

# India on the Path of Technological Leadership in Defence Technologies

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For years, a few nations, mostly from the west, dominated the global defence industry. But now India, with a sharp focus on self-reliance and technological innovation, is steadily making its mark to change that story. By making advanced military technologies to meet its own security needs, India is not only strengthening its defence forces but also emerging as a serious player in the global market. Today, Indian-made weapons and systems are among the most advanced technologies in the world, signaling the country's growing leadership in defence innovation.

The nation's growth in defence capabilities is not just due to increasing investments in its military infrastructure but also because of strategic collaborations, indigenous technological advancements, and a robust defence ecosystem. With the rise in geopolitical tensions, India's need to enhance its defence capabilities has never been more critical. The government of India has recognized this and made significant strides towards modernizing its military technologies and enhancing its self-reliance in defence production. This shift is evident by India's focus on cutting-edge technologies, such as Main battle tanks, Light Combat Aircraft, Advance Medium Combat Aircraft, Hypersonic missiles, Air defence systems, and advanced radar and communication systems, which are at the forefront of global defence technology.

India's rise in the global defence landscape is characterized by its ability to develop and produce advanced military technologies that were once the domain of a select few countries. Most of these advanced weapons and systems are being designed and developed indigenously by Defence Research and Development Organisation (DRDO), R&D organization under Ministry of Defence of India. Among the key achievements that underline India's growing capabilities are:

## **Main Battle Tanks (MBTs)**

India is one of the few countries globally that produces its own Main Battle Tanks (MBTs). The Indian Army's indigenous **Arjun MBT** is a testament to India's growing prowess in military vehicle technology. While only a few countries have the capability to develop and manufacture MBTs, India has succeeded in creating a world-class tank that meets its specific requirements. Now, India is also developing Zorawar Light Tank to enhance its operational capabilities in diverse terrains, including high-altitude regions. It is equipped with modern modular armor protection, superior mobility, and advanced situational awareness systems. The tank embodies agility, firepower, and adaptability.

## **Missile Systems**

India is among the select few nations, which has developed its own Surface-to-Air Missiles, Air-to-Air Missiles, Air to Surface, Surface-to-Surface Missiles and Anti-Tank Missile. To name a few are Akash Missile System, Rudram, Naval Anti-Ship Missile, Astra BVVR, Pralaya missile, Dhruvastra, Helina etc. Building on this success, DRDO is now working on next-generation hypersonic weapons, including air-launched cruise missiles and glide vehicles designed to outmaneuver even the most advanced air defence systems. These cutting-edge weapons offer exceptional speed, precision, and range, giving India a powerful edge in modern warfare. The recent trials, which

successfully demonstrated scramjet propulsion, are a testament to India's growing self-reliance in advanced defence technologies.

## **Fighter Jets and Aerospace Technology**

India is making remarkable strides in aerospace technology with its indigenous fighter jet programs, strengthening its self-reliance in defence manufacturing. The Tejas, a multi-role light combat aircraft (LCA), is a key milestone in this journey. The Tejas Mk1A, the latest variant, offers enhanced operational capabilities, including beyond visual range (BVR) missile compatibility, improved maintainability, and better survivability, further reducing dependence on foreign fighter jets.

Adding to this progress is the Advanced Medium Combat Aircraft (AMCA), India's first 5.5-generation stealth fighter currently under development that acts as a formidable addition to India's air superiority arsenal.

Continuing its focus on cutting-edge technology development, the Military Combat Parachute System (MCPS) has been successfully tested from height of 27,000 feet with a full combat load, showcasing India's growing expertise in advanced airborne systems.

## **Radar and Surveillance Systems**

India is self-reliant in all types of Radar Systems, it has developed cutting-edge systems like Uttam AESA radar, boosting fighter jets with superior detection, tracking, and electronic warfare capabilities. The Arudhra MPR and Ashwini LLTR further strengthen air defence with long-range surveillance and precise threat tracking. Additionally, Airborne Early Warning and Control (AEW&C) system enhances aerial situational awareness, providing real-time intelligence and strategic advantage.

## **Underwater Weapons and Countermeasure Systems**

India is making significant strides in underwater warfare technology, bolstering its maritime defence capabilities with a suite of advanced torpedoes and counter measure systems. At the forefront is the Torpedo Advanced Lightweight (TAL), an anti-submarine, electrically propelled, self-homing torpedo. Launchable from both ships and rotary-wing aircraft, it offers versatility in deployment. Its active and passive modes of operation, combined with an all-digital control and guidance system, enhance its precision and effectiveness, making it a reliable asset for naval forces.

Complementing this is the Varunastra, a ship-launched, heavyweight, electrically propelled, anti-submarine torpedo. Designed to target quiet submarines in both deep and shallow waters, it remains highly effective even in intense countermeasure environments, reinforcing India's offensive underwater capabilities.

For defence, the Mareech Advanced Torpedo Defence System (ATDS) provides a robust shield against enemy torpedoes. This indigenous system can detect, confuse, divert, and decoy incoming torpedoes, significantly enhancing the survivability of naval vessels.

## **Rising Defence Exports from India**

India's defence exports have reached a new high, marking significant progress towards self-reliance and global competitiveness. According to the Ministry of Defence, India recorded ₹21,083 crore in defence exports for FY 2023-24 with exports to over 100 countries. This growth highlights the rising global demand for India's indigenously developed defence systems, now being exported to over 85 countries.

Government initiatives, such as liberalized export policies and streamlined licensing procedures, have played a pivotal role in enabling this growth. The rising demand for missiles, radar systems, and defence electronics reflects India's growing reputation for delivering reliable and advanced technologies. This export surge not only strengthens India's presence in the global arms market but also boosts its economic and strategic influence. With continued policy support, innovation, and increased private-sector participation, India is steadily positioning itself as a trusted defence supplier. The focus on indigenous manufacturing and technology development is enhancing the country's defence capabilities, while also fostering stronger international partnerships.

### **India and Brazil: Opportunity for Defence Cooperation at LAAD 2025**

India's rising prominence in global defence highlights its commitment to self-reliance, technological advancement and strategic partnerships. Among its key alliances, the India-Brazil defence cooperation is steadily gaining momentum, driven by collaborative technological efforts. This growing partnership will take center stage at the LAAD Defence & Security Exhibition 2025 in Brazil, where India will showcase its advanced military technologies, reinforcing its position as trusted defence partner in Latin America.

At LAAD 2025 India will present an array of cutting-edge defence systems, demonstrating its technological prowess and export capabilities. Apart from system and technologies being showcased by Indian DPSU, DRDO is also showcasing various cutting edge technologies and systems. The display will feature the Airborne Early Warning & Control System (AEW&C), enhancing airborne surveillance, alongside the Low Frequency Dunking Sonar (LFDS-X) and the Dornier Mid-Life Upgrade (Shyen), highlighting India's maritime warfare expertise. Its land and aerial combat capabilities will be represented by the Wheeled Armoured Platform (WhAP) and the Light Combat Aircraft (LCA) Mk 2. Additionally, India will showcase its precision-strike and air defence systems, including the Very Short-Range Air Defence System (VSHORADS), RudraM-II, and the Guided Pinak Weapon System. The Advanced Light-Weight Torpedo (ALWT) and Multi-Sensor Data Fusion (MSDF) system will further underscore India's growing expertise in maritime and electronic warfare.

The India-Brazil partnership has witnessed steady growth, particularly through technology cooperation. A key milestone in this collaboration is DRDO's partnership with Brazil's Embraer for the AEW&C program. Under this initiative, Embraer's EMB-145 aircraft was integrated with DRDO's indigenously developed mission systems, significantly enhancing India's airborne surveillance capabilities. This successful technology transfer strengthened India's defence production capacity and laid the foundation for future co-development projects.

Both nations are also expanding their defence industrial cooperation through technology-sharing agreements and joint ventures. This collaboration promotes the co-production of defence systems, boosting manufacturing capabilities in both countries. For Brazil, the partnership offers access to missile, radar and electronic warfare technologies, while India benefits from Brazil's aerospace expertise, fostering mutual technological growth.

Looking ahead, the India-Brazil defence partnership holds significant potential. With a focus on joint R&D, technology exchange and co-production, both nations aim to enhance interoperability and regional security. Their collaboration will drive innovation, promote self-reliance and pave the way for the co-development of advanced defence systems strengthening their strategic presence on the global stage.

### **Conclusion: India's Emerging Role as a Global Defence Leader**

India's ascent as a technological powerhouse in the global defence landscape is a testament to its strategic vision and growing capabilities in advanced military technologies. From developing indigenous systems like the Arjun MBT, BrahMos missiles, and Tejas fighter jets to enhancing its air, naval, and space-based defence capabilities, India is positioning itself at the forefront of modern military technology. The country's focus on self-reliance, robust defence research and development, and public-private partnerships has created a dynamic ecosystem for innovation, ensuring India remains competitive on the global stage. As India continues to strengthen its defence ecosystem, it is also expanding its global influence through strategic collaborations.

Through initiatives like the LAAD 2025 exhibition, India is not only showcasing its technological advancements but also solidifying its role as a key player in global defence cooperation. Looking ahead, India's dedication to building its technological capabilities, coupled with expanding defence exports, will continue to enhance its military self-reliance and foster stronger international alliances. The future of defence cooperation between India and countries like Brazil holds great promise, contributing to regional and global security while shaping the next generation of defence technologies. India's rise as a leader in defence technology is not just a triumph of innovation but a strategic step towards securing its place as a global leader in the evolving world of military technology.