives and five for other ordnance items. By the early 1990s, they were producing more than 1500 items of arms, ammunition, equipment and components[18]. By the early 1990s, the OFs collectively reached place 45 on the list of the largest arms producing companies in the world, and were placed at 29 in 2000.[19]

The OFs, with a cumulative work force of 1,75,000, have been engaged in various types of land-based weapons. During the period under examination, the bulk of the production, nonetheless, still constituted of large quantities of relatively low- to medium- technology items. These, among others, included small arms, anti-tank and anti-aircraft guns, mortars, associated ammunition, rocket projectiles, bombs, grenades, mines, transport vehicles, leather items, parachutes and ordnance clothing for the armed forces. The establishment of the Heavy Vehicle Factory at Avadi (in the state of Tamil Nadu) in the early 1960s was crucial for the production of tanks and combat vehicles. This is where

16 Ajay Singh, note 9, p. 131

17 Annual Report : 2001–2002, Ministry of Defence, Government of India, p. 56

18 Rahul Roy-Chaudhury, 'Defence Industries in India', in Jasjit Singh (ed.), *Asian Strategic Review: 1993–94* (New Delhi: Institute for Defence Studies and Analyses, 1994), p. 236

19 Table 7.2 (Appendix 7 A), *SIPRI Yearbook 2002* (Oxford: Oxford University Press, 2002), p. 358

the first series of tanks, called 'Vijayanta' were manufactured under license from the British firm Vickers. This was followed by the manufacture of the ex-Soviet T-72 'Ajeya' MBTs. Although this project was taken up during the 1970s, it finally rolled out in 1988. In some projects, however, the level of indigenization has been pretty high, for example, up to about 80 percent in the case of 'Sarath' infantry combat vehicles[20]. The overall performance of the OFs during that period was modest, although a lot could have been done to improve the performance of many factories.

Hindustan Aeronautics Limited (HAL)

Hindustan Aeronautics Limited performed modestly during this period. Created in 1964 through an amalgamation of two aircraft companies, Hindustan Aircraft Limited and Aeronautics India Limited, HAL has become the only major aerospace company. With a total work force of nearly 45,000, it stands as the 57th largest defence company in the world.[21] During the beginning , it was primarily catering to maintenance and overhaul but over a period of time has slowly developed itself to undertake assembly, license manufacture and indigenous design and development. During the 1960s and well beyond, it was engaged in various license manufacture projects, amongst others the MiG-21 series aircraft, HF-24 Marut transonic fighters, 'Kiran' HJT – 16 jet trainer.. Apart from this, it also undertook to license manufacture 'Cheetah' (Aerospatiale SA 315 B) and 'Chetak' (Aerospatiale SA 316 B) helicopters. Bharat Electronics, set up in 1954 to manufacture electronic equipment, was perhaps the only DPSU which showed positive production results during the same period[22]. Other DPSUs such as BEML, BDL, MDL were engaged in production, which may again be termed as modest. Bharat Dynamics Limited, established in 1970, is the other DPSU, which was engaged in the production of missiles and associated products. Except during the 1990s, it had engaged in the past in license manufacture of some of the low range missile series.

To sum up: While the Indian defence industry was expected to raise its production level during the half a century (1960s to mid-1980s), both its objectives of self-reliance through indigenous activity and more active collaborative activity, have brought very limited results. Some analysts even term this phase

20 In this and several other cases, the OFs have also outsourced several components to the private companies. See, *Annual Report 1992-93*, Ministry of Defence, Government of India, p. 39.

21 *SIPRI Yearbook 2002*, p. 356

22 BEL is the one of the prominent 'relatively low defence dependent' DPSUs with its share of civilian production exceeding 60 percent. For details, see, *Annual Report 2001-02*, pp. 62-63. Also see, Rahul Roy-Chaudhury, note 18, pp. 243-245.

as an 'era of license-manufacture'[23], nothing more. While plant utilisation capacities remained at the lower end, with around 40 to 50 percent, the quality, range and mode of production was modest and generally confined to low and medium technologies.

2.3 Gaps Galore

From the early 1960s till the early and mid-1980s, license production and direct purchase and acquisitions remained the predominant form of supply for the Indian defence forces. Analysts like Ajay Singh argue that there was a gap of nearly three decades in India's effort toward indigenous production[24]. This gap was especially evident in the fields of design and development, which constitutes the upper spectrum of self-reliance. A fighter aircraft between Marut and the Light Combat Aircraft (LCA), a basic trainer aircraft between HT-2 and HPT-32, an intermediate trainer between Kiran and an yet-to-be fully developed Advanced Jet Trainer (AJT) are some of the examples that typify both the technology and production gaps. Weapons for the army had been manufactured under license with no significant design activities undertaken till the 1980s when a tank and a small arms project commenced. The first was a Main Battle Tank (MBT, named Arjun) while the last is known as the Indian Small Arms Systems (INSAS). The Situation was a little better for the Indian Navy, where at least some ship platforms were designed indigenously. The period thus witnessed a time gap in the design and development while emphases were more on license production and acquisitions that led to two problems – below par quality performance of the defence industry, although the quantum of production was on expected lines and lack of or little funding for critical and strategic sectors of the defence industry including R&D. Analysts also argue that given the situation even half the allocation for acquisitions would have been

Gaps in design, technology and production

[23] Chris Smith, *India's Ad-hoc Arsenal: Direction or Drift in Defence Policy?* (Oxford: Oxford University Press/SIPRI, 1994), p.48. Also see, WPS Sidhu and Chris Smith, *Indian Defence and Security : Industry, Forces and Future Trends*, Special Report, Jane's Information Group, Surrey, June 2000, pp. 129-135.

[24] Ajay Singh, 'Quest for Self-Reliance', note 9, pp. 125-56. While analysts like K. Subrahmanyam, Ajay Singh, and others have been moderately critical, analysts like Chris Smith and WPS Sighu have been overtly critical of India's defence-industrial capabilities. This paper demonstrates that while there have been enough problems due to a number of factors, performance of India's defence industry has been quite moderate and even impressive in some quarters.

sufficient to ensure delivery on time, if not at the required level of technology.

Figure 1: Trends in India's Defence Expenditure: 1980–2000

Data on defence expenditure in India

Year	Defence Expenditure [a]	GDP Current Market Prices [a]	Population	Armed Forces (in thousands)	Central Government Expenditure (CGE)	DE/GDP(%)	DE/CGE (%)
1980/81	38.66	1,360.1	689	1,104	224.9	2.84	17.19
1981/82	46.51	1,597.6	704	1,104	254.1	2.91	18.31
1982/83	54.08	1,781.3	720	1,120	304.9	3.04	17.74
1983/84	63.09	2,075.8	736	1,250	359.8	3.04	17.53
1984/85	66.60	2,313.4	752	1,380	438.7	2.98	15.18
1895/86	79.87	2,622.4	768	1,380	531.1	3.05	15.04
1986/87	104.7	2,929.4	784	1,380	640.2	3.58	16.37
1987/88	119.6	3,322.0	800	1,380	703.0	3.59	17.02
1988/89	133.4	3,957.8	812	1,360	814.0	3.37	16.39
1989/90	144.1	4,568.2	825	1,260	950.5	3.17	15.17
1990/91	154.2	5,355.4	843	1,200	1,040.7	2.88	14.70
1991/92	163.4	6,168.0	858	1,200	1,127.3	2.65	14.50
1992/93	175.8	7,059.1	877	1,150	1,259.2	2.49	13.96
1993/94	218.4	8,769.5	892	1,150	1,457.8	2.49	14.98
1994/95	232.4	10,378.4	910	1,100	1,669.9	2.24	13.92
1995/96	268.5	12,179.6	934	1,100	1,852.3	2.21	14.50
1996/97	295.0	14,098.4	950	1,145	2,112.5	2.09	13.97
1997/98	352.7	15,635.5	973	1,145	2,320.6	2.26	15.20
1998/99	398.9	17,668.1	981	1,100	2,819.1	2.32	14.60
1999/00	456.9	19,788.3	995	1,100	2,838.8	2.31	16.10
2000/01	570 [b]						
2001/02	650 [c]						

US $1 approx. Rupees (Rs.) 45. The estimates have been derived accordingly.
[a] in billion Rs. [b] Revised Estimates [c] Budget Estimates

Sources :*Defence Service Estimates*, Government of India, for relevant years
Economic Survey, Government of India, for relevant years
Annual Report, Ministry of Defence, Government of India, for relevant years

3. Trends in the 1980s and 1990s

3.2 Defence Production during the 1980s and 1990s

The of model of self-reliance, adopted by the defence industry during the 1960s and continued since then, became more prominent during the mid-1980s. After a critical gap in access to defence technology for more than two decades, the defence industry started looking for enhancement of its performance level. This period was also witnessing profound changes in the international security environment. Global defence expenditures rose to an all time high in 1987 and then fell sharply during the late 1980s and early 1990s. Major production initiatives were curtailed and funding slashed. The Cold War came to an end but South Asia faced a security threat of a different kind. The superpower involvement in Afghanistan left a huge quantum of surplus small arms, which were redirected toward armed violence in Kashmir and Northern Sri Lanka and the volume of general lawlessness and crimes grew manifold. This was also the time when Pakistan was developing its clandestine nuclear programme which reached a critical threshold in 1987. The decision to accelerate India's nuclear programme gained momentum as of the early 1980s when leadership received positive information on the fact that Pakistan was working on a nuclear programme. Although the option had been kept open since the late 1960s, Indian leadership had gone slow after the 1974 Pokhran nuclear test, classified by India as a PNE (Peaceful Nuclear Explosion). As is mentioned before , defence production was quite modest during the previous decades and it was desired that it should pick up momentum. Hence, one may notice a kind of upswing in India's defence production activities during the early 1980s, which continued thereafter. This was due both to internal and external factors, as cited above, but was more driven by a sense of urgency that was long lacking[25]. It is also interesting to note that while during the 1960s and 1970s the overall expenditure toward defence lay well below the 3 percent mark of the GDP, it started expanding beyond this mark for some years in the 1980s, only again to fall well below this mark in subsequent years[26]. Major acquisitions from abroad coupled with major initiatives in indigenous defence production, including R&D, activities mark this period.

Defence production

25 Interview with senior Government officers in New Delhi.

26 For detailed data, see Figure 1.

Indigenous production

The OFs during this period were engaged primarily in manufacturing a series of licensed production items and were also striving for indigenous design and development. MBTs, ICVs, and small arms were some of the products which were produced with interest. In the MBT series, 'Ajeys', a licensed manufactured version of the T-72, was considered as a major step forward which emboldened the OFs further to produce 'Arjun'[27], an MBT conceived during the 1970s and designed and developed in the 1980s and 1990s, which came out for serial production during the mid-1990s. Arjun is dubbed as a fine indigenous product by India although a minor portion of its components were imported which have subsequently been modified. Similarly, Sarath ICV was developed with full indigenous activities and is doing well for the armed forces. The latest generation INSAS, the 105mm light field gun, mortars, carbines, light machine guns, and related ammunition were produced in several of OFs. Of note is the latest generation of 5.56mm INSAS assault rifle, which is said to be an equivalent of an AK- assault rifle. Production of all these systems were going on with average to expected turnover during the 1990s.

In the field of aerospace, a series of new projects were begun and licensed production continued during this period. After the MiG 21 aircraft, Marut transonic fighter, HAL started looking for new products. Since the early 1980s, among others, it has taken up the license manufacture of Jaguar deep penetration strike aircraft (from France). The first aircraft of this type was delivered to the Air Force in 1987/88[28]. HAL had already handed over the contemporary version of the Mig (named MiG - 27M), which was license manufactured for the Indian Air Force. During the mid-1980s, HAL produced the first Dornier Do-228 transport aircraft and, had indigenously designed the modified version of the Kiran trainer by 1989/90,. In fact, production of Kiran MKII (license manufacture) and Dipak basic trainer aircraft had commenced in 1983/84[29]. During the 1990s, it engaged in manufacturing the R-25 and R-29 B aero-engine for fighter helicopters. It is modernising the Air Force fleet of Jaguar and is also engaged in

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27 Details about Arjun MBT is described in Air Vice Marshal Samir K. Sen, *Military Technology and Defence Industrialisation: The Indian Experience* (New Delhi: Manas Publications, 2000), pp 92–104. Also see, Eric Arnett, 'Military Technology: The Case of India', in *SIPRI Yearbook 1994*, pp. 42-43

28 *Annual Report 1987-88*, Ministry of Defence, Government of India, p. 35

29 *Annual Report 1984-85*, Ministry of Defence, Government of India, p. 50

the overhaul of airframe and accessories of the Mirage-2000 series of fighter aircraft. Among its most recent pride, is the indigenously designed prototype of the Advanced Light Helicopter and the involvement in the initial stages for the Indian AWACS project and, along with the Aeronautical Development Agency (ADA, based in Bangalore), its responsibility for the design and development of the Light Combat Aircraft (LCA). The LCA has been in the news for quite some time because of long delays in flight testing. Tests of the engine for the prototype (GE-404, supplied by the General Electric Corporation of the United States), however, were successful. Apart from undertaking these programmes, which are primarily for military uses, it has contributed significantly to the civilian sector as well, as is explained later. It is worth noting that HAL has contributed at various stages to India's space programme. Light alloy structures, specially designed tanks, and many other components of India's PSLV programme were manufactured by HAL[30].

Light Combat Aircraft

It is during the early 1980s that India undertook a major initiative in the production of missiles. In 1983, an Integrated Guided Missile Development Programme (IGMDP) was initiated under the Defence Research Development Organisation (DRDO). This programme was crucial to India's national security as for the first time it made a decision to produce its own brand of missiles. Although missile technology was and its applications were long in existence in many parts of the world, it took India some time because during the 1970s it was going for indigenous development only. For this purpose, a new DPSU, named Bharat Dynamics Limited (BDL), was created. Since its establishment in 1970, it has been engaged in production activities, both through license manufacture and, since the 1980s and 1990s, through indigenous development. In the latter, it is closely linked with the DRDO, which is responsible for R&D activities in missile technology. BDL entered into an agreement with the French company, Aerospatiale for license manufacture of the SSI anti-tank guided missile. Production of this series was continued during the whole of the 1970s and early 1980s. It is to be noted that the content of indigenously produced parts in this missile was more than 70 percent while only the warhead contained more than 80 percent[31]. This was hailed as a major success. The next series of anti-tank guided missile replaced SSII in 1985 when

30 Air Vice Marshal Samir K. Sen, Note 27, p. 112

31 *Annual Report 1984-58*, Ministry of Defence, Government of India, p. 74

Figure 2: India's Defence Industry: Select Indicators

Industry / No of Units	No. of staff (app.)	Value of Production 1980-81 a)	Value of Production 1990-91 a)	Value of Production 2000-01 a)	Major Production (Indigenous and Others including future projections)	Defence / Civil Sales in % (1993-94)
Ordnance Factories /39	173,000	6,710	26,510	55,360	Arjun, T-90, T-72, ICVs, INSAS	90/10
Hindustan Aeronautics Limited /14	45,000	1,580	8,958	26,032	Cheetah, Chetak, Marut, MiGs, LCA, PTA, ALH, etc	94/06
Bharat Electronics Limited / 9	19,400	808	7,002	17,875	Sonars, communication systems, electronics	45/55
Bharat Earth Movers Limited / 4	15,800	982	7,793	13,431	Military vehicles, heavy earth moving equipment	6/94
Mazagaon Dockyard Limited / 4	13,700	869	3,085	7,115	Delhi class, Veer corvettes, Khukri	45/55
Garden Reach Shipbuil-ders & Engineers Limited / 2	10,300	392	1,868	4,910	Brahmaputra class Frigates, Khukri, merchant ships	82/18
Goa Shipyard Limited / 1	2,200	688	810	1900	Samar OPV, Fast attack Patrol crafts, Sukanya OPV	99/01
Bharat Dynamics Limited / 1	2,000	404	1,370	2,186	Prithvi missiles, Akash, Trishul SAMs, Nag ATGM, INSAS LMG, etc	99/01
Mishra Dhatu Nigam Limited / 1	1,500	160	456	1,138	Various alloys, specialised metal plates and others	50/50

a) in million Rupees (Rs.) (US $1 approx. Rs. 45.)

Source: *Annual Report*, Ministry of Defence, Government of India, for relevant years
Annual Report, Ordnance Factories and DPSUs, for relevant years

serial production of 'Milan' started[32]. The first indigenously developed 'Nag' ATGM to replace Milan has been well underway for quite some time and has already been introduced with the armed forces. Two more versions of short range surface-to-air missiles, Trishul and Akash, after necessary tests and extensive user trials, have been inducted. In surface-to-surface missile series, 'Prithvi' has already been inducted and is currently with the 333rd Missile Group of the Indian Army. It is claimed that more than 90 percent of these missiles are indigenously developed with very little components bought from abroad[33]. BDL's most famous production is related to three versions of ballistic missiles, named 'Agni'. The 'Agni' is wholly indigenous in terms of its design and its re-entry and propulsion systems. It has three versions so far—Agni I, Agni II, and Agni III. Details of this series of ballistic missiles are explained in the subsequent section.

Three DPSUs are engaged in defence production for naval forces. Mazagaon Dockyard Limited (MDL) is the largest and one of the oldest in the Indian defence industry[34]. Along with Garden Reach Shipbuilders and Engineers, it has been engaged in both repair, maintenance of warships as well as production. Both DPSUs have constructed a series of specialised vessels such as frigates, destroyers and submarines. In the late 1970s, after the successful construction of a series of Leander class frigates through license manufacture, the MDL undertook a follow on class of 3,600 tonne frigate, called 'Godavari'. This class of frigate was produced mainly during the 1980s. Also during the same period, it produced two larger 6,500 tonne- 'Delhi' class destroyers as well as two 1,500 tonne- Shalki class HDW – 209 Type submarines[35]. Indigenously built submarine 'Shankul' was commissioned into the Indian Navy in 1994. In addition, both the DPSUs have built several patrol and coastal combatants for the Indian Navy and the Coast Guard.

Mazagaon Dockyard Limited (MDL)

Production patterns during the 1980s and 1990s show that India has been able to initiate a number of projects for indigenous development in the defence sector. This has been partly possible due to increased allocation of funds for these projects as well as for R&D. Both the former and the latter have been given

32 Milan was produced under license with a French company. For details, see, Note 27, p. 120

33 Interview with senior MoD official in New Delhi.

34 For details about indigenous production for the Indian Navy, see, Chris Smith, *India's Ad-Hoc Arsenal : Direction or Drift in Defence Policy* , Note 23, pp. 153 – 56.

35 *Annual Report: 1987-88*, Mazagaon Dockyard Limited, 1988, p. 14. Also see, *Jane's Fighting Ships 1993-94*, pp. 282-83.

importance since the early 1980s. However, during the last two decades, funding was also cut or stopped many times, leading to a delay or abandonment of projects. This is common knowledge. For example, the project for LCA has been especially controversial as main reasons for its delay have been attributed to both funding and lack of access to technology[36]. It is also expected that an increase in defence R&D (which is currently increasing and is expected to increase further) will boost indigenous production activities[37]. However, the proportion of allocations for R&D still remains well under 10 percent.

3.2 Major R&D and Other Initiatives

As mentioned earlier, it was during the mid- and late 1980s , that the Indian defence industry got renewed attention. During this period, several projects were undertaken and carried out in the defence sector, many of which have been continued until today and are expected to continue in future. Many new projects have been added and are expected to be initiated in the near future. DRDO has been especially geared up to initiate and further R&D activities to boost and complement the defence industry in this regard.

Versatility of 'Agni' missiles

The DRDO, born out of the Defence Science Organisation during the 1950s, has contributed immensely to defence R&D in the country. With a network of nearly 50 laboratories/ establishments spread across the country, it has been considered as the main pillar of India's research activities. [38] Its achievements have been far and wide, most importantly including the IGMDP, MBT, LCA and other programmes. Under the IGMDP, it has been engaged in several series of missile programmes as explained earlier. Its latest endeavour includes the 'Agni' series of missiles with several tests conducted in recent years. The 2,500 km 'Agni II has been operationalised and is ready for induction in the armed forces. In addition to this, recent successful test of medium range Agni I (700-750 km range), single-stage and solid propelled, designed to fill the gap between Agni II and Prithvi, has been

36 Eric Arnett, 'Military Technology: The Case of India', in *SIPRI Yearbook 1994*, pp. 349 – 50.

37 WPS Sidhu and Chris Smith, Note 23, p. 134

38 For a brief description of the role of DRDO in recent times, see, Air Marshal B D Jayal, 'Defence R&D and Defence Production', *Journal of the United Services Institution of India*, Col. CXXXI, No. 546, October-December 2001, pp. 531-533.

hailed as a major achievement.[39] It is also reported that the Agni I has been specially designed with Pakistan in mind. It is likely to be operational by the end of 2003[40] which will depend on the results of more tests this year. The Agni-III ballistic missile, with a strike range of 3,500 to 4,000 km, the technology not being too different from the earlier versions of Agni, is being developed and is likely to be tested by the end of this year[41]. The solid-fuelled Agni-III will be both rail and road mobile to confer operational flexibility in deployment. It will be an entirely new vehicle, along with an inertial navigation system, to accord capabilities to deliver a one-tonne warhead. According to some analysts, a fourth version of the ballistic missile, named Agni-IV, in the range of beyond 5,000 km, is also underway. This would provide India with ICBM capability. If this was not enough, there are also reports that an ICBM programme, code named 'Surya' has also been started since the mid-1990s. This missile will probably be nuclear tipped and is likely to have a range of 8,000 to 12,000 km. It will be based on components developed from the Agni series and the Polar Satellite Launch Vehicle (PSLV) programme, the latter successfully initiated and undertaken by the Indian Space Research Organisation (ISRO)[42]. However, high ranking defence ministry officials and others responsible for such a kind of programme deny this. They argue that India does not need an ICBM programme as its security needs can be met effectively by IRBMs. Agni can act as a classic deterrent against any potential adversary, they say. According to a well-respected scientist, India is trying to develop a ballistic missile defence system like a hypersonic class of missiles and long-range detection and tracking radar with the objective of countering incoming missiles and other forms of offensive weapons. Hence, India has its eyes on developing defensive weapons systems[43]. While design and

'Agni' as ICBM ?

39 'Agni-I, Brahmos may be operational by end-2003', *The Times of India* (New Delhi), December 31, 2002.

40 'India to conduct more tests of Agni-I and Prithvi missiles', *The Hindustan Times* (New Delhi), December 31, 2002.

41 According to Dr V K Atre, Director DRDO and Scientific Advisor to the Defence Minister, successful tests of all missile and other products demonstrate India's technology prowess. See, 'Agni-III test likely by year-end', *The Times of India*, 11 January, 2003.

42 WPS Sidhu and Chris Smith, Note 23, pp 103-04

43 Dr V K Saraswat, Director of Hyderabad-based Research Centre Imarat (RCI), brushes aside queries related to India's interests in long-range ICBMs by arguing that, even though the country faces security threats, these are not of the kind that would require ICBMs. He, instead, puts his emphasis on the development of defensive

development of weapons systems rest with DRDO, which in turn takes technical and other inputs from other scientific institutions like ISRO, the Indian Institute of Technology (IIT) and others, the production rests with the respective DPSUs and OFs. Missile production has been entrusted to BDL.

Tactical battle-field weapons systems....

Apart from strategic weapons such as ballistic missiles, several tactical battle-field weapons systems have been developed and produced by India. The Prithvi, Trishul, and Nag fall under the latter category. Serial production of Prithvi missiles has been started by the BDL and delivered to the armed forces. Trishul and Nag have been periodically tested and serial production of these two missiles are expected shortly. Another much publicised weapon system developed jointly by India and Russia, called Brahmos, a supersonic cruise missile, was tested recently. The first trial of Brahmos took place in 2001 and the second in 2002. The recent test of this missile took place from a naval vessel. High speed, stealth properties, advanced jamming protection and highly explosive warheads are some of the features of this missile which has a range of 290 km and a payload of up to 300 kg. This missile can be launched from multiple platforms – ship, land, submarine and air. The missile is expected, after a successful series of trials, to go into serial production by the end of 2003. Various versions will be developed, its air-to-ground version is configured to be fitted in the Su-30 MKI multi role fighter aircraft[44]. All versions of this missile are also slated for sale on the international market.

Most recent developments in the fields of aerospace and other areas, in which India's defence industry is intricately involved, are many. They include the project on the Unmanned Aerial Vehicle (named 'Nishant'), which has cleared all tests. The Pilot-less Target Aircraft 'Lakshya', after a series of successful trials, is inducted into the IAF and Navy. The LCA programme, which started during the 1980s and had faced a lot of troubles, both financial and mainly technological[45], has been accelerated again since the late 1990s. Despite these difficulties, already forty-eight test trials have been conducted and the second prototype is already on its way to have flight trials. The third prototype is

weapons. See, 'India developing ballistic missiles to counter threats', *The Hindu* (New Delhi), 10 February 2003.

44 ' India's Cruise Missile', *The Hindu*, 15 February 2003.

45 The LCA programme has generated a lot of debate within India and elsewhere. See, 'A Project with Promise, *The Hindu*, 28 January, 1993. Also, Air Marshal B D Jayal, 'India's Defence Research and Industry', *Indian Defence Review* (New Delhi), Vol. 16, No. 2, April-June 2001, pp. 15-16

slated to be built by the end of 2003. According to the Secretary, DRDO, Dr. V. K. Atre, five more prototypes are intended to be built and the aircraft is planned to be inducted into the IAF after initial operational clearance in 2005/06[46]. The Air Force is expected to have four operational squadrons of LCA between 2010 and 2015. The task of such a huge order is taken up by the HAL, which is quite hopeful of meeting the expectation. Kaveri aero-engine for the LCA, an indigenous project to replace the GE-404 for the LCA, is currently undergoing high altitude tests in Russia. A success of Kaveri, the first endeavour to produce an advanced aero-engine in India, is certainly going to boost the confidence of both the scientific and defence-industrial establishments manifold. This will also signal, along with LCA, a new era in the field of aerospace in India. As a spin-off project, its marine version is also contemplated.

... and the LCA programme

India is also developing a twin-engine Medium-range Combat Aircraft (MCA). This was disclosed at the 54th Annual General Meeting of the Aeronautical Society of India (in Kolkata) by no other than the President of India, Dr. A P J Abdul Kalam, who is also considered as the father of missile and nuclear technology. He said that the MCA programme was in the design phase. He also said that India was working on the design of a hyper plane, a re-usable and cost-effective hypersonic space vehicle. While reusable missile configuration and technology has not yet emerged in the world, Indian technologists have started working on a reusable hypersonic cruise missile system, an integrated design of multiple technologies derived from UAV, aircraft and missile systems[47].

A new Intermediate Jet Trainer Aircraft (HJT–36), perceived as an interim arrangement to replace MIG trainers as well as to finally replace the indigenous Advanced Jet Trainers, was planned to be ready for production from 2003. Design and development of a Test Bed for Pegasus engines for the Navy, successful flight trials of Pilot-less Targeted Aircraft Engines (PTAE), up-gradation of Jaguar, modification of air to air re-fuelling of Mirage, up-gradation and modernisation of MIGs are some of the other programmes which have been undertaken by both the scientific establishments and defence industry. Successful trials of

46 *The Hindustan Times*, 31 December 2002.

47 Dr APJ Abdul Kalam also said that India would attain self sufficiency in the current decade. It will see its own combat aircraft, advanced missiles, submarines and all major aspects of military technology. See, 'India Working on Hyper-plane: Kalam', *The Hindustan Times*, 21 January, 2003.

short range Battlefield Surveillance Radars (BESR), and the three dimensional Medium Range Radars (CAR) have demonstrated DRDO's breakthrough in radar technology. In the field of Navy equipment, one important development is the Advanced Technology Vessel project for indigenous submarines, which is expected to take some time, at least till early in the next decade. According to newspaper reports, major work on this project is still pending and its status has caused some concern. According to the Defence Minister, indigenous construction of an aircraft carrier will be soon begin at Cochin Shipyard, which may take a decade to be completed[48]. Given the nature and extent of activities in the field of defence science and technology, it is obvious that the industry seems quite upbeat to do the follow-up job of serial production of a number of ambitious programmes.

Self-reliance

3.3 From Licence to Co-Production

The 'self-sufficiency' model adopted during the first years, with massive industrialisation in all core sectors of the economy including defence, was replaced by what is known as the 'self-reliance' model, which roughly commenced during the late 1950s and early 1960s. The self-reliance model, with primary emphasis on indigenous production and development and secondary dependence on imports from reliable foreign sources, continues to guide policy. As explained earlier, the half–a-century of technology gap and a performance below all expectations in the defence industry, from the early 1960s to the mid-1980s, led to a renewed emphasis on indigenous production activities. The period since the late 1980s and early 1990s thus witnesses a change in nature of defence-industrial production activities. The earlier era, among others, witnessed an increase in license production, which reduced indigenous production to a considerable extent. The present times, however, have witnessed more emphasis on indigenous production, a major change in this regard being the increasing number of co-production activities coming from various sources.

Although license production has been a stable form of production, it has not made India self-reliant in terms of upper-ends of defence production, especially in the field of design and development. With indigenous activities having its own weaknesses, especially financially and lack of or difficult access to foreign military technologies, other alternatives to fill the

[48] 'Our Own Aircraft Carrier in Nine Years: Fernandes', *The Hindu*, 29 December 2002.

technology gap have been contemplated for some time. This is where the idea of joint design and development as well as co-production come in. Among other factors, trends in global defence industry have influenced this decision in many countries. On its quest for self-reliance in the 1990s and beyond, India has tried to follow this trend.

Several new projects in the Indian defence-industrial sector are planned to be jointly designed and developed, and India is keen on taking up this opportunity to the fullest possible extent[49]. HAL has led the way in this. After the successful integration of several electronic components in the Su-30MKI by Indian scientists and technicians in recent times, the Russians are very interested in a partnership, initially in license production of the aircraft by HAL but incrementally substituted by joint production in future, which is unprecedented in this kind of fourth generation aircraft project. A new simulator which will make it possible to train pilots for the Su-30MKI is on the cards for India[50]. HAL is going to produce this aircraft soon. Russia, in addition to this, has also proposed to become a partner in the ambitious fifth-generation combat aircraft project, of which details are not available. It has offered to design, develop and produce this project with India, thus sharing incurring costs.[51].

Co-production

Brahmos, as explained earlier, is a joint venture between India and Russia, which was expected to be ready for serial production and possibly exports by the end of 2003. This cruise missile project started in 1998 and is said to be one of the major steps by India toward international collaboration. India's recent decision to initiate an Advanced Jet Trainer (AJT) project is also going to lead to the involvement of international collaboration partners. The US aviation giant Lockheed Martin, which is interested in the AJT deal, is keen to offer technology transfer for this project[52]. It has claimed that its model of an advanced trainer, the T-50 Golden Eagle, is the world's newest and only supersonic trainer. It has also shown an interest in close collaboration with defence companies in India, especially with HAL. Similarly, to get a share in the project, in which initially British Aerospace had been the front runner with its Hawk trainer aircraft, several

49 'India Keen on International Collaboration: Fernandes', *The Times of India*, 5 February 2003.

50 'Sukhoi Family Will be Present in Strength', *The Hindu*, 4 February 2003.

51 'Russia Offers India Partnership in 5th Generation Combat Aircraft Project', *The Hindustan Times*, 10 February 2003.

52 'Lockheed Looking for Technology Transfer', *The Hindu*, 4 February 2003

British aerospace and defence companies are interested in joint ventures with their Indian counterparts[53]. This is the first time that, except for Russia, more and more front line arms producing countries are showing interest not in exports but, more importantly, in joint ventures and other forms of industrial participation. The Indian defence industry, especially since the last couple of years, has been experiencing noticeable changes. It is gearing up to take this opportunity which was previously quite limited. Industry watchers believe that the Indian defence industry is going to benefit from such swift changes in production policies in many ways.

3.4 Trends in Acquisitions

India's arms acquisitions, especially during the last decade, have been substantial. Two primary factors are attributed to this. First, the technology gap, which is either due to the long-lasting indigenous design and development activities during the 1960s to the 1980s and insufficient resources for R&D and production or the perception that arms acquisitions were only a short-term remedy (with an invitation for long-term difficulties, often ignored by decision-makers). Second, greater demands of security needs, where state-of-the-art weapons are necessary for national defence. A third factor, which is often cited by many analysts, is that of an inconsistency in arms purchases from abroad. While there have been arms imports throughout the time, the least active period was witnessed during the 1960s to the 1980s, in which an over emphasis on license production led to a situation in the defence-industrial sector where it was unable to provide requisite weapons at the right time, thus forcing the government to opt for immediate short term action in terms of imports. The gap in the national arsenal became visible soon after the Gulf War, when India felt that it was way behind others in terms of overall defence preparedness. The most worrying aspect of India's defence preparedness was exposed when the Kargil conflict started in mid-1999. To its horror, it found out that it was ill prepared in terms of defence equipment as shortages of arms and ammunition were noticed. In brief, security needs were not matched by existing possession of weaponry and there was a need to fill the gap.

Arms purchases from...

India has imported several weapons systems from many countries. The main source of weapons for India's military is

[53] 'U.K. Aerospace Firms for Joint Ventures', *The Hindu*, 5 February, 2003.

Russia, which accounts for nearly 70 percent of the total purchases. West European giants like France, the United Kingdom and Germany have also supplied several systems. Italy, the Netherlands and Poland are some of the other European countries which have also supplied some weapons. New emerging suppliers include, among others, Israel and South Africa. The latter is considered to be a long-term reliable source of weaponry. The United States has recently also become an important supplier, despite the fact that there used to be times in which both countries had not got on well in the field of arms transfers.

India imported a Mirage-2000 fighter aircraft from France. Recent reports also suggest that India is going to buy six 'Scorpene' submarines at an estimated cost of US $1.8 billion. There are also negotiations with the French on the purchase of 130 Mirage-2000H fighters amounting to an estimated cost of US $7 billion. Although such large-scale purchases often lead to procedural delays in India, it is quite hopeful of finalising the deals soon.[54] The Scorpene deal will also involve India in a different manner with the Mazagaon Dockyard Limited being responsible for the future transfer of technology for the building of the submarine in India. The French defence electronics company, Thales, has already signed an agreement with MDL in this regard[55]. A contract (yet to be signed) regarding the purchase of Type-209 submarines from Germany is also in the pipeline. Also, a contract with Germany for SUT class Anti-submarine torpedoes for Type 209 ('Sishukumar' class) was supposed to be signed the status of which is not known yet[56]. Italy has supplied 10 Seaguard TMX fire control radar and A244 ASW torpedos during the 2001/02 period for the Brahmaputra class frigates, produced by India.

... France, Germany, Italy, the Netherlands, Poland, Slovakia, ...

Countries like the Netherlands, Poland, and Slovakia have supplied surveillance radar, armoured recovery vehicles and other

54 The French Prime Minister, Mr Raffarin, recently visited India where, during an interview, he emphasised the wish for strategic ties between the two countries. He mentioned that France was optimistic about not only providing India with required weapons systems but was also eager to forge industrial partnerships with Indian companies. For example, French aircraft engine manufacturer, Snecma, has signed a Memorandum of Understanding (MoU) with HAL for the manufacture of PM333B engine under license from the Snecma subsidiary Turbomeca. This is expected to lead to technology transfer in the future. See, 'France for Strategic Ties with India: Raffarin', *The Hindu*, 3 February, 2003.

55 'Submarine Purchase From France', *The Hindu*, 8 December 2002.

56 *SIPRI Yearbook 2002*, p. 428

systems. South Africa, considered a new partner in the military industrial co-operation, has supplied armoured personnel carriers (APC) in 2000. It is also involved in a new Ordnance Factory in India (40th OF at Nalanda). Israel, considered a potential future supplier and partner especially in the fields of defence electronics and aerospace, has supplied a number of items in the last half-a-decade. These include, among others, Heron and Searcher class UAVs, EL/M variants of aircraft, combat battlefield and fir control radar. A deal to supply Barak class SAM is in the pipeline while there is also a rumor that anti-missile defence systems will be supplied for which negotiations are going on. Its proposed sale of airborne early warning systems (AWACS) to India has recently caused discomfort to many countries, primarily the United States which is opposing the sale as it involves some US technology.

... South Africa, Israel and Russia.

Russia, the most trusted friend in the field of military and industrial co-operation, has been the main source of defence equipment. In the last decade or so, it has supplied Helix class AEW helicopters, MiG–29K aircraft, Su-30MKI (purchase worth more than US $5 billion in total) fighter aircraft, AA-11/12 class air to air missiles, naval and land versions of MRLs like BM-9A52/BM-23, T-90 MBTs, a wide variety of radar systems, SS-N-25 class anti-ship missiles, Krivak class frigates and others. The cumulative deal in the last five years (19972002) is estimated at US $6 billion[57]. If this is not enough, Indo-Russian defence-industrial partnership has been gaining much momentum in recent times. India has recently been on the verge of finalising a deal to acquire the 45,000 tonne Kiev class aircraft carrier 'Admiral Gorshkov', Tu-22M3 (on lease) long-range strategic bombers, Akula class submarine and is expecting delivery of three Krivak class stealth frigates by March 2003.[58] In addition to these, both countries have signed an 'Inter-Governmental Commission for Military Technical Co-operation' recently to boost both military and industrial partnership. As the Indian defence industry is undertaking a series of joint ventures with Russia, both countries have also recently signed a protocol on arms exports under which exports of such systems are to be decided on a case-to-case basis.[59] India's arms shopping in the year 2003 is reported to be in excess of US $6 billion.

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57 For a detailed list of arms purchases by India from different countries, see, *SIPRI Yearbook 2002*, pp. 427-30.

58 'Gorshkov Deal by March-end', *The Times of India*, 18 January 2003

59 'India, Russia Sign Protocol on Arms Exports', *The Hindu*, 12 December 2002.

One can witness a noticeable change in India's import of sophisticated weapons. During the 1990s, negotiations for arms purchases in many cases have involved discussion on joint industrial partnership. This is a clear diversion on the part of India as earlier it was based on outright purchase of complete weapons systems or license manufacture. In recent times, however, many formal and informal deals have included the willingness on both supplier and recipient's part to forge military technical and industrial ties. Informal understandings with major suppliers is paving the way for joint partnerships, which is benefiting Indian defence industry.

3.5 Civilian Production: Diversification as Key

It is often assumed that India's hitherto closed defence industry does not have much scope for civilian production. Similarly, conversion or diversion of military industry into civilian production has long been perceived as a non-starter in countries like India due to the obvious closed nature of its defence industry. During the Cold War period, the little conversion which was attempted in the West encountered a lot of problems. These ranged from technical issues of diverting military factories to civilian production to frequent changes in the political and security environments for military production during the 1960s and 1970s. Still, it was assumed that surplus arms production capacity could be quickly and successfully converted to suit civilian needs, once disarmament was decided upon.

Diversification...

The second phase of conversion, initiated by major arms producing countries in the West, started during and after the end of Cold War. Existing surplus defence-industrial capacities were tried to be converted through various means, including diversification, for civilian purposes. However, the process of conversion, considered a means to contribute to disarmament and peace, has faced many hindrances despite decisions to reduce military spending..

Still, conversion through diversification has been a major feature in India's defence industry which has not been discussed so far. In fact, many believe that India does not possess a sizeable industrial base to contemplate conversion – meaning that its facilities are still insufficient for conversion or diversion, which normally takes place in surplus capacities. But, on the other hand it is emphasised that enhancement of civilian production in the defence industry will benefit both the civilian and military sectors.

Civilian production in the Indian defence industry had been encouraged since the late1950s. The primary goal of this attempt

was to attain a greater degree of production efficiency and to maintain operational capacities during slack periods of demand. Mr V.K. Krishna Menon initiated this programme during his time (1958-62), which saw civilian products like coffee percolators, consumer electrical items, and engineering and construction equipment being produced by defence units[60]. The war with China in the early 1960s, however, curtailed this activities as more emphasis was put on the establishment of a number of defence-industrial units. It is during this time that the aircraft producing company, HAL, was established, along with a number of OFs and DPSUs. It suffices to mention here that an initiative to begin civilian production in the defence industry was evident during the time when conversion was initiated in the West. Also, this initiative led to a similar process as was initiated in China where Lin Biao and other military political leaders initiated what is known as 'civil production during peace time and military production during war-time'.

... into civilian production ...

Although the OFs had diversified into civilian production as early as in the 1950s, it received a major boost during the 1980s and 1990s. The diversification programme included a time-bound plan of action with strategies for each factory, and the appointment of professional consultants to identify products and potential markets.[61] This would enable the OFs to utilise their spare capacities. The former Minister of Defence, Sharad Pawar, had authorised the OFs to employ as much as 40 percent of their rated capacities for the production of goods for the civilian sector[62]. Diversified products included a range of consumer goods for which quality certificates were awarded to five of the OFs. By the mid-1990s, the sale of civilian goods by the OFs had exceeded 10 million rupees[63]. HAL, manufacturer of aerospace products for the defence sector, has also been involved in several products for the civilian market. These include high technology products for space and other programmes. It was involved in several products for the PSLV programme undertaken by ISRO. Since the late 1980s, it has started supplying spare parts for civilian aircraft. In 1993, it joined an Asian consortium to co-produce medium and small passenger aircraft. It also has a tie co-operates with Boeing to take care of the maintenance of Boeing 737 passenger planes in

60 Major General Pratap Narain, *Indian Arms Bazaar*, Note 12, p 67-68

61 *Annual Report 1994-95*, Ministry of Defence, Government of India, p. 44

62 'Defence Industry to Boost Civil Products', *The Times of India*, 11 August 1994.

63 'Civil Products cross Rs 1 crore', *The Economic Times*, 16 April 1996.

India. The percentage ratio of civilian production to the military in the defence industry, including the OFs and the DPSUs, is available in Figure 2.

The Indian defence industry is optimistic about its civilian production. In a recent seminar on 'Current Trends in Embedded Technology and Applications', top defence scientists, including P. Rajkumar, Director of the Aeronautical Development Agency which has undertaken the LCA programme, are of the opinion that India's indigenous military systems are harnessing cutting edge technologies such as embedded systems, which, when allowed to trickle through into the civilian arena, could ignite huge markets.[64] Custom-built embedded units applied extensively to LCA and other aerospace systems have been in demand in the civilian sector, especially in information technology. National Aerospace Laboratory, a key unit of the HAL, has recently rolled out its first prototype of a 14-seater light transport aircraft, named 'Saras'. This aircraft is expected to enter into commercial production within the next two years[65]. The market size of this category of aircraft is considerable. It is expected that production of this aircraft is going to benefit aircraft industry in India.

... in aerospace and information technology.

DPSUs like Bharat Electronics have been engaged in civilian production in a big way. In fact, BEL's production for the military sector is less than 50 percent. In the case of Bharat Earth Movers, it is less than 7 percent. Civilian production of two other DPSUs, Mazagaon Dockyard and Mishra Dhatu Nigam, lies at more than 50 percent[66]. More than 350 items are produced by BEL for the civilian sector which are primarily meant for the communication market. Since 1992/93, it has also entered the cordless phone and cellular phone market. Among others, it is now concentrating on the production of X-ray tubes for the world market. Other DPSUs are similarly producing a range of products for both domestic as well as international markets.

The Indian defence industry has a huge potential for the civilian market. It is now entering into a phase of concentrated production. This means that industrial units are geared up to produce more and more dual-use items and at the same time concentrate on core areas of both military and civilian technologies. Spin-off and spin-on are both expected to constitute a major part in this strategy. The opening up of the

64 'Military Embedded Technology can Ignite Civilian Markets', *The Hindu*, 21 December 2002.

65 'Saras Prototype Ready, Maiden Flight in 8 Months', *The Hindu*, 5 February, 2003.

66 See Figure 2

defence sector for private participation has not only created opportunities for the defence industry to venture more into the civilian market, the spin-on effect is also expected from the private civilian industries. The private industry in India is confident of contributing to this in future.

3. India's Defence Industry in the 21st Century

3.1 Major Policy Initiatives

India's defence industry entered a new phase of self-reliance on the eve of the 21st century. Since the mid-1990s, several initiatives have been undertaken by the government to effect changes in the defence industry. Soon after the liberalisation of the economy was announced in 1990/91, the defence industry started realising the importance of civil-military interaction in the industrial sector. The private industries in India, which were thus far debarred from entering into defence production and whose role in the defence sector was limited to supplying spare parts and other minor contributions, started demanding a share in defence production. In 1994, the then Defence Minister founded six Task Forces on major areas of defence modernisation, of which reforms in defence industry was an important part. This was carried out by the government in consultation with institutions like the Confederation of Indian Industries (CII). The CII, on its part was instrumental in bringing out a series of proposals in the broad field of private participation in the defence sector and armed forces–industry co-operation. Soon after this, the government initiated a programme called 'Army-Industry Partnership', under the auspices of CII which highlighted the importance of co-operative arrangements between the armed forces, defence industry and the government.

Civil-military interaction

After India's nuclear tests, various sanctions were imposed on India, of which sanctions related to the import of military and dual-use goods and technologies were considered the most important. Sanctions were imposed on more than 150 items, which affected the progress of many defence products. However, the impact of sanctions on military technology was taken up as a another phase of challenge for the defence scientists as they had faced similar sanctions after the test in 1974. At that time they had faced more difficulties as the defence industry was not in a position to withstand such severe cuts which had resulted in delays in many major programmes. This time around, the defence industry had made significant progress to be able to withstand sanctions. After the Kargil conflict in mid-1999, the government

started looking into security gaps and founded a committee under Mr K. Subrahmanyam. He brought out a major report on this conflict, which is known as the 'Kargil Committee Report'. This report, among other recommendations, highlighted the importance of reforms in higher defence management and reforms in institutional processes in the security sector. The Government also founded a Group of Ministers' committee to look into major aspects of the overall security management of the country. The committee submitted its report to the government, which is known as GoM Report on 'Reforming the National Security System'[67]. This report highlighted the importance of self-reliance in India's defence industry and recommended several steps to introduce institutional changes into the system.

Coupled with changes at institutional and organisational levels, India's defence industry entered an entirely new era after the Government announced a major change in policy by outlining codes of conduct for and inviting private participation in the defence industry. This is seen as by far the most important policy shift in the defence-industrial sector in the last fifty years. By doing so, the Government, through an official notification No. 5(37)/2001-FCI, allowed private sector participation up to 100 percent and permitted foreign direct investment (FDI) up to 26 percent[68]. This decision has been hailed by both the private industry and the government-owned defence industry. Institutions like CII and FICCI, which represent interests and views of the private sector, have been instrumental in influencing such a marked change in policies. According to Mr Sushanto Sen, the Director General of CII, such a policy change is certainly going to benefit both the defence industry and the private sector[69].

Private sector participation

In tune with the stated objectives of India's defence industry to achieve a higher degree of self-reliance and a desire to make its flagship units globally competitive, thus entering into competitive defence markets, the Government has also introduced some institutional changes that are expected to smoothen operations both at structural and organisational levels. Earlier, procurement

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67 This Report is considered to be one of the most important contemporary reports on national security. It was submitted to the Government in February 2001 and was subsequently made public. For details, see, 'Reforming the National Security System: Recommendations of the Group of Ministers', Report of the GoM on National Security, February 2001

68 For detailed guidelines for private participation in the defence sector, see Box 1.

69 Interview with Mr S. Sen at CII Headquarters in New Delhi

procedures were considered cumbersome, and there were overlaps in organisational responsibilities of respective organs responsible for procurement[70]. Under the new system, the Services Headquarters were integrated into the Ministry of Defence to provide closer interaction. The procurement structure is now a three-tier structure with the recent establishment of the Defence Acquisition Council (DAC) at the apex[71]. Its primary role will be to accord in-principle-approval of long-term perspective plans (15-20 years), acceptance of necessity for the capital acquisition plan (5 years), identify 'Make', 'Buy' and 'Make and Buy' projects and monitor progress of the three Boards under it – the Defence Procurement Board, Defence Production Board and the Defence R&D Board. The Defence Procurement Board under the Defence Secretary will have the primary role of capital procurements and co-ordination. The Defence Production Board will be headed by the Secretary Defence Production and Supplies and will oversee all activities related to indigenous manufacture, progress in 'make' projects and will provide support to DAC. The Defence R&D Board will be headed by the Secretary Defence R&D and will oversee progress, monitor and report on all R&D proposals in consultation with the user service and production board. Other measures at institutional level include direct linkages between the armed forces and the Ministry of Defence through integrated headquarters, which include respective perspective planning branches. In sum, organisational and institutional changes brought about recently seem to complement policy changes.

New defence procurement structure

4.2 Problems and Prospects: An Assessment

India's quest for self-reliance has produced mixed results. Some of the lessons that India has learnt in the past fifty years are worth noting here. First, a combination of factors have led to the indigenous design and development component of self-reliance

70 For a comprehensive description of procurement process and production, see, Lt. Gen Chandra Sekhar (Retd.), 'Defence Procurement and Production Systems', *Journal of the United Services Institution of India*, Vol. CXXXI, No 546, October-December 2001, pp. 524-39. Also see, Lt. Gen Vinay Shankar, 'India's Defence Procurements', *Indian Defence Review* (New Delhi), Vol. 16, No. 4, October-December 2001, pp. 18-22.

71 Members of DAC include the Defence Minister, Minister of State for Defence, Chief of Staff Committee, Service Chiefs, Vice Chiefs of Defence Staff, Secretary Defence, Defence Production and Supplies and Special Secretary Acquisition.

slowing down to almost zero for over a quarter of a century after 1962. This has led not only to a huge technology gap but also contributed to severe difficulties in technology assimilation in the industrial sector. However, since the mid-1980s, activities toward achieving a greater degree of self-reliance have taken up momentum. The technology gap also widened the scope for acquisition of production technology rather than design technology from foreign sources. This in turn has created a license production regime at the cost of indigenous production . During the 1990s, the activities to encourage joint ventures and co-production in the defence-industrial sector is largely seen as a step to reduce license regime and boost indigenous industrial capabilities. How far this will achieve desired results are yet to be seen as such activities are only of recent origin and they need lead time to prove themselves. For example, the market for Brahmos missiles is estimated to be large, but it depends on how much is it likely to penetrate the cruise missile market at a global level. Success of this kind will not only validate India's defence-industrial capabilities to meet domestic demands but also increase its confidence in many ways.

Problems ...

Second, private participation in the defence-industrial sector has started after a long delay. This is attributable to several factors, ranging from the socialist and protective nature of the defence sector to fears of what is called 'security diffusion'. The latter especially relates to a fear of below-expectation performance by the private sector as it is hardly specialised to meet strict high military standards, hence compromising security standards. This kind of fear has been criticised by many who argue that private participation is essential in the defence sector which is primarily technology driven and capital intensive. The recent opening up of the defence sector for private participation has generated a lot of interest in the country. Institutions like CII caution that while such initiatives are always welcome, the government should come out with a clear 'road-map' for the private sector participants in defence so as to enable them to prepare themselves for the new reality. Fears regarding the ability of the private sector to match expectations of the country in the highly demanding and technology-dominated industrial sector are countered by industrialists like Atul Kirloskar (Chairman of Committee on National Defence, CII), who claim to have absolute faith in their abilities. Many also claim that given a chance, the secondary role of the private sector can be turned into a primary one in a short period of time. Some of the leading industrialists even claim that they have or intend to possess capabilities to produce complete weapons systems. Several

companies like Mahindras and Mahindras (M&M), the Tata Group, Kirloskar Brothers, Larsen and Toubro (L&T), and many others have already jumped into the fray to obtain orders from the defence industry. Since 2002, the Government has received more than ten applications from the private sector to manufacture weapons systems. It has recently awarded five licenses to L&T and M&M to produce military vehicles and some weapons systems.

... and prospects

Third, the government has emphasised measures to enhance the defence industry to cope with future challenges. Such measures are carried out by both OFs and DPSUs, apart from respective branches of the Government and the armed forces. Digitalisation, strict quality control, performance-related benefits, professional management systems, allowing the private sector to carry out R&D activities in the government-owned laboratories, are some of the measures which have come up in recent years and are likely to impinge the defence-industrial landscape. A simplification of production and procurement rules promise better buyer-seller relations. There were some protests coming from employees' unions of OFs and DPSUs against privatisation. The Government has assured these unions that employees' interests will be borne in mind but that it will give priority to performance. In one instance, the Defence Minister is reported to have appealed to the workers in one DPSU to not to worry about possible relocations due to privatisation and assured them to take effective steps to safeguard their interests. It seems that rationalisation of the defence industry is on the cards which might bring some unrest in the form of reduction of employment in the defence-industrial sector. There are even rumours that some of the units, especially from the ordnance sector might be closed down. The private sector participants are, however, optimistic. They argue that their factories can effectively be converted into profit making civilian units. In several rounds of interviews with senior officers and industry analysts by the author, it seems that some of the industrial units may come under close scrutiny. Conversion to civilian production in their cases is not ruled out. In brief, significant rationalisation, diversification and closer private participation are coming and are likely to influence India's defence industry in many ways.

Box 1: Private Participation in Defence Industry: Introducing a New Change

Government of India
Ministry of Commerce and Industry
Department of Industrial Policy and Promotion
SIA (FC Division)
Press Note No. 2

Subject : Guidelines for Licensed Production of Arms and Armaments

In pursuance of the Government decision to allow private sector participation up to 100 per cent in defence industry sector with foreign direct investment (FDI) permissible up to 26 per cent, both subject to licensing as notified vide Press Note No. 4 (2001 series), the following guidelines for licensing production of arms and armaments are hereby notified:

1. License applications will be considered and licenses given by the Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, in consultation with Ministry of Defence.
2. Cases involving FDI will be considered by FIPB and licenses given by the Department of Industrial Policy and Promotion in consultation with Ministry of Defence.
3. The applicant should be an Indian firm/partnership firm.
4. The management of the applicant company/ partnership should be in Indian hands with majority representations on the Board as well as the Chief Executive of the company/partnership firm being resident Indians.
5. Full particulars of the Directors and the Chief Executives should be furnished along with the application.
6. The Government reserves the right to verify the antecedents of the foreign collaborators and domestic promoters including their financial standing and credentials in the world market. Preference would be given to original equipment manufacturers or design establishments, and companies having a good track record of past supplies to Armed Forces, Space and Atomic energy sectors and having an established R&D base.
7. There will be no minimum capitalisation for the FDI. A proper assessment, however, needs to be done by the management of the applicant company depending upon the product and the technology. The licensing authority would

satisfy itself about the adequacy of the net worth of the foreign investor taking into account the category of weapons and equipment that are proposed to be manufactured.

8. There will be a three-year lock-in period for transfer of equity from one foreign investor to another foreign investor (including NRIs (Non-Resident Indians) with 60 percent or more NRI stake) and such transfer would be subject to prior approval of the FIPB and the Government.
9. The Ministry of Defence is not in a position to give purchase guarantee for products to be manufactured. However, the planned acquisition programme for such equipment and overall requirements would be made available to the extent possible.
10. The capacity norms for production will be provided in the license based on the application as well as the recommendations of the Ministry of Defence, which will look into existing capacities of similar and allied products.
11. Import of equipment for pre-production activity including development of prototype by the applicant company would be permitted.
12. Adequate safety and security procedures would need to be put in place by the licensee once the license is granted and production commences. These would be subject to verification by authorised Government agencies.
13. The standards and testing procedures for equipment to be produced under license from foreign collaborators or from indigenous R&D will have to be provided by the licensee to the Government nominated quality assurance agency under appropriate confidentiality clause. The nominated quality assurance agency would inspect the finished product and would conduct surveillance and audit of the Quality Assurance Procedures for the licensee. Self-certification will be permitted by the Ministry of Defence on case to case basis, which may involve either individual items, or group of items manufactured by the licensee. Such permission would be for a fixed period and subject to renewals.
14. Purchase preference and price preference may be given to the Public Sector organisations as pre guidelines of the Department of Public Enterprises.
15. Arms and ammunition produced by the private manufacturers will be primarily sold to the Ministry of Defence. These items may also be sold to other Government entities under the control of the Ministry of Home Affairs and State Governments with the prior approval of the Ministry of Defence. No such items should be sold within the country to

any other person or entity. The export of manufactured items would be subject to policy and guidelines as applicable to Ordnance Factories and Defence Public Sector Undertakings. Non-lethal items would be permitted for sale to persons/entities other than the Central or State Governments with the prior approval of the Ministry of Defence. Licensee would also need to institute a verifiable system of removal of all goods out of their factories. Violation of these provisions may lead to cancellation of the license.

16. Government decision on applications to FIPB for FDI in defence industry sector would be normally communicated within a timeframe of 10 weeks from the date of acknowledgement by the Secretariat for Industrial Assistance in the Department of Industrial Policy & Promotion.

(M. S. SRINIVASAN)
Joint Secretary to the Government of India

No 5 (37)/2001-FC I dated 4th January 2002.

Fourth, after a substantial amount of time spent on soul-searching, the government is now encouraging the defence industry to have more joint-design and development and production collaborations to reduce dependence on imports and this policy is likely to continue in the future. Also the triangular relationship between the defence industry, DRDO, and the armed forces is changing in a positive direction. Changes in policies related to defence industries announced by the government is likely to influence all three branches in a positive manner. Similarly, changes at institutional level, such as the creation of several Boards at highest level and linking them to respective branches like procurement, perspective and planning are designed to bring in better co-ordination. Respective armed forces HQs have been integrated into the Ministry of Defence, and the creation of institutions such as the Chief of Integrated Staff (CIDS) and similar reforms in higher defence management are all likely to influence the defence-industrial structure. Although a lot still needs to be done in order to facilitate extensive interaction, the positive attitude of all three groups of actors—the defence industry, DRDO, and the armed forces—denotes optimism for the future.

Enhancements in the defence-industrial structure

Total import substitution possible?

Fifth, the government is also contemplating a viable strategy for arms exports. The recent announcement to give export-related incentives, including subsidies, to the industry is an example of this strategy. This strategy needs careful examination. India has been spending US $0.5 billion on an average annually for the last five years. This is likely to go up to US $1 billion in the next decade as it seems to have ambitious plans to buy some sophisticated weapons systems like fourth generation and fifth generation fighter aircraft, submarines, and many high technology electronics and aerospace items. The Defence Minister has recently admitted that although import substitution is desired, it is highly unlikely that it will be substituted by domestic production. Domestic production still constitutes around 30 percent of the overall requirements by the armed forces. However, he is also optimistic about the fact that current and future production may eventually take India close to the desired level of self-reliance. If current activities, especially in the fields of electronics, aerospace, missiles are taken into consideration, it is assumed that by the end of the current decade, India might be able to save a huge amount of foreign exchange through import substitution. On the other hand, projects like Brahmos, Saras, LCA, and others promise enough potential to be likely global products in the future. With the international arms market being extremely competitive, it is too early to project or expect success. But, on the other hand, the incremental approach to enter this market might be viable as India is currently gearing up to enter the regional market first. It is too early to expect miracles but the industry seems to welcome this strategy.

4.3 Conclusion

India's defence-industrial strategy is directed primarily toward achieving self-reliance. Presently, there is a clear imbalance in requirements by the armed forces. While roughly 70 percent of requirements are met through arms imports, the domestic sources supply the rest. The current strategy is geared to reverse this trend with the primary aim of supplying three-fourth of the requirements through domestic sources. India's decision to allow private participation in the defence-industrial sector is seen as a dual aim, namely to achieve much-needed capital and production enhancement and, secondly, to open up to the external market through their presence. There is also an effort to adopt suitable strategies to make select sectors like aerospace and electronics globally competitive. DPSUs like HAL and BEL are now much in demand and are trying to become viable global giants, not to be

included in SIPRI's List of Top 100 Defence Companies for their sheer size only but for their performance. And, the overall strategy is to make the defence-industrial sector act as a locomotive for economic development. In this regard, an emphasis on dual-use technologies and production is contemplated which could benefit both the defence and civilian sector. The current strategy also looks into various options toward minimising the state investments in the defence sector while encouraging private and foreign portfolio investment in existing Indian defence companies. Such a tall order for the defence-industrial sector is often regarded as unrealistic by many in India but that is another matter. If recent changes in various policies related to the defence industry are supposed to have any meaning, then, despite all problems, there is something to be optimistic about in the Indian defence industry.

Goals for the future

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