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The State of Defense Innovation in India: Can It Catch Up with Global Leaders?

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India, like China, is an aspiring great power that has long harbored the goal of possessing a technologically advanced self-sufficient arms industry—a quest for autarky and stature that has the country's determination of one day becoming a major arms-producing nation, capable of meeting most, if not all its requirements for self-defense through indigenous means. As India's economic power has expanded, and as its technological prowess in certain areas (such as information technologies) has grown, it has become more determined than ever to create a world-class, globally competitive defense industry.¹

Like China, India possesses one of the largest and most broad-based defense industries in the developing world. It produces fighter aircraft, surface combatants, submarines, tanks, armored vehicles, helicopters, artillery systems, and small arms. The country also has a huge defense research and development (R&D) establishment with considerable experience in indigenous weapons design and development going back more than 50 years. That said, India has long been confronted with serious impediments to its efforts to build a state-of-the-art arms industry. While the rest of India appears to be racing into the 21st century, powered by a dynamic, free market-oriented economy, the defense sector seems mired in the country's Nehruvian socialist and protectionist past. Consequently, the nation is still predominantly saddled with a bloated, non-competitive, non-responsive military-industrial complex—capable, it seems, of only producing technologically inferior military equipment, and even then, never on time and nearly always exceeding their original cost estimates. Moreover, innovation in defense technology is impeded by a defense research establishment that is bureaucratically rigid, riddled with corruption and nepotism, lacking in qualified scientists, engineers, and technicians, and largely unaccountable to the Indian military in terms of product, capabilities, and costs. Given such longstanding deficiencies in its defense industrial base, it is little wonder why India's drive for great power status has been so fitful.

¹ Recent studies on the Indian defense industry include Stephen P. Cohen and Sunil Dasgupta, *Arming without Aiming: India's Military Modernization* (Washington, DC: Brookings Institution, 2010); Deba R. Mohanty, *Arming the Indian Arsenal* (New Delhi: Rupa, 2009); Ajay Singh, "Quest for Self-Reliance," in Jasit Singh, *India's Defense Spending* (New Delhi: Knowledge World, 2000); Deba R. Mohanty, *Changing Times? India's Defense Industry in the 21st Century* (Bonn: Bonn International Center for Conversion, 2004); Rahul Bedi, "Two-Way Stretch," *Jane's Defense Weekly*, February 2, 2005; Manjeet S. Pardesi and Ron Matthews, "India's Tortuous Road to Defense-Industrial Self-Reliance," *Defense and Security Analysis* 23, No. 4 (December 2007); Timothy D. Hoyt, *Military Industry and Regional Defense Policy: India, Iraq, and Israel* (New York: Routledge, 2007).

India's Traditional Policy of Self-Reliance in Arms Production

Self-reliance has long been a fundamental goal of indigenous armaments production in India. Such an objective had military, political, and economic salience. As Ajay Singh put it:

After independence, and the adoption of a policy of non-alignment, it was ... obvious that foreign policy would need to be reinforced by a policy of self-reliance in defense ... Prime Minister Jawaharlal Nehru believed that no country was truly independent, unless it was independent in matters of armaments.²

Early on, too, a distinction was made between “self-sufficiency” and “self-reliance.” Singh defined the former as requiring that “all stages in defense production (starting from design to manufacture, including raw materials) ... be carried out within the country.” He added that, “To be self-sufficient, a country must not only have the material resources required for defense production, but also the technical expertise to undertake design and development without external assistance.” *Self-reliance*, on the other hand, was much more modest, as while it entailed the indigenous production of armaments, it allowed for the importation of foreign designs, technologies, systems, and manufacturing know-how.³

While self-sufficiency was the preferred approach, self-reliance has long been the practice when it comes to Indian armaments production. As such, New Delhi has long conceded the need to import considerable amounts of foreign military technology—mostly from the Soviet Union/Russia but also from France and the United Kingdom—in order to establish and expand its indigenous military-industrial complex. Thus, from the early 1960s to the late 1980s, India undertook the licensed production of several foreign weapons systems, including MiG-21 and MiG-27 fighter jets, Jaguar strike aircraft, Alouette III helicopters, T-55 and T-72 tanks, Milan antitank weapons, and Tarantul corvettes.⁴

At the same time, however, it was always New Delhi's intention to gradually and incrementally replace licensed production with indigenously developed and designed weaponry. Consequently, starting as far back as the 1950s, the manufacture of foreign-sourced military systems was complemented with local products.⁵ India began development of its first indigenous fighter jet, the HF-24 Marut, in 1956, with first flight occurring in 1961. Truly indigenous armaments development and production did not really take off until the 1980s, with the inauguration of several ambitious home-grown projects, such as the Light Combat Aircraft (renamed the Tejas in 2005), the Advanced Light Helicopter, the Arjun tank, and, especially, the Integrated Guided Missile Development Program, which involved the development of a number of tactical missile systems. While many of these “indigenous” programs still incorporated considerable amounts of foreign technology or subsystems, the objective has always been to reduce this dependency along the lines of the evolutionary “ladder-of-production” model, and eventually achieve true self-sufficiency.⁶ This intent was underscored, for example, in 1995 when New Delhi announced that within ten years it would increase its “local content” of weapons systems in the Indian armed forces from 30 percent to 70 percent.⁷

India's Military-Industrial Complex: An Overview

Traditionally, Indian armaments production has been entirely embedded within a huge government-run military-industrial complex. Even in the second decade of the twenty-first century, after a few modest reforms, the vast bulk

2 Singh, “Quest for Self-Reliance,” 126–27.

3 Ibid., 127.

4 Angathevar Baskaran, “The Role of Offsets in Indian Defense Procurement Policy,” in J. Brauer and J. P. Dunne, eds., *Arms Trade and Economic Development: Theory, Policy, and Cases in Arms Trade Offsets* (London: Routledge), 211–13, 221–26.

5 Pardesi and Matthews, “India's Tortuous Road,” 421–29.

6 Richard A. Bitzinger, *Towards a Brave New Arms Industry?* Adelphi Paper No. 356, International Institute for Strategic Studies (Oxford: Oxford University Press, 2003), 16–18.

7 Singh, “Quest for Self-Reliance,” 151.

of defense manufacturing remains in the hands of the state. As such, the Indian defense industrial base consists of eight government-owned Defense Public Sector Undertakings (DPSUs), 41 Ordnance Factories (OFs), and, at the top, the powerful Defense Research and Development Organization (DRDO).⁸ The Indian state-run defense sector employs more than 1.4 million workers (of which about 105,000 work in the OFs), including some 30,000 scientists and engineers within the DRDO. In 2010 it enjoyed revenues of approximately US\$7.8 billion.⁹

The DPSUs and OFs carry out the bulk of Indian arms manufacturing, often operating mainly as monopoly suppliers. Hindustan Aeronautics Ltd. (HAL), for example, is the sole DPSU engaged in aircraft production, including combat aircraft, helicopters, trainers, and transport planes, as well as avionics and engines.¹⁰ HAL was established in 1964 with the merger of Hindustan Aircraft Ltd. and Aeronautics India Ltd.; it is headquartered in Bangalore and operates four main manufacturing and design complex. HAL both license-produces foreign-designed aircraft—including the Soviet/Russian MiG-21, MiG-27, MiG-29, and (currently) Su-30 fighter jets, as well as the Anglo-French Jaguar strike aircraft—and manufactures indigenously developed combat planes, such as the HF-24 Marut and, currently, the Tejas Light Combat Aircraft (LCA). Other military aircraft programs include the Advanced Light Helicopter (ALH), the Light Combat Helicopter (LCH), and the Intermediate Jet Trainer (IJT).

Another key DPSU, Bharat Dynamics Ltd. (BDL), builds tactical and strategic missiles for the Indian military. Most important, BDL is the production base for India's Integrated Guided Missile Development Program (IGMDP), which was launched in the early 1980s. The IGMDP entailed the development and production of several types of missile systems, initially two surface-to-surface ballistic missiles (the short-range Prithvi and the medium-range Agni), the Akash and Trishul surface-to-air missiles, and the Nag antitank guided missile (ATGM). Additionally, BDL builds the BrahMos antiship cruise missile, the Sagarika (a submarine-launched version of the Prithvi missile), and the Astra air-to-air missile.

At the very top of India's military-industrial complex stands the DRDO, which has primary responsibility for the design, manufacture, and management of indigenous weapons programs weapons systems for the Indian armed forces. The DRDO comprises more than 50 state-owned laboratories engaged in the research and development of defense technologies; it employs more than 30,000 workers, including 5,000 scientists and about 25,000 other scientific, technical, and supporting personnel. The DRDO's budget in 2010 was approximately US\$1.88 billion, or 6 percent of overall Indian military expenditures.¹¹

The DRDO is presently engaged in more than 400 research projects, such as the development of missile systems, combat and trainer aircraft, radar, electronic warfare systems, and other types of armaments. Key R&D programs include the Tejas LCA, the next-generation Medium Combat Aircraft, an advanced unmanned aerial vehicle, an airborne warning and control system for the Indian Air Force, and a "mini nuclear submarine" for the Indian Navy.¹² In addition, the organization has primary responsibility for all indigenous missile development programs, particularly the BrahMos antiship cruise missile, the Shaurya and Sagarika sea-based missiles, and the entire IGMDP. The DRDO also manages the Aeronautical Development Agency, a consortium of more than 100 defense labs and academic and industrial institutions established in the mid-1980s to specifically oversee R&D of all aspects of the Tejas LCA, including airframe, propulsion, radar, and flight control systems.¹³

8 Laxman Kumar Behera, "India's Growing Defense Industry Base," *Defense Review Asia*, November 2010, 34.

9 "Interview with M. Mangapati Pallam Raju, Minister of State for Defense, India," *Defense News*, March 7, 2011; Behera, "India's Growing Defense Industry Base," 31–34.

10 Laxman Kumar Behera, "Background Paper on India's Defense Industry: An Overview," prepared for the National Seminar on the Defense Industry, New Delhi, January 23–24, 2009, 4.

11 Brian Cloughly, "Analysis: DRDO Fails to Fix India's Procurement Woes," *Jane's Defense Weekly*, June 28, 2010.

12 Vivek Raghuvanshi, "Indian Research Agency Agrees to Tech Transfers," *Defense News*, January 25, 2010.

13 Aeronautical Development Agency website, <http://www.ada.gov.in>.

Enduring and Endemic Problems in India's Defense Industry

Despite more than 50 years of effort, the history of India's defense industry is a nearly unbroken story of spectacular failures. For several decades, the Indian armaments production process has been a vicious cycle of ambitious program overreach, followed by technological setbacks and lengthy delays, too often resulting in equipment that has typically been of substandard quality and suboptimal performance. For example, India's supposedly state-of-the-art Tejas fighter jet is more than twelve years behind schedule, while R&D costs have nearly doubled. The Tejas LCA was intended to propel India's aerospace industry into the twenty-first century, advancing this sector in several key areas, including composites (carbon-fiber composites account for 45 percent of the aircraft, by weight), a modern "glass cockpit," a fly-by-wire (FBW) flight-control system, a multimode pulse-doppler radar, and an afterburning turbofan engine. Unfortunately, India has run into several development problems regarding the Tejas, including delays in finalizing the aircraft's FBW software, and, more significantly, failures to deliver both an effective indigenous radar *and* jet engine; in both cases, a foreign substitute had to be found.¹⁴ The indigenous Kaveri engine has suffered so many setbacks (in particular, it has been deemed overweight and underpowered) that it was "de-linked" from the Tejas program in 2008, and for the foreseeable future, all Tejas aircraft will be outfitted with General Electric's F404 turbofan.

The Tejas was to be initially deployed with the Indian Air Force (IAF) around 2002, but the first "proof-of-concept" model did not fly until 2001, and a production-model LCA did not achieve first flight until 2007; the aircraft finally achieved initial operating capability with the IAF in 2011. Up to 260 LCAs could be built, in both IAF and naval versions (for India's future aircraft carriers), but so far only 40 aircraft have been ordered. The Tejas went into production in 2010 and will be manufactured at a very low rate of around 10–12 aircraft a year for the next twenty years; at that rate, the aircraft could be obsolete before the last one is delivered.

Even the country's much-vaunted missile development program, initiated in 1983 as a comprehensive, intensive effort to make India self-sufficient in tactical missile systems, has so far produced few successes. Only two IGMDP projects—the Prithvi and Agni surface-to-surface ballistic missiles—have so far been deployed to the Indian armed forces. Even then, the Prithvi is a relatively short-range, liquid-fueled missile (maximum range: 350 km) of limited tactical use, while the Agni "does not appear to have been produced in large enough numbers for induction into the services."¹⁵ Moreover, some missiles under the IGMDP, including the Trishul surface-to-air missile system and the Astra air-to-air missile—are still in development decades later and will likely never be anything more than "technology demonstrators."¹⁶ For its part, the Nag ATGM is still undergoing test and validation trials after more than 20 years of development, and it was only accepted into the Indian Army (on a trial basis, with just 443 missiles being ordered) in 2011.¹⁷ So far, only the Akash surface-to-air missile has gone into serial production and deployment.

If anything, Indian efforts to move from self-reliance to self-sufficiency in armaments production have taken a huge step backwards over the past 15 years. The Indian military is as dependent as ever on foreign systems and technologies. Around 60 percent of the components for the Arjun tank are imported, for example, while the Tejas fighter utilizes a U.S. jet engine and either a European or Israeli radar.¹⁸ Even India's highly touted BrahMos supersonic cruise missile (available in both antiship and land-attack variants) is heavily based on the Russian-designed P-800

14 Shiv Aroor and Amitav Ranjan, "23 Yrs and First Fighter Aircraft Hasn't Taken Off," *Indian Express*, November 14, 2006.

15 Cohen and Dasgupta, *Arming without Aiming*, 33.

16 Joshi, "If Wishes Were Horses"; Shiv Aroor and Amitav Ranjan, "Armed Forces Wait as Showpiece Missiles are Unguided, Way off Mark," *Indian Express*, November 13, 2006.

17 Ajal Shukla, "Army Opts for Nag Missile as it Enters Final Trials," *Business Standard*, March 8, 2010; Gordon Arthur, "Indian Armed Force Programs: Large Budget Increases," *Defense Review Asia*, March 2009, 13–14

18 Shiv Aroor and Amitav Ranjan, "Arjun, Main Battle Tanked," *Indian Express*, November 14, 2006; Manu Pubby, "Israel, EU in Contention to Co-develop Radars for Tejas," *Indian Express*, July 14, 2010.

Yakhont missile; India's particular contribution to this program, other than money, is hard to identify.¹⁹ Indeed, the most advanced armaments coming out of Indian factories are still predominantly license-produced versions of foreign weapons systems: Su-30MKI combat aircraft, T-90 tanks, the Konkurs and Milan ATGMs, and Scorpène submarines, among others. Additionally, most of the Rafale fighters acquired under the Medium Multi-Role Combat Aircraft (MMRCA) program will locally built under license.

Consequently, the Indian arms industry still functions mainly as an assembler, rather than an across-the-board innovator.²⁰ In 1995, New Delhi announced that within ten years it would increase the "local content" of weapons in the Indian armed forces from 30 percent to 70 percent. By 2005, however, foreign weapons systems (that is, both imports and licensed production) still comprised around 70 percent of the Indian military's acquisitions.²¹ In 2010, the percentage of imported systems still hovered around 70 percent.²²

The problems with India's defense industry are structural, financial, and, most of all, cultural. A cabal of monopolistic state-owned enterprises has traditionally dominated the arms production process. In turn, these DPSUs and OFs are larded with bloated workforces and excess productive capacity; estimates are that much of the defense industry operates at barely 50 percent of capacity.²³ At the same time, the defense industry has been starved of capital for modernization to keep pace with the global state-of-the-art in arms production. India's defense budget constituted less than two percent of the country's GDP in 2011.²⁴ Funding for defense R&D amounted to barely US\$1 billion in 2011, barely three percent of total military expenditures; in contrast, the United States spent US\$78 billion on defense R&D in FY2010, while China's military R&D budget is estimated to be around US\$5–6 billion. One result has been that the Indian defense sector has been unable to train enough highly qualified technicians, engineers, and scientists.²⁵ Finally, there has also traditionally been a lack of coordination between the defense sector and the armed forces when it comes to requirements, planning, and production.²⁶

Despite these obvious deficiencies, there was for a long time little incentive from within the arms industry to reform and restructure itself. A "statist" mindset generally permeated the Indian military-industrial complex, and the government, DPSUs, and OFs operated in a cozy, sealed environment. Under the guise of "self-reliance," state-run defense firms were pretty much guaranteed production work; little stress was put on meeting project milestones or ensuring quality or operational effectiveness. Moreover, the private sector was not permitted to bid on major weapons contracts. For their part, the Indian armed forces were essentially forced to accept indigenous military equipment, whatever their preferences.²⁷ Consequently, as recently as 2005, one Indian defense ministry official was quoted as stating "the DPSUs have no need to be competitive as they face no competition and have a captive market in the military."²⁸

Much of the blame for the failure of the Indian military-industrial complex to perform adequately has been laid directly upon the DRDO, which has frequently been criticized for its poor performance in overseeing the country's

19 Author's interviews in India, March 2011; Globalsecurity.org, "PJ- 10 BrahMos," <http://www.globalsecurity.org/military/world/india/brahmos.htm>.

20 Author's interviews in India, March 2011.

21 Singh, "Quest for Self-Reliance," 151; Bedi, "Two-Way Stretch."

22 Cloughly, "Analysis: DRDO Fails to Fix India's Procurement Woes"; Guy Anderson, "India's Defense Industry," *RUSI Defense Systems*, February 2010, 68.

23 Bedi, "Two-Way Stretch," 25–26; Singh, "Quest for Self-Reliance," 155.

24 Rahul Bedi, "India Announces 12% Defense Budget Increase," *Jane's Defense Weekly*, March 3, 2011.

25 Pardesi and Matthews, "India's Tortuous Road," 424.

26 *Ibid.*, 432–34; Singh, "Quest for Self-Reliance," 148–49.

27 Author's interviews in India, March 2011.

28 Quoted in Bedi, "Two-Way Stretch," 28.

overall weapons development process.²⁹ In particular, the institution has been accused of arrogance, self-promotion, and weak leadership, and with a stronger emphasis on the acquisition of technology and know-how than on its actual application. Cohen and Dasgupta, in their 2010 book on Indian military modernization, put it bluntly:

The reasons for DRDO's failures are multifaceted. One review concluded that poor planning, over-optimistic timelines, and a lack of coordination with the armed forces led to cost and time overruns of major defense projects. However, the most important reason is the agency's lack of political leadership. DRDO officials engaged in exaggerated and wildly over-optimistic statements of their own capabilities, and civilian politicians with little knowledge about strategic or military affairs, let alone the intricacies of military technology and hardware, allowed DRDO a free hand for decades.³⁰

Insisting that maintaining an indigenous defense R&D and industrial base is a strategic technological and economic imperative, the DRDO historically took a reflexive approach that overwhelmingly and relentlessly favored indigenous solutions over foreign options. Particularly during the 1980s and 1990s, when India began its attempts to move from licensed production-based "self-reliance" to more autarkic "self-sufficiency," the DRDO

made it a practice to claim that it could provide services in, and make any product related to, aeronautics, armaments, electronics, combat vehicles, engineering systems, instrumentation, missiles, advanced computing and simulation, special materials, naval systems, life sciences, training and information systems...³¹

Consequently, the organization has had the persistent tendency to overestimate the technological abilities of the local defense sector while also low-balling weapons costs and development timelines:

The organization has adopted a classic foot-in-the-door strategy: winning initial support by promising products on the cheap but later citing sunk costs to demand more money.³²

At the same time, the DRDO has long had "the power to kill any procurement proposal from the armed forces," and could furthermore "set the hardware-modernization agenda through its power to veto or delay acquisition from overseas in favor of indigenous research and development."³³

At the same time, the Indian military must bear some of the blame for delays and failures in indigenous weapons programs. It often tries to add new requirements and new capabilities to weapons projects that are already well into R&D, slowing development and deployment, and sometimes even leading to the cancellation or scaling back of the program. This then forces the military (or gives it the excuse) to acquire a (often superior) foreign system.³⁴

The challenges to the Indian defense industry will likely only increase over the next several years, especially as the country embarks on a massive recapitalization of its armed forces. Estimates are that the military will, over the next two decades, need to buy up to 450 combat aircraft, 100 transport aircraft, 200 helicopters, 1,500 tanks, 500 combat vehicles, 1,500 artillery pieces, and 140 naval ships, including up to 20 submarines and two to three aircraft carriers.³⁵ It is arguable whether the Indian military-industrial complex is up to the task of supplying state-of-the-art systems to the nation's armed forces within this timeframe.

29 Bedi, "Two-Way Stretch," 27; Rahul Bedi, "India Launches 'Thorough' Audit of DRDO's Effectiveness," *Jane's Defense Weekly*, January 24, 2007; Rahul Bedi, "Making Decisions," *Jane's Defense Weekly*, January 25, 2010; Manoj Joshi, "If Wishes Were Horses," *Hindustan Times*, October 18, 2006.

30 Cohen and Dasgupta, *Arming without Aiming*, 33.

31 Joshi, "If Wishes Were Horses."

32 Cohen and Dasgupta, *Arming without Aiming*, 33.

33 Ibid.

34 The author is grateful to Timothy Hoyt for pointing out this argument.

35 Vivek Raghuvanshi, "India May Increase Defense Spending as Percent of GDP," *Defense News*, September 24, 2007; Bedi, "Two-Way Stretch," 28; author's interviews in India, March 2011.

Reforming the Indian Defense Industry, 2001–2011

To be fair, the Indian government has long been aware of the deficiencies affecting the country's defense industrial base, and for roughly a decade it has pursued a number of initiatives intended to reform and revitalize the defense sector. These reforms generally fall under one of several categories: 1) opening up defense contracting to the private sector; 2) permitting foreign firms to invest in India's defense industry; 3) encouraging more joint R&D and co-production arrangements with foreign firms; 4) formalizing offsets and leveraging them for technology acquisition; and 5) encouraging arms exports. In general, the Indian government is seeking to use private firms to put pressure on the state-owned defense sector to reform itself. By permitting commercial businesses to bid on defense contracts and to create joint ventures with foreign defense companies, it is hoped that the competition will force the DPSUs and OFs to become more market-oriented and cost-effective, and also more responsive to customer requirements (i.e., the Indian military). In addition, a formalized offsets strategy is intended to inject critical technologies into the Indian military-industrial complex where they are most needed, and in a timely fashion.³⁶

Additionally, in an effort to formalize technology transfer obligations, the Indian government has over the past decade inaugurated and refined an official defense offsets policy. In the 2000s, New Delhi's Defense Procurement Procedures (DPP) guidelines outlined three broad acquisition strategies for the Indian armed forces: "buy," "buy and make," and "make." "Make" refers to military products that would be more or less wholly designed, developed, and manufactured within India; its basic objective is to ensure the maintenance and expansion of indigenous R&D, design, and production capabilities on the part of the local defense sector, both state-owned and private.³⁷ The "buy" category entails products that are intended to be imported; under the terms of the 2006 DPP, any such arms import greater than 3 billion rupees (approximately US\$67 million) required a minimum 30 percent direct offset, either in the form of counter-purchases of Indian defense equipment or foreign direct investment (FDI) in the Indian defense industry (such as co-development or co-production arrangements, or joint international marketing efforts). The "buy and make" category applies mainly to major military programs, such as the MMRCA, that entail licensed production inside India and which therefore demand considerable technology transfers and industrial participation. In cases such as the MMRCA a 50 percent offset is usually mandated.

Perhaps it is too soon to tell if these initiatives will have their desired impact, but so far these efforts have shown few tangible results. First of all, it has been difficult to encourage India's private sector to invest in a line of work that requires large, risky investments in R&D and infrastructure, in exchange for low returns. This effort is made all the harder by the persistence of a "statist mindset" on the part of the Indian Ministry of Defense—and especially the DRDO—that still tends to default to giving large military contracts (and defense offsets) to the DPSUs and OFs. This was most recently reflected in the defense ministry's 2010 awarding of a noncompetitive contract worth US\$1 billion to Bharat Electronics for the Indian Army's battle management systems.³⁸ Moreover, the *Raksha Udyog Ratnas* (RUR) or Champions of Industry initiative was eventually abandoned, in part due to stiff resistance from trade unions representing workers in the DPSUs and OFs.³⁹

Additionally, while the government has permitted foreign firms to invest in Indian defense companies (now up to 49 percent of shares), so far there have been few takers. Overseas investors have no independent means by which to value these companies' stock, and they are not permitted much say in how these companies should be run. Additionally, the Indian government has frequently rejected foreign shareholding or joint venture efforts, and consequently only four such foreign-Indian defense joint ventures have been set up since 2001.⁴⁰ According to one

36 Author's interviews in India, March 2011.

37 Behera, "India's Growing Defense Industry Base," 36.

38 Raghuvanshi, "Exec: Award Shows India Still Favors State Firms."

39 Jon Grevatt, "India Delays Defense Reforms Again in Face of Multiple Pressures," *Jane's Defense Weekly*, December 21, 2007; Anderson, "India's Defense Industry," 69.

40 Author's interviews in India, March 2011.

source, in 2009 such FDI amounted to less than US\$142,000.⁴¹ At the same time, any privatization of the country's state-owned defense sector, that is, the DPSUs or OFs, is so unlikely as to be almost inconceivable.

Again, the biggest impediment to defense innovation remains the DRDO. It has the ability to stifle foreign—and even domestic—competition to the established state-owned defense industrial establishment, yet at the same time, is unable to advance the nation's state of the art in defense R&D. Overall, the DRDO functions largely autonomously of the Indian military. According to a recent Ministry of Defense audit, the DRDO spends considerable sums of money on nonproductive programs, promotes unqualified institutions, lacks transparency in its accounting methods, and has failed to stem the exodus of qualified personnel.⁴² Moreover, there appears to be no sense of urgency on the part of the DRDO to reform and change the way it does business, which has had the unintended consequence of *stifling* innovation. In general, the DRDO appears to be more interested in maintaining its vaunted status as the country's central and premier defense R&D establishment.

Conclusions

It is, of course, easy to be dismissive of Indian's defense industry—both of its current capacities for advanced armaments production, and of its likelihood of engaging in real, effective reform. In general, India's track record in both of these areas has not been encouraging, and overall the history of India's military-industrial complex has been particularly disheartening. After China, India possesses the largest and most ambitious defense industrial base in the Asia-Pacific, if not the entire developing world, and yet the performance of its defense industry over the past 50 years has been disappointing in the very least. Billions of dollars have been spent on domestic weapons programs that have never performed up to their requirements or met their objectives when it came to costs and milestones. And while the rest of the world has marveled at India's globally competitive information technologies sector, the country's defense industry has remained, for the most part, an overwhelmingly statist enterprise undauntedly committed to autarkic armaments production. The Indian military-industrial complex was a huge white elephant of highly protected, monopolistic state-owned corporations, headed up by a bloated DRDO, which pressed for indigenous solutions with little heed paid to capabilities or timeliness. It is little wonder, therefore, that Cohen and Dasgupta would flatly state that the Indian military-industrial complex “has not delivered a single major weapon system to the armed forces in five decades of existence.”⁴³ And while such an assertion may strike one as unfair and exaggerated, the sad fact is that this claim was right more times than it was wrong.

Defense industrial reforms also have some powerful allies in the government and the military. In particular, both are keen to use the local private sector and foreign firm involvement to pressure the DRDO, DPSUs, and OFs to change their business-as-usual practices. In this regard, they are strongly supported by such powerful allies as the Confederation of Indian Industries, which has long pressed for the liberalization and opening up of the country's defense business.

Nevertheless, reforming India's military-industrial complex remains an uphill battle. The state-owned defense sector is still very powerful, and the DPSUs and OFs will likely continue to strongly oppose any initiatives to remove or reduce their role as the primary producers of the nation's armaments, particular when it comes to such big-ticket items as combat aircraft, warships, missile systems, and tanks and other armored vehicles. Moreover, the DRDO still wields considerable influence within the national armaments planning process, and is thus a strong advocate for the status quo. In particular, it still prefers, when it can, to pursue indigenous development programs over licensed production or foreign joint ventures.

41 Anderson, “India's Defense Industry,” 69.

42 Yatish Yadav and Nardeep Singh Dahiya, “The Secret World of DRDO,” *New Indian Express*, September 2, 2012.

43 Cohen and Dasgupta, *Arming without Aiming*, 32.

Ultimately, it is too soon to tell if these recent reform efforts will take root and flower. One thing is for certain, however: So long as India continues to shield and coddle its traditional military-industrial complex in the name of self-sufficiency and strategic imperative, it will never be able to remake the local defense industry into something capable of supplying the Indian armed forces with the equipment it requires. That, in turn, will mean that Indian ambitions of becoming a great power will always be circumscribed.

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