

Atmanirbharta Through Technology Self-Sufficiency

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Introduction

In the last seven decades since independence, the private industry's participation in India's defence industrial ecosystem was dismally limited. Further, innovations were largely fragmented and indigenous supply chains remained underdeveloped. India's defence preparedness was contingent on foreign suppliers for major platforms, critical technologies and advanced military equipment. Military hardware was either imported or manufactured under licence with limited transfer of technology. This import reliance imposed a substantial financial burden while constraining India's strategic autonomy, exposing the armed forces to supply chain disruptions, technology denial regimes and geopolitical pressures.

In the last decade, defence self-reliance has evolved substantially from a policy aspiration to a national strategic mission. Under the broader vision of Atmanirbhar Bharat, India has progressively strengthened domestic manufacturing, encouraged private-sector participation, developed indigenous supply chains and promoted exports. Defence production has since grown from approximately INR 46,429 cr in FY 2014-15 to more than INR 1.54 lakh cr in Financial Year (FY) 2024-25, with a target of INR 3.0 lakh cr by 2029.¹ Defence exports have risen from INR 686 cr in 2013-14 to over INR 23,600 crore in 2024-25, with estimates exceeding ₹38,000 cr in FY 2025-26.² Indian defence products are now exported to more than eighty countries.

Though this transformation has boosted indigenous manufacturing and defence exports, long-term strategic autonomy requires a transition from manufacturing capability to technology sovereignty. As warfare is increasingly shaped by Artificial Intelligence (AI), autonomous systems, cyber capabilities and advanced materials, military power will depend on a nation's capacity for continuous innovation rather than production alone. India needs to harness its vast pool of scientific and entrepreneurial talent to transform operational challenges into indigenous technological solutions. The next phase of *Atmanirbharta* (Self-reliance) must be measured by what India invents, owns and exports.

Private Sector Participation

The emergence of private industry alongside public sector enterprises has diversified India's industrial base. Over 16,000 Micro, Small, and Medium Enterprises now participate in defence manufacturing, along with start-ups which are contributing to AI, drones, autonomous systems, cyber technologies and electronic warfare.³ Indigenous production today includes artillery systems such as Advanced Towed Artillery Gun System and Dhanush, missile systems including Akash and Pinaka, naval warships, surveillance radars, armoured vehicles and increasingly sophisticated aerospace components.⁴

Policy initiatives such as the Positive Indigenisation Lists, the SRIJAN portal and Innovations for Defence Excellence have further transubstantiated India's defence industrial landscape by encouraging indigenous development, substituting imported components and connecting innovators with operational challenges of the armed forces. Yet, despite this impressive manufacturing growth, India continues to face technological dependence in several critical domains. Manufacturing alone is no longer enough. The next leap demands innovation, technological ownership and the ability to create, rather than merely produce.

Manufacturing versus Technology Superiority

Manufacturing and technology are often used interchangeably, but both essentially represent diverse capabilities. Manufacturing is the ability to produce systems efficiently, economically and at scale. Technology sovereignty is the ability to own and control the underlying knowledge, intellectual property, software, design authority and critical technologies that determine a system's performance, future evolution and exportability. A combat aircraft assembled in India may still depend upon imported engines, radar modules, flight control software or electronic warfare systems. A missile may be assembled domestically but remain dependent on imported seekers. A warship may be built in an Indian shipyard while relying on foreign propulsion systems. Likewise, autonomous platforms may be designed and manufactured in India but remain dependent on imported navigation software, AI algorithms or critical electronic components.⁵

The real challenge is not merely assembling a system; it owns the technologies that make it work. India must avoid equating assembly with true self-reliance. Licensed production strengthens manufacturing, generates employment and develops indigenous supply chains, but it does not confer ownership of critical technologies, intellectual property or design authority. India must possess the capability to improve, upgrade and export its systems throughout their entire lifecycle without external dependence. This distinction between manufacturing a platform and owning its underlying technologies will increasingly define not only industrial competitiveness, but also military power and strategic autonomy.

Impact of Changing Character of Warfare

The need for this transition stems from the changing character of warfare. Military power is no longer determined by the number of weapons or platforms a nation possesses. It progressively depends on how rapidly it can develop, adapt and integrate new technologies. Recent conflicts have demonstrated that inexpensive drones and autonomous systems can neutralise or destroy far more expensive military platforms. AI is transforming target identification, mission planning and intelligence analysis, while electronic warfare has become a contest of continuous software upgrades, cyber resilience and adaptive countermeasures. Consequently,

future military power will depend less on the size of an arsenal and more on a nation's capacity for continuous innovation.

Many developed nations have followed an evolutionary path. India now stands at a similar inflection point. The next leap is to design, develop, own, continuously improve and export indigenous technologies. Attaining this will require a vibrant innovation ecosystem with research institutions, universities, start-ups, industry, Defence Research and Development Organisation (DRDO) and the armed forces working in collaboration to create breakthrough technologies. This will enable *Atmanirbharta* to evolve from manufacturing capability to genuine technological sovereignty. This vision is aptly reflected in the ex-Chief of Defence Staff's observation that "Innovation in thought and action will drive our capability development".⁶ It underscores the shift from a procurement and production-centric approach to one focused on creating indigenous technologies and continually enhancing military capability.⁷

Transitioning to Innovation-Led Capability Development

Continuous Innovation. For decades, India's defence capability was largely driven by procurement. The armed forces identified their operational requirements, industry supplied the equipment and the services inducted it into service. In an era of rapid technological obsolescence, contemporary defence capability requires continuous innovation. Operational challenges should drive research, prototype development, user testing, production and an iterative feedback loop for continuous improvement. Procurement is no longer the end goal; it is just a stage in the broader innovation ecosystem.

Global Lessons. The experience of leading military powers reinforces this lesson. The United States established institutions such as Defence Advanced Research Projects Agency that brought together military users, universities, research laboratories, start-ups, and industry to solve operational challenges and develop breakthrough technologies. Israel transformed operational necessity into technological leadership through close collaboration between the armed forces, academia and industry. South Korea too progressed from licensed manufacturing to the indigenous design, development and export of advanced defence systems. The common thread through these success stories is that lasting military superiority is not built by acquiring equipment alone. It is fostered by nurturing innovation ecosystems that continuously develop, test, refine and deploy new technologies.

Converting Human Capital to Strategic Asset

- India's greatest strategic asset is its immense reservoir of scientific, engineering and entrepreneurial talent. Indian scientists and engineers dominate leadership positions across the world in fields such as aerospace, AI, robotics, semiconductors, quantum technologies, advanced materials and autonomous systems. The talent and intellectual capability already exist. The challenge is to build institutions, incentives and innovation ecosystems that

channel this immense human capital towards advancing India's national and strategic objectives.

- The recent autonomous rescue missions near Strait of Hormuz, involving the autonomous surface vessel Corsair, illustrate this reality. Indian-origin technologist Vibhav Altekhar was among the engineers associated with this breakthrough. The episode demonstrates both the growing importance of autonomous systems in future warfare and the global contribution of Indian talent. It is important that India should build such an ecosystem that enables niche technologies to be conceived, developed and operationalised within the country.

Deep-Tech: The New Strategic Frontier

- India is witnessing growth of deep-tech companies working in robotics, AI and autonomous systems. Many of these technologies are developed for civilian use but have significant military applications. AI can improve military logistics. Autonomous systems can power unmanned vehicles. Machine vision can support surveillance, reconnaissance and target recognition.⁸ As warfare becomes more technology-driven, many critical defence technologies will be dual-use from the commercial sector. India's deep-tech ecosystem must therefore act as a strategic national asset for achieving technology sovereignty.

Building Innovation Ecosystems

- Recognising this reality, the Government has proposed the creation of defence manufacturing clusters anchored by premier institutions such as the Indian Institutes of Technology and the Indian Institute of Science. Their long-term success, however, will depend on whether they evolve merely as manufacturing hubs or as integrated innovation ecosystems.⁹
- Successful ecosystems bring together universities, defence laboratories, industry, start-ups, investors, testing agencies and the armed forces. They enable ideas to move seamlessly from research to prototypes, user trials, industrial production and battlefield deployment. More importantly, they encourage experimentation, rapid prototyping and continuous improvement. India's objective should therefore be not simply to produce more defence equipment, but to build an ecosystem that continuously generates indigenous technologies and strategic advantage.

Translating Technology Sovereignty to Innovation Sovereignty

Technology sovereignty should be the foundation for innovation sovereignty. Manufacturing sovereignty enables a nation to build defence equipment. Technology sovereignty enables it to own the critical technologies behind those systems. Innovation sovereignty goes further and enables a nation to create new technologies, set global standards and shape the future of warfare.¹⁰ The next decade must focus on owning critical technologies in areas such as AI, propulsion,

semiconductors, autonomous systems and advanced materials. The long-term goal should be to transform India from a technology adopter into a global technology leader.

Recalibrating *Atmanirbharta* Metrics

If India seeks true technology sovereignty, it must also redefine how success is measured. Production, exports, indigenous content and domestic procurement are important indicators, but do not fully capture technological self-reliance. Future assessments must evaluate ownership of intellectual property, indigenous patents, design capability, software and source codes, mastery of critical technologies, the ability to upgrade systems independently, export autonomy and the global competitiveness of Indian defence technologies. These are more meaningful measures of strategic capability because genuine self-reliance lies not merely in manufacturing defence equipment, but in owning, controlling and continuously advancing the technologies that power it.

The Road Ahead

India has a strong foundation for defence manufacturing. The next challenge is to build a strong innovation ecosystem by bringing together the armed forces, DRDO, academia, start-ups, industry, venture capital and the global Indian scientific community. Operational challenges should drive research and innovation. Promising technologies need timely funding, testing and support, while procurement systems should encourage innovation without compromising operational standards. India must invest in critical technologies such as propulsion, semiconductors, AI, quantum technologies, advanced materials, cyber capabilities and autonomous systems. The goal should not only be to manufacture future defence equipment, but also to develop, own and continuously improve the technologies behind it.

Conclusion

The coming decade must mark India's transition from manufacturing sovereignty to technology and innovation dominance. Success should be measured not only by what India produces or exports, but by its ability to design, own and continuously improve critical defence technologies. India has shown it can manufacture complex defence systems; it must now demonstrate that it can invent the technologies behind them. Only then will Made in India truly evolve into Invented in India, making India a global leader in defence innovation.

Endnotes

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⁵ Ravi Shankar, "From Buyer to Builder: India, Israel Shift Defence Partnership Towards Joint Production", *Bharat Shakti*, 30 Jun 2026, accessed 22 Jul 2026, <https://bharatshakti.in/from-buyer-to-builder-india-israel-shift-defence-partnership-towards-joint-production/>

⁶ Brigadier Narendra Pratap Singh, "Product was Brought, Capability was Not", *LinkedIn*, Jun 2026, accessed 20 Jul 2026, https://www.linkedin.com/posts/npsingh101_for-decades-we-have-treated-defence-innovation-ugcPost-7469934223731109888-7zU6/?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAJhbx0Bqo-DFRYJJsGGDMD1WrdWPYv6PX4

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⁹ Dalip Singh, "Centre plans to create 7 State clusters backed by IITs to boost indigenous defence manufacturing", *The Hindu Business Line*, 21 Jun 2026, accessed 21 Jul 2026, <https://www.thehindubusinessline.com/news/centre-plans-to-create-7-state-clusters-backed-by-iits-to-boost-indigenous-defence-manufacturing/article71128960.ece>

¹⁰ Shankar, "From Buyer to Builder".

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