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India Expands Defence Self-Reliance as DRDO Transfers Conventional Missile Technologies to Domestic Industry for Indigenous Production

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Recent Developments:

- On 25 August 2026, Defence Minister **Rajnath Singh** approved the transfer of technology of **all conventional missile systems developed by DRDO** to eligible Indian defence industries for domestic production. The initiative aims to strengthen indigenous manufacturing, reduce import dependence, increase domestic value addition and deepen the participation of Indian industry in the defence ecosystem.
- The decision seeks to bridge the gap between **laboratory-level development and industrial-scale production**, enabling Indian companies to absorb advanced technologies developed by DRDO and manufacture them domestically under applicable qualifications, certifications and regulatory requirements.
- The initiative is consistent with the broader **Aatmanirbhar Bharat** approach in defence, under which DRDO increasingly works with Indian industry for technology absorption, productisation and manufacturing. DRDO's current ToT framework includes military technologies as well as dual-use and commercial technologies.
- DRDO's technology-transfer portfolio already includes systems such as the **HELINA Missile System**, while its 2026 listings also cover advanced seekers, actuators and other defence technologies.

Understanding Missile Technology Transfer:

Meaning and Scope:

- **Technology Transfer (ToT)** refers to the systematic transfer of technological knowledge, design information, production processes, technical expertise and associated capabilities from a research organisation to an industrial partner for commercial or operational production.
- In defence, ToT is particularly important because successful development of a weapon system does not automatically create the industrial capacity required for **large-scale, reliable and cost-effective production**.
- Missile ToT can therefore convert indigenous research achievements into deployable capabilities while strengthening the domestic **defence industrial base**.

From Know-How to Know-Why:

- **Know-how** includes practical knowledge required to manufacture a system, such as production drawings, assembly procedures, specifications, testing methods and process requirements.
- **Know-why** represents deeper technological understanding of underlying principles, materials, engineering concepts, control systems and design logic, enabling industry to **modify, upgrade and develop subsequent generations** of technology.
- Strategic autonomy becomes stronger when domestic firms progress from merely reproducing transferred designs towards **absorbing, adapting and independently innovating** the underlying technology.

Major Forms of Technology Transfer:

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Vertical and Horizontal Transfer:

- **Vertical Technology Transfer** occurs when technology moves across different stages of the innovation chain, such as from basic research and development laboratories to engineering development and industrial production.
- DRDO transferring a developed missile system to an eligible Indian manufacturer for serial production represents an important example of this laboratory-to-industry transition.
- **Horizontal Technology Transfer** involves transfer between organisations operating at comparable technological or production levels, often through **licensing, joint ventures, industrial partnerships or government-to-government arrangements**.
- In defence, both forms can contribute to technology diffusion, but the depth of indigenous absorption determines whether ToT produces genuine technological capability or merely licensed manufacturing.

Dual-Use Technology:

- **Dual-use technologies** have applications in both civilian and military sectors and can generate **spin-in** and **spin-off** effects.
- **Spin-in** occurs when civilian technologies are adapted for defence applications, while **spin-off** occurs when defence-developed technologies find civilian applications.
- Such technology diffusion can strengthen the broader innovation ecosystem by connecting defence research with **aerospace, electronics, advanced materials, navigation and space technologies**.

Why Missile Technology Transfer Matters for India:

Scaling Up Indigenous Production:

- DRDO is primarily oriented towards **research, development, testing and technological advancement**, whereas industrial firms possess the production systems needed for large-scale manufacturing.
- ToT therefore enables the transition from **prototype development to serial production**, shortening the time between technological development and operational availability.
- The recent decision specifically seeks to facilitate this transition by enabling domestic industry to manufacture DRDO-developed conventional missile systems.

Reducing Import Dependence:

- Excessive dependence on foreign suppliers can create vulnerabilities during **wars, geopolitical crises, sanctions or disruption of international supply chains**.
- Domestic absorption of critical missile technologies can improve India's **operational preparedness and strategic autonomy** by ensuring greater control over production and maintenance.
- Indigenous production also reduces dependence on external suppliers for critical spares, upgrades and life-cycle support.

Strengthening the Defence Industrial Ecosystem:

- Technology transfer can integrate **Micro, Small and Medium Enterprises**, start-ups and specialised suppliers into defence manufacturing chains.
- This can create domestic capabilities in areas such as **precision engineering, electronics, propulsion, advanced materials, guidance systems and testing infrastructure**.
- DRDO's existing ToT mechanism allows industry to express interest in technologies, undergo technical assessment and enter licensing arrangements after fulfilling the prescribed requirements.

Promoting Defence Exports:

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- Indigenous production creates the possibility of expanding India's role from a defence importer to a **manufacturer and exporter of defence systems**.
- Missile exports, however, remain subject to India's export-control framework and relevant international obligations.
- The **BrahMos programme** illustrates how indigenous industrial capability combined with international cooperation can support India's emergence as a defence-exporting country.

Policy and Institutional Architecture:

DRDO's Technology Transfer Framework:

- DRDO has established a structured mechanism for transferring technologies to Indian industry through **Licensing Agreements for Transfer of Technology**.
- For military technologies classified under **Category A**, DRDO undertakes direct technology transfer to industry, while export of such technologies remains subject to prescribed approvals.
- The process can involve **Confidentiality and Non-Disclosure Agreements, Material Transfer Agreements and Licensing Agreements**, depending on the technology and industrial requirement.
- DRDO released an updated **Policy for Transfer of Technology in 2025**, emphasising faster absorption of indigenous technologies by Indian industry and strengthening the transition from laboratories to industrial production.

Industry–DRDO Collaboration:

- India's defence-industrial model increasingly seeks to combine **DRDO's R&D capabilities with private-sector manufacturing capacity**.
- The successful flight test of the **Long Range Land Attack Cruise Missile in June 2026** also demonstrated the growing role of Indian industry partners in developing missile subsystems alongside DRDO laboratories.
- Such collaboration can create a continuous innovation cycle involving **research, design, testing, production, upgrades and exports**.

Major Challenges:

Technology Absorption Deficit:

- Merely receiving technological documentation does not guarantee successful production because advanced missile manufacturing requires specialised **machinery, metallurgy, electronics, propulsion, precision manufacturing and testing capabilities**.
- Indian companies therefore need sustained investment in internal **research and development, skilled manpower and quality-control systems**.

Intellectual Property and Security:

- Missile systems involve highly sensitive technologies related to **guidance, propulsion, seekers, control systems and materials**.
- Expanding the industrial supply chain increases potential risks of **intellectual-property theft, industrial espionage, cyber intrusion and unauthorised disclosure**.
- Strong cybersecurity, access controls, technology classification and secure supply-chain management are therefore essential.

High Capital Requirements:

- Missile manufacturing requires expensive infrastructure for **testing, environmental qualification, specialised production, quality assurance and safety compliance**.

- Private firms may face difficulties in making such investments when procurement orders are uncertain or production volumes remain low.
- Long-term procurement visibility and predictable contracting can therefore encourage private investment.

Export-Control Constraints:

- Missile technologies are strategically sensitive and are subject to international export-control arrangements.
- The **Missile Technology Control Regime (MTCR)** seeks to restrict the proliferation of missiles and unmanned systems capable of delivering weapons of mass destruction.
- India's participation in international export-control arrangements requires domestic defence exports to balance **commercial objectives with non-proliferation responsibilities**.

From Licensed Production to Strategic Autonomy:

The Need for Deeper Indigenous Capability:

- Strategic autonomy requires moving beyond **assembly of imported or licensed components** towards domestic control over critical technologies.
- High-value capabilities should progressively include **propulsion, guidance, seekers, flight-control systems, advanced materials, warheads, software and thermal protection**.
- Indian firms should develop independent R&D capabilities so that transferred technologies can be **upgraded, modified and redesigned** without continuous external technological dependence.

Building a Competitive Defence Manufacturing Ecosystem:

- India needs stronger linkages among **DRDO laboratories, armed forces, universities, start-ups, MSMEs and major defence manufacturers**.
- Defence procurement should provide sufficient demand visibility to justify private-sector investment in specialised manufacturing infrastructure.
- Greater standardisation, testing facilities and certification support can reduce entry barriers for smaller technology firms.
- Technology transfer should therefore be evaluated not only by the number of agreements signed but also by **production achieved, indigenous value addition, technology absorbed, patents generated, exports and subsequent indigenous innovations**.

Way Forward:

Policy Priorities:

- India should establish a **technology-absorption framework** that measures whether industry has genuinely acquired the capability to manufacture, modify and upgrade transferred systems.
- Defence procurement should provide predictable production orders so that private manufacturers can justify investment in advanced infrastructure.
- **Testing and certification infrastructure** should be expanded because inadequate testing capacity can delay the transition from prototype to production.
- Universities and industry should collaborate with DRDO on specialised areas such as **propulsion chemistry, radar seekers, guidance systems, advanced composites and thermal protection**.
- Cybersecurity and intellectual-property protection should become integral components of every major defence technology-transfer programme.
- Export-oriented production should be encouraged while maintaining India's **strategic and non-proliferation obligations**.

Conclusion:

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- The transfer of DRDO-developed conventional missile technologies to Indian industry represents an important step from **indigenous research capability towards indigenous manufacturing capability**.
- Its ultimate success will depend not merely on transferring technology but on India's ability to achieve **deep technology absorption, scalable production, continuous innovation and global competitiveness**.
- A truly **Aatmanirbhar defence ecosystem** should enable India to design, manufacture, maintain, upgrade and eventually export sophisticated weapon systems with progressively lower dependence on foreign technology.
- The long-term objective should therefore be to transform ToT from a mechanism for transferring production knowledge into an instrument for building **strategic technological sovereignty**.

Value Addition for UPSC:

Key Concepts:

- **Technology Transfer:** Movement of technological knowledge and capabilities from research institutions or technology owners to industrial users.
- **Technology Absorption:** Ability of domestic industry to understand, reproduce, modify, upgrade and further innovate upon transferred technology.
- **Strategic Autonomy:** Capacity of a state to pursue national security objectives without excessive dependence on external powers.
- **Dual-Use Technology:** Technology capable of serving both civilian and military purposes.
- **Indigenous Value Addition:** Proportion of a product's technological, manufacturing and economic value generated within the domestic ecosystem.

Relevant Institutions and Frameworks:

- **DRDO:** India's principal organisation for research and development of advanced defence technologies.
- **Defence Industrial Base:** Network comprising public-sector enterprises, private companies, MSMEs, start-ups, research institutions and specialised suppliers involved in defence production.
- **MTCR:** Multilateral export-control arrangement aimed at preventing the proliferation of missiles and unmanned delivery systems capable of carrying weapons of mass destruction