

Drivers of Change in the Indian Defence Industrial Base

From Indigenisation to Structural Capacity-Building

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Indigenisation and self-reliance have been the key objectives of India's defence industrial policy since the 1990s. However, over the last decade, these objectives have become central to the agenda of the new political dispensation, and accordingly, the policy framework has been designed to make the defence industry a champion industry in the manufacturing sector, alongside its role in ensuring national security. India's leadership has consistently maintained that indigenisation is not synonymous with isolation; rather it is a process of innovation, investment and integration aimed at capacity-building through global cooperation and consortium-driven manufacturing. The main focus of the successive policy frameworks is to transform India from a buyer to a builder, from a processor to a programmer, and from a purchaser to a proprietor of critical technological capabilities.

However, India's efforts to indigenise critical technologies—from combat aircraft and aero-engines to main battle-tanks—have confronted a persistent design–execution gap. Indigenisation efforts have taken many years, burdened by prolonged technological deficiencies that have created significant capability gaps between policy ambition and operational reality. Against this backdrop, this article examines two questions: first, whether

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the changing policy framework of the last decade has substantively enhanced the capability of India's defence industrial base; and second, how specific post-Kargil war policy measures broke with the earlier state-led model to create conditions for a collaborative, private-sector-integrated ecosystem.

Employing qualitative institutional analysis and drawing on policy documents, the study finds that while recent frameworks represent a genuine structural departure from the licensed-assembly model, the transition from indigenisation to innovation remains incomplete. Bridging the design–execution gap requires not merely procurement reform, but also the integration of academic Research and Development (R&D) into the defence industrial ecosystem as a core institutional priority.

Keywords: *Indigenisation; Atmanirbhar Bharat; Defence Industrial Complex; Structural Transformation; Private Sector Integration; DPM 2025*

INTRODUCTION

The policy framework for indigenisation in India has evolved through successive policies of defence industrial planning, procurement and production; however, to date, these attempts within the defence sector have achieved only partial success. Domestic production often remains limited to the assembly of foreign-sourced core technologies—a phenomenon analysts term ‘assembling technology’. This creates a facade of self-reliance while maintaining deep-seated dependencies on external suppliers for advanced sensors, engines and microelectronics. Experts suggest that categorising such systems as ‘indigenised’ contributes to an inflated perception of domestic capability.¹

To rectify these structural deficiencies, India has strategically re-oriented its policy framework over the last decade. While this shift gained significant momentum recently, the roots of policy re-formulation can be traced back to the post-Kargil war era. The introduction of the Defence Procurement Procedures (DPP), the Defence Production Policy, and the Offset Policy marked the beginning of a re-structured defence industrial complex. This period saw the historic opening of the sector to private players and the introduction of Foreign Direct Investment (FDI), ending a 50-year state monopoly.

From the K. Subrahmanyam-led National Security Advisory Board to the Kelkar and P. Rama Rao Committees, along with others,² a constant evolution in policy logic has been observed. Today, the sector is no longer viewed solely through the lens of strategic preparedness; it is now positioned

as a national economic driver capable of fulfilling the aspirations of millions through job creation and global marketing.

RESEARCH QUESTIONS

In light of the transitional shifts in India's defence ecosystem, this article seeks to answer the following questions:

- How do recent reforms under the 'Make in India' and 'Atmanirbhar Bharat' frameworks differ qualitatively from previous indigenisation attempts?
- To what extent has the current policy shift functioned as the primary driver of structural change by fostering a genuine collaborative ecosystem between the public sector, private integrators and the global original equipment manufacturers (OEMs) over the last decade?

RESEARCH OBJECTIVES

The primary goal of this article is to analyse the transition from mere indigenisation to genuine capacity-building, specifically:

- to examine the historical policy shifts (post-Kargil) alongside contemporary initiatives like 'Atmanirbhar Bharat' to identify patterns of continuity and change;
- to evaluate the impact of private sector integration and FDI liberalisation on the actual technological depth of the Indian defence industrial base;
- to assess the dual role of the defence sector as both a tool for strategic autonomy and a driver of national economic growth; and
- to interrogate the institutional hurdles and 'capability gaps' such as the Tejas and Arjun cases that necessitated the current strategic departure.

METHODOLOGY AND THEORETICAL FRAMEWORK

This article adopts a dual-lens methodological framework, synthesising positivist and critical realist perspectives to provide a comprehensive analysis of India's defence industrial landscape. From a positivist standpoint, this research operates on the premise that the evolution of India's defence sector can be understood through systematic analysis and empirical observation. Policy shifts are not merely abstract concepts; they manifest in measurable data points and observable industrial outcomes. By examining longitudinal data on defence procurement, FDI inflows, and domestic production outputs, this

article aims to produce generalisable and sustainable propositions regarding the changing political economy of the defence industry.

While positivism captures the ‘what’, critical realism is employed to investigate the ‘how’ and ‘why’. The critical realists argue that institutional changes and the narratives propagated by government bodies or media houses must be explained with reference to the underlying systemic, organisational and structural contexts. This lens allows the study to move beyond surface-level claims of ‘indigenisation’ and ‘technological competence’. It critically assesses the gap between official state claims—often amplified by domestic media—and the assessments of international watchdogs that frequently describe these advancements as ‘beyond the reality’ of actual capability. Applying this dual lens, we begin with the legacy programmes—the empirical record against which the current framework’s departures must be measured.

THE LEGACY DEFICIT: CAPABILITY GAPS AND THE SCREWDRIVER PARADOX

Before evaluating the transformative claims of ‘Atmanirbhar Bharat’, it is essential to establish the empirical baseline—the record of institutional failure that made structural departure not merely desirable, but unavoidable. The history of Indian defence indigenisation is dominated by what this study terms the ‘licence production system’, i.e., a state in which domestic assembly fails to translate into combat-ready autonomy, forcing repeated reliance on foreign alternatives.

The Indigenisation Paradox: Tejas, Arjun and the Aerospace Domain

While Hindustan Aeronautics Limited (HAL), in its service history, has manufactured 17 types of aircraft and helicopters,³ a striking irony exists when we compare its LCA Tejas programme with the Swedish SAAB Gripen at the global level. Both programmes commenced in the early 1980s⁴ with the goal of achieving domestic aerospace sovereignty; however, while the Gripen evolved into a global phenomenon,⁵ the Tejas remains a symbol of technical deficiencies, which is also highlighted by the Comptroller and Auditor General of India (CAG).⁶ Despite relying heavily on foreign-sourced core technologies—such as US-made GE engines⁷—HAL struggled to deliver a technically error-free platform. Although HAL and the National Aerospace Laboratories (NAL) possess long institutional histories, their success in manufacturing combat-ready aircraft remains disproportionately low relative to their years of service. The SAAB Gripen, which started in the 1980s

alongside India's LCA Tejas project, received final operational clearance (FOC) in 1997 and secured export orders as early as 2005. However, India failed to even name its project for 20 years and took 23 years to decide that it required the outsourcing of combat engines. It took India 23 years to formally acknowledge that its indigenous engine programme (Kaveri) could not meet the Tejas's requirements, eventually forcing the outsourcing of power plants (GE F404/414). In contrast, Sweden successfully integrated foreign technology (Volvo RM12) within a domestic design framework from the outset. The structural urgency for procurement reform during this period was publicly crystallised by several converging events: the CAG's assessments of War Reserve deficiencies, and General V.K. Singh's 2012 letter⁸ to the then Prime Minister Dr Manmohan Singh, which brought critical equipment shortfalls into the public domain. What the V.K. Singh letter accomplished was to transform an institutional imperative into a political one—and it is precisely this convergence of institutional and political pressure that the critical realist framework identifies as the condition for genuine structural departure, rather than incremental revision. The period was marked by sustained public concern over the state of military preparedness. DPP 2013 followed in June 2013, consolidating a series of procedural amendments intended to streamline capital acquisition and sharpen the preference hierarchy in favour of indigenous sourcing. Despite this, the Tejas is still struggling to achieve final operational clearance for the naval version. Meanwhile, the Gripen has established itself as a major fighter platform, recently proving its efficacy in regional combat scenarios (e.g., between Thailand and Cambodia). The disparity is further underscored by the trajectory of the Naval LCA programme. Sanctioned in 2003, the Ministry of Defence (MoD) committed an additional US\$ 1.7 billion in 2010, specifically for the development of a more powerful engine to meet carrier-borne operational requirements. Despite this investment, Naval Chief Admiral Sunil Lanba formally rejected the LCA Navy in 2016, stating that the platform in its present form did not meet the operational capability required by the Indian Navy. The Aeronautical Development Agency (ADA) subsequently developed the LCA Navy Mk 1 prototype, which completed initial tests in January 2020. Former Naval Chief Admiral Karambir Singh thereafter announced that the first test flight of the LCA Navy Mk 2 was expected by January 2026. As of now, no confirmed test flight has been publicly reported, indicating a further delay. This trajectory—spanning over two decades from sanction to a still-unverified Mk 2 first flight—represents a failure of development velocity that has no parallel in comparable international programmes.⁹

The Gripen offers a pointed contrast. The Gripen E/F is a land-based platform; no naval variant exists or was attempted. The comparison between the LCA Tejas and the Gripen therefore remains valid at the programme level—both are light-weight multi-role fighters initiated in the early 1980s¹⁰—and the absence of a Gripen naval equivalent does not weaken the comparison. It reinforces it: Sweden resolved the question of carrier capability at the design stage; India is still attempting to answer it four decades later.

The ALH Dhruv (initiated 1984) serves as another primary case study of this ‘capability gap’: ‘Despite a projected demand for 500 helicopter units by 2029—as estimated by the Confederation of Indian Industry (CII) in 2009¹¹—only 76 were delivered by 2025.¹² In September 2023, the Indian Army and the Indian Air Force (IAF) expressed their intention for procurement of 156 Prachanda LCH—66 for the IAF and the remaining for the army—with the Defence Acquisition Council (DAC) giving the sanction in November 2025 for 156 units.¹³ By 2017, internal assessments by the then-Army Chief General Bipin Rawat confirmed that the Rudra and LCH lacked essential anti-tank capabilities due to the protracted development of the NAG/Helina missile.¹⁴

The Arjun Main Battle Tank (MBT), initiated in 1972 and entrusted to the Defence Research and Development Organisation (DRDO) in 1974,¹⁵ highlights the same paradox on land.¹⁶ The tank only saw limited induction by 2008 and remains plagued by excessive weight (68 tonnes) while the Army’s operational requirement specifies tanks not exceeding 50–55 tonnes,¹⁷ rendering it unsuitable for many operational terrains compared to the Russian T-90, on which the Army remains over-dependent. The Arjun Mk-I’s reliance on German MTU engines—now a ‘closed shop’ due to supply chain issue—underscores a persistent structural over-dependence on foreign technical foundations.

The struggle for indigenous mastery extends to the civilian–military dual-use sector. The NAL Saras light transport aircraft, approved in 1998, saw its progress derailed by a fatal prototype crash in 2009.¹⁸ The Regional Transport Aircraft (RTA) project, conceptualised in 2007,¹⁹ never materialised owing to ‘inter-agency friction’—with HAL under the MoD and NAL under the Ministry of Earth Sciences—and a critical lack of dedicated funding.²⁰

Joint Venture Stagnation and Maritime Delays

This inertia extends beyond state monopolies into joint ventures. The 2016 MoU for the Ka-226T (Kamov) helicopters, via a joint venture (JV) between HAL and Rosoboronexport,²¹ remains stalled. Despite the 2017 formation of

Indo-Russian Helicopters Pvt. Ltd (IRHL), the project remained in technical evaluation as late as 2021. Post-2022 sanctions have restricted Russia's access to European engines and components, leaving the project in a 'fluid' state as of 2025.²² 'This stagnation underscores a structural vulnerability: without a robust domestic component ecosystem, even a willing JV partner cannot insulate the programme from third-party supply chain disruptions—as demonstrated when post-2022 sanctions severed Russia's access to the European-sourced components required for the Ka-226T.

In the maritime domain, Project P-75(I)—approved in 2003, with the Request for Proposal only issued in 2021 after an 18-year gap—exemplifies the capability gap. Protracted price negotiations between the MoD and shortlisted foreign–Indian JV partners mean that the first vessel is now unlikely to be delivered before 2030.²³

These long-standing programmes collectively illustrate the critical realist insight that indigenous content classifications function as institutional narratives that often overstate material capability. No formal claim of 100 per cent self-reliance has been made; however, the systematic labelling of assembled platforms as indigenised creates what this framework terms a structural misrepresentation of the technology lifecycle gap. Whether it is the weight issues of the Arjun, the engine dependencies of the Tejas, or the bureaucratic fragmentation of the RTA, the results are the same: stagnant progress and a recurring need for emergency foreign acquisitions—exemplified by the emergency T-90 tank order following Kargil, the leasing of Su-30s to address fighter squadron depletion while the Tejas remained in development, and the negotiations for a nuclear submarine lease following the *INS Sindhurakshak* disaster.²⁴

This systematic failure of the state-owned manufacturing apparatus provided the ultimate justification for the strategic departure towards the private-sector-led builder model envisioned in 'Atmanirbhar Bharat'. The CAG reports from 2010 to 2015 served as a strategic wake-up call.

The 2015 report of the CAG highlighted a critical vulnerability—in the event of a high-intensity conflict of India's War Wastage Reserves. The cumulative weight of these findings—while the CAG itself confined its mandate to audit findings rather than prescriptive restructuring—provided the empirical foundation upon which subsequent policy reform was justified. The political leadership drew from this record the conclusion that a fundamental restructuring of the defence industrial model was unavoidable. This revelation exposed two concurrent failures: first, the structural inadequacy of the licensed-assembly model, which created

genuine capability gaps at the platform level; and second, the dysfunctional procurement system that failed to maintain minimum acceptable risk levels for ammunition and spares, irrespective of whether platforms were indigenously produced or imported.

This was further enabled by the consolidation of executive authority under a government entering its third consecutive term—a configuration that, as scholars of institutional reform note, provides the combination of electoral legitimacy and bureaucratic leverage required to execute structural reforms against entrenched vested interests.²⁵ Quantity of licences does not equal quality of indigenous content. As Table 1 shows, the cumulative cost overruns on delayed Union Government projects—including those in the defence production sector—demonstrate the direct fiscal burden of this.

Table 1 Cost overrun of delayed Union government projects (in crores)
(For projects related to Defence Production along with others*)

Year	Number of Projects	Original Estimate	Currently Anticipated	Cost Overrun
2012	02	6,938	12,796	5,858
2013	01	6,395	11,609	5,214
2014	01	2,494	2,494	0
2015	17	82,662	82,662	0
2016	18	64,808	72,118	7,310
2017	26	98,854	1,08,617	9,763
2018	27	86,365	87,106	742
2019	27	71,272	72,514	1,242
2020	56	1,29,505	1,77,485	47,980
2021	69	1,53,112	2,17,166	64,054
2022	35	1,52,255	2,23,574	71,319
2023	35	1,49,433	2,23,853	74,422
2024	30	1,40,343	2,14,865	74,522
* Others include projects under Urban Development, Water Resources, Social Justice, Department of Higher Education, Home Affairs, DPIIT, DoNER, and Renewable Energy. Standalone statistics for only defence production are not available.				

Source: *Handbook of Statistics on the Indian Economy 2024–25* by RBI, p. 69.²⁶

POLICY ARCHITECTURE OF ATMANIRBHAR BHARAT: FROM THE POST-KARGIL REFORMS TO THE DEFENCE ACQUISITION PROCEDURE

The Atmanirbhar Proposition: An Attempt to Master the Technology Lifecycle

Within the framework of this military–industrial institutional gestation, the policies of ‘Atmanirbhar Bharat’ and ‘Make in India’ represent a crucial departure from earlier paradigms. While they continue the trajectory of reform, they fundamentally shift the approach towards a more collaborative and result-oriented indigenisation effort. Under this new logic, the ‘Atmanirbhar Thesis’ posits that true self-reliance is not merely about substituting imports but about mastering the entire lifecycle of defence technology—bridging the gap between design intent and industrial execution. This strategic re-orientation utilises substantial defence procurement spending to incentivise domestic production, supported by transformative initiatives such as positive indigenisation lists, liberalised FDI, and a mandated emphasis on domestic procurement.

This shift does not mean a complete abandonment of licensed production—the AK-203 rifle programme at Amethi and several legacy transfer of technology (T-o-T) arrangements remain active—but it represents a decisive reorientation of the procurement hierarchy, positioning indigenous design (Indigenously Designed, Developed and Manufactured; IDDM) above licensed manufacture in policy priority for the first time. India’s policy re-orientation represents a transition towards a manufacturing model driven by frontier technologies, robust R&D ecosystems, and a future-ready workforce, as outlined in the NITI Aayog’s Advanced Manufacturing Roadmap (2025)²⁷ and operationalised through the Defence Procurement Manual (DPM) 2025’s formal academia–start-up–military bridge provision. Central to this shift is the ‘Viksit Bharat’ mission, which seeks to elevate the manufacturing sector’s GDP contribution from the current 15–17 per cent to a target of 25 per cent.²⁸ This is not merely an economic goal but a geopolitical necessity to reverse the ‘Colonial Narrative’ that positioned India as a primary goods supplier and technology consumer, structurally excluded from high-value manufacturing and to position India as a dominant pole in a multi-aligned world.²⁹ This strategic roadmap is contextually situated within a broader competitive landscape—including China’s ‘Made in China 2025’ and Dual Circulation policies,³⁰ South Korea’s precision manufacturing renaissance, and the protectionist turn in American industrial policy—though it is important to note that Indian policy documents frame ‘Viksit

Bharat' primarily in terms of domestic necessity rather than explicit external competition.³¹

This mission acknowledges that growth can no longer rely solely on a demographic dividend or 'catch-up' opportunities fuelled by low-level labour productivity. Instead, the focus has shifted to the Second Machine Age³²—an era defined by the substitution of human labour with intelligent machines. As global manufacturing enters this phase, characterised by automation and artificial intelligence (AI), India's indigenisation strategy is prioritising robotics and smart value chains to prevent its demographic dividend from becoming a liability through strategic roadmap initiatives by NITI Aayog in 2025 to prepare India's strategic and national security as per the changing dynamics of world technological development.

The Defence Procurement to the Defence Acquisition: An Institutional Trajectory

Two distinct instruments govern India's defence procurement: the Defence Acquisition Procedure (DAP, formerly DPP), which covers capital expenditure on platforms and weapon systems and is the primary vehicle for indigenisation policy; and the DPM, which governs revenue procurement of stores and consumables. The indigenisation narrative in this article primarily relates to the DAP/DPP trajectory; the DPM 2025 represents a significant reform of the revenue procurement system, though its direct impact on indigenisation of platforms is limited compared to the DAP.

A policy trajectory originated in the institutional wake of the Kargil War. The Kargil Review Committee (1999), chaired by K. Subrahmanyam, first identified India's critical defence industrial vulnerabilities. Its findings, consolidated in the Group of Ministers Report of 2001 on Reforming the National Security System, provided the foundational blueprint for the Defence Procurement Policy 2002—which formally ended the state monopoly on defence manufacturing and opened the sector to private enterprise for the first time. Building on this foundation, the Vijay Kelkar Committee report of 2005 established the offset mechanism and deepened the institutional framework for indigenisation. The successive Defence Production Policies (2011) form the core framework for transforming the political economy of India's defence sector. The trajectory of India's defence industrialisation was fundamentally reshaped by the DPP 2011,³³ which moved beyond 'licensed production' towards the four-fold objective of substantive indigenous design, private sector integration, MSME participation and a broadened R&D base. This was reinforced by the 2012 Joint Venture guidelines and the 2013 Technology

Perspective and Capability Roadmap, which provided the private sector with the long-term visibility required for high capital investment. Government of India (GoI), through different DPP/DAP, tried to find out and address the issues of import dependence, limited technology transfer, weak domestic industry, skilled workforce and inconsistent policies. By institutionalising the 'Make', 'Buy and Make' and 'Buy Global' categories, the state created a lucrative ecosystem designed to dismantle public monopolies and integrate the private sector.

The DPP 2016³⁴ has its most significant contribution in the placement of the IDDM category at the apex of the procurement preference hierarchy—above both licensed production and assembled platforms. Analysts have interpreted this hierarchy as an implicit policy signal towards indigenous intellectual property (IP) development, since IDDM status by definition requires design ownership rather than technology absorption.³⁵ By placing IDDM at the top of the procurement hierarchy—above the 2013 categories of 'Buy (Indian)' and 'Buy and Make'—the MoD formally recognised design as the highest form of indigenisation. The 'Make' category had not taken off in the country before 2016. In DPP 2016, this categorisation can be split into three parts: The 'Make I' category would be for government-funded projects, the 'Make II' category would be for industry-funded projects, and the 'Make III' category projects would be reserved for MSMEs.³⁶ For the first time, the policy environment incentivised Indian companies to invest in R&D. By giving IDDM the highest priority, the government forced a pivot from 'processing' foreign technology to becoming 'proprietors' of original technology.

In 2020, in the DAP, it was further categorised to enhance the Indigenous Content (IC) to help Indian component, sub-system and equipment manufacturers establish themselves in the international defence supply chain.³⁷ Building on the DPP 2016 and 2020 frameworks, the DPM 2025 now serves as the benchmark for the 'Viksit Bharat' vision, representing the first major overhaul of revenue procurement since 2009. The government's quantitative ambitions were first articulated in the draft Defence Production and Export Promotion Policy (DPEP) 2020, which set targets of Rs 1.75 lakh crore in total defence production and Rs 35,000 crore in exports by 2025. These benchmarks provided the operational roadmap for subsequent frameworks like DPM 2025. While Figure 1 tracks this policy trajectory (demarcating historical growth from projected targets through 2028–29), the fundamental reality is that both targets were officially realised by early 2026. Consequently, these metrics no longer serve as forward-looking aspirations,

but rather demonstrate the successful execution and real-world impact of recent defence industrial reforms.

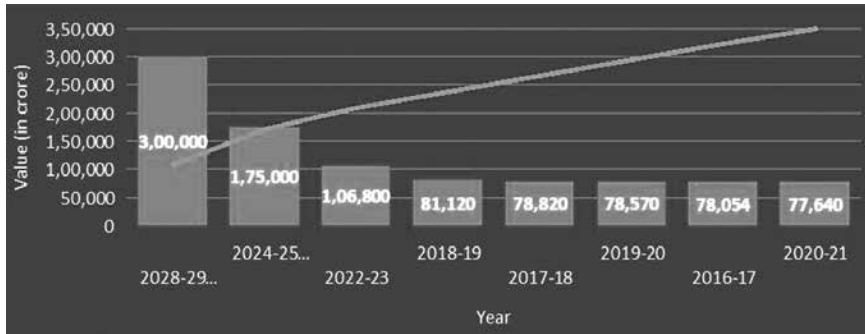


Figure 1 Value of Defence Production (2016–17 to 2028–29)

Source: MoD and Press Information Bureau³⁸

DPM 2025: Revenue Procurement Reform and Its Indirect Role in the Indigenisation Supply Chain

The DPM 2025 represents the first major overhaul of revenue procurement since 2009. While the DPM 2025 does not directly drive the indigenisation of major platforms—that remains the domain of the DAP—its significance lies in its overhaul of revenue procurement procedures, which affect the supply chain ecosystem underpinning the defence industrial base. Its contribution to indigenisation is indirect but not trivial: by governing the recurring, lower-value procurement stream, it shapes the order predictability on which smaller domestic suppliers depend, even though the principal instruments of indigenisation policy remain the DAP and the positive indigenisation lists. The six reforms introduced by DPM 2025 address institutional bottlenecks that have historically slowed the flow of orders to domestic vendors, including micro, small and medium enterprises (MSMEs). In this indirect but important sense, DPM 2025 complements the indigenisation thrust of the DAP 2020 rather than leading it. In addition, a draft DAP 2026 was released by the MoD for public comments in February 2026.

The DPM 2025 now serves as the benchmark and ‘Viksit Bharat’ vision representing the first major overhaul of revenue procurement since 2009. It institutionalises ‘jointness’ across the Army, Navy and Air Force through six pivotal reforms:³⁹

- Abolition of mandatory No Objection Certificate (NOC) from defence public sector undertakings (DPSUs), which removes state-sector protectionism, enabling private companies to compete on equal footing.
- Academia–start-up–military bridge; it creates a formal pathway to move beyond ‘assembling technology’ towards indigenous IP.
- Relaxed financial penalties during development—recognising that innovation involves failure, it lowers vendor risk to incentivise private R&D.
- Extended placement cycle—from 5-year to extendable up to 10-year order cycles, allowing vendors to plan long-term manufacturing.
- Delegated financial procurement powers—bypasses bureaucratic delays of higher headquarters by empowering field-level authorities.
- Enhanced MRO efficiency—a 15 per cent work margin allowance and autonomy for additional repairs ensures faster turnaround for combat assets.

THE COLLABORATIVE TURN: FROM LICENSED PRODUCTION TO CONSORTIUM INNOVATION

India’s defence journey has long been defined by a paradox: a vast institutional infrastructure (DRDO, DPSUs) that, despite its potential, left the nation as a leading importer rather than a creator of high-end technology. For decades, systemic inefficiencies forced a reliance on foreign platforms, relegating domestic efforts to the periphery of the global military–industrial complex. However, a structural shift towards a civil–military configuration—aligned with the 2005 mandate for long-term perspective planning—has now integrated the ‘Make in India’ initiative directly with military requirements.⁴⁰

By synchronising policy dynamics, the DAP now prioritises procurement categories such as ‘Buy (Indian)’, ‘Buy and Make (Indian)’, and ‘Make’ to incentivise domestic production. This strategic collaboration creates a level-playing field, allowing private companies to partner with foreign original equipment manufacturers (OEMs) and DPSUs. Consequently, the industry is streamlined to manufacture within India, leveraging a significant cost advantage, a vast talent pool, and enhanced global competitiveness to build a resilient, self-sustaining ecosystem. This transformation underscores a strategic departure: India is moving beyond mere ‘assembly’ to actively reshape its industry by adopting the historical lessons of successful nations that utilised external collaborations to catalyse domestic innovation.

The Consortium Precedent: How Defence Powerhouses Bypassed the Isolation Trap

Historically, nations that transitioned into defence powerhouses leveraged external partnerships to bypass long gestation periods and technological ‘death valleys’. Comparative analysis reveals that even established powers relied on external expertise during their formative stages: from the 1940s through the 1960s, the Soviet Union’s expansion benefitted from German technical expertise, while the foundational growth of Chinese and Israeli sectors was catalysed by technology transfers from the Soviet Union and France, respectively.

Israel’s experience is particularly instructive: following the abrupt termination of French collaboration in 1967, the nation pivoted towards an indigenous ecosystem, eventually becoming a top-ten global exporter. South Korea’s rise as a leading exporter is rooted in long-term technological collaboration with the United States. The Eurofighter Typhoon serves as a hallmark of ‘consortium-led innovation’, where the combined R&D and industrial capacities of the United Kingdom, Spain, Germany and Italy—managed through BAE Systems, Airbus and Leonardo—achieved a platform that no single nation could have realised alone.⁴¹

This global precedent underscores that, for the Indian defence industry, strategic partnerships are the essential scaffolding for genuine indigenous capacity. Technological autonomy is rarely achieved in isolation. India’s current policy re-orientation mirrors this global reality, i.e., moving away from isolated laboratory successes towards an integrated, market-driven and ‘Atmanirbhar’ framework.

Complementing Licensed Production with Collaborative Innovation

While licensed production remains an active feature of India’s procurement landscape, the ‘Make in India’ initiative represents a paradigm re-orientation—expanding the policy toolkit to include co-production and co-development models alongside existing T-o-T arrangements in India’s Defence Industrial Sectors (DIS). A pivotal moment in this transition occurred in May 2015, when a ten-member committee of experts was established to suggest amendments to procurement procedures, specifically to facilitate the ‘Make in India’ strategy. The committee’s report, submitted in July 2015, contained 43 comprehensive recommendations aimed at intensifying private-sector participation. A core proposal was the introduction of ‘Strategic Partner’ status,⁴² which sought to remove procedural hurdles and integrate private firms into the heart of defence manufacturing. This

strategy aims to position India as a simulation-led manufacturing hub by intensifying private-sector participation, notably through the granting of ‘Strategic Partner’ status and the removal of historical procedural hurdles for private firms. This policy departure at the state level re-orientates to overcome the challenges that obstruct the reforms. It encouraged the industries to move beyond the structural limitations of ‘licensed production’ and adopt a model where global cooperation facilitates the deep absorption of cutting-edge technology into the Indian private sector. As a result, India’s defence sector is undergoing a strategic transformation, expanding its focus from internal self-reliance to include the ambition of becoming a major global player.⁴³ By leveraging external partnerships to bypass long gestation periods and technological ‘death valleys’, this framework has fostered a resilient ecosystem where private-sector agility supplements public-sector infrastructure through high-tech joint ventures. The efficacy of this Consortium Model⁴⁴ is evidenced by the exponential growth in defence exports, which reached a record US\$ 4.15 billion in 2025–26.⁴⁵ Figure 2 shows that the value of defence exports, in both the public and private sectors, has risen since 2010. The unprecedented success, where defence exports increased 55 times, can be argued as the success of a policy departure that demonstrates the efficacy of the consortium model.

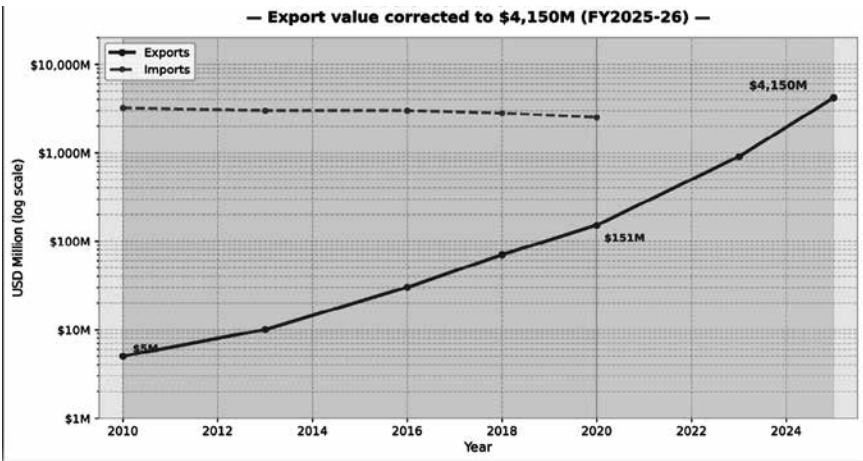


Figure 2 India Defence Trade (in USD million)

Source: India–Sweden Defence Industry Cooperation: Capitalising Opportunities for Growth and Security; Indian Express, 2026.⁴⁶

The Public–Private–Foreign Framework under ‘Make in India’

To continue with this qualitative departure in policy orientation and achieve the mission of indigenisation indicates that recent reforms differ qualitatively from previous attempts by embedding India’s specific needs within the changing world structure through high-technology partnerships rather than isolated domestic efforts. India has pivoted away from the historical ‘reverse engineering’ model employed by China,⁴⁷ moving towards a framework of transparent, collaborative public–private–foreign consortiums. This strategic shift is evidenced by high-stakes collaborations with global aerospace leaders: Safran (France) continues its support for the Rafale ecosystem, while General Electric (USA) supplies the F404 engines for the LCA Tejas⁴⁸ and the upcoming Advanced Medium Combat Aircraft (AMCA). Interest from Russia’s Rosoboronexport regarding Su-57 engine technology and Rolls-Royce (UK) for the AMCA Mark 2 programme underscores a global willingness to engage with India’s defence sector.⁴⁹

By contrast, India’s current trajectory avoids the ‘copy-cat’ trap that characterises many of China’s frontline platforms—viewed by analysts as derivatives of Russian innovations, including the J-11B (derived from the Su-27), the J-15 (Su-33), and the J-16 (Su-30).⁵⁰ India’s collaborative transparency distinguishes ‘Atmanirbhar Bharat’ from the practices of neighbouring competitors. While China maintains a ‘no-limits’ partnership with Russia, Moscow remains hesitant to share sensitive technologies—fearing China’s propensity for reverse engineering. The future envisions a collaborative network of partnerships, joint ventures and industry clusters. This will involve not only established players but also a focus on developing domestic vendors, particularly MSMEs, to create a robust supply chain. Fostering innovation and supporting start-ups with disruptive ideas remains a priority. To achieve long-term success, India is adopting learning lessons from not only successful leaders in the defence sector but also getting valuable lessons from its experience in building the automobile industry’s ecosystem. ‘Make in India’ emphasises that collaboration is key, and the policy transition highlights the importance of bridging the gap between policymakers, universities, think tanks, research facilities and the defence industry itself. SAAB’s establishment of a fully foreign-owned defence manufacturing unit in India marks a significant shift, paving the way for deeper foreign involvement. Several recent developments exemplify the success of this collaborative approach, such as SAAB’s 100 per cent FDI Project.⁵¹ The establishment of SAAB-FFV India, the first fully foreign-owned defence manufacturing unit in India,⁵² marks a significant shift. This project will manufacture the Carl

Gustaf M4 weapon in Haryana, bringing advanced technology and creating local jobs. It is also a landmark case of the public–private foreign framework of changing policy orientation and qualitative shifts of India’s defence industries ecosystem, which was predominantly monopolised by state-run industries. However, it is to be noted that SAAB-FFV is a manufacturing agreement rather than an academic consortium. It must be acknowledged that the Strategic Partnership model, while theoretically representing the most ambitious consortium framework, has yet to yield a single finalised contract. This gap between policy architecture and contractual reality is itself evidence of the design–execution gap that the paper’s critical realist framework identifies—the mechanism exists at the ‘real’ level, while the ‘actual’ events of signed contracts remain outstanding.

**FROM BUYER TO BUILDER: THE PRIVATE SECTOR’S
STRUCTURAL ASCENT**

Empirical Evidence: Licences, Exports and Tier-1 Integrators

The structural shift towards a collaborative ecosystem is best evidenced by the rapid acceleration of private sector participation under ‘Make in India’. By June 2014, 121 private companies had successfully obtained industrial licences, and 28 had already established JVs with foreign equity.⁵³ Furthermore, defence licences increased from 215 in 2014 to 728 licences up to December 2024, as per the Annual Report of the MoD 2024–25.⁵⁴ Figure 3 shows the growth trajectories of private sector in defence exports prior to policy departure.

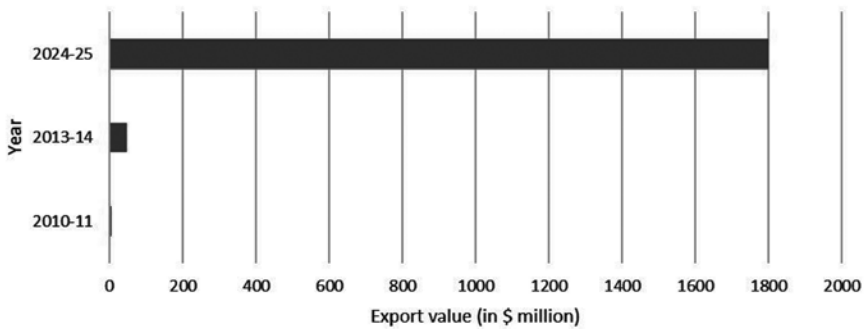


Figure 3 Analysis of Defence Exports
Source: Author’s own compilation.

The growth in private sector defence exports underscores this transition: in FY 2010–11, exports amounted to a modest Rs 0.29 billion (US\$ 6.4 million), but by 2013–14, this figure had surged to Rs 2.86 billion (US\$ 47.3 million). Major global defence firms placed high-value orders with Indian entities: Dynamatic Technologies secured orders worth Rs 39 billion (US\$ 620 million) from Boeing, Airbus and Bell Helicopter, while the Tata Group—with 14 companies active in the sector—maintained an order book of Rs 80 billion (US\$ 1.3 billion), including contracts from Sikorsky and Lockheed Martin.⁵⁵ It should be noted that a portion of India's defence export growth during this period reflects OEM offset obligation discharges rather than independently initiated Indian exports—a distinction that reinforces the article's argument that the transition from assembly to design sovereignty remains incomplete.

Figure 4 illustrates the growing trajectory of India's defence exports over the decade, representing a decisive policy departure. This shift indicates that exports are now being pursued as a core strategy, moving away from the traditional import substitution agenda.

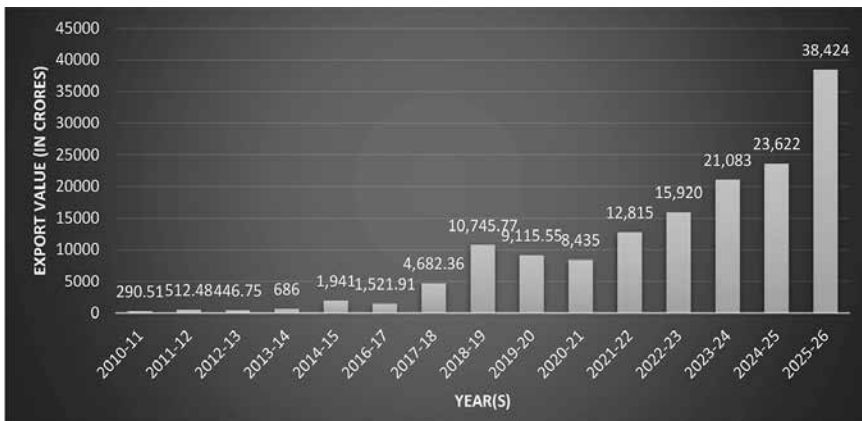


Figure 4 Defence Exports by India (Rs Crores) 2010–11 to 2025–26

Source: Press Information Bureau reports referred by the author⁵⁶

The issuance of nearly 728 industrial licences to private entities in 2024—a significant leap from only 215 in 2014 (*Annual Defence Report 2024–25*)—signals a rapid expansion in domestic manufacturing capacity. The ecosystem is now tiered and diversified, featuring Tier-1 integrators such as Adani Defence, Swan Energy and Tata Motors Defence Systems, supported

by an MSME backbone of over 16,000 enterprises, including Alpha Design Technologies, Axis Aerospace and Centum Electronics. A definitive policy breakthrough occurred when the government approved the private sector to manufacture 40 aircraft for the Air Force—a domain previously reserved exclusively for HAL.

To this end, a strategic roadmap has been prepared for Mission 2047 to make India self-sufficient and fully indigenised. A multi-criteria decision framework (MCDF)—which evaluates technologies across strategic value, industrial readiness, import dependency and future battlefield relevance—was deployed to identify four pivotal frontier technologies essential for this transition, i.e., AI and machine learning, advanced materials, digital twins and robotics. By integrating these into the ‘Make in India’ and Production-Linked Incentive (PLI) schemes, the government aims to create a future-ready ecosystem.

The growing defence procurement by the government reflects not only its increasing capital expenditure but also its commitment to the capacity-building measures of the Defence Industrial Base (DIB). Capital outlay has risen consistently over the last ten years, covering defence procurement, arms production, ammunition, armoured vehicles, components, spares and construction activities. Defence Minister Rajnath Singh announced that the government would allocate 75 per cent of its capital outlay to procurement from domestic manufacturers in 2023–24—a significant increase from 68 per cent in 2022–23 and 64 per cent in 2021–22. These figures demonstrate the consistent growth of India’s procurement capacity and its attempt to indigenise weapon systems, transitioning from core components to critical sectors. Table 2 shows the proportionate contribution of different sectors to India’s defence exports and the capacity enhancement of the military–industrial complex.

Table 2 Capital expenditure on defence as a constituent of total capital expenditure (For Year[s] 2010–11 to 2025–26) (in crores)

Year	Total Capital Receipts	Total Capital Expenditure	Capital Expenditure on Defence*	Percentage of capital expenditure allocated to defence (approx.)**	Growth in Capital Expenditure on defence (Y-o-Y) (approx.)***
2010–11	4,02,428	1,56,604	62,056	39.62 %	-
2011–12	5,68,918	1,58,580	67,902	42.81 %	9.42 %

2012–13	5,82,152	1,66,858	70,499	42.25 %	3.82 %
2013–14	5,63,894	1,87,675	79,125	42.16 %	12.23 %
2014–15	4,84,448	1,96,681	81,887	41.63 %	03.49 %
2015–16	5,82,579	2,53,022	79,958	31.60 %	-02.35 %
2016–17	6,09,886	2,84,609	86,371	30.34 %	08.02 %
2017–18	7,02,650	2,63,140	90,445	34.37 %	04.71 %
2018–19	7,63,518	3,07,714	95,231	30.94 %	05.29 %
2019–20	9,97,301	3,35,726	1,11,092	33.09 %	16.65 %
2020–21	18,83,105	4,26,317	1,34,305	31.50 %	20.89 %
2021–22	16,21,353	5,92,875	1,37,987	23.27 %	02.74 %
2022–23	18,11,573	7,40,025	1,42,940	19.31 %	03.58 %
2023–24	17,13,617	9,49,195	1,54,256	16.25 %	07.91 %
2024–25 (RE)	14,88,412	10,18,429	1,59,500	15.66 %	03.39 %
2025–26 (BE)	16,42,452	11,21,090	1,80,000	16.05 %	12.85 %
* Defence expenditure is exclusive of payment of pensions and civil expenditure. ** All the values are rounded to two decimal places only. *** All the values are rounded to two decimal places only.					

Source: Handbook of Statistics on the Indian Economy 2024–25, by RBI, pp. 144–146.⁵⁷

The Karnataka–Gujarat Industrial Model: Brownfield and Greenfield

This transition is physically manifested in the divergent industrial models of Karnataka and Gujarat. Taking leverage of its historical association with DPSUs like HAL, Karnataka has emerged as a premier aerospace hub, currently hosting 25 per cent of India's aircraft and spacecraft industries; accounting for 67 per cent of all aircraft and helicopter manufacturing for defence sector; harbouring 70 per cent of India's supplier base for aircraft and defence industries with the 'Bangalore Cluster' organically evolving around existing DPSU infrastructure,⁵⁸ creating a dense network of suppliers. To institutionalise this growth, the state is in the process of establishing aerospace parks (measuring more than 2,000 acres adjacent to the Bengaluru International Airport, specifically earmarking 30 per cent of the land for MSMEs to ensure a balanced industrial ecosystem.⁵⁹

In contrast, Gujarat has rapidly developed into a 'Greenfield' epicentre for defence manufacturing.⁶⁰ By providing a streamlined regulatory environment and brand-new infrastructure, it has attracted fresh investment without the constraints of legacy systems. Gujarat's model represents the 'Greenfield' approach, where modern manufacturing units are built from the ground up to meet the specific requirements of the 'Make in India' and 'Atmanirbhar Bharat' initiatives. This rapid industrialisation is anchored by the Gujarat Single Window Clearance Act (2017), which streamlined the ecosystem for global players and significantly enhanced the 'ease of doing business'. Dholera Industrial City Development Ltd (DICDL) of the Gujarat government has set up an aerospace and defence cluster with a Rs 3,000 crore investment and signed an agreement with Airbus (France) to establish a specialised A&D cluster. Hazira, another coastal city and critical to national security, has developed itself as a manufacturing complex hosting some of the world's largest forging facilities, including the production of K9 Vajra-T artillery guns and the hull of India's nuclear-powered submarine, *INS Arihant*. Ranoli and Vadodara have emerged as an epicentre of Larsen & Toubro (L&T), which operates state-of-the-art facilities in defence electronics and primary structures for supersonic articles like the BrahMos cruise missile. Furthermore, the Gujarat ecosystem is characterised by deep integration between domestic giants and OEMs. For instance, Adani Aero Defence has partnered with Israel's Elbit-ISTAR for Unmanned Aircraft Systems (UAS), while SAAB (Sweden) has collaborated on the potential development of Gripen Fighter Aircraft. In the area of precision engineering, partnerships involving Punj-Lloyd and US-based Rave Gears focus on high-precision aerospace components. A significant initiative by Boeing focuses on accelerating the skill development of frontline MSME workers, ensuring that the local talent pool meets global Level A to E criticality standards. Similar initiatives have been undertaken with Adani groups. Leveraging a strong maritime and industrial tradition, Gujarat has developed rapidly as a 'greenfield' powerhouse, providing a modern alternative to the traditional 'brownfield' development seen in Karnataka (Bangalore). While Karnataka relies on an established legacy of PSUs and research labs, the Gujarat model focuses on pivoting into defence manufacturing in previously untouched industrial zones. This expansion is a key component of India's strategic roadmap to establish defence manufacturing as a 'champion sector' within the 'Viksit Bharat 2047' vision.

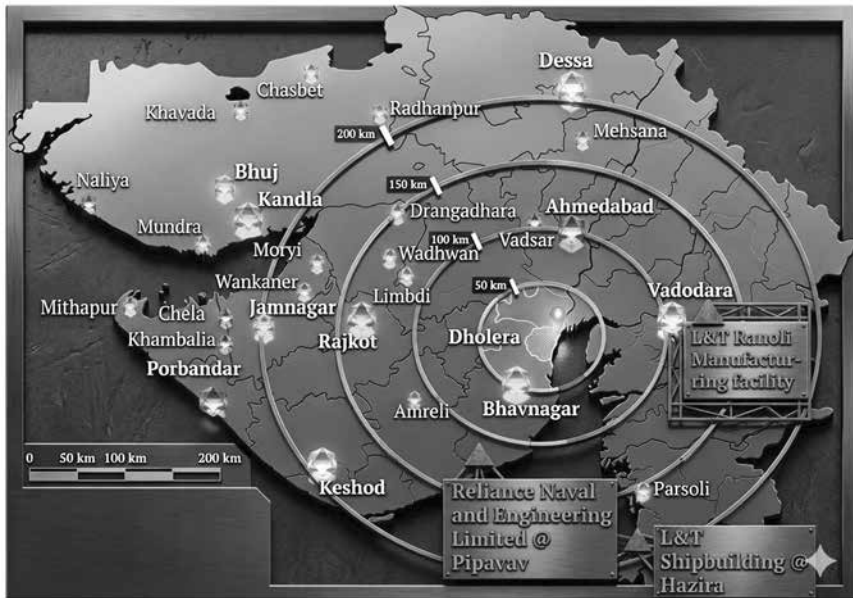


Figure 5 Aerospace and Defence Industries in Gujarat

Source: Sector Profile of Aerospace and Defence Industries released by the Government of Gujarat.⁶¹

FDI, OEMS AND THE TECHNOLOGY TRANSFER ECOSYSTEM

FDI Cap Evolution and the Management Control Challenge

The 'Make in India' initiative represents a paradigm shift towards co-production and co-development models.⁶² This shift is reinforced by proactive government policies that have liberalised FDI, streamlining approvals to make India an attractive destination for global investors. The revised FDI policy removed an earlier provision that required the single-largest resident Indian shareholder to hold at least a 51 per cent equity share.⁶³ Under current regulations, this shareholder now has the power to appoint a majority of directors in a joint venture. The automatic approval route for FDI was expanded from 49 per cent in 2016 to 74 per cent in 2020,⁶⁴ making India a more attractive proposition for foreign investors. India's progressive liberalisation of defence FDI norms—permitting 100 per cent investment via the government route and 74 per cent via the automatic route—represents a genuine structural opening at the regulatory level. Yet

official data reveals a persistent gap between this policy openness and actual capital inflows. DPIIT data records cumulative defence FDI of merely US\$ 32.29 million since 2000, with only US\$ 16.51 million received between January 2023 and March 2026—figures that render defence the fourth least-attractive sector for foreign investment despite the most liberalised FDI regime in the sector’s history (DPIIT Newsletter, June 2026). Far from contradicting this article’s central argument, this data validates it: the critical realist framework identifies regulatory openness and investor confidence as operating at different structural levels. Investors respond not to empirical-level policy announcements but to real-level structural conditions—supply chain depth, IP protection regimes, procurement timeline predictability, and design authority parameters—which the indigenisation framework has not yet consolidated. The FDI gap is therefore not an anomaly within the ‘Make in India’ trajectory; it is its most revealing diagnostic.

Figure 6 shows the recent upsurge in FDI inflows in comparison with past decades; however, this is not as substantial as the investment other sectors have received in the recent years. It shows that policy departure helps in a positive direction, and the future may yield more substantial investment.

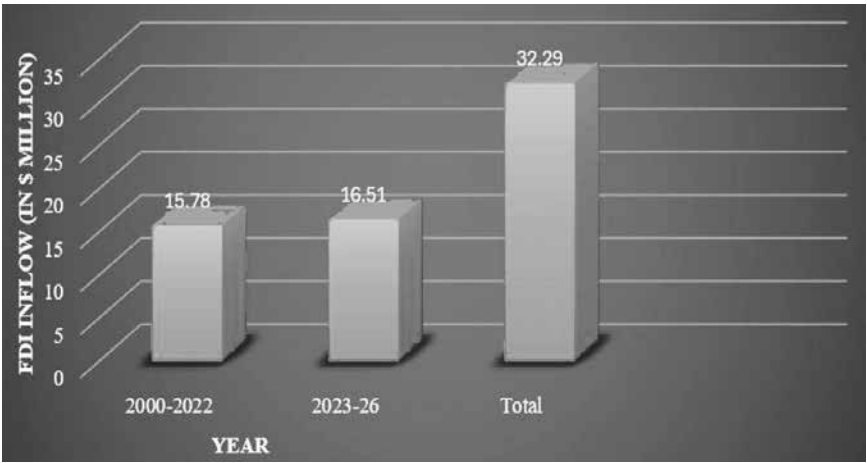


Figure 6 FDI Inflows in Defence Sector (2000–2026)

Source: FDI Newsletter No. XXXVI No. 4.⁶⁵

Positive Indigenisation Lists and the DRDO–L&T Milestone

By actively encouraging collaboration with foreign OEMs through T-o-T and JVs, the government is securing access to advanced defence technologies.

Industry leaders, including Boeing, Lockheed Martin, Dassault and SAAB, are now moving beyond traditional buyer–seller relationships, offering to establish domestic manufacturing bases coupled with substantive technology transfers. Table 3 shows how the Positive Indigenisation List (PIL) scheme helps the DIB in capacity-building and in enhancing its indigenisation capability. The disparity in the second PIL figures reflects the two distinct series issued: one by the Department of Military Affairs (DMA) for the armed forces and another by the Department of Defence production (DDP) for DPSUs.⁶⁶

Table 3 Positive Indigenisation Lists (PILs)* notified by the Union of India

Positive indigenisation lists along with date of notification	Total defence systems/ components to be indigenised	Defence components actually indigenised	Defence components yet to be indigenised	Timeline targeted for full indigenisation
1 st PIL (Notified on 27-12-2021)	2851	2815	36	December 2022 to December 2024
2 nd PIL (Notified on 28-03-2022)	108/107	Not specified	Not specified	Not specified
3 rd PIL (Notified on 28-08-2022)	780	155	625	December 2023 to December 2028
4 th PIL (Notified on 12-05-2023)	928	10	918	December 2023 to December 2029
5 th PIL (Notified on 25-06-2024)	346	10	336	December 2024 to December 2029
* The PILs were notified with a timeline beyond which they will only be procured from the domestic industry. No foreign orders can be placed for these items after that. Till 31 December 2024, 3,025 items have been indigenised. The rest are in different phases of being indigenised.				

Source: 'Fourteenth Report of the Standing Committee on Defence', 18th Lok Sabha, p. 14.⁶⁷

The shift in policy orientation directly addressed the persistent demands of industry leaders for guaranteed orders and a clear path to profitability. This has been achieved through the positive indigenisation lists—banning the import of more than 5,000 defence items. The government has created a protected domestic market, effectively incentivising both private and public units to invest in local production capacities.

Figure 7 shows the increasing capacity-building across all sectors—including private, public and DPSU firms—in defence production. The figure also shows the development of the Defence Industrial Corridors (DICs) in India.

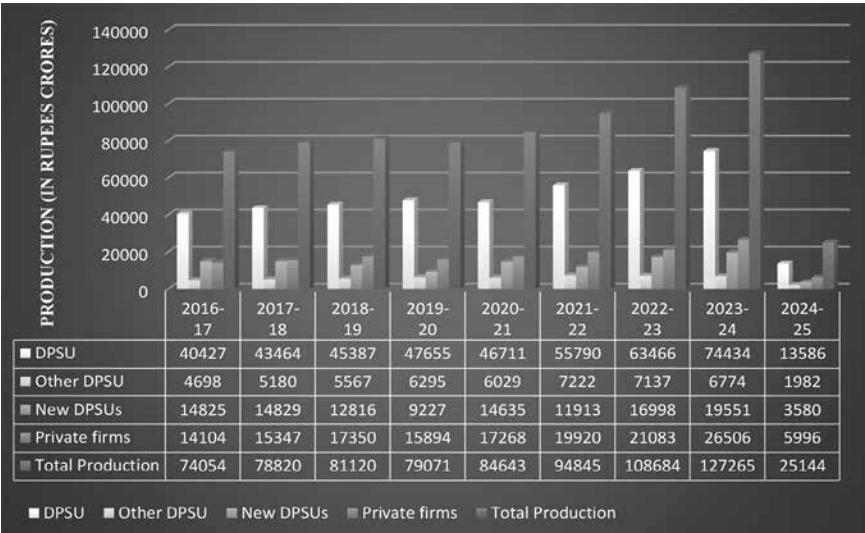


Figure 7 Defence Production during FY 2016–17 to FY 2024–25
Source: Open Government Data Platform⁶⁸

A significant milestone in this trajectory was the DRDO signing a technology transfer agreement with L&T for the commercial production of the *Lakshya* pilotless target aircraft. This marks the first instance where technology for a high-value product developed by the DRDO has been provided to a private-sector firm for licensed production. Furthermore, private entities—such as Tata, L&T, Adani Defence and Bharat Forge—have been shortlisted for high-stakes programmes like the AMCA Mark 2 and the Medium Multi-Role Combat Aircraft (MMRCA), signalling the state’s willingness to bypass traditional public units. Yet this structural transformation, while real in scale,

has been uneven in depth. The quantity of licences does not equal the quality of indigenous content. A significant academic and policy challenge persists: the absence of a standardised methodology for calculating indigenisation levels—particularly in software-defined systems and advanced electronics—means that progress in industrial licensing has not always translated into progress in genuine technological sovereignty.

THE MEASUREMENT PROBLEM: PERSISTENT GAPS AND INSTITUTIONAL CHALLENGES

Indigenous Content as Institutional Fiction

A significant academic and policy challenge persists in accurately determining the Value of Indigenous Content (IC) within the defence platforms. The absence of a standardised, transparent methodology for calculating indigenisation levels—particularly in software-defined systems and advanced electronics—remains a major hurdle. This has led to what analyst(s) term ‘screwdriver technology’, a phenomenon where domestic assembly occurs but core technologies remain foreign-sourced, creating a facade of self-reliance. As Jane’s Information Group suggests, the tendency of Indian policymakers to categorise these systems as ‘indigenised’ contributes to an inflated perception of domestic capability while masking a deep-seated reliance on foreign suppliers for sensors, engines and micro-electronics.

The persistent struggles of the LCA Tejas to fulfil defence requirements substantiate the critical lens of international watchdogs. Despite institutional history spanning 60 to 80 years, HAL’s success ratio in manufacturing combat-ready aircraft remains disproportionate to its years of service. Even with engines supplied by General Electric and avionics sourced from Israel’s Rafael, HAL has yet to produce a consistently error-free platform.

The DAP provides a cost-based formula for calculating IC—components manufactured domestically, regardless of design origin, count towards the IC percentage. This methodology is particularly inadequate for software-defined systems and advanced electronics, where the most strategically significant IP resides in source code and system architecture rather than physical components. A platform may achieve 60 per cent IC by cost, while remaining entirely dependent on foreign design authority for its mission-critical sub-systems—precisely the structural misrepresentation that critical realism identifies as the central measurement problem.

The Implementation Gap: Institutional Resistance and Stagnation

A defining characteristic of India's defence industrial challenge is the persistent gap between strategic recommendations and institutional execution. As early as 2008, the DRDO Review Committee recognised the need for a centralised, high-level authority and recommended the creation of a Defence Technology Commission—a body envisioned to lead self-reliance efforts by providing unified policy direction, setting R&D targets, and rigorously monitoring indigenous projects. Nearly two decades later, this recommendation has yet to be implemented.⁶⁹

The Ordnance Factory Board was corporatised in October 2021, creating seven new DPSUs—a landmark institutional transformation that formally ended India's century-old state arsenal model. Several DPSUs, including HAL, Bharat Electronics Limited (BEL), BEML, Bharat Dynamics Limited (BDL) Mishra Dhatu Nigam Limited (MIDHANI), Mazagon Dock Shipbuilders Ltd (MDL) and Garden Reach Shipbuilders & Engineers (GRSE), are already listed on the stock exchange. The institutional challenge that persists is not corporatisation but its downstream consequences: the integration of newly corporatised ordnance entities into the broader private sector supply chain ecosystem; the rationalisation of product portfolios to concentrate DPSU capacity on high-technology platforms where state-sector expertise is irreplaceable; and the development of genuine commercial disciplines in pricing, delivery timelines and quality assurance that stock exchange listing creates accountability for but does not automatically produce.

THE R&D IMPERATIVE: FROM LICENSED ASSEMBLY TO ORIGINAL INNOVATION

The partial success of indigenisation resulted in isolated pockets of achievement that failed to coalesce into a comprehensive defence ecosystem. The structural weaknesses of the domestic industry, coupled with the escalating complexities of modern warfare, exposed the inherent limitations of early indigenisation models. A primary driver of this stagnation is the disparity in research investment—India currently spends a significantly lower proportion of its GDP on R&D than global technological powers. India's policy framework initiative faces a crucial challenge: achieving cutting-edge technology and indigenous design capabilities in defence manufacturing. The government tried to address this by opening up FDI and relaxing licensing policies. However, India's investment in R&D pales in comparison to that of major defence suppliers, hindering India's competitiveness. To bridge

this gap, India has increased investment in R&D from both public and private sectors. While private sector contributions have been rising over the past decade, they remain insufficient. Collaboration between leading OEMs like Boeing and Indian institutions like the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc) offers promise. However, success in getting a technological niche that can be path-breaking is still awaited. The offset policy was introduced to enhance indigenisation thrust, which mandates foreign companies to re-invest a portion of their contract value back in India. However, the offset policy faces an uncertain institutional future: the draft DAP 2026, released for public comment in February 2026, does not appear to include offset provisions. However, the critical distinction is between the mechanism and the function. The function that offsets served—inducing technology transfer, R&D investment, and MSME integration from foreign OEMs—remains a legitimate structural need that an indigenisation framework without formal offsets must address through alternative instruments. These may include mandatory IP co-development clauses in Strategic Partnership contracts, mandated foreign OEM contributions to the Technology Development Fund, or source code deposition requirements as conditions of platform contracts. The question is not whether to abandon the objective of technology induction but how to embed it more effectively within the new procurement architecture that DAP 2026 is establishing.

The R&D Investment Gap: A Comparative Bottleneck

While the United States and China consistently allocate more than 10 per cent of their total defence budgets towards R&D, India's R&D expenditure—primarily channelled through the DRDO—has stagnated between 3 per cent and 5 per cent of the total allocation towards MoD as a constituent of Union Budget. This limited fiscal headroom, compounded by the negligible R&D spending within the domestic private industry, has severely constrained India's defence technological progress. Figure 8 shows India's lower investment in R&D sectors compared to the G2 (USA and China). It highlights the tension between India's aspiration to become a global pole and the necessity to counter the technological innovations of the Second Machine Age through a frontier technological roadmap. The data reflects the reality of current funding gaps versus the policy departure required for genuine innovation and invention, specifically indicating the sectors where India must intensify its efforts.

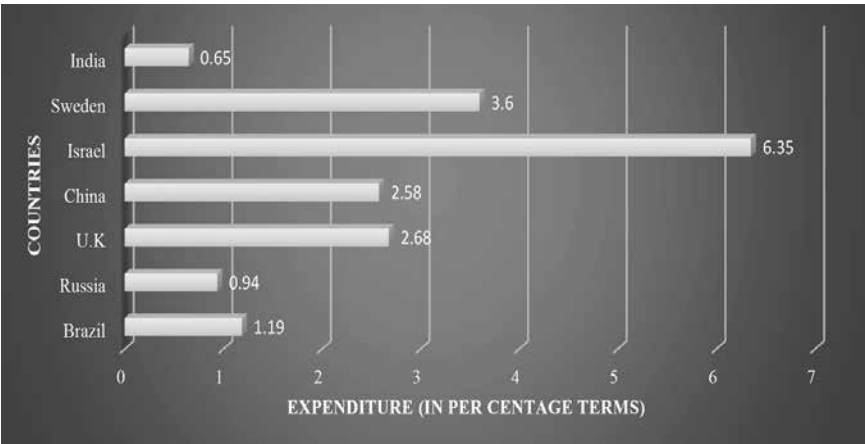


Figure 8 R&D Expenditure of selected countries as a constituent of GDP (in per cent)

Source: World Bank⁷⁰

Note: For Figure 8, the data is available latest for the year 2020; for Israel, Sweden, UK, and China, the figures are latest as per 2023. For Russia, the figures are as of 2024.

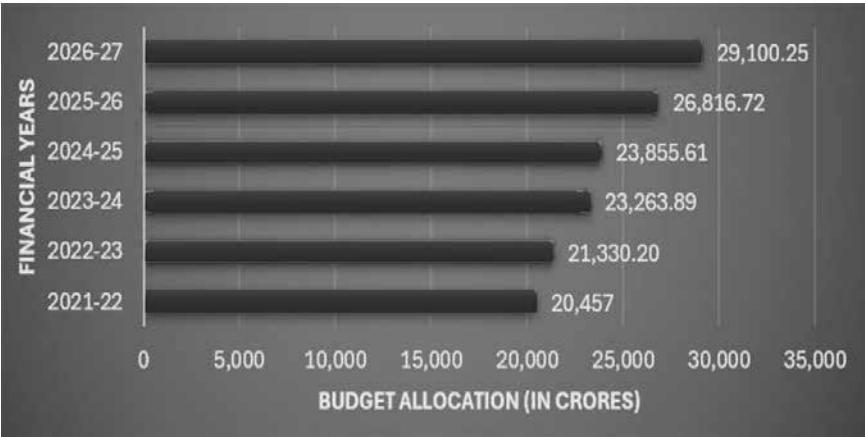


Figure 9 Budget allocation for DRDO as a constituent of MoD Budget (in crores)

Source: Author’s own compilation from Press Information Bureau data.

Without bridging this investment gap, the transition from ‘licensed assembly’ to ‘original innovation’ remains vulnerable to technological obsolescence. Therefore, the current policy shift towards incentivising private R&D through the PLI framework is not merely an economic choice but

a strategic imperative to achieve the US\$ 250 billion objective of a self-sustaining defence ecosystem. Figure 10 provides a holistic examination of India's aspiration to become a G3 power in comparison with the G2 (USA and China) regarding R&D expenditure in the post-Kargil era. These figures highlight a primary reason for India's inability to produce indigenised engines over the last several decades: the persistent gap in research funding.

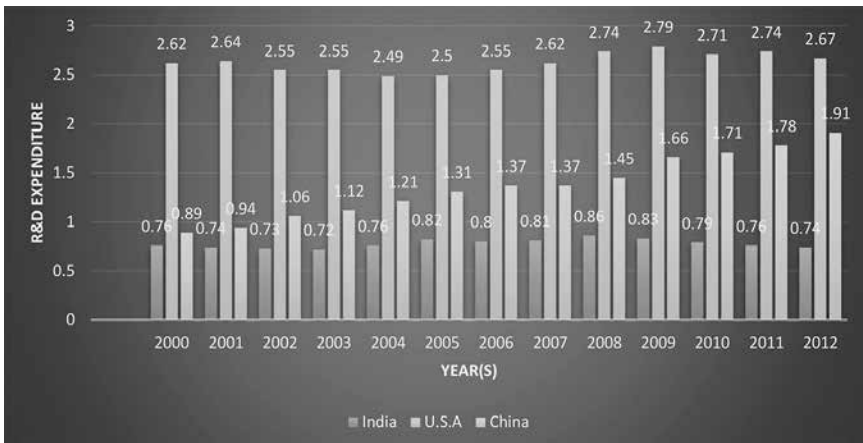


Figure 10 Country-wide analysis of R&D expenditure (as % of GDP)
[Year 2000–2012]

Source: World Bank⁷¹

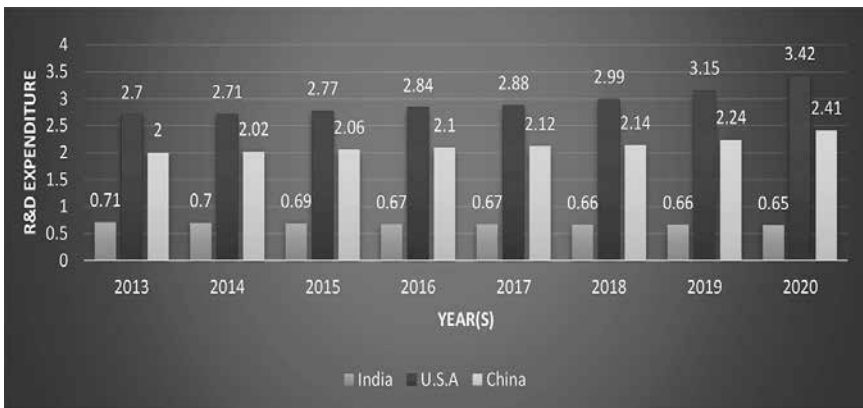


Figure 11 Country-wide analysis of R&D expenditure (as % of GDP)
[Year 2013–2020]

Source: World Bank⁷²

Addressing the complexity of technological depth is essential for the effective implementation of PLI schemes. Despite the strategic rhetoric, India's defence industries continue to be constrained by historically low investment in R&D, deep-seated organisational deficiencies, and a persistent lag in both private-sector participation and FDI.

The Academia–Industry Missing Link: Towards Original Innovation

The fundamental failure of past indigenisation efforts lies in the chronic underfunding of R&D and the detachment of the university ecosystem from industrial innovation. The primary hurdle remains the dual challenge of resource constraints and the high capital risk associated with long-lead defence projects. Collaboration between leading OEMs such as Boeing and premier Indian institutions like the IITs and IISc offers promise, but these represent isolated initiatives rather than systemic integration.

The offset policy, which mandates foreign companies to re-invest a portion of their contract value back into India, served to incentivise R&D investment, and the underlying function it performed must now be embedded within alternative instruments, as the offset mechanism itself faces institutional uncertainty under the forthcoming DAP 2026 framework. Specific areas requiring focus include nanotechnology, composite materials, metal research, night vision technology, electronic miniaturisation, textile technology, satellite defence systems and cyber warfare solutions.

This transformation is a cornerstone of the 'Viksit Bharat 2047' vision, which prioritises a strategic roadmap centred on frontier technologies—specifically AI, advanced materials, digital twins and robotics. By shifting the focus to these critical domains, the government aims to ensure that the projected US\$ 250 billion investment translates into a self-sustaining, future-ready defence ecosystem.

THE FINAL FRONTIER: WHY ACADEMIA, NOT PROCUREMENT, WILL DETERMINE INDIA'S DEFENCE SOVEREIGNTY

While the DPM 2025 addresses procurement bottlenecks with considerable ambition, it is important to recognise that its institutional remit—however transformative—is insufficient on its own. The six reforms it introduces operate within the defence industrial system. But India's bid to become a global defence powerhouse requires structural change that transcends any single policy instrument, extending into labour laws, skill-based education,

land acquisition and judicial reforms. These cross-sectoral prerequisites are not peripheral concerns; they are the enabling conditions without which even the most well-designed defence procurement framework will under-deliver.

The Second Machine Age and India's Frontier Technology Roadmap

Power is shifting away from the mere owners of capital towards the scientists and experts within universities and research institutions. India, with its deep-rooted traditions in philosophy and science, must pivot towards this 'knowledge-as-capital' model—what sociologist Daniel Bell termed the 'post-industrial society',⁷³ and what Brynjolfsson and McAfee (2014) characterise as the Second Machine Age.

In the Second Machine Age, traditional human capital is being superseded by autonomous systems. As evidenced by contemporary conflicts in West Asia, machines are increasingly fighting wars on behalf of nations. Strategic security now belongs to those who possess the most advanced technological 'machines'. For India, this creates both a threat and an opportunity: the threat of being left behind as automation re-defines manufacturing competitiveness; and the opportunity to leapfrog traditional industrial stages by fostering an ecosystem for MSME enablement and sustainable circular manufacturing.

This strategy includes the deployment of 20 'Plug and Play Frontier Technology-enabled Industrial Parks' and the adoption of digital twin strategies to revolutionise R&D through virtual simulation. These interventions are designed to ensure national security and technological sovereignty, transforming India into a reliable, high-tech manufacturing hub by 2035. By integrating the Second Machine Age framework into the DPM 2025 architecture—specifically through the PLI scheme's AI, advanced materials, digital twins and robotics priorities—India is building not merely a defence industry but a technology civilisation.⁷⁴ The comparative chart illustrates the consistent growth of India's manufacturing sector since 1990, moving from 14th to 5th place and recently bypassing South Korea. However, surpassing or competing with the G2 remains a distant dream relative to the objectives envisioned in the 'Viksit Bharat' vision.

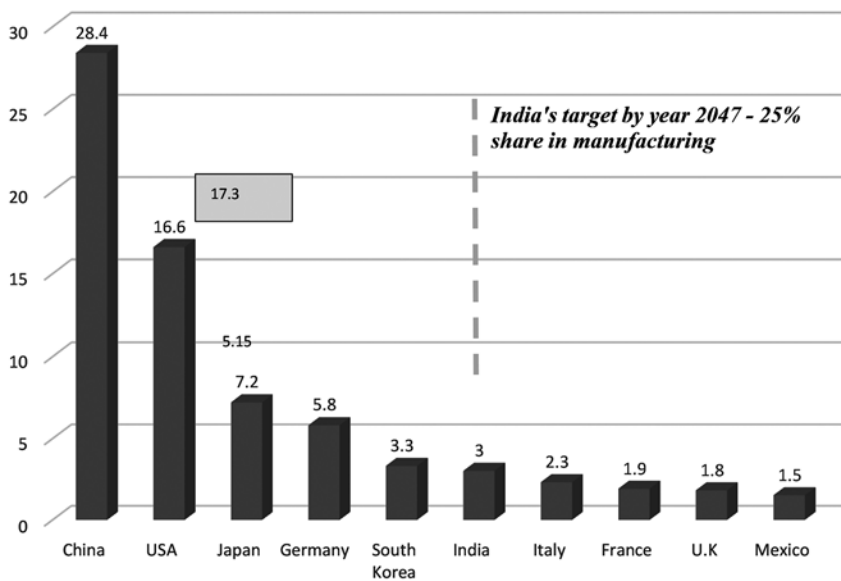


Figure 12 Country wise share in global manufacturing as in 2018 and 2025

Source: World Economic Forum, Safeguard Global and NITI Aayog⁷⁵

Cross-Sectoral Prerequisites for a Global Defence Powerhouse

Historically, India's lag in the 'manufacturing race' can be traced to the late 20th century. While China successfully re-structured its developmental plan to become the 'World Factory'—now capturing over 30 per cent of global industrial output—India missed the initial industrial bus. However, the current shift towards a post-industrial society offers a new opening.

Beyond defence-specific policies, critical attention is required in labour laws, skill-based education, land acquisition and judicial reforms to create a truly competitive industrial climate. International observers and domestic industry leaders alike suggest that overcoming these cross-sectoral hurdles is the prerequisite for India to transition from a developing economy to a developed global powerhouse. The DPM 2025 serves as the vital bridge for the missing link—by integrating academia with industry and research with innovation, it creates a framework where universities become the engines of defence IP. This synergy is essential to dismantle the 'import perk' culture and transform India into a net exporter of defence technology; this knowledge exchange will fuel innovation and informed decision-making. It is important

to acknowledge that achieving a level of competency comparable to the auto industry might take around 15 years. However, with a clear vision, a focus on collaboration and domestic capabilities, India's defence sector is on the right track to becoming a self-reliant and potentially export-oriented powerhouse. Overall, the vision for the future of India's defence production emphasises collaboration, innovation, knowledge sharing, and a long-term commitment to achieving self-reliance and potentially becoming a major exporter of defence equipment.

CONCLUSION: FROM ASSEMBLY TO AUTONOMY

The trajectory of India's defence industrialisation, spanning from the post-Kargil reforms to the DPM 2025, marks a definitive qualitative departure from earlier paradigms of passive indigenisation. While current frameworks maintain policy continuity, they represent a fundamental restructuring of the military-industrial complex—integrating private players, liberalising FDI and expanding MSME participation.

This study demonstrates, in response to the first research question, that 'Make in India' and 'Atmanirbhar Bharat' have moved beyond indigenisation as a mere 'policy shell' towards an 'intent to deliver', where domestic assembly is being replaced by lead integration and original innovation. They differ qualitatively from previous attempts not in aspiration but in architecture: by embedding India's specific needs within the changing world structure through high-technology partnerships rather than isolated domestic efforts.

In response to the second research question, the current policy shift has functioned as the primary catalyst for structural transformation within India's defence industrial base. By dismantling legacy state monopolies, it has fostered a dynamic, tiered ecosystem anchored by Tier-1 integrators—including Adani Defence, Tata, and L&T—and an MSME backbone of over 12,000 enterprises. This structural evolution is evidenced by the emergence of industrial clusters, defence exports, and the significant expansion of industrial licensing. Furthermore, targeted regulatory reforms have liberalised the sector, positioning India's DIB to integrate into global supply chains. Nevertheless, critical bottlenecks persist: the absence of finalised Strategic Partnership contracts, negligible defence FDI inflows, and domestic R&D expenditure stagnating between 3 and 5 per cent of the MoD budget remain major structural hurdles to achieving genuine indigenisation. In critical realist terms, the policy architecture exists at the real level; the actual events that would confirm transformation—signed SP contracts, significant

FDI, and indigenous design authority—remain outstanding. Ultimately, as the institutional analysis of the Tejas, Arjun and Dhruv programmes demonstrates, this structural change remains an iterative and unfinished process.

Empirical evidence—the surge in private licences, the emergence of Greenfield (Gujarat) and Brownfield (Karnataka) clusters, and the DRDO–L&T technology transfer milestone—provides positive signals; yet the ultimate success of Mission 2047 rests on increasing R&D intensity to the global benchmark of 10 per cent of the defence budget. DPM 2025 serves as the operational catalyst that institutionalises ‘jointness’ and mitigates the risks of the Second Machine Age. By prioritising IP over hardware acquisition, India is re-positioning itself as a pivotal pole in the global supply chain.

For the ‘Viksit Bharat’ vision to be realised, defence sovereignty must be mastered across the entire technology lifecycle—ensuring it is as much a product of India’s universities as it is of its factories. Bridging this ‘missing link’ between academia and industry remains the final requirement for India to truly transition from a global buyer to a global builder.

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