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Magnetic Dependence: How China's Rare Earth Monopoly Shapes India's Defence and Strategic Autonomy

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Abstract

Contemporary warfare is increasingly shaped not by visible force structures alone but by control over critical materials embedded deep within defence-industrial supply chains. Rare Earth Permanent Magnets (REPMs), indispensable to advanced military, aerospace, and electronic systems, have emerged as a foundational yet underexplored determinant of strategic autonomy. China's near-monopoly over rare earth processing and high-performance magnet manufacturing has created asymmetric dependencies for import-reliant states, exposing them to coercive leverage in both peacetime and crisis scenarios. This paper analyses the strategic implications of India's dependence on externally sourced REPMs, examines the defence-industrial vulnerabilities arising from supply chain concentration, and evaluates India's recent policy initiative to establish indigenous REPM manufacturing capacity. It argues that control over REPMs constitutes a critical pillar of twenty-first-century defence sovereignty, comparable to semiconductors and propulsion technologies, and that India's intervention represents a necessary recalibration of its approach to strategic autonomy.

Keywords: Rare Earth Permanent Magnets (REPMs), Strategic Autonomy, Defence Supply Chain Vulnerability, Critical Minerals Geopolitics, India's Defence Manufacturing.

1. Introduction

In the evolving character of warfare, strategic power is increasingly determined by access to enabling materials rather than by conventional metrics such as troop strength or weapons inventories alone. Advanced military systems are embedded within complex global supply chains, where disruption at upstream nodes can undermine operational readiness without direct kinetic confrontation. Scholars have increasingly highlighted how control over critical inputs enables states to exercise structural power through what Farrell and Newman (2019) [8] conceptualise as "weaponised interdependence." Within this framework, Rare Earth Permanent Magnets (REPMs) occupy a strategically significant yet largely invisible position.

REPMs underpin the functionality of advanced defence platforms by enabling compact, efficient, and reliable electromechanical systems. Despite their centrality, India remains heavily dependent on imports for these materials, with China dominating global production and processing. This dependence represents not merely an economic inefficiency but a structural vulnerability with direct implications for India's defence preparedness, technological sovereignty, and strategic autonomy. As modern militaries become increasingly electrified, digitised, and autonomous, the strategic importance of REPMs is set to intensify rather than diminish.

2. Strategic Importance of Rare Earth Permanent Magnets in Defence

Rare Earth Permanent Magnets, particularly neodymium-iron-boron (NdFeB) and samarium-cobalt (SmCo) magnets, possess unique physical properties, including exceptionally high magnetic energy density, resistance to demagnetisation, and reliable performance under extreme thermal and mechanical stress. These characteristics make them indispensable for defence applications where size, weight, precision, and durability are critical constraints (Humphries, 2013) [12]. Modern missile systems rely on REPM-enabled actuators for guidance fins, seeker gimbals, and stabilisation mechanisms that must operate flawlessly at high speeds and temperatures. Similarly, radar and sonar systems integrate permanent magnet motors and generators within signal processing and power conditioning units, where reliability and precision are non-negotiable (U.S. Department of Defense [DoD], 2022) [23].

The strategic relevance of REPMs extends further into aerospace and space domains. Satellite attitude control systems, reaction wheels, and high-efficiency electric motors used in aircraft subsystems depend on REPMs to achieve performance targets while minimising mass and energy

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consumption (Binnemans *et al*., 2013) [1]. In emerging domains of warfare, including unmanned aerial vehicles, loitering munitions, autonomous underwater vehicles, and robotic combat systems, compact electric drives powered by REPM-based motors are fundamental enablers. Naval propulsion is also undergoing a structural transformation with the adoption of integrated electric propulsion systems, where permanent magnet motors offer quieter and more efficient alternatives, directly enhancing submarine stealth and survivability (DoD, 2022) [23]. Collectively, these applications demonstrate that REPMs are not peripheral inputs but core enablers of modern military power.

3. China's Rare Earth Monopoly and Structural Power

China's dominance over rare earth elements and permanent magnet manufacturing is the result of deliberate long-term industrial and strategic policy rather than market accident. Over several decades, Beijing consolidated control across the entire value chain, encompassing mining, separation, refining, alloy production, and large-scale magnet manufacturing. While rare earth deposits exist in multiple countries, China retains overwhelming advantages in the most technologically complex and environmentally sensitive stages of processing and magnet fabrication (Mancheri *et al*., 2013) [16]. This vertical integration grants China pricing power, supply control, and the ability to influence downstream industries critical to defence and high-technology manufacturing.

Unlike conventional commodities, rare earths are difficult to substitute and costly to process, with significant environmental externalities and long lead times for capacity development. As a result, dependence on Chinese supply constitutes a strategic risk rather than a temporary market distortion (Humphries, 2013) [12]. China has demonstrated its willingness to exploit this leverage through export restrictions and regulatory interventions, reinforcing its ability to translate economic centrality into geopolitical influence. Within the logic of weaponised interdependence, such control over chokepoints enables coercion without direct confrontation, a dynamic of particular concern for defence-dependent supply chains (Farrell & Newman, 2019) [8].

4. Defence Vulnerabilities and Strategic Exposure for India

For India, dependence on externally sourced REPMs translates into acute strategic exposure. Defence-grade magnets are not generic components; they require precise compositions, application-specific designs, and strict manufacturing tolerances. These characteristics limit the feasibility of substitution or indefinite stockpiling, as performance degradation and system specificity constrain long-term buffering strategies (Tellis, 2016) [21]. Consequently, even short-term supply disruptions can ripple across the defence industrial base, delaying production schedules, increasing costs, and forcing design compromises.

In scenarios of heightened geopolitical tension or military crisis involving China, this dependence assumes a far more dangerous character. Supply disruption, whether deliberate or incidental, could delay indigenous weapons programmes, constrain spares availability, and limit surge production capacity at precisely the moment when flexibility is most critical. Beyond immediate operational risks, China's control over REPMs reinforces its broader techno-military ecosystem, enabling leadership in electric mobility, aerospace, robotics, and space systems. Import-dependent states, by contrast, remain structurally constrained, undermining their ability to achieve credible deterrence and sustained strategic autonomy.

5. Strategic Autonomy and the Imperative of Supply Chain Sovereignty

Strategic autonomy in the twenty-first century extends beyond control over weapons platforms to encompass assured access to the materials that enable, sustain, and scale military capability. Defence sovereignty requires not only the ability to design and manufacture systems but also to maintain, upgrade, and rapidly expand production under crisis conditions. From this perspective, control over REPM supply chains is as vital as mastery over semiconductors, propulsion systems, or advanced composites (DoD, 2022) [23].

Indigenous REPM capability enhances confidentiality in sensitive defence programmes, reduces exposure to technology denial regimes, and aligns civilian industrial growth with defence requirements. It also strengthens resilience against external shocks, reinforcing the freedom of strategic choice that lies at the heart of autonomy. Without such control, even the most sophisticated platforms remain vulnerable to upstream disruption.

6. India's Policy Intervention: Building Indigenous REPM Capability

Recognising these vulnerabilities, the Government of India approved a ₹7,280 crore Scheme to Promote Manufacturing of Sintered Rare Earth Permanent Magnets, marking a significant recalibration of national security policy. Approved by the Union Cabinet in November 2025, the scheme aims to establish approximately 6,000 metric tonnes per annum of integrated domestic REPM manufacturing capacity, covering the entire value chain from rare earth oxides to finished magnets (Government of India, 2025) [10]. Importantly, the policy explicitly identifies defence, aerospace, automotive, and electronics as priority sectors, situating REPMs within a broader national security and industrial strategy.

The scheme combines sales-linked incentives amounting to ₹6,450 crore over five years with a ₹750 crore capital subsidy, lowering entry barriers while encouraging private sector participation. Capacity allocation through competitive bidding is intended to prevent monopolistic outcomes and promote efficiency and innovation. By emphasising end-to-end localisation, the policy avoids the strategic pitfall of partial indigenisation that would leave India exposed at critical choke points within the supply chain (Government of India, 2025) [10].

7. Defence-Industrial and Geopolitical Implications

From a defence-industrial perspective, indigenous REPM manufacturing strengthens the domestic ecosystem by reducing import dependence, conserving foreign exchange, and enhancing security in sensitive weapons programmes. It enables faster prototyping, testing, and deployment cycles for indigenous platforms, a critical advantage in rapidly evolving threat environments. Strategically, the policy carries significant signalling value, demonstrating India's intent to identify and neutralise upstream vulnerabilities that lie beneath visible manifestations of military power.

In an era where conflict is increasingly shaped by sanctions, export controls, and logistics disruption, resilience in critical materials constitutes a form of deterrence. An adversary's ability to exert coercive leverage diminishes when such leverage no longer exists. India's intervention thus strengthens not only material capacity but also strategic credibility (Farrell & Newman, 2019) [8].

8. Beyond Manufacturing: Sustaining Strategic Autonomy

While the establishment of domestic REPM manufacturing capacity represents a critical foundation, genuine autonomy will require sustained effort beyond initial production targets. Investment in upstream exploration, environmentally responsible mining, recycling of rare earth materials from legacy systems, and advanced defence-specific magnet research and development will be essential. As defence requirements evolve, India must move up the value chain toward next-generation magnetic materials tailored to specific military applications (Binnemans *et al*., 2013) [1]. Strategic stockpiling, diversification of overseas mineral partnerships, and long-term procurement frameworks must complement domestic production to ensure long-term resilience.

9. Conclusion

China's rare earth monopoly represents a subtle yet profound challenge to India's defence and strategic autonomy. Rare Earth Permanent Magnets may be invisible to public discourse, but they underpin the credibility and sustainability of modern military power. India's policy intervention to localise REPM manufacturing corrects a long-standing structural weakness and reflects a sophisticated understanding of contemporary security dynamics. By securing the magnet supply chain, India is not merely manufacturing components; it is reinforcing deterrence, safeguarding sovereignty, and reclaiming strategic control over the material foundations of future warfare.

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