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Indigenisation of the Indian Armed Forces:Outcome-Based Evaluation of Perational and Lifecycle Self-Reliance (2014–2025) with Reference to Operation Sindoor

Dissertation Report Submitted to
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CHAPTER 1: INTRODUCTION

1.1 Background and Context

For much of the post-independence period, India's armed forces have depended heavily on foreign suppliers for the weapons platforms, systems, and technologies that constitute their operational backbone. This dependence has carried with it a set of well-recognised vulnerabilities: supply disruptions during conflicts, restricted access to spare parts, inability to independently maintain or upgrade platforms, and a chronic drain on the foreign exchange reserves. The 1965 and 1971 wars exposed some of these limitations; the Kargil conflict of 1999 brought them into sharp relief once again.

The political decision to change this trajectory took firm shape after 2014, when the Government of India launched the Make in India initiative and subsequently the Aatmanirbhar Bharat Abhiyan, both of which placed defence indigenisation at the centre of the country's industrial and strategic policy. The years that followed saw a cascade of reforms: revised Defence Procurement Procedures, the introduction of Positive Indigenisation Lists (PILs) that restricted import of specified items, higher Foreign Direct Investment limits in defence manufacturing, the creation of a dedicated Defence Industrial Corridor in Uttar Pradesh and Tamil Nadu, and the launch of iDEX to bring startups and MSMEs into the defence supply chain.

The numbers that followed have been striking. Annual domestic defence production rose from roughly Rs. 46,429 crore in 2014-15 to a record Rs. 1,27,265 crore in 2023-24 and Rs. 1,54,000 crore in 2024-25. Defence exports climbed from Rs. 1,941 crore to over Rs. 23,000 crore across the same period. The defence budget itself grew from Rs. 2.53 lakh crore

in 2013-14 to Rs. 6.81 lakh crore in 2025-26. These are significant achievements, and they have been cited widely in policy discourse as evidence that India's indigenisation drive is working.

Yet a more careful reading of the evidence reveals a more complicated picture. Despite producing three times as much domestically as it did a decade ago, India remained the world's second largest arms importer between 2020 and 2024, accounting for 8.3 per cent of global arms imports (SIPRI, 2025). This co-existence of rising domestic production and persistent import dependence is the central puzzle this dissertation attempts to resolve.

1.2 Meaning of Indigenisation in the Defence Context

Indigenisation in the defence sector is not a single, clearly defined concept. In popular usage it tends to mean simply that something is made in India. In policy documents it often refers to the percentage of content by value sourced domestically. Both of these framings, while useful for certain purposes, miss a great deal of what actually matters strategically.

For the purposes of this dissertation, indigenisation is understood as encompassing the development, production, and full lifecycle sustainment of military equipment within India, with substantially reduced dependence on foreign Original Equipment Manufacturers (OEMs). Critically, it includes not just manufacturing capability but also indigenous design authority, domestic research and development ownership, localised supply chains, autonomous Maintenance, Repair and Overhaul (MRO) capability, and independent control over upgrades and spares. A platform can achieve 60 per cent indigenous content by value and still be fundamentally dependent on a foreign OEM for the engine, the software, and the upgrade pathway. Such a platform would fall short of meaningful indigenisation under the definition adopted here.

1.3 The Core Distinction: Production vs. Capability Ownership

The most important conceptual distinction in this study is the difference between indigenous production and indigenous capability ownership. The former refers to the physical manufacture or assembly of defence equipment in India, regardless of whether the design, key components, or intellectual property originate domestically. The latter refers to a deeper form of self-reliance in which India holds design authority, retains intellectual property, can independently maintain and modify systems, and can upgrade them across their operational life without external permission or assistance.

Much of what is counted in India's indigenisation statistics falls into the first category. Licensed manufacturing, final assembly of imported sub-systems, and DPSU production of platforms whose core technology was transferred from foreign OEMs all contribute to the production headline figure without necessarily constituting capability ownership. This distinction is not merely academic. In a conflict scenario or under sanctions pressure, a military that produces platforms domestically but cannot maintain, upgrade, or re-supply them without foreign cooperation is not genuinely self-reliant.

1.4 Research Problem

Despite a sustained decade-long policy drive toward defence indigenisation, the extent to which India has achieved genuine operational and lifecycle self-reliance in its armed forces remains an open empirical question. Domestic production has expanded significantly, but persistent dependencies are visible in propulsion systems, advanced avionics, radar technology, military-grade electronics, and upgrade autonomy. The gap between what policy claims and what operational reality reflects constitutes the central research problem of this study.

A further dimension of this problem is that the existing academic and policy literature evaluates indigenisation almost entirely through the lens of inputs — budget allocations, policy reforms, production targets — rather than outcomes. Whether indigenisation has actually reduced operational dependence on foreign suppliers, which stages of the defence lifecycle remain most import-reliant, and what operational deployment can tell us about the depth of achieved capability, are questions that remain largely unaddressed.

1.5 Significance of the Study

This dissertation is timely for several reasons. First, India's regional security environment is at its most demanding in decades. Operation Sindoor in May 2025 — India's military action against terror infrastructure in Pakistan — provided the first large-scale, real-world test of India's indigenous defence systems in actual combat conditions. The performance of those systems offers empirical evidence about the current depth of indigenisation that no prior study has been able to draw on.

Second, the global supply disruptions arising from the Russia-Ukraine war and the Iran-Israel-US conflict of 2025-26 have simultaneously constrained India's two largest historical arms suppliers. Russia, which has historically accounted for 36 per cent of India's arms imports, has redirected virtually its entire defence industrial output toward its own war needs since 2022. Israel, India's second largest supplier at 34 per cent of Israeli defence exports, is similarly consumed. This conjunction of events makes the case for genuine indigenisation more urgent than ever.

Third, at 1.9 per cent of GDP, India's defence budget remains below the threshold that most analysts regard as necessary for a country of its strategic exposure. The post-Sindoor environment has reopened the debate about whether this should rise to 2.5 per cent, and how any such increase should be allocated. An outcome-based evaluation of where indigenisation is working and where it is failing is essential context for that discussion.

Chapter 2: Review of Literature

2.1 Policy and Procurement Reform Literature

The largest body of existing scholarship on Indian defence indigenisation concerns the policy architecture that has been constructed since the early 2000s and more intensively since 2014. Work in this domain includes analyses of successive editions of the Defence Procurement Procedure, culminating in the Defence Acquisition Procedure 2020, which consolidated earlier reforms and introduced new indigenisation mandates including a minimum Indigenous Content requirement of 50 per cent for Buy Indian (IDDM) category procurements and an outright ban on importing specified sub-systems where domestic alternatives exist.

A number of institutional analyses have examined the role of specific policy instruments: the Positive Indigenisation Lists (five rounds by 2024, covering over 5,500 items), the iDEX programme which channels MoD funding to defence startups, the SRIJAN portal maintained by the Department of Defence Production, and the Defence Industrial Corridors in Uttar Pradesh and Tamil Nadu. The work of Brig. P.P. Singh (2025) and Shakil Bhat (2025), along with publications from the Institute for Defence Studies and Analyses (IDSA) and the Observer Research Foundation (ORF), provides useful overviews of these reforms and their stated rationale.

The general limitation of this body of literature is that it is primarily descriptive. It documents what policies have been introduced, what their stated objectives are, and what the headline production or procurement figures show. It does not ask whether these policies have reduced operational dependence on foreign suppliers, whether lifecycle sustainment has become more autonomous, or whether the systems produced under these frameworks perform effectively in real operational conditions.

2.2 Production Statistics and DPSU Performance

A second strand of literature tracks the output of India's defence industrial base through production statistics, export figures, and the financial performance of Defence Public Sector Undertakings. The annual reports of the Ministry of Defence, the DDP portal, and the public disclosures of HAL and BEL provide the primary data for these analyses. HAL's annual revenue grew from roughly Rs. 13,000-15,000 crore in 2009-10 to Rs. 29,810 crore in FY 2023-24. BEL's production value rose from around Rs. 5,000 crore to Rs. 19,700 crore across the same period. The corporatisation of the Ordnance Factory Board in 2021, which created seven specialised Defence Public Sector Undertakings from the old OFB structure, is another development this literature tracks.

This body of work provides a useful quantitative baseline. Its limitation, however, is that it conflates production volume with capability depth. Rising HAL revenues partly reflect India's growing domestic order book for licensed production and final assembly of platforms that were designed abroad. A revenue figure tells us relatively little about how much of the actual intellectual property, design authority, or technological know-how is held domestically.

2.3 Arms Import Dependence Studies

SIPRI's Arms Transfer Database provides the most systematic time-series data on Indian arms imports. The data shows that India's import volumes did decline between 2016-20 and 2021-25, which SIPRI attributes partly to the growing ability of Indian manufacturers to supply certain categories of equipment. However, the same data shows that India remained the world's second largest arms importer over 2020-24, accounting for 8.3 per cent of global imports. Russia contributed 36 per cent of those imports, France and the United States together a further 46 per cent.

IDSA and ORF policy briefs have examined the strategic implications of this dependence, particularly in the context of Russia's involvement in the Ukraine war and the consequent disruption to maintenance and spare parts supply for Russian-origin platforms. These analyses are valuable but remain at the level of strategic commentary rather than systematic empirical evaluation.

2.4 Operational Deployment Literature

The thinnest area of the existing literature is on what actual operational deployment tells us about the depth of India's indigenisation. There are case studies of the Kargil conflict (1999), the Balakot air strikes (2019), and, most recently, Operation Sindoor (2025). Brig. P.P. Singh's (2025) analysis and Shakil Bhat's (2025) work on Sindoor represent perhaps the earliest serious attempts to draw indigenisation-relevant conclusions from that operation.

However, these accounts are largely descriptive and non-systematic. They note which indigenous systems were used, and draw general conclusions about India's capability. They do not apply an evaluation framework, do not differentiate between lifecycle stages, and do not assess what the operation reveals about the gaps that remain.

2.5 Research Gap

Across all four strands identified above, a common limitation emerges: existing scholarship evaluates indigenisation through the lens of policy inputs and production outputs rather than operational and lifecycle outcomes. No study has applied an outcome-based evaluation framework that spans the full defence lifecycle — from R&D ownership through design, manufacturing, supply chain, MRO, and upgrade autonomy — across all three services simultaneously. No study has used an operational case study as a systematic validation tool within such a framework. The present dissertation attempts to address both gaps.Chapter 3: Research Objectives, Questions, and Hypotheses

3.1 Research Objectives

This dissertation is guided by five research objectives, each of which corresponds to a dimension of the indigenisation question that existing literature has not adequately addressed:

1. To evaluate the outcomes of India's defence indigenisation drive in terms of operational self-reliance and lifecycle capability autonomy across the Indian Army, Indian Navy, and Indian Air Force.
2. To assess the depth of indigenisation across key defence systems, distinguishing between domestic production and genuine design ownership and capability autonomy.
3. To examine lifecycle sustainment, MRO autonomy, and upgrade independence for selected indigenous defence platforms.

4. To analyse Operation Sindoor (2025) as a real-world, non-tactical validation of indigenisation outcomes using open-source, publicly available information.

5. To identify the persistent technological and institutional constraints — particularly in propulsion, avionics, and electronics — that limit the achievement of true self-reliance.

3.2 Research Questions

The primary research question guiding this dissertation is: Has India's defence indigenisation drive (2014–2025) translated into genuine operational and lifecycle self-reliance, or does a significant gap persist between the growth in domestic production and the depth of capability autonomy?

Four subsidiary questions flow from this:

- Has indigenisation meaningfully reduced India's operational dependence on foreign suppliers, and if so, is that reduction uniform across services and systems?
- Which stages of the defence lifecycle — R&D, design, manufacturing, supply chain, MRO, or upgrades — remain least indigenised?
- What does operational deployment, specifically the use of indigenous systems in Operation Sindoor, reveal about the current depth of achieved capability?
- What role does lifecycle sustainment and upgrade autonomy play in determining whether indigenisation constitutes genuine strategic self-reliance?

3.3 Hypotheses

Two hypotheses are tested in this study:

H1: Indigenisation has reduced India's operational dependence on foreign suppliers, but the extent of this reduction is uneven across services and defence systems, with the Indian Army showing the highest indigenisation depth and the Indian Air Force remaining the most import-dependent.

H2: Despite significant growth in indigenous production volumes, limited design ownership and lifecycle sustainment capabilities continue to constrain India's true strategic self-reliance, with the gap most pronounced in propulsion, advanced avionics, and military electronics.

Chapter 4: Research Methodology

4.1 Research Design and Approach

This study adopts a mixed-method approach that combines doctrinal analysis of defence policy with empirical analysis of secondary data. The choice of methodology is driven by the nature of the research problem: assessing indigenisation outcomes requires both an understanding of the policy framework within which those outcomes were pursued and a systematic evaluation of the empirical evidence about what those policies actually produced.

The doctrinal component involves a careful examination of India's Defence Procurement Procedures, the Defence Acquisition Procedure 2020, the Positive Indigenisation Lists (I through V), the iDEX and SRIJAN frameworks, and MoD policy circulars related to indigenisation. This allows the study to situate observed outcomes in the context of stated policy intent and to identify where the two diverge.

The empirical component relies on time-series analysis of secondary data drawn from the sources described below. An outcome-based evaluation framework, structured around six stages of the defence lifecycle, is applied to the data to

generate a comparative assessment of indigenisation depth across the three services. This is complemented by a non-tactical case study of Operation Sindoor.

4.2 Data Sources

The study draws on the following categories of sources:

Government Sources

- Ministry of Defence Annual Reports (2013-14 to 2024-25)
- Union Budget documents — defence allocation statements (PIB press releases)
- DRDO Technology Perspective and Capability Roadmap documents
- DDP SRIJAN Portal indigenisation data
- Positive Indigenisation List notifications (I through V)

International Databases

- SIPRI Arms Transfer Database (1990–2024)
- SIPRI Military Expenditure Database (MILEX)
- World Bank Military Expenditure (% of GDP) data series

Corporate and Institutional Reports

- HAL Annual Reports (FY 2009-10 to FY 2024-25)
- BEL Annual Reports (FY 2009-10 to FY 2024-25)
- Mazagon Dock Shipbuilders Limited and Garden Reach Shipbuilders production data

Academic and Think-Tank Sources

- IDSA Occasional Papers and Monographs on defence indigenisation
- ORF Policy Briefs (2020–2025)
- VIF India — Defence Exports and Indigenisation Review (2024)
- Brig. P.P. Singh (2025) — Operation Sindoor defence analysis
- Shakil Bhat (2025) — Indigenisation outcomes study

4.3 The Lifecycle Evaluation Framework

The central methodological innovation of this study is the application of a six-stage lifecycle evaluation framework to assess indigenisation depth across the Indian Army, Navy, and Air Force. The six stages are:

6. R&D Ownership — Does India hold the design authority and intellectual property for the system or platform?
7. Design Authority — Was the system designed domestically, or was a foreign design licensed or transferred?
8. Manufacturing Capability — To what extent is physical production carried out in India, using domestically sourced components?
9. Supply Chain Localisation — How much of the sub-system and component supply chain is based in India?
10. MRO Autonomy — Can India independently maintain, repair, and overhaul the platform without depending on foreign OEMs?

11.Upgrade Autonomy — Does India hold the rights and technical capability to independently upgrade and modify the platform across its service life?

Each stage is assessed for each service on a four-point qualitative scale (High, Moderate, Low, Very Low) based on publicly available information. The resulting matrix — what this study terms the Lifecycle Indigenisation Scorecard — provides a cross-service comparative picture of where indigenisation is deep and where it remains shallow.

4.4 Case Study: Operation Sindoor

Operation Sindoor in May 2025 provides an unusual opportunity: a real-world, large-scale operational event that used a range of Indian military systems under actual combat conditions. The case study is deliberately limited to open-source, non-classified, non-tactical information. It draws on publicly available reporting, official government statements, and academic analysis to identify which systems were used, what their indigenous origin and content were, and what the operational outcome can tell us about the depth of capability that has been achieved.

The case study is used as a validation tool — to test whether the lifecycle scorecard findings are consistent with what operational deployment reveals — rather than as a primary source of indigenisation data.

4.5 Scope and Exclusions

The study covers the Indian Army, Indian Navy, and Indian Air Force over the period 2014–2025. It examines indigenisation at the platform and system level using publicly available secondary data. Tactical operational data, classified information, system-level technical specifications, and primary stakeholder interviews are outside the scope of this research. The analysis of Operation Sindoor is strictly non-tactical.

Chapter 5: Policy Landscape and Data Analysis (2014–2025)

5.1 Defence Budget Trajectory

India's defence budget has expanded substantially over the past decade, both in absolute terms and relative to the base year. Table 1 below summarises the key budget figures.

Table 1: Defence Budget Growth (2013–2026)

Financial Year	Total Defence Budget (Rs. Lakh Cr)	Capital Outlay (Rs. Lakh Cr)	% Change (Total)
2013-14	2.53	0.79	—
2015-16	2.47	0.78	-2.4%
2017-18	3.59	0.86	+45.3%
2019-20	4.31	1.03	+20.1%
2021-22	4.78	1.35	+10.9%
2023-24	5.94	1.62	+24.3%
2025-26	6.81	1.80	+14.6%

Source: PIB Press Releases 2024-25 and 2025-26; MoD Annual Reports; Union Budget Documents.

Two features of this trajectory are worth noting. First, the capital outlay — the portion of the defence budget that finances new equipment procurement — has grown from Rs. 0.79 lakh crore in 2013-14 to Rs. 1.80 lakh crore in 2025-26. Critically, from 2022-23 onwards, the government mandated that 75 per cent of the capital budget be reserved for domestic procurement, which represents a significant structural shift in how procurement capital is allocated.

Second, despite the absolute growth, India's defence spending as a share of GDP has remained at approximately 1.9 per cent — below the levels of both China (approximately 1.7 per cent officially, likely higher) and Pakistan (approximately 2.7 per cent), and well below the 2.5 to 3 per cent that most strategic analysts argue is appropriate for a country facing India's security environment. This budgetary constraint has important implications for the pace at which genuine indigenisation — particularly in expensive R&D-intensive domains like propulsion and avionics — can realistically proceed.

5.2 R&D Investment: The DRDO Budget

Table 2: DRDO R&D Budget Allocation (2013–2026)

Financial Year	DRDO Budget (Rs. Crore)	As % of Defence Budget
2013-14	9,298	~5.8%
2016-17	15,244	~6.1%
2019-20	19,382	~6.2%
2021-22	21,215	~6.3%
2022-23	23,264	~5.9%
2024-25	23,856	~5.8%
2025-26	26,817	~5.9%

Source: MoD Annual Reports; Union Budget Documents (various years).

The DRDO budget has grown nearly threefold in absolute terms, from Rs. 9,298 crore in 2013-14 to Rs. 26,817 crore in 2025-26. However, as a percentage of the total defence budget, it has remained broadly flat at around 5.8 to 6.3 per cent. This is a telling figure. Countries that have achieved deep indigenisation — South Korea, Israel, Turkey — have historically invested 10 to 15 per cent of their defence budgets in R&D. India's DRDO allocation, while growing in absolute size, has not kept pace with what deep technological self-reliance requires.

5.3 Indigenous Production and Exports

Table 3: Defence Production and Export Figures (2014–2025)

Year	Production (Rs. Lakh Cr)	Exports (Rs. Crore)	Export Nations
2014-15	0.46	1,941	~30
2016-17	0.54	4,682	~40
2018-19	0.79	10,745	~55
2020-21	0.80	8,435	~75

Year	Production (Rs. Lakh Cr)	Exports (Rs. Crore)	Export Nations
2022-23	0.90	15,920	~85
2023-24	1.27	21,083	100+
2024-25	1.54	23,622	100+

Source: DDP Annual Reports; PIB (2025); VIF India Defence Export Review; MoD Annual Reports.

The growth in both production and exports is substantial. Domestic defence production has more than tripled in eleven years, from Rs. 46,429 crore in 2014-15 to Rs. 1,54,000 crore in 2024-25. Defence exports have grown even more dramatically, rising from Rs. 1,941 crore to Rs. 23,622 crore — a more than twelve-fold increase — with India now supplying to over 100 countries, including the United States, France, and Armenia.

Ammunition production is one of the clearest success stories: India has achieved 88 per cent self-sufficiency, a significant improvement from a position of considerable import dependence a decade ago. Other notable indigenised platforms include the Dhanush and ATAGS artillery systems, the Arjun MBT, the LCA Tejas, the Akash SAM system, the BrahMos cruise missile, the Pinaka MLRS, INS Vikrant, and the P17A stealth frigates.

However, several important caveats apply to the production figures. Not all domestic production represents genuine technological ownership. A substantial portion represents licensed manufacturing, final assembly of imported components, or production under technology transfer agreements in which the core intellectual property remains with the foreign OEM. The headline production figure does not distinguish between these categories.

5.4 Procurement Shift: Domestic vs. Foreign Capital Procurement

Table 4: Domestic vs. Foreign Capital Procurement (2014–2024)

Year	Domestic Procurement (%)	Foreign Procurement (%)	Notes
2014-15	~60.6%	~39.4%	Baseline year
2016-17	~62.0%	~38.0%	Declining foreign share
2018-19	~51.3%	~48.7%	Spike: Rafale, S-400 deals
2020-21	~54.0%	~46.0%	Post-Ladakh push
2022-23	~66.0%	~34.0%	PIL impact visible
2023-24	~75.0%	~25.0%	75% domestic mandate

Source: MoD Annual Reports; DDP data; author calculations from PIB data.

The domestic share of capital procurement has risen from roughly 60 per cent in 2014-15 to over 75 per cent in 2023-24. The notable spike in foreign procurement in 2018-19 reflects a cluster of large foreign acquisitions during that period — the Rafale fighter aircraft from France and the S-400 Triumf air defence system from Russia, in particular. The subsequent decline in the foreign share reflects both the mandated 75 per cent domestic procurement target and the increasing ability of Indian DPSUs and private firms to supply a wider range of equipment categories.

5.5 DPSU Performance

The Defence Public Sector Undertakings have been the backbone of India's domestic defence production. Among them, HAL and BEL have shown the strongest growth. HAL's annual revenue grew from approximately Rs. 13,000-15,000 crore in 2009-10 to Rs. 29,810 crore in FY 2023-24, its highest ever. BEL similarly grew from around Rs. 5,000 crore to Rs. 19,700 crore in FY 2023-24.

The 2021 corporatisation of the Ordnance Factory Board, which split the old OFB into seven specialised DPSUs, was intended to improve efficiency, accountability, and commercial orientation. Early results are cautiously positive: the new entities have begun seeking export orders and commercial partnerships, marking a departure from the insular, captive-supply culture of the old OFB structure.

Chapter 6: Outcome-Based Evaluation of Indigenisation

6.1 Service-Wise Assessment: Indian Army

The Indian Army presents the strongest indigenisation profile among the three services, particularly in the domain of land-based platforms and equipment. Several factors contribute to this. Ground-based systems are generally less technologically complex than naval or air platforms, making domestic design and manufacturing more feasible. The Army has also been the primary beneficiary of the Positive Indigenisation Lists, which have restricted imports across a wide range of categories relevant to land forces.

Key achievements include the Dhanush artillery gun system, the Advanced Towed Artillery Gun System (ATAGS, worth Rs. 7,000 crore), the Arjun Mk1A main battle tank, the Pinaka Multi-Launch Rocket System (now being exported), and the domestically manufactured AK-203 assault rifles under the India-Russia joint venture. The Army has achieved 88 per cent self-sufficiency in ammunition production, which is strategically significant given that sustained conflict operations are highly ammunition-intensive.

Over 3,000 items from the Positive Indigenisation Lists had been completed by 2024, a significant portion of which are Army-relevant. The Army also sources the majority of its equipment by value from domestic suppliers.

Gaps persist nonetheless. Anti-tank guided missiles of the more advanced varieties remain partially import-dependent. Night-vision and thermal imaging equipment for infantry continues to rely on imported optics. Electronic warfare systems for ground forces are still primarily sourced internationally.

6.2 Service-Wise Assessment: Indian Navy

The Indian Navy has achieved perhaps the deepest form of indigenisation among the three services, particularly in the domain of shipbuilding and platform design. India's shipyards — Mazagon Dock, Garden Reach, Hindustan Shipyard, and Cochin Shipyard — have demonstrated genuine capability to design and build complex warships domestically.

The most significant single achievement is INS Vikrant, India's first indigenously designed and built aircraft carrier, commissioned in 2022. This represents a genuine design-owned platform — not a licensed build or technology transfer — and its construction involved the development of a domestic supply chain for ship steel, radar systems, and propulsion components that did not exist before. The P17A Nilgiri-class stealth frigates, of which seven have been ordered, carry a significantly higher indigenous content than their predecessors. The P75 Scorpene class submarines, while built under French licence, have generated significant domestic manufacturing capability.

The Varunastra heavyweight torpedo and the integration of the Astra beyond-visual-range missile on naval aircraft are further examples of genuine indigenous capability in naval weaponry.

However, important gaps remain. Submarine propulsion, particularly Air Independent Propulsion (AIP) technology for extended underwater operation, is not domestically available. The Navy's carrier-based aviation will require aircraft that India cannot currently produce domestically. Certain high-end sensor and sonar systems continue to be sourced internationally.

6.3 Service-Wise Assessment: Indian Air Force

The Indian Air Force presents the most complex and in several respects the most concerning indigenisation picture. It is the service most dependent on imported platforms, and the service for which the gap between production and capability ownership is widest.

The LCA Tejas programme represents India's most ambitious attempt to indigenise its combat aircraft capability. Orders for 83 Tejas Mk1A and 97 Tejas Mk2 aircraft have been placed, and the programme has generated genuine domestic design and manufacturing capability at HAL. The Integrated Air Command and Control System (IACCS) and the Akashteer electronic warfare and air defence management system are both fully indigenous and represent world-class capability in their domains.

However, the Tejas Mk1A uses the General Electric F404 engine — a US-supplied powerplant — because India's own Kaveri engine programme, after more than 35 years and substantial investment, has not produced an operationally certified high-thrust jet engine. The Tejas's radar systems are currently imported, with the domestic UTTAM AESA radar still under development. The IAF's primary strike platform remains the Rafale, a French aircraft for which France holds all upgrade authority. The S-400 air defence system is Russian, and its maintenance and software upgrades depend on Rosoboronexport. The Apache and Chinook helicopters are American.

This combination means that while the IAF's support, command, and some air defence functions are increasingly indigenised, its core strike and air superiority capability remains substantially import-dependent.

6.4 Lifecycle Indigenisation Scorecard

Table 6 presents the Lifecycle Indigenisation Scorecard — the central empirical output of this dissertation's evaluation framework.

Table 6: Lifecycle Indigenisation Scorecard — Service-Wise

Lifecycle Stage	Indian Army	Indian Navy	Indian Air Force	Overall Assessment
R&D Ownership	Moderate	Moderate	Low	Moderate-Low
Design Authority	Moderate	High	Low	Moderate
Manufacturing	High	High	Moderate	High
Supply Chain	Moderate	Moderate	Low	Moderate
MRO Autonomy	Moderate	Moderate	Low	Moderate-Low
Upgrade Autonomy	Low	Moderate	Low	Low

Source: Author's assessment based on MoD Annual Reports, HAL/BEL Annual Reports, DRDO Technology documents, SIPRI data, and open-source platform-level information.

Several observations follow from this scorecard. Manufacturing capability is high for both the Army and Navy and moderate for the Air Force — reflecting the genuine production capacity that India has built. But design authority is high only for the Navy, and upgrade autonomy is low across all three services. This pattern is consistent with the central

argument of this dissertation: India has built production capability but has not yet built commensurate capability ownership.

6.5 Case Study: Operation Sindoor (2025)

Background

Operation Sindoor, launched in May 2025, was India's military response to a terrorist attack on tourists in the Pahalgam area of Jammu and Kashmir. The operation targeted terrorist infrastructure in Pakistan and Pakistan-administered Kashmir. It involved strikes on multiple targets, and included a defensive response to Pakistani counter-attacks. It was, by most accounts, the most significant direct military confrontation between India and Pakistan since Kargil.

Indigenous Systems Deployed

Table 7: Indigenous Systems Deployed in Operation Sindoor

System	Indigenous Status	Primary Role
IACCS	Fully indigenous (BEL-developed)	Multi-domain command and control
BrahMos Cruise Missile	Jointly developed (India-Russia); domestically produced	Precision strike on ground targets
Akash SAM System	Fully indigenous (DRDO design, BEL production)	Air defence; interception of counter-attacks
Akashteer	Fully indigenous	Electronic warfare; adversary communications jamming
Rafale (IAF)	French origin (Dassault)	Strike missions against selected targets

Source: PIB MoD official statements; Brig. P.P. Singh (2025); Shakil Bhat (2025); open-source non-tactical reporting.

What Sindoor Validates

Operation Sindoor provides the strongest empirical validation to date of India's indigenous military capability in several domains. The IACCS demonstrated that India can orchestrate a complex, multi-domain military operation using a fully indigenous command and control architecture. The Akash SAM system's successful interception of Pakistani counter-attacks under real combat conditions is particularly significant: it is the system's first large-scale operational test, and it performed credibly. The Akashteer electronic warfare system's role in disrupting adversary communications represents a genuine indigenous capability in a domain where India was entirely import-dependent as recently as a decade ago.

The BrahMos strikes demonstrated India's precision strike capability using a domestically produced (though jointly developed) cruise missile. Collectively, these systems represent a genuine and operational indigenous capability across the C4ISR, air defence, and precision strike domains.

What Sindoor Also Reveals

At the same time, Sindoor reveals the limits of current indigenisation. The IAF's strike missions relied on Rafale aircraft — a French platform for which India holds no design authority and no upgrade rights. India was able to conduct the operation and achieve its tactical objectives, but the most demanding strike missions required a foreign aircraft. This is a telling limitation.

The operation also does not resolve questions about MRO sustainment under extended conflict conditions. A brief, high-intensity operation of the type Sindoor represented does not tax the same logistics and sustainment systems that a prolonged conventional conflict would. The question of whether India could sustain indigenous systems through an extended campaign remains open.

Assessment Against Hypotheses

In terms of H1, Sindoor partially supports the hypothesis. Indigenisation has clearly reduced operational dependence in the C4ISR and air defence domains, but the continued reliance on Rafale confirms that the reduction is uneven, with the Air Force's strike capability remaining significantly import-dependent.

In terms of H2, Sindoor is broadly consistent with the hypothesis. The systems that performed well — IACCS, Akash, Akashteer — are systems where India has genuine design ownership and domestic supply chains. The Rafale's role in the strike mission confirms the lifecycle gap: India produced domestically in some areas but could not replicate that in its primary strike aircraft.Chapter 7: Results, Discussion, and Conclusions

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7.1 Hypothesis Testing Results

H1: Uneven Reduction in Foreign Dependence

H1 is supported with qualification. The evidence from the data analysis and the lifecycle scorecard confirms that indigenisation has reduced India's operational dependence on foreign suppliers in a meaningful and measurable way. The domestic procurement share has risen from roughly 60 per cent in 2014-15 to over 75 per cent in 2023-24. Arms import volumes declined between 2016-20 and 2021-25. The number of systems that India can manufacture domestically has expanded substantially. Operation Sindoor demonstrated that India can execute a significant military operation drawing on indigenous command, air defence, and strike systems.

However, the qualifier 'uneven across services and systems' is not merely a caveat: it is the most substantively important part of the finding. The Army has achieved the highest domestic procurement share. The Navy has achieved genuine capability ownership in shipbuilding and select weapon systems. The Air Force remains heavily dependent on foreign platforms for its core combat roles. And even within domains where production has been indigenised, upgrade autonomy remains low across all three services — meaning that as the current generation of platforms ages, India will face the same import-dependent upgrade cycle it faces today.

H2: Lifecycle and Design Ownership Gaps

H2 is strongly supported. The lifecycle scorecard shows that upgrade autonomy is low across all three services and that MRO autonomy is moderate at best. The most striking confirmation comes from the propulsion domain: India has still not produced an operationally certified high-thrust jet engine despite over 35 years of effort through the Kaveri programme. The Tejas, India's flagship indigenous combat aircraft, uses an American engine. The IAF's most capable fighter, the Rafale, is French. The submarines built under the P75 programme are Scorpene-class vessels whose propulsion and combat management systems were designed and are sustained by Naval Group of France.

These are not marginal dependencies. They sit at the heart of India's combat aviation and naval capability. The production figures, however impressive, do not capture this reality. The scorecard does.

7.2 Discussion: The Indigenisation Paradox

The central finding of this dissertation can be stated simply: India produces more than three times as much defence equipment domestically as it did a decade ago, yet remains the world's second largest arms importer. This paradox — high production, persistent dependence — is the defining feature of India's current indigenisation situation.

The explanation lies in the distinction between production and capability ownership. A large share of what India counts as domestic production involves final assembly of imported components, licensed manufacturing of foreign-designed platforms, or production of less technologically intensive items (ammunition, small arms, basic vehicles) where design ownership is less consequential. The categories where design ownership, MRO autonomy, and upgrade rights matter most — jet engines, advanced radars, submarine propulsion, military-grade electronics — are precisely the categories where India remains most dependent.

This is what might be called the assembly trap: the production figures improve, the import statistics look better, the policy narrative becomes more confident, but the underlying technological dependency remains substantially intact. Until India can independently design, produce, sustain, and upgrade the critical subsystems that make its major platforms actually work, the indigenisation story will remain more impressive in the statistics than in the operational reality.

7.3 Structural Weaknesses

Propulsion

The absence of a domestic high-thrust jet engine is the single most significant structural weakness in India's defence indigenisation. The Kaveri programme, which began in 1986, has consumed decades of DRDO effort and substantial public funding. It has produced a demonstrator engine but has not achieved operational certification for flight. The recently concluded agreement with General Electric for co-production of the F414 engine for Tejas Mk2 includes some technology transfer provisions, but whether India will receive the foundational intellectual property — rather than the right to assemble under licence — will determine whether this represents genuine progress or a continuation of the assembly trap in a new form.

Advanced Electronics and Semiconductors

Military-grade semiconductor manufacture — radiation-hardened processors, military-specification communication chips, advanced sensor arrays — is a domain where India has virtually no domestic capability. Every major defence platform depends on imported electronics at the component level. Building a domestic semiconductor capability of the kind required for defence applications takes sustained investment over a decade at minimum, and India has not yet made the policy commitment or capital allocation that this would require.

Submarine Propulsion and AIP

Air Independent Propulsion technology, which allows submarines to operate submerged for extended periods without surfacing to recharge batteries, is a strategically critical capability for operations in the Indian Ocean. India's P75 submarines do not have AIP. The P75I programme, intended to address this, has faced prolonged delays. India currently has no domestic AIP capability and will need either to develop one or to continue depending on foreign providers.

7.4 Conclusions

This dissertation set out to evaluate whether India's defence indigenisation drive (2014–2025) has translated into genuine operational and lifecycle self-reliance. The answer is nuanced but can be stated with reasonable confidence.

In quantitative terms, the progress is real and substantial. Production has tripled, exports have grown more than twelvefold, ammunition self-sufficiency has reached 88 per cent, and Operation Sindoor has demonstrated credible indigenous capability across the C4ISR, air defence, and electronic warfare domains. These are not trivial achievements.

In qualitative terms — measured against the standard of genuine capability ownership across the full defence lifecycle — significant gaps remain. Upgrade autonomy is low across all three services. Propulsion, advanced avionics, and

military electronics remain heavily import-dependent. The Air Force's primary strike capability relies on a French aircraft. The production paradox — high volumes, persistent import dependence — has not been resolved.

H1 is supported with the important qualifier that the reduction in foreign dependence is uneven, with the Air Force lagging significantly. H2 is strongly supported: despite production growth, lifecycle sustainment and design ownership gaps continue to constrain strategic self-reliance.

The path to genuine Aatmanirbharta requires three fundamental shifts. The first is from production targets to capability ownership metrics: measuring indigenisation by what India can design, sustain, and upgrade, not only by what it can assemble. The second is from 1.9 per cent to at least 2.5 per cent of GDP in defence spending, with a meaningfully higher share directed toward R&D. The third is from licensed assembly to indigenous intellectual property: ensuring that technology transfer agreements actually transfer foundational technology, not just production rights.

7.5 Policy Recommendations

- Prioritise propulsion: Commit to a funded, time-bound indigenous jet engine programme, with clear milestones and accountability, as the single highest-priority technology gap.
- Restructure technology transfer mandates: Ensure that all major foreign procurement is conditional on the transfer of foundational intellectual property, not merely assembly rights, with verification mechanisms built into the contract.
- Expand the private sector's role: Develop guaranteed procurement pipelines and IP frameworks that give private defence companies the long-term revenue certainty needed to justify sustained R&D investment.
- Increase the R&D allocation: Raise the DRDO budget from its current 5.8 per cent of the defence budget toward 10 per cent over five years, with a focus on the three critical gaps: propulsion, electronics, and submarine AIP.
- Adopt lifecycle metrics for indigenisation measurement: Replace headline production figures with a more granular scorecard that tracks design ownership, MRO autonomy, and upgrade independence alongside manufacturing volume.
- Raise the defence budget to 2.5 per cent of GDP: The current 1.9 per cent is structurally insufficient for the scale of R&D investment that genuine indigenisation requires.

7.6 Further Scope of Research

This study opens several avenues for further inquiry. A comparative study of India's indigenisation trajectory against South Korea (DAPA model), Israel (hybrid public-private R&D ecosystem), and Turkey (ASELSAN model) would yield useful prescriptive benchmarks. A detailed economic impact study quantifying the macroeconomic multiplier effects of indigenisation on employment, technology spillovers, and industrial capability would strengthen the case for increased defence R&D investment.

As information about Operation Sindoor becomes more fully available through declassification and official accounts, a more systematic post-operation analysis examining system-wise performance, sustainment outcomes, and lifecycle gaps exposed during operations would constitute a valuable contribution. Primary data collection through structured interviews with DRDO scientists, procurement officials, and HAL and BEL engineers would also substantially strengthen future studies in this domain.

Finally, the indigenisation of next-generation capability domains — AI-guided munitions, quantum communication, autonomous drone swarms, and directed energy weapons — represents a frontier that existing literature has barely begun to address.

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