

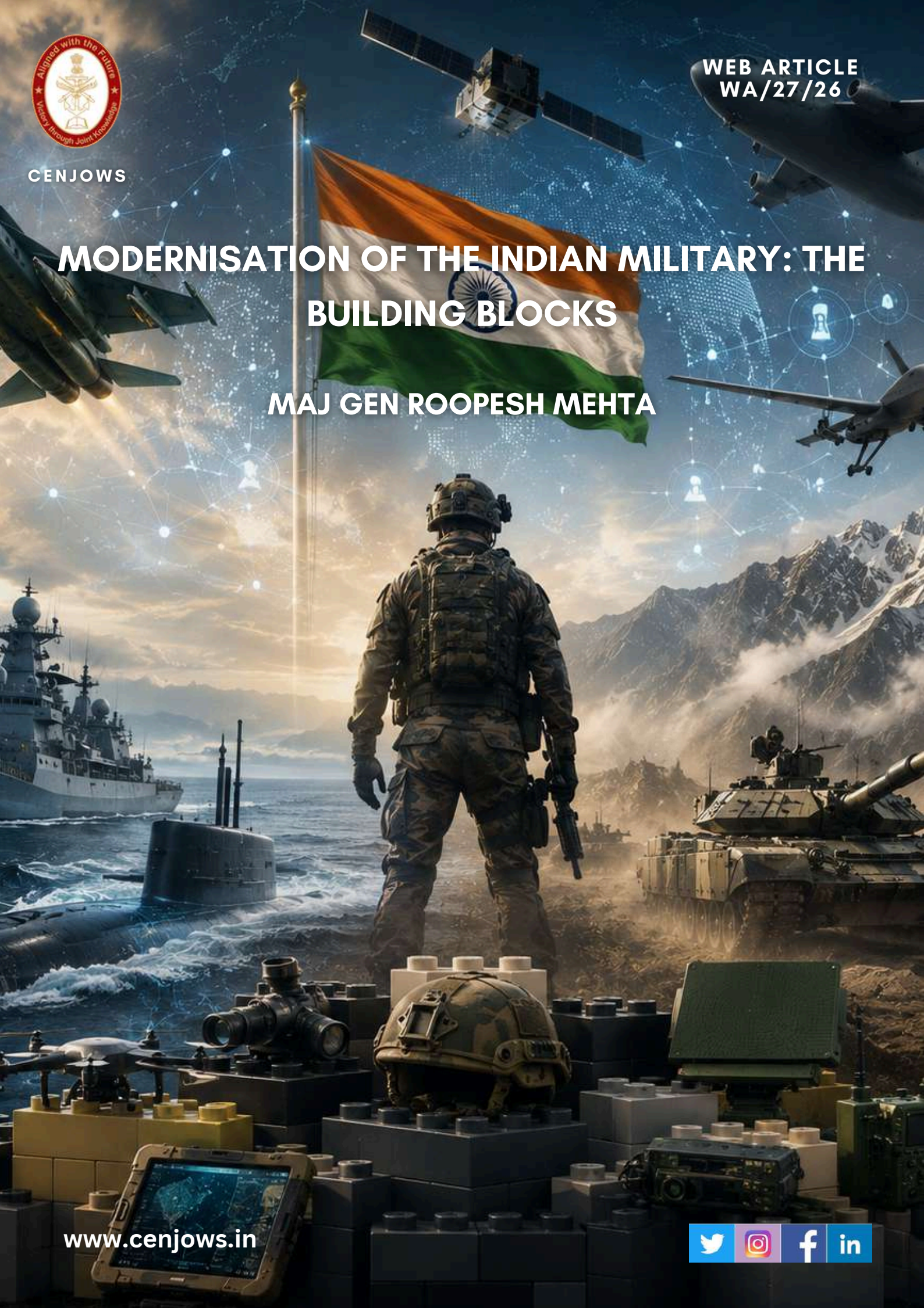


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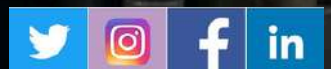
WEB ARTICLE
WA/27/26

MODERNISATION OF THE INDIAN MILITARY: THE BUILDING BLOCKS

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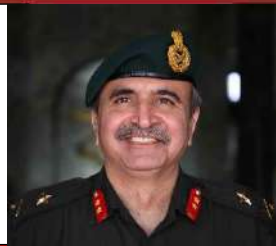


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Modernisation of the Indian Military: The Building Blocks



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The Raksha Mantri recently released the 'Defence Forces Vision 2047' document. It listed the three phases towards the future. Phase 1 till 2030 is termed the 'Era of Transition'; that is, to create structures for multi-domain operations and develop indigenous capabilities for future wars. The second phase is till 2037, termed the 'Era of Consolidation', focusing on the next level of data-centric operations to carryout multi-domain operations leading to the operationalization of Mission Sudarshan Chakra. It seeks to ensure conceptual clarity and tangible capability development. The third phase would be till 2047, the 'Era of Excellence', focusing on achieving technological leadership to enable excellence in the conduct of multi-domain operations. Vision 2047's promise will be realised only if India modernises along four principal pillars: electromagnetic dominance, autonomous systems, AI-enabled decision-making, and strategic industrial autonomy.

The document lays out a vision that needs to be put into action to enable Indian national security and strategic autonomy in this century of technological disruptions. Recent conflicts have broken the illusion of global stability under the 'rules-based

order.' Clausewitz's trinity endures, perhaps most starkly in the 'people' element of primordial violence, hatred, and enmity, more visibly in the last decade than seen since the world wars. Jomini's geometry of war now features novel actors – drones, proxies, electronic warfare, cyber, space, AI, and cognitive warfare, forcing military thinkers to rethink decisive points and operational lines. Technology and innovation will dominate how future wars will be fought; the technology and military minds will have to collaborate to remain current and ahead of the adversary.

Technology is Changing the Character of War

How is Technology Affecting Warfare?

Technology, historically, a key player in warfare, has endured as a key arbitrator of strength from the era of crossbows to guns to air power to nuclear weapons. The technology leaders have nearly always been the hegemons. The wider the gap, the greater the arrogance of power, which the pre-war colonists and post-war victors have exploited for the last 80 years. The era of that lead and control is seeing a change. The weak have over the past few decades used terror, proxies, and now the drone and missiles to hit back at the technology leaders. The monopoly of technology-driven capability to inflict damage is no longer absolute – the response can hurt, as is visible in the current Israel/US – Iran conflict. The weaker force can use innovation to bridge the technology gap on the battlefield, making the cost of war high or even prohibitive for the stronger force. India, as a developing nation and a culture for innovation and ability to do high-end tech tasks at low cost, like the Chandrayan, will need synergy of the military minds and tech innovators to meet national security needs at affordable costs.

Revolution in Sensors

In battle field, inputs of various sensors are fused to create a coherent COIP. Technologies for fusion are rapidly evolving from an era of facing the challenge of unsuited formats and protocols, to an era where the fusion of unstructured data is becoming possible in real time. The US project MAVEN, which started in 2017 focused on creating a sensor-based capability to detect, identify, and locate targets in real time for effective engagement. The same capability has suddenly become mainstream with more and more countries. Indian systems had the first test during Op Sindoor. India's

push in data handling, AI and quantum computing is in the direction of improving integration of sensor inputs.

Recent wars have revealed that large radars (i.e. emitters) in combat zones are easily detected and destroyed; they are currently intrinsic to elaborate, expensive defensive systems in a combat zone. The ease with which they are being picked up and destroyed is leading to and speeding up increased use of passive detection means and diffused low-power emitters spread over the TBA. The emitters need to be smarter to emit less and be agile to quickly change locations, just like the guns and rockets. This will test innovation. Secondly, Indian capabilities use ELINT to pick up adversary emitters and destroy them using guns, long range vectors, or anti-radiation missiles need an upgrade.

Evolved Electromagnetic Spectrum Dynamics

Electromagnetic spectrum warfare has, in many ways, been democratised. Where large, complex ESM and EW systems were once confined to higher-level operations, ELINT and EW are now intrinsic to the lowest levels of combat, especially in drone warfare.

The evolution of drone warfare has seen the shifting pendulum between the drone and counter drone effectiveness in using or denying use of the EM spectrum for communication or navigation. Fibre-optic links cover the short- and medium-range combat zone (up to 30 km), while deep-strike operations depend largely on efficient spectrum use, spectrum-free navigation, or simply better algorithms.

New technologies allow effective exploitation of bands previously considered unsuitable due to bandwidth, range, or beam-width limits. Advances in broadband and multi-band antennas, mm-wave¹, adaptive waveforms, and phased-array beamforming now allow use of higher frequencies, which were traditionally dismissed as impractical. In time, WLRs and 5G networks will be used to detect small drones.

DEW and lasers use high power microwaves and high-energy lasers as a weapon; they still are under development and available only as a niche and at high cost. EMP weapons are another evolving field. These weapons have the advantage of speed

and accuracy critical in defence against incoming missiles, rockets and drones. India has made some progress in these fields, including deployment of laser-based DEW; R&D for better, more potent systems is a work in progress.

In sum, mastery of the EM spectrum is now foundational for multi-domain superiority, this is acknowledged in Vision 2047, which states", Create capabilities to dominate the Electro-Magnetic spectrum." The Proposed Space Command, Cyber Command, and Cognitive Warfare Action Force will provide the architecture to build the capabilities. Since human resources matter in military operations, the military leaders and soldiers have to understand and train to fight in the EM Spectrum.

Indian Environ Realities

Op Sindoor: A Timely Reality Test for India

Op Sindoor brought home principal realities that were probably less appreciated prior to the operations. Firstly, it demonstrated non-contact kinetic force as a full phase of war; no manned combat element crossed the IB or LC. Secondly, it pushed the electromagnetic spectrum into the lexicon of all arms, not just Signals and Army Air Defence; soldiers and commanders alike now recognise that the next war will demand leader's adept at fighting in the EM spectrum. Thirdly, the need to have secure networks and become data centric was driven home, AI enablement realities are also getting visible. What was so far academic and futuristic is now required to be combat-ready. In this, mission Sudarshan Chakra is rightly poised as a strategic direction for national air defence aspiration.

Supply Chain Vulnerability

India's reputation as the world's top defence importer has long been its achilles heel. This has now turned into an urgent call for action to design and make in India. The last two decades of efforts have shown shoots of success, but many key platforms and technologies continue to be import-dependent. India is working on twin strategies of spreading the sourcing options to reduce supply chain vulnerability and using multiple routes, including strategic joint ventures, to build an Indian Defence eco-system, this remains true for hardware centric platforms. New-age technologies that use data, networks, quantum, and AI would need sovereign control and ownership. This is a

zone of opportunity for a nation known to have technical skills to create such products for other nations. Indian defence procurement and R&D funding ecosystems will need to be agile to fund development of such products.

Leadership: An Exacerbated Vulnerability

Targeting political and military leadership in war is not new – leaders were always the centre of gravity. The recent Iran–US–Israel war has brought leadership decapitation strikes back to the centre of campaign design. Iran’s preplanned response to a successful elimination of top leadership; delegated and decentralised command, with provincial IRGC commands² and pre-designated successors surprised the adversaries. These may become a benchmark for resilient wartime leadership. Technology now allows collaboration and consultation from dispersed command posts where stake holders consult in virtual mode rather than physical meets. Such distributed operations centres could become standard practice to deny an adversary the chance to eliminate a large segment of top leadership in one strike, as seen in Tehran. India will have to update the national command posts and theatre command posts based on these realities. The Executive Council, COSC and Theatre Commanders would need a dispersed operational deployment in safe command centres in addition to a well-defined succession line, rehearsed and plugged in.

Industrial Base: Capability to Build, Sustain and Surge

‘Make in India’ in Defence Needs a Mindset Change

The Indian military has long created or curated Qualitative Requirements (QRs) by scanning global capabilities, then adapting TTPs to whatever was finally available on ground through global purchase or Indian development and manufacturing. The joint development of new war-winning capabilities was not in the lexicon of the military, DRDO, or the MoD. The push for ‘Make in India’, investment in R&D, and unleashing of Indian innovation in new-age technologies has created possibilities to create weapon systems ahead of the global benchmarks. The current limits in Military – Developer synergy are being pushed. A synergy that is challenging and providing an opportunity to the military and technology minds to conceive CONOPS that can become objectives for the innovators and defence industry. CONOPS that can be battle winners in the next war.

Structures and mindsets must evolve, shifting soldiers from "use what's available" or 'fighting with what we have' to imagining battle winning CONOPS using futuristic technologies for fighting in multi-domain wars. These CONOPS then become objectives for innovators. Imagination, professional excellence, understanding of technology, and risk-taking abilities are needed for this phase of evolution in capability development. Ukraine is a classic case where combat challenges have enabled rapid 'in the battle field' soldier – innovator synergy, leading to war winning innovation and creation of defence capabilities. Similarly, innovation in drones and missiles by Iran has challenged the most technologically advanced armies of the world. India's decision to be Atma Nirbhar in defence manufacturing is in a zone of opportunity till 2047. The men and women in charge of the process need to grab the opportunity.

Building Autonomous Systems Warfare Capability

In addition to drones, the land- and water-based autonomous systems are seeing rapid upgrades towards combat deployment. It is visible that a heterogeneous mix of drones and unmanned ground systems (UGS) will lead infantry platoons or mechanized teams in battle as early as in 2027/28.

Autonomous systems now dominate all three classical domains of warfare. Ukraine, without a navy, defeated the Russian Black Sea fleet. The simple, cheap, and potent drones have redefined air warfare in contested space in favour of the unmanned drones. The Indo-Pakistan conflict of Op Sindoor reinforced the sub-continental reality, though it explored only the depth of non-contact kinetic warfare. The Ukraine war has seen the tactical manifestation of drones in pitched battles between frontline troops jostling to manoeuvre and expand.

In this phase of rapid development by different companies and R&D ecosystems, the challenge is in ensuring interoperability. As different engineering teams develop varying autonomous combat platforms, the military must take the lead in setting protocols (like NATO STANAG) that aid collaboration without impeding innovation and security of individual platforms. These will be critical for Indian military's MUM-T aspirations and Vision 2047.

Situational Awareness (SA) in the Multi-domain Battle Field?

Historically, intelligence about the enemy and situational awareness about one's own combat elements have been the primer for operational planning. Denial of the same intelligence to the enemy were the basics of information warfare operations. The more lucid the picture, the more empowered are the planning teams in making and executing a war winning plan. Modern battlefields demand heightened SA.

The counter rocket, missile, and drone operations bring out the complexity of current SA needs. The world's leading air defence systems of the US and Israel have gotten tested and vulnerability has been exposed to threats emanating from a degraded Iran. The reports of destruction of advanced THAD radars at Jordan's Muwaffaq Salti base³ are a case in point. It is no longer just 3D SA but 3.5D/4D, with electronic warfare becoming intrinsic to Air Space control. The Indian Vision 2047⁴ plan creates a Defence Geospatial agency, showing realization of this need.

The operational and tactical commanders have to synergize and operate through the 3/3.5 dimensions for both offensive and defensive actions. In defence, the desired capability is visibility (real-time 3D coordinates) of incoming threats and inputs about the use of the EW spectrum by the threat. Multi-sensor fusion to create a common intelligence picture (COIP). Visibility of one's own assets on a situational awareness tool, with capability depicted in 3D, including ranges for kinetic and EM spectrum weapons, can enable decision-making.

A decision support system for near real-time identification-classification of drone threats and tasking of best-suited assets to engage is now a base requirement. For offensive drone operations, the need is to have visibility of known enemy counter drone assets in the tactical battle space (TBS), own assets or users in the airspace, coordinated use of the EM Spectrum⁵ in time and space in the chosen TBS to avoid physical or EM fratricide, and then executing multi-domain operations exploiting the gaps in the adversary's counter drone grid.

Advances in simulation and creation of virtual or digital twins are slowly becoming standard tools for combat operations planning. They are becoming means to help

commanders understand the multi-domain terrain environment and train on them & thus to enable timely decisions. Simulation techniques need to keep up with the requirements.

AI in Defence

Anthropic is under pressure by the US government for resisting military application of AI for military use. The shifting ground between ML, deep learning, AI, AI on edge, and agentic AI are challenging the technical knowledge base of military planners at speeds never seen before in the history of warfare. Ukraine – Israel – US – Russia have used the wars to collect battle data, which is showing results in field deployment of new capabilities. Palantir, largely trained in Ukraine is credited with being a key enabler of US operations in Ecuador.

AI impact on the battlefield is now a reality – Indian military efforts through DG IS show urgency but may need an even further push and alignment with the National AI mission to meet deadlines. What earlier would take years of R&D for an adversary to catch up now can happen in weeks or months. New-age AI tools, coding platforms, and digital twins have compressed engineering research cycles. How this will manifest in next decade is tough to approximate.

The military hierarchy has to ensure quick optimal integration of military and technological leadership to understand the possibilities and push for development of futuristic military platforms and networked capabilities. Rapid induction of technical minds into the decision-making and execution ecosystem is an urgent need – this has to avoid the rank consciousness, as new-age technology needs young scientists' soldiers to lead the soldier- developer synergy.

Component-Level Strategic Autonomy

The global supply chain vulnerabilities have become more real. Denial and disruptions in the last few years have hit hard. China, the major supplier to the world, has trust issues – the risk of malware makes India look towards alternate sources, especially in defence, even though costs are higher. The capability to sustain and surge production can only be reliable if the manufacturing eco-system is built in India.

India has the advantage of a large domestic demand to make the effort cost effective; the world too is looking at alternate destinations from where to source such equipment and components. Indian policymakers and industries are cognizant of the opportunity to create an Indian defence manufacturing industrial complex. Technologies like 3D printing, additive manufacturing, digital twins, and AI can be exploited to accelerate the process.

Conclusion

The future military readiness of India should rest on pillars of home-grown technology, electromagnetic dominance, autonomous and AI-enabled systems. A resilient industrial base of home-grown technology that exploits modern tools to create combat systems for the next war, leading to strategic autonomy that deters the most formidable adversaries not only in kinetics but also in all domains of warfare. The effort in last decade has laid a sound foundation for next two decades towards India Vision 2047.

DISCLAIMER

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ENDNOTES

¹ Microwave Journal. 2017a. "The Use of Broadband Military Antenna Technology in Modern Communications Systems." Microwavejournal.com. 2017.

<https://www.microwavejournal.com/articles/4205-the-use-of-broadband-military-antenna-technology-in-modern-communications-systems>

² Stewart, Phil, Parisa Hafezi, and Menna Alaaeldin. 2026a. "Israel and US Launch Strikes on Iran, Pushing Middle East into New Conflict." *Reuters*, February 28, 2026.

<https://www.reuters.com/business/aerospace-defense/israel-us-launch-strikes-iran-2026-02-28/>

³ Lucha, Struggle La. 2026. "Making Sure You're Not a Bot!" Mronline.org. 2026.

<https://mronline.org/2026/03/11/iran-destroys-the-radar-systems-at-the-heart-of-u-s-missile-defense/>

⁴ Ministry of Defence. 2026a. "Raksha Mantri Releases 'Defence Forces Vision 2047: A Roadmap for a Future-Ready Indian Military.'" Pib.gov.in. 2026.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=2237368®=3&lang=2>

⁵ <https://x.com/GrandpaRoy2/status/2032985356266840212?s=20>