April - June 2026

Vol 9, Issue 33 | ₹300/-

rakṣha ANIRVEDA

DECODING SELF-RELIANCE & DEFENCE DYNAMICS

INDIA'S MISSION MODE DECADE

From Catch-Up to Leapfrog

BIG BANG BOOM SOLUTIONS

Your Friendly Neighbourhood Defence Company

PORTABLE SHOOTING RANGE

Unleash Precision Anywhere with Our Portable Shooting Ranges.

Your Compact Solution for Professional Training and Tactical Readiness

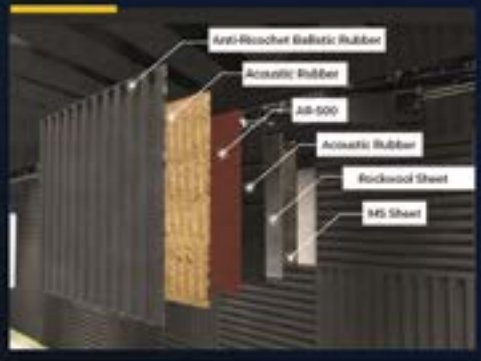
- COST-EFFECTIVE & SPACE-EFFICIENT
- HIGH-SAFETY STANDARDS
- REAL-TIME SHOOTING PERFORMANCE TRACKING
- ADVANCED AI-BASED SHOOTING
- VERSATILE TRAINING SCENARIOS
- WEATHERPROOF & ALL-SEASON OPERATION

MOBILITY

The containerized shooting range can be easily transported and deployed to virtually any location, offering flexibility for both permanent and temporary training setups. Its mobility is highly beneficial for remote areas or missions that require quick setup and takedown.

MODULARITY

These ranges are modular and customizable to meet specific training requirements, such as different shooting distances, ballistic standards, and target systems. Multiple containers can be combined to create larger or more complex range systems, such as multi-room tactical training environments.



SAFETY

Equipped with advanced anti-ricochet materials, ballistic-rated walls, and soundproofing. Our ranges ensure the highest levels of safety for users. These materials are designed to absorb rounds, preventing hazards from ricochet and stray bullets, while also minimizing noise pollution.

www.bigbangboom.com

+91 98925 99220

SCHIEBEL INDIA

UNRIVALLED

MULTI-ROLE MULTI-DOMAIN

CAMCOPTER® S-100 UNMANNED AIR SYSTEM

EDITORIAL

Ajit Kumar Thakur
Editor & Business Director

NAVIGATING THE TURMOIL AND THE DECISIVE DECADE

The unpredictable geopolitical developments over the past three months have been turbulent and chaotic across the globe. It reminds me of the term "*Mortecene*," proposed by Clifton Crais in his book "*The Killing Age*," which marshals vast statistical and historical evidence, mainly from 1750 to 1900. Isn't the modern world getting darker?

India, continuously observant of the unwarranted emerging challenges and crises arising out of expanding conflicts, has pragmatically insulated itself while ensuring the continuity of its growth momentum. It has remarkably weathered the global storms through a "Chakravyuh" manoeuvre to navigate economic uncertainty with calibrated exit openings, avoiding the creation of new imbalances through focused fiscal and monetary policies. Quietly, India has been building its resilience in an increasingly volatile global environment with a focus on technology, innovation, and sustained economic growth. The past few years have seen India's strength rise, with its freedom to engage and shape external outcomes and its strategic autonomy evolving as a discipline where the credibility of its choices—its own terms to say yes or no, backed with capability and matched with delivery—matters and resonates widely.

> "India is entering into a decisive decade—the "Mission Mode Decade"—where it should focus on its goal of being a developed nation by 2047. Becoming a global leader will not be a seamless ascent; it requires digging deep to address lingering weaknesses and structural bottlenecks"

Aware of the rising energy concerns, India achieved a major nuclear breakthrough in the first week of April with the criticality of the Prototype Fast Breeder Reactor (PFBR). The three-stage nuclear programme, which started in 2004 and was to be completed by 2012, was finally achieved on April 4, 2026. This landmark event at Kalpakkam in Tamil Nadu is a big boost for India's energy security and self-reliance. It is another "Pokhran moment" for the country and its nuclear scientists, reflecting a stubborn persistence in the face of long-standing technical hurdles. This success will eventually replace uranium imports with thorium utilisation and provide Aatmanirbharta in energy security to the nation.

The learnings from Middle East war, effectively over by now as per analysts, provides ample clarity for *Rising India* to reset its priorities on multiple fronts. Strategy is now dictated by economics and geoeconomics has an edge over geopolitics. Without strengthening of its maritime power status and credible, sustainable, and technologically advanced air defence and air strike capabilities, India's aspirations and strategic ambitions will remain constrained. India is entering into a decisive decade—the "Mission Mode Decade"—where it should focus on its goal of being a developed nation by 2047. Becoming a global leader will not be a seamless ascent; it requires digging deep to address lingering weaknesses and structural bottlenecks.

The government's focus on the Aatmanirbhar Bharat initiative, prioritising innovation, technology-driven domestic manufacturing and a strong procurement pipeline, has been encouraging and a big booster to revive Bharat's centuries-old tradition of valuing innovation. The coming decade (2026–2036) will be crucial for the *Viksit Bharat 2047* goal—as it cannot afford any misstep or complacency now. The road ahead is rugged, and the time for easy wins is over.

In a shifting, distracted world order where flux is the new constant, a disciplined and alert India should tap the emerging opportunities with proactive reforms, consolidated efforts, a strong economic buildup, and round-the-clock preparedness. India should refocus within and navel-gaze during this decade to address its critical vulnerabilities, build deterrence, and be prepared for the inevitable crises that it may encounter in the future. In a preoccupied world, India is entering into another phase of interregnums when it can strengthen itself. The coming decade is all about changing the course from "*all talk, no walk*" to "*walking the talk*" and winning the speed contest. India simply cannot afford to lose it.

Raksha Anirveda's April-June 2026 edition with its elaborate and full-spectrum coverage of "*India's Mission Mode Decade*," will not only engage its esteemed readers but also initiate vibrant discussions among stakeholders. Moreover, the edition is power-packed with its regular features, in-depth analyses, and diversified content offerings. Team Raksha Anirveda believes that the latest edition has the right flavour to attract its esteemed readers' focused indulgence.

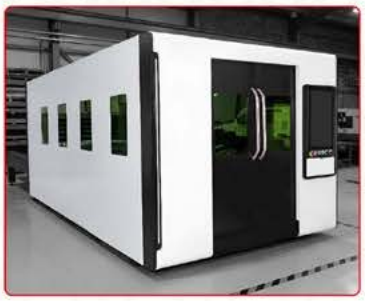
Happy Reading. *Jai Bharat!*

(Ajit Kumar Thakur)

AKSI AEROSPACE GROUP

MAKE IN INDIA AEROSPACE AND DRONE TECH GROUP

From concept to aircraft, Aksi Aerospace Group delivers end-to-end manufacturing solutions.
Precision engineering, advanced materials, and cutting-edge technology drive every stage we handle.
Design, prototyping, production and assembly all seamlessly integrated under one roof.
With AKSI, innovation takes flight with reliability you can trust.
Drone OEMs looking for scalable production may reach out to us.





Machinery Images from Shop Floor

1 lakh square feet integrated shop floor

- Agricultural Drones
- Industrial Drones
- Cargo Drones
- Autopilots
- Batteries
- Motors
- Cameras
- Drone Composites
- Training Academy

+91 93419 71308 | www.aksiaerospace.com | business@aksiaerospace.com

CONTE

LEAD STORY

A Handshake for the Global South

SPOTLIGHT

THOUGHT POT

IN CONVERSATION

NTS

PBG Media Ventures

raksha ANIRVEDA

RNI NO. DELENG/2018/76856

Editor & Business Director
Ajit Kumar Thakur

Executive Editor
Devendra Singh

Consulting Editors
Asad Mirza
Sri Krishna
Vishal Duggal
Vinay Kumar

Advisory Board
Amb Smita Purushottam, IFS
Air Marshal M Matheswaran
Lt Gen (Dr) SK Gadeock
Lt Gen P C Katoch
Lt Gen P R Shankar
Lt Gen A B Shivane
Maj Gen J S Kataria
Maj Gen Deepak Mehra
Lt Col Narendra Tripathi
Cmde Ranjit B Rai
Cmde Anil Jai Singh
Cdr K P Sanjeev Kumar
Dr Vivek Kumar Rai
Dr Mathew Simon
Amit Cowshish
Sameer Joshi
Natalia Freyton
Dr Punit Saurabh

Advisor-International Outreach
Cdr Sumit Ghosh

International Roving Correspondent
Arie Egozi

Legal Advisor
The LawArmour - Solicitors & Partners

Creative Director
Md Moeen Aijaz

For advertisements, contact us at:
ajit@raksha-anirveda.com
rakshaanirveda@gmail.com

For any complaints or queries, contact us at:
info@raksha-anirveda.com
ajit@raksha-anirveda.com

Raksha Anirveda is printed and published by PBG Media Ventures

Published, Edited & Printed by: Ajit Kumar Thakur on behalf of **'PBG Media Ventures'**
649/4, Konark Residency, Nambardar Colony, Burari, Delhi -110084

Printed at: Star Print-O-Bind, Star House, F-31, Okhla Industrial Area Phase-I, New Delhi-110020

Editor: Ajit Kumar Thakur
All disputes are subjected to the jurisdiction of Delhi, Mobile: +91-9910252485

SHARE YOUR VIEWS

Team *'Raksha Anirveda'* looks forward to receiving comments and feedback from the readers on the content of the magazine. Please share your thoughts at *info@raksha-anirveda.com*

REVAMPING INDIA'S DEFENCE

Though we may exult over our increasing defence exports, the fact remains that the Indian defence procurement system lags in many critical areas. It is also high time that the government's promise of deep reforms is extended to the procurement system of the defence ministry, to make it a dynamic system coordinating with defence R&D, innovation, and working pro-actively with the industry without compromising the basic integrity of the procurement system

G MOHAN KUMAR

The ongoing US-Israel-Iran conflict offers food for thought for all defence planners. Iran's strong resistance against the most powerful military in the world speaks volumes for the efficacy of its asymmetric strategy of using cost-effective weapons like drones and missiles, targetting the energy and industrial assets of the US allies in the Middle East, and inflicting economic damage to the rest of the world by blocking the Strait of Hormuz.

Its innovative use of small but heavily armed boats has been highly effective in controlling the Strait of Hormuz at a time when its own naval and air forces have been decimated. Even after the huge damages to its infrastructure, Iran is in no mood to give up its steely resistance. It appears that Iran is well on its way to emerging as the dominant power of the whole of the Middle East.

Many recent conflicts have demonstrated how the old paradigms of conventional war are making way for new ones, driven by technology, innovation, and asymmetric strategies. This indicates unequivocally that India's defence planning must undergo a total make over. We need to think of right sizing our armed forces with a view to drastically increasing the teeth-to-tail ratio. We must be pragmatic about recruitment for conserving resources for capability building.

The Agniveer Scheme is a path breaking reform which has to be carried forward resolutely. Huge investments on conventional hardware have to make way for sleek and sophisticated AI driven equipment like drones, drone interceptors, underwater equipment, state-of-the-art missiles, precision bombs, robotics, ISR equipment, net-centric air defence, quantum communications, etc.

The Iran-US conflict highlights the need for factoring energy security as an integral part of our national security strategy. Strategic capabilities like chip making, rare earths procurement and processing, development of super alloys and composites, self-sufficiency in electronic components, active pharmaceutical ingredients (API) etc., have a key role to play in national security.

The changeover to renewable energy and electric mobility are critical in an extremely uncertain energy situation. Tapping the demographic dividend for accelerated growth by providing quality jobs to the unemployed needs to be urgently addressed. This requires a well-executed national programme for imparting high quality skills. Visionary policies for combating climate change both in terms of food and water security are of great importance.

The ongoing US-Israel-Iran conflict offers food for thought for all defence planners. Iran's strong resistance against the most powerful military in the world speaks volumes for the efficacy of its asymmetric strategy of using cost-effective weapons

Countering radicalism at its roots is a must. Every factor which can jeopardise national security needs to be countered by short, medium, and long-term action plans. Equally critical is the need to arrest brain drain. The critical technologies originating from the US invariably have the indelible imprint of migrant Indian talent on them; India's technological backwardness can ultimately be traced to the dearth of strategic vision to retain and absorb the talent produced by our premier technology institutions in the last several decades.

There have been many good initiatives in the recent past. The promotion of chip manufacturing and the support to the private sector for rare earth magnets are excellent initiatives. But one wonders why these initiatives came late in the day. India's rare-earth resources are substantial but there was hardly any effort to develop technologies for their processing on an industrial scale. When China was scouting every continent for rare-earths, we were neither alert nor diligent. We were tardy in attracting investment in electronic

component manufacturing. These are instances of the lack of strategic vision in the area of national security and economic development.

It is often seen that when there is a crisis the armed forces resort to emergency procurement of cutting-edge equipment using fast track procedures, necessitating large-scale imports. While this may be necessary in the short run, this practice needs to be avoided. Strategic independence and defence self-reliance depend on technological self-reliance. This in turn depends upon our investments in R&D and our capacity to mobilise the country's premier scientific talent not only from within but also from our diaspora.

China's visionary scheme of 'Thousand Talents' to bring-in Chinese diaspora was launched with a clear vision of attaining technological edge over the US and they are almost winning the game. Our efforts have been feeble and half-hearted. The basic reason, as mentioned before, is that we failed to develop a larger strategic vision for the country at the turn of the century. Such a strategic vision would have led to a mission mode approach to R&D and technological self-reliance.

We have not had even a good mission mode project in defence till now. On the other hand, our defence research projects have been tardy with cost overruns as documented by the CAG. Today we are compelled to approach foreign countries for critical technologies like AI, quantum computing, and aero engines. In the present scenario, such dependence is dangerous considering the non-reliability of the US and other countries as strategic partners.

There has to be a strong touch of realism when we celebrate the unprecedented rise in defence manufacturing and exports. The acid test is whether the technologies touted by the industry are homegrown or not. Manufacturing high-tech products by assembling imported components could be a strategic mistake given the frequent imposition of controls by the exporting countries on sensitive exports. Therefore, India's foremost mission should be the creation of a vibrant R&D eco-system based on exclusive private sector participation and public-private partnerships.

Leading universities and technological institutions must be made partners. Consortiums of private and public organisations could be assigned key technology development projects. The expenditure on general R&D as well as defence R&D needs to be ramped up substantially. A part of this work has been accomplished through the establishment of the Anusandhan National Research Foundation and the Research Development and Innovation Fund for the industry by the government. There must be a substantial enhancement of defence R&D funds including funds channelled through the iDEX (innovation for Defence Excellence) for innovation in defence.

To achieve its objective, the government needs to be liberal in funding the private sector in developing targeted technologies that will give Indian armed forces a definitive edge. Procedures for streamlining the flow of funds to the industry must be evolved. A technology mission needs leadership and outstanding human resources. Such resources are easily accessible to the private sector which doesn't have to worry about protracted procedures and objections.

Defence procurement by the government is the life blood of the defence industry. Protracted procurement processes create an uncertain environment for the industry. A professional and autonomous system working as the arm of the Defence Acquisition Council must be setup. Defence bureaucracy is loath to giving up the inviolable turf of procurement. This must change if 'Make in India' has to achieve significant breakthroughs.

–The writer is a former Defence Secretary. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

THE TURBULENT SANDS OF TIME IN THE MIDDLE EAST

The conflict between the United States of America and Israel against Iran in the geopolitically sensitive Middle East necessitates a nimble-footed approach by India. New Delhi must act quickly and sagaciously to try and bring peace to this restive region and emerge as a moralpolitik great power

PRANAY K SHOME

International politics, according to the realist school of thought, is considered to be the reflection of the competitive impulses of the human nature. This manifests itself in actions taken by states to safeguard their national interests which often run contrary to the letter and spirit of the rules-based international order. In that context, national interests become anchored in martial and strategic policies that end up upending the sense of status quo in a region.

Something of this sort is currently unfolding in the Middle East. One of the most turbulent geopolitical regions for a long time, peace is considered to be a luxury, here. The latest conflict pertains to the concerns in the West over Iran's nuclear programme and the activities of its formidable proxy forces in the region.

This latest episode of conflict centres around three principal actors—the United States of America, Israel and Iran. On February 28, the US and Israel jointly launched coordinated strikes targeting key figures and strategic installations and locations in Iran under the cover of Operation Epic Fury (USA) and Operation Lion's Roar (Israel).

The outcome was the outbreak of another conflict that has increasingly assumed proportions of a widening regional conflagration with global implications. In the military operations, the US and Israel killed key Iranian figures, including the powerful Supreme Leader Ayatollah Ali Khamenei; Ali Larjani, security chief of the Supreme National Security Council of Iran; and Gholamreza Soleimani, head of the Basij paramilitary force, among others. Apart from this, the duo targeted Iran's defence programme as well as Iran's nuclear facilities such as Fordow, Isfahan and Natanz, causing significant damage to their infrastructure.

Iran retaliated fiercely, targetting American bases across the nook and cranny of the Middle East using drones and its potent arsenal of ballistic and cruise missiles. In addition, Iran has also targeted oil and natural gas installations of key Gulf countries, threatening to upend global energy supply chains. These tit-for-tat attacks have not only upended life in the region but have also sent global hydrocarbon and financial markets into a tailspin. What's all the more concerning is that despite Tehran not closing the Strait of Hormuz, it is increasingly targeting vessels linked to the US and Israel, thereby sending global oil and natural gas prices soaring.

One of the countries that have found itself in the greatest of dilemmas is India. A civilisational state that has maintained good ties with almost all the countries in the region, the situation is especially tricky.

TO PICK OR NOT TO PICK SIDES

The Middle East is a part of New Delhi's extended neighbourhood. Not only does the Indian diaspora have a sizable presence in the region, but it is a key source as far as India's extended

national interests are concerned. What compounds the matter is the very composition of the actors in the military conflict. Israel is one of India's most trusted partners, particularly in the realms of defence and technology. It has helped India in trying times; notable instances include the Kargil War and Operation Sindoor. Israel's foremost ally, the United States is one of our largest bilateral commercial and strategic partners. The Indian American community, in particular, plays a critically important role in shaping the contours of Indo-American policies to a large extent.

On the other hand, we've Iran with which we share civilisational ties, dating back to the 6th century BC. In addition to this, Persia is an important energy and strategic partner. It is through the Chabahar Port that India seeks to circumvent Pakistan and gain access to a mineral rich Afghanistan and the strategically important region of Central Asia. Hence, New Delhi finds itself in an impossible situation—to pick or not to pick sides in this conflict.

ENERGY AND ECONOMIC SECURITY

The Middle East can be called the energy basket of India. More than 40% of our petroleum and more than 30% of our liquefied natural gas (LNG) is imported from this region via the Strait of Hormuz. These hydrocarbon resources and their uninterrupted and timely arrival are especially consequential for India, which is the world's third largest oil importing nation. India's dependence on imported oil stands at over 88%.

In addition to energy, the Indian diaspora that resides and works in the Middle East is a significant source of monetary remittances. Globally, India is the largest recipient of remittances from the Middle East. Among the remittance sending countries, UAE accounts for almost half. These remittances serve as economic lifeline for hundreds of thousands of households, particularly in states like Kerala.

The latest episode of conflict in the Middle East centres around three principal actors—the United States of America, Israel, and Iran. On February 28, the US and Israel jointly launched coordinated strikes targeting key figures and strategic installations and locations in Iran under the cover of Operation Epic Fury (US) and Operation Lion's Roar (Israel)

LEGAL CONSIDERATIONS

Apart from energy and economic issues, New Delhi finds itself in another fix—the legality of US-Israel operations. From a dispassionate legal standpoint, the joint military actions have raised important questions about the theological-strategic legality of their actions. This must be seen from two key ideas of the Just War tradition—jus ad bellum and jus in bello. While the former is concerned with the right to go to war, the latter is concerned with the right conduct in warfare. These traditions are the outcome of a long intellectual tradition traversing civilisational lines. Some of the elements within the Just War tradition that merits attention in this context include recta intentio or Right Intention, justa causa or Just Cause and discrimen or discrimination i.e., exercising careful selection of targets.

These elements find their legal expression through Articles 2(4) and 33 of the United Nations (UN) Charter that correspondingly talks about the need for "states to refrain from using force or threatening the use of force" and "ensure peaceful resolution of disputes". These legal provisions of the UN charter appear to have been violated in the ongoing conflict. In addition to the above mentioned provisions, Rule 89 of the International Humanitarian Law (IHL) that forbids indulging in violence against non-combatants also appears to be violated. For a country like India, that has always stood by the need to uphold an international order anchored in rules and regulations, this conflict raises troubling questions.

RESOLVING THE CRISIS

In this hour of crisis when a lot is at stake for New Delhi, it is imperative that India takes some meaningful steps

to not only ensure that its national interests in the extended neighbourhood remain shielded but in the process of protecting its interests, India can bolster its diplomatic capital and goodwill. Some suggestions are:

First, New Delhi must initiate what the late American career diplomat and academic Henry Kissinger called shuttle diplomacy. India must play an active mediatory role between the three key actors in the conflict—Iran, Israel and the United States. Using its diplomatic goodwill on all sides, New Delhi must bring all the parties onto the negotiating table and hold talks with the parties in New Delhi and their respective countries on thorny outstanding issues—Iran's nuclear programme, Israel, and the US' allegations regarding Iran's use of its proxy forces and issue of Palestinian statehood.

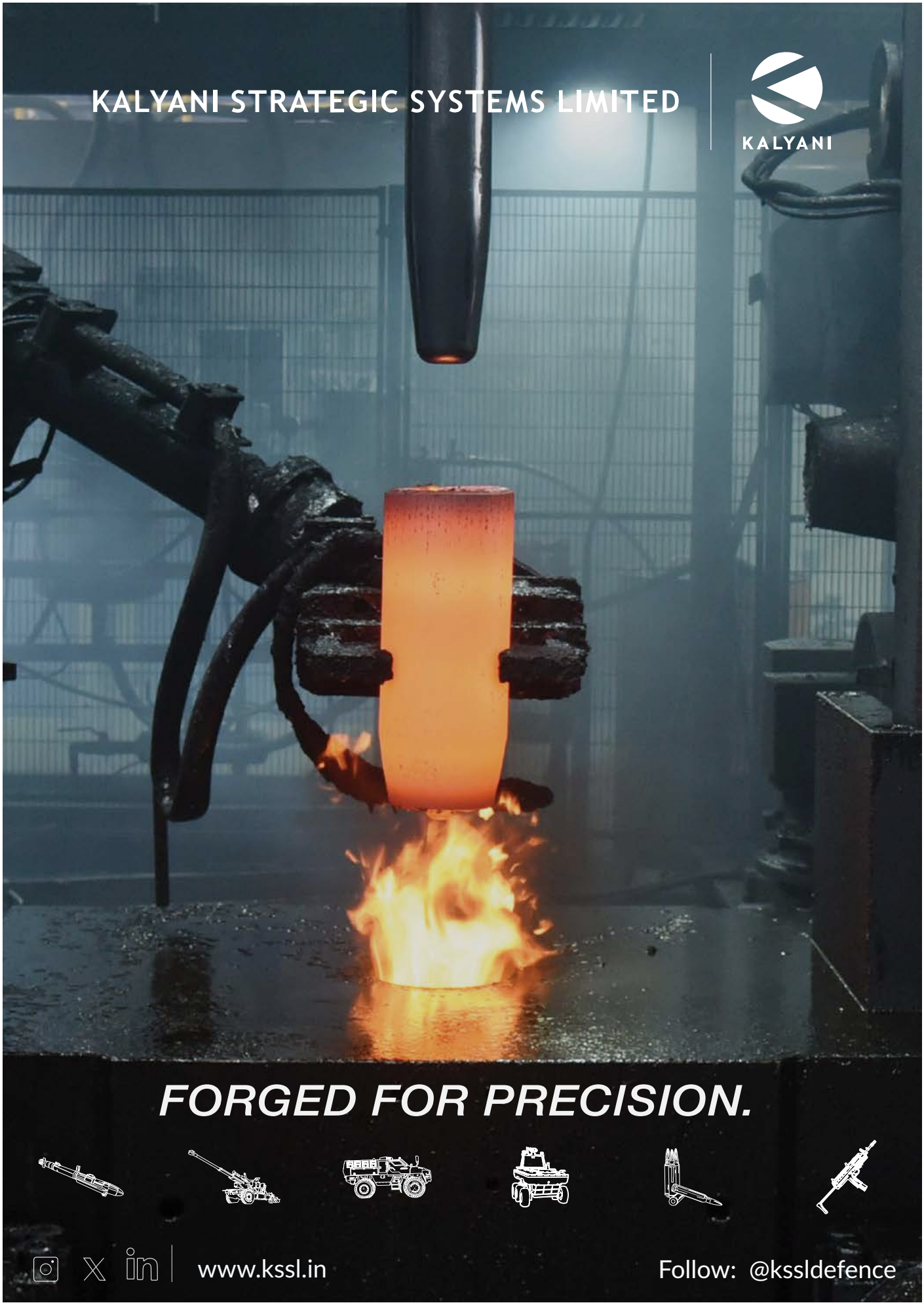
Second, this is where New Delhi's demographic profile will come in handy. India can contemplate starting Track 2 diplomatic initiatives by making use of influential theological figures present in India's Shia Islamic community on one hand and the Christian and small but influential Jewish community on the other hand to try and address the outstanding concerns of all the parties to the conflict. Through negotiations, a new social compact can be initiated among the various demographic groups of the actors involved, so as to cement intra-state and inter-state stability.

India can consider initiating Track 2 diplomacy by exporting her civilisationally rooted idea of "Vasudhaiva Kutumbakam" to the region. This can manifest itself in New Delhi urging all sides in the conflict to make some compromises for the greater economic good of the region. It could be said that the clock for India is ticking

Third, India can consider initiating Track 2 diplomacy by exporting her civilisationally rooted idea of "Vasudhaiva Kutumbakam" to the region. This can manifest itself in New Delhi urging all sides in the conflict to make some compromises for the greater economic good of the region. India's emphasis must, in this context, be guided by expanding connectivity via IMEEC or the India-Middle East-Europe Economic Corridor (IMEEC).

Overall, it could be said that the clock for India is ticking. New Delhi must act quickly and sagaciously to try and bring peace in this restive region and emerge as a moral politik's great power.

–The writer, a columnist, is a doctoral candidate in Political Science at Mahatma Gandhi Central University. He is also a Research Associate at Defence Research and Studies (dras.in). The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda


KALYANI STRATEGIC SYSTEMS LIMITED
KALYANI
FORGED FOR PRECISION.
www.kssl.in
Follow: @kssldefence

A HANDSHAKE FOR THE GLOBAL SOUTH

President Lula's visit to India has fundamentally redefined the bilateral security architecture, elevating a historic diplomatic friendship into a high-tech strategic alliance

DR ARUNA PRAKASH

The February 18–22, 2026, State Visit by Brazilian President Luiz Inácio Lula da Silva to India has solidified a robust defence and security partnership. The visit saw the signing of several landmark aerospace partnerships involving Mahindra, Adani, and Embraer, alongside a trilateral maritime cooperation agreement concerning Scorpene-class submarines. It also included the launch of a strategic digital partnership aimed at strengthening the security of critical infrastructure.

The State Visit has fundamentally redefined the bilateral security architecture, shifting it from a historical diplomatic friendship into a high-technology strategic alliance. While the two nations have maintained a formal defence agreement since 2003, this latest summit represents a transition toward deep industrial integration that extends far beyond simple buyer–seller relationships. Both nations, recognising their roles as leading voices of the Global South, have pivoted toward a "self-reliant" defence philosophy. Their endeavour is to align India's Aatmanirbhar Bharat initiative with Brazil's established aerospace and naval industrial base to create resilient, alternative supply chains that are less dependent on traditional Western powers.

Prime Minister Narendra Modi encapsulated this synergy during the joint press statement on February 21, 2026. "Our cooperation in the defence sector is steadily expanding... it stands as a strong example of mutual trust and strategic alignment between our two countries," he remarked. The partnership is no longer just about transactional procurement. It is about the co-development of sovereign technologies that can serve not only both nations' armed forces but also the wider international market, positioning India and Brazil as net providers of security in their respective regions.

The partnership is no longer just about transactional procurement. It is about the co-development of sovereign technologies that can serve not only both nations' armed forces but also the wider international market, positioning India and Brazil as net providers of security in their respective regions

SPURRING THE AEROSPACE REVOLUTION

A defining pillar of this renewed cooperation is the aerospace sector, specifically the partnership surrounding the Embraer C-390 Millennium multi-mission transport aircraft. On February 19, 2026, the Mahindra Group and Embraer announced plans to establish a dedicated Maintenance, Repair and Overhaul (MRO) hub in India for the C-390. This facility is designed to support the Indian Air Force (IAF) Medium Transport Aircraft programme , offering comprehensive base and heavy maintenance, structural testing, and technical training. The MRO hub, likely to be located at a strategic airbase in central India, is expected to become operational by late 2027. It will serve as the primary maintenance centre for the entire future IAF C-390 fleet, which is anticipated to number between 40 and 60 aircraft.

Bosco da Costa Junior, President and CEO of Embraer Defense & Security, emphasised the long-term intent, stating, "Embraer is committed to delivering not only the aircraft but also a robust support ecosystem tailored to India's requirements." Beyond mere maintenance, the two groups are exploring a roadmap to integrate Indian suppliers into Embraer's global supply chain, positioning India as a regional sustainment node for C-390 operators throughout the Indo-Pacific. This could eventually see Indian-made components, such as wiring harnesses or avionics sub-assemblies, installed on Brazilian aircraft exported to other nations.

INDUSTRIAL SYNERGIES IN REGIONAL AVIATION

The aerospace momentum extends into the civil–military dual-use domain through an enhanced Memorandum of Understanding (MoU) signed between Adani Defence & Aerospace and Embraer on February 21, 2026, in the presence of President Lula and Union Minister Piyush Goyal. This partnership aims to establish a Final Assembly Line (FAL) for the E175 regional jet, creating an indigenous Regional Transport Aircraft (RTA) ecosystem.

This FAL, potentially located at Adani's Aerospace Park in Nagpur, represents an investment of over ₹1,000 crore and is projected to create hundreds of high-skilled jobs. It will not only assemble aircraft for the booming Indian commercial market but could also be configured for military roles such as troop transport, signals intelligence, and electronic warfare, offering an indigenous solution for the armed forces' own regional airlift requirements.

Jeet Adani, Director of Adani Defence, noted that "the need for an indigenous regional aviation ecosystem has become critical" as initiatives like UDAN (Ude Desh ka Aam Nagrik) transform connectivity across Tier-2 and Tier-3 cities.

COLLABORATION IN MANAGING MARITIME ASSETS

In the maritime domain, the cooperation has reached new depths with the trilateral MoU signed between Mazagon Dock Shipbuilders Limited (MDL), the Indian Navy, and the Brazilian Navy on December 9, 2025. This ten-year agreement establishes a framework for technical expertise exchange and life-cycle support for Scorpene-class submarines, which both countries operate.

By sharing maintenance philosophies for these French-designed platforms, India and Brazil are ensuring higher operational availability for their undersea fleets while advancing India's

vision of emerging as a trusted defence partner for friendly nations. The initial focus will be on streamlining the procurement of spares and standardising maintenance procedures, potentially reducing maintenance downtime by up to 20 per cent. Future phases could involve joint mid-life refits and upgrades, with MDL potentially bidding to service Brazilian submarines in South Atlantic naval facilities.

STRENGTHENING DIGITAL AND STRATEGIC INFRASTRUCTURE

The 2026 summit also saw the launch of a comprehensive Joint Declaration on Digital Partnership for the Future, acknowledging that modern defence is as much about code as it is about hardware. During his remarks, Prime Minister Modi highlighted this shift, stating, "Technology and innovation cooperation holds significance not only for our two countries but for the entire Global South."

Both nations have pledged to collaborate on the security of Digital Public Infrastructure (DPI) and the protection of strategic industrial corridors. This includes establishing a Centre of Excellence for DPI in Brazil and launching the Open Planetary Intelligence Network (OPIN) to leverage digital tools for climate action. Critically, the partnership will focus on hardening the digital perimeters of their respective defence industrial bases. It will entail the sharing of threat intelligence in real time and developing common security standards for 5G and future 6G networks to be used in military applications.

By merging their industrial strengths—from the assembly lines of Embraer to the dry docks of MDL—and setting an ambitious bilateral trade target of $30 billion by 2030, India and Brazil are demonstrating that a South–South defence cooperation can become a new cornerstone of global strategic stability

Furthermore, the visit also led to the signing of an agreement on Critical Minerals and Rare Earths on February 21, 2026. Described by the Indian government as a "major step towards building resilient supply chains," it will pave the way for the high-tech components required by modern defence systems, from permanent magnets in missile seekers to advanced batteries in next-generation submarines.

KEY TAKEAWAYS

The final layer of the 2026 defence partnership is the synchronisation of global security doctrines and the commitment to reform. Prime Minister Modi and President Lula reaffirmed their commitment to a "people-centric and humanity-first approach" as India prepares to chair the 18th BRICS Summit in late 2026. Both leaders called for the urgent reform of the United Nations Security Council (UNSC). They reiterated their mutual support for each other's permanent membership on the Council.

Furthermore, they agreed to coordinate their votes and diplomatic strategies more closely on key United Nations peacekeeping mandates and on defining emerging norms for warfare, including the use of lethal autonomous weapons systems and the militarisation of outer space.

President Lula's visit, accompanied by eleven Cabinet ministers and a large mission of entrepreneurs, underscored a shared belief that "when India and Brazil work together, the voice of the Global South becomes stronger and more confident." By merging their industrial strengths—from the assembly lines of Embraer to the dry docks of MDL—and setting an ambitious bilateral trade target of $30 billion by 2030, India and Brazil are demonstrating that a South–South defence partnership can become a new cornerstone of global strategic stability. The growing India-Brazil relationship may serve as a blueprint for a multipolar world where power and innovation are increasingly shared among nations.

– The writer retired as a Senior Technical Officer at the Central Salt and Marine Chemicals Research Institute, Bhavnagar (Gujarat), and currently contributes articles to research journals and magazines. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

Engineering Intelligence
Simulating The Future

Digital Twin Technology

AI-Enabled Systems

Simulation Technology

Training solutions

Sensors

Mechatronics

Wargaming

Precise today Perfect tomorrow

sales@tecknotrove.com

www.tecknotrove.com

+91 22 6151 3000

FOCUS ON SECURITY THROUGH SAṂSKĀRA

The 11th edition of the Raisina Dialogue (March 2026) was widely considered a success, with more than 2,700 participants from over 110 countries discussing geopolitics, tech, and security under the theme, "Saṁskāra: Assertion, Accommodation, Advancement". Key outcomes included the launch of the "Raisina Science Diplomacy Initiative" and strong, high-level engagement to position India as a key voice for the Global South

RA EDITORIAL DESK

The Raisina Dialogue 2026 was inaugurated by the Prime Minister Narendra Modi, with the keynote address delivered by Alexander Stubb, President of Finland, as Chief Guest. Other eminent speakers at the event included India's External Affairs Minister, S Jaishankar; Indian Foreign Secretary, Vikram Misri, and tech pioneer Nandan Nilekani. Speakers also deliberated on how to bridge diplomacy, governance, and industry.

2026 EDITION'S THEME

The 2026 edition of Raisina Dialogue revolved around the central theme - Saṁskāra, which in its deepest sense, is a civilisational tool, a statement of continuity. It is the inheritance of meaning that allows societies to assert their truth, accommodate their contradictions, and advance through refinement. Today, nations are asserting sovereignty over borders and bandwidth alike - claiming their right to shape their economic futures, digital destinies, and industrial ambitions.

SIX PILLARS FOR A SHIFTING WORLD ORDER

Raisina 2026 structured its discussions around six thematic pillars, each reflecting a dimension of global governance:

Contested Frontiers: Power, Polarity and Periphery. Regions once considered marginal are asserting strategic weight. Cybersecurity breaches, supply-chain disruptions, and hybrid conflicts challenge conventional security models. Raisina debates explored how states and institutions can recalibrate to meet these evolving threats.

Repairing the Commons: New Groups, New Guardians, New Avenues. Maritime routes, cyberspace, and outer space are increasingly contested. Emerging coalitions, including issue-specific multilateral arrangements, are now tasked more with safeguarding global commons amid geopolitical fragmentation.

White Whale: The Pursuit of Agenda 2030. With 2030 on the horizon, widening development gaps demand attention. Raisina conversations focussed on inclusive growth, poverty reduction, and sustainable economic strategies. India's experience with the EU–India Clean Energy and Climate Partnership and the International Solar Alliance demonstrates how dialogue can accelerate tangible collaboration.

The Eleventh Hour: Climate, Conflict and the Cost of Delay. Rising temperatures, extreme weather

events, and climate-induced migration increasingly intersect with economic and security challenges. India's discussions at Raisina emphasised urgency and practical policy interventions for this crucial sector.

Tomorrowland: Towards a Techtopia. Artificial intelligence, digital public infrastructure, and emerging technologies are redefining governance. This pillar examined how innovation can be harmonised with privacy, regulation, and cyber resilience.

Trade in the Time of Tariffs: Recovery, Resilience and Reinvention. Global trade faces protectionist pressures and strategic competition. Raisina sessions explored resilient supply chains and new frameworks for international commerce, including bilateral successes such as Denmark's Green Strategic Partnership with India, covering digitisation, waste management, and renewable energy collaboration.

In an interactive session at the event, EAM S Jaishankar argued that multipolarity is here to stay. "My sense is you're going to have a future which will be much more multipolar because no country today has hegemony over so many domains that it is an overall hegemon," he said. The EAM made the remarks during a discussion on Finnish President Alexander Stubb's book, "The Triangle of Power". Jaishankar further said that multipolarity is not against multilateralism.

"You can have multipolarity with multilateralism and multipolarity without multilateralism," he said, "The success of multilateralism should not depend on the weakening of multipolarity because the weakening of multipolarity is not going to happen," he added. Jaishankar further said that India has hosted the Voice of Global South meetings for the past three years, as there is a new basis for a Global South platform. The era of big countries creating spheres of influence and reaching huge compacts of a sweeping nature has effectively ended, he said.

The 2026 edition of Raisina Dialogue revolved around the central theme - Saṁskāra, which in its deepest sense, is a civilisational tool, a statement of continuity. It is the inheritance of meaning that allows societies to assert their truth, accommodate their contradictions, and advance through refinement

Iranian Minister at the Raisina Dialogue slammed the US attack on 'unarmed' Iranian vessel returning from India.

Speaking at a curtain-raiser session of the Raisina Dialogues titled "Power, Purpose, & Partnerships: American

Foreign Policy in a New Era", Deputy Secretary of State Christopher Landau emphasised the US commitment to its national interests while advocating for a collaborative partnership with India.

For the American government, Landau said, the purpose of foreign policy of United States was to advance the country's national interests. However, Landau had a warning for India: the US will not make the same mistakes it did with China, "where we let you develop all these markets and then let you beat us with them".

In response to a question about the ongoing War in West Asia, Landau said that the endgame is an Iran that is not a threat to others, one in which Iran does not have access to a nuclear weapon.

In his presentation at the event, General Upendra Dwivedi, Chief of the Army Staff (COAS), outlined the key lessons learnt from Operation Sindoor by the Indian Army and its major transformation, focussing on integrating new technology and restructuring for future warfare.

On the successful execution of Operation Sindoor and what lessons has the Army drawn from the operation, General Dwivedi said, "This is the first time where India decided that we have to be very credible about it. Three things that are required for the deterrence is credibility, capability and will to wage war. And this is the first time where we actually executed all of it. This was our first lesson from Operation Sindoor."

"Firstly, we have to be very clear that all the tactical commanders have to become techno commanders. Technology has to be part of life. Secondly, platforms in isolation are no good. There have to be a system of systems. To keep-up with the synergy with what Viksit Bharat 2047 is being looked at. And for that we have identified what are the organisational and doctrinal changes required and what is the equipment upgrade and equipment transformation required"

"It is a new normal and this will now be a policy. In case there is a terror action, the policy will be retaliating on our own conditions," he said. "Another lesson is that next time, something like this happens, we should be able to synergise more, not just with the tri-services, but also with the intelligence agencies, support agencies and logistic stakeholders," he added.

He also highlighted the adoption of Integrated Battle Groups, drone regiments (Shaktiman), and enhanced cyber/AI capabilities to counter modern, multi-domain threats.

On the need for continuous reforms in the Army, General Dwivedi said, "Firstly, we have to be very clear that all the tactical commanders have to become techno commanders. Technology has to be part of life. Secondly, platforms in isolation are no good. There have to be a system of systems. To keep-up with the synergy with what Viksit Bharat 2047 is being looked at. And for that we have identified what are the organisational and doctrinal changes required and what is the equipment upgrade and equipment transformation required."

The Ministry of External Affairs and Observer Research Foundation (ORF) have jointly hosted the Raisina Dialogue, the flagship multilateral conference on geopolitics and geo-economics since 2016. Over the years, it has emerged as India's premier conference on geopolitics and geo-economics.

So far, each edition of the Dialogue has featured vibrant debates and collaboration on topics ranging from shifting geopolitical alliances, climate change, technology, economic security, and evolving global governance systems. This year's theme succinctly captured the moment we find ourselves in, i.e.: Saṁskāra outlined the inheritance of identity that enables civilisations to assert who they are, accommodate the difference and advance through refinement.

ANANTH TECHNOLOGIES

A GLOBAL AEROSPACE ENGINEERING AND MANUFACTURING FIRM

- Inception in 1992.
- Mission: Indigenization of Space and Defence Systems.
- Leading contributor to Indian defense programs.
- Designed & Manufactured systems for 30+ Indigenous missiles.
- Complete satellite manufacturing facilities with class 10K & 100K Clean Rooms, SMT production lines, MIC Facility, In-house test facilities.

Contributed to

89

Launch Vehicles and

109

Satellites

Areas of Expertise :

- Telemetry & Tele-command Systems
- Navigation, Guidance and Control Systems
- Onboard Computing Systems
- Seeker systems – RF & IR
- Satellites and Launch Vehicles
- Small Sats
- EO Surveillance Systems
- Raman based explosive identifiers
- Laser Designators
- Missile systems
- Radar systems
- Aircraft & helicopter subsystems
- Unmanned Systems

Electro-Optics Surveillance Systems Development at Ananth for DRDO

Compact Light-Weight Integrated Multi-Sensor Technologies (CLIMT)

Gimbaled Laser Target Designator (GLTD)

Ultra low pitch High Format Detector (UHDT)

Laser Altimeter (LA) & Laser Range Sensor (LRS)

Hyderabad - Head Quarters
Ananth Technologies Pvt Limited 39, Ananth Info Park, Phase - II
Hi-Tech City , Madhapur
Hyderabad, India - 500 081

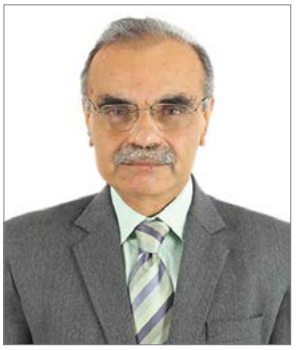
Bengaluru
Ananth Technologies Pvt Limited No:64, KIADB Bangalore
Aerospace Park, Singahalli Village, Budigere Post, Bangalore
North Taluk, Bangalore, India – 562129

Thiruvananthapuram
Ananth Technologies Pvt Limited, Plot No: 51-(b), Street F,
St.Xavier's PO, KINFRA, Menamkulam,
Thiruvananthapuram - 695586 Kerala, India.

Scan this to view our website

DEFENCE ACQUISITION PROCEDURE 2026: CONFUSION RATHER THAN EASE

The latest Draft Defence Acquisition Procedure 2026, instead of simplifying the acquisition process for the tri-services, has rather created far more confusion and complexity. For better results, the MoD in the long run will have to address these issues to improve the efficacy of the Indian acquisition system



AMIT COWSHISH

Former Financial Advisor (Acquisition), Ministry of Defence

The Draft Defence Acquisition Procedure 2026 (DAP 2026) was released by the Ministry of Defence (MoD) on February 11, seeking comments on the proposed changes by March 3. The final version of the manual, to which a procedure for acquisition of aerospace systems will be added later, is awaited.

From an 84-page document, when the first Defence Procurement Procedure (DPP) was promulgated in 2002 to regulate capital acquisitions for the armed forces and the Indian Coast Guard, it has swelled into 800-odd pages of a complex document, split into two volumes: one containing the procurement policies and the other, instructions, formats and appendices related to various procedural aspects.

For a doorstopper like this, which took more than six months to take shape, opening a 20-day window for the interested readers to soak-in its contents and offer their comments seemed more like ticking a box and not an earnest attempt to solicit genuine professional feedback.

Be that as it may, amidst all the proposed changes, the manual's objective remains virtually unchanged from what it has always been: timely acquisition of military equipment, systems, and platforms with due regard to performance, capabilities, quality standards, and optimum utilisation of allocated budgetary resources.

What distinguishes draft DAP 2026 from its earlier version of 2020, however, is the shift in focus from 'Make in India' to 'Owned by India' by prioritising co-development and Intellectual Property (IP) ownership by the Indian companies as the basis of acquisition decisions. Various measures, such as incentives for offering products with indigenous design, have been introduced to promote this concept.

It is not easy to make a system based on incentives and weightages work. A system of weightages in determining the lowest bid was introduced in 2016 for bidders who offered products meeting pre-defined enhanced performance parameters, but the system did not seem to have worked as well as it was intended to. It will require sustained efforts to make the proposed incentive for indigenous design work.

Right from the first DPP of 2002, the procurement architecture is built around classification of capital acquisitions into various categories, which have mutated and multiplied over the years. In keeping with this trend, the draft DAP 2026 proposes to replace 'Buy (Indian)' and 'Buy and Make (Indian)' categories with 'Buy (Indian) and Manufacture in India'. This change in nomenclature seems as cosmetic as the replacement of the 'Buy and Make' category with 'Buy (Global – Manufacture in India)' category in 2020, as the defining characteristics of these categories remain fundamentally unchanged.

Other categories, like 'Buy (Indian- Indian Designed, Developed and Manufactured)', 'Buy (Global – Manufacture in India)', 'Design and Development by DRDO/ DPSUs', and 'Make' have been retained, and Technology Readiness Level (TRL) introduced as one of the determining factors for categorisation, except in 'Buy (Global)' category. Given the transience of the procurement personnel, it may be a

challenge to deal with this added procedural complexity.

The requirement of indigenous content (IC) in the products to be procured by the MoD has been increased from 50% to 60% under various procurement categories. In 'Buy (Global)' category, which currently entails no obligation, IC requirement has been introduced and pegged at 30%. Some incentives have also been introduced for achieving the requisite IC levels. However, considering that there are reports of the vendors facing difficulty in achieving the currently prescribed levels of IC in their products, a 10% jump in IC requirement seems somewhat ambitious.

The existing DAP 2020 contains several other stand-alone procurement categories and special procurement procedures. The stand-alone categories include 'Make' category along with its three sub-categories, including Leasing, and the Strategic Partnership Model (SPM). There are special procedures for acquisition of systems designed and developed by DRDO and DPSUs, acquisition of ICT products and systems, and defence shipbuilding. There is also a Fast Track Procedure in place, apart from a 'Other Capital Procurement Procedure'.

Some additions are proposed to this multitude. A new category called 'Low-Cost Capital Acquisition (LCCA)' is proposed for acquisition of equipment exclusively from the Indian vendors for trial and evaluation before its induction in bulk, for financial powers will be exercised by the Services Procurement Board. A Long-Term Bulk Acquisition (LTBA) procedure is also proposed to be introduced for acquisition of capital-intensive, Hi-Tech, and complex equipment, systems, platforms, and ammunition, from Indian and foreign sources over a long term and in multiple tranches, with progressive indigenisation and upgrades.

In DAP 2020, 'Innovation' was treated as a branch of the 'Make' category, but in the draft DAP 2026, there is a separate chapter detailing the procedure for acquisition of technologies and products developed by Indian entities under the Innovations for Defence Excellence (iDEX) initiative and Technology Development Fund (TDF), or by the Services through their own internal R&D organisations.

The offset policy, which requires foreign vendors to plough back a certain percentage of the contract value into the Indian defence sector by procuring 'Made-in-India' eligible defence products from the Indian companies, investing in them in kind or cash, or via transfer of technology (ToT) to them or to DRDO, is conspicuous by its absence in the first volume of the Draft DAP 2026, additionally there are disjointed references to offsets in the second volume, which creates confusion.

What distinguishes draft DAP 2026 from its earlier version of 2020, however, is the shift in focus from 'Make in India' to 'Owned by India' by prioritising co-development and Intellectual Property (IP) ownership by the Indian companies as the basis of acquisition decisions. Various measures, such as incentives for offering products with indigenous design, have been introduced to promote this concept

Introduced two decades ago, the offset policy has increasingly lost its relevance. Only one offset contract has been signed since 2021 and, more to the point, the policy did not lead to any meaningful ToT as the vendors opted for easier options to discharge their offset obligations. The exemption granted in DAP 2020 to all foreign procurements under inter-governmental agreements, including Foreign Military Sales Programme of the US Government, from offsets, may have dealt a final blow to the policy.

Considering these facts, it will not be surprising if the MoD intends to

phase out defence offsets, but SPM and Make I procedure, which never really took off, have been retained. SPM was adopted in 2017 for a roll-out in four manufacturing segments - aircraft, helicopters, submarines, and armoured fighting vehicles or main battle tanks- but not a single SPM project has matured since then.

Likewise, under Make I procedure - an offshoot of the original Make procedure which was adopted in 2006 to promote indigenous prototype development of futuristic equipment by harnessing available technologies - no major project has fructified so far. It is not known if the utility of persisting with these categories was considered by the MoD, especially since the objectives of these categories can also be achieved via other procurement categories. That, of course, is a discussion for another day.

The stages, from formulation of the Services Qualitative Requirement (SQR) to the signing of the contract, which constitute a typical acquisition cycle have been retained. Some of these stages, like formulation and approval of services qualitative requirements, technical and staff evaluations, field trials, and contract negotiations are prone to delay. While the acquisition programmes will continue to follow more or less the same routine as before, refinement of the processes linked with these stages envisaged in the draft could help cut down delays.

The Standard Contract template has been updated to incorporate a provision for resolution of disputes under the provisions of the Mediation Act, 2023, for which policy directives were issued by the Procurement Policy Division of the Ministry of Finance on June 3, 2024. This may possibly make the dispute resolution mechanism nimbler. However, some earlier textual ambiguities remain unaddressed, as in the case of the Adequacy Clause.

Proliferation of procurement categories, complexity of the conditionalities attached to each one of them, and multiplicity of the special procedures has created a virtual bureaucratic maze. It was probably unavoidable, and in any case, it is too late to address these issues in the final version. However, MoD can address the lack of textual clarity at many places in the draft as it militates against uniformity in interpretation of various provisions of the manual and prolongs the deliberations at various stages.

Under a wider perspective, multiplicity of the agencies involved in the acquisition process with each one of them following a different chain of command, absence of an overarching procurement organisation managed by procurement professionals, absence of outcome-oriented execution of financially viable acquisition plans, and several other related factors have been the bane of acquisition programmes in the past. However, in the long run, MoD will have to address these issues to improve the efficacy of the acquisition system

Under a wider perspective, multiplicity of the agencies involved in the acquisition process with each one of them following a different chain of command, absence of an overarching procurement organisation managed by procurement professionals, absence of outcome-oriented execution of financially viable acquisition plans, and several other related factors have been the bane of acquisition programmes in the past. These issues were beyond the remit of the committee which prepared the draft DAP 2026, but in the long run, MoD will have to address these issues to improve the efficacy of the acquisition system.

IG DEFENCE™
For the Nation with Precision

ENGINEERING THE FUTURE OF AUTONOMOUS DEFENCE SYSTEMS

AI-DRIVEN • COMBAT-READY • UNMANNED PLATFORMS

★★ INDIA'S NO.1 DRONE MANUFACTURER ★★

01 FPV KAMIKAZE DRONES
PRECISION STRIKE

02 MISSILE SYSTEMS
GUIDED STRIKE

03 DEEP STRIKE UAVs
LONG RANGE ISR & STRIKE

04 UGV / USV
AUTONOMOUS GROUND & NAVAL SYSTEMS

05 ELECTRONIC WARFARE & RF JAMMING
SPECTRUM DOMINANCE

06 COUNTER-DRONE SYSTEMS
DETECT - TRACK - NEUTRALIZE

07 AI TARGETING & PRECISION STRIKE
COMPUTER VISION TARGETING

08 CYBER WARFARE
SECURE DIGITAL BATTLESPACE

CORE TECHNOLOGY ENABLERS

- SWARM INTELLIGENCE
- GNSS-DENIED NAVIGATION
- SECURE COMMUNICATIONS
- EMBEDDED SYSTEMS
- POWER SYSTEMS
- RAPID PROTOTYPING

Built in Bharat, Built for Bharat & Ready for the World

IG Defence develops indigenous AI-powered autonomous defence systems for modern warfare environment.

info@igdefence.com

www.igdefence.com

VISION 2047 OUTLINES INDIAN DEFENCE FORCES' ROADMAP FOR THE FUTURE

Defence Minister Rajnath Singh released *Defence Forces Vision 2047: A Roadmap for a Future-Ready Indian Military* at an event in South Block, in March. This comprehensive blueprint has been articulated by Headquarters Integrated Defence Staff to transform the county's defence forces into a modern, integrated and technologically-advanced military capable of supporting India's aspirations to become fully developed, or a Viksit Bharat, by 2047

ASAD MIRZA

The 2047 vision document outlines the strategic reforms, capability enhancements and organisational changes required within the country's defence forces to effectively address the evolving geostrategic, technological and security environment. It envisages the transformation of the military into an integrated, multi-domain and agile force capable of deterring adversaries, responding across the full spectrum of conflict and protecting expanding strategic interests, amid the rapidly changing global and regional dynamics. The document is part of the broader Viksit Bharat @2047 initiative, which aims to transform India into a fully developed nation by the 100th anniversary of its independence.

A central pillar of the vision is the emphasis on jointness and synergy among the three services, promoting greater coordination in planning, operations and capability development. The document also highlights the importance of innovation, advanced technologies and modern training framework to build a force that is adaptable to future warfare challenges. Another key focus area is Aatmanirbharta in defence, encouraging

Defence Minister Rajnath Singh released *Defence Forces Vision 2047: A Roadmap for a*

the development and adoption of indigenous technologies and solutions tailored to the country's unique security requirements. Strengthening domestic defence manufacturing and technological capabilities is expected to enhance operational readiness while contributing to national growth.

The vision document adopts a calibrated roadmap with clearly prioritised capability goals across short-term, mid-term and long-term timelines. This structured approach will guide the development of critical military capabilities, institutional reforms and strategic partnerships required to build a world class defence force.

The 2047 vision document outlines the strategic reforms, capability enhancements and organisational changes required within the country's defence forces to effectively address the evolving geostrategic, technological and security environment

Future-Ready Indian Military

Recognising the complexity of future security challenges, the vision document underscores the need for a whole-of-nation approach, integrating military strength with diplomatic, technological and economic power to ensure national security. Through sustained reforms, innovation and national commitment, it aims to ensure that by the centenary of India's independence, the nation's military stand as a globally-respected, technologically-advanced and combat-ready military, contributing to a strong and resilient Viksit Bharat.

CORE OBJECTIVES OF DEFENCE FORCES VISION 2047

The roadmap shifts India's military posture from traditional service-specific silos to an integrated, high-tech, and agile force. It focuses on preparing the military for battles across land, air, sea, cyber, space, and AI-driven domains.

This would be achieved by prioritising "Jointness" among the Army, Navy, and Air Force, including the establishment of Integrated Theatre Commands (ITCs) to unify operational command. Further, Aatmanirbharta targets a major transition from foreign dependence to 60–65% indigenous production in the short term, with long-term goals for India to become a top five global defence exporter by 2038. This could also be accelerated by emphasising the integration of autonomous systems, quantum computing, and space-based early warning systems to counter regional threats.

The Three-Phase Roadmap of the vision document will be implemented through a calibrated, three-phase strategy:

Phase 1 (Up to 2032): Focuses on rapid organisational restructuring, doctrinal reforms, and the early absorption of indigenous technologies.

Phase 2 (2032–2037/40): A consolidation phase aimed at deepening inter-service synergy and

HIGHLIGHTS OF THE ROADMAP

Combat Readiness and Responsiveness: Strengthen deterrence by acquiring intelligent platforms, modernising weapon systems, promulgating theatre strategies, etc.
Organisational Agility and Interoperability: Tri-services' integrated logistics and inventory management system; Joint Headquarters & Joint Operations Coordination Centre, etc.
Capability Development and Sustenance: Developing the Defence Geospatial Agency, Air Defence systems as part of Mission Sudarshan Chakra; Data Force, Drone Force, etc.
Conceptual and Doctrinal Clarity: Transition from information superiority (net-centric warfare) to decision superiority (data-centric warfare); cognitive warfare capabilities, etc.
Training, Education and Empowerment: Strengthen the Agnipath scheme to attract youth; advanced military-technical courses, especially in AI and emerging technologies.
Defence Diplomacy: Establish India's role as a 'Vishwabandhu' by acting as a first responder for Humanitarian Assistance and Disaster Relief (HADR) in the region.
Strategic Culture and Climate: Rooted in indigenous Indian knowledge while shedding colonial practices; Indian Defence University (IDU) to align professional military education with strategic leadership and innovation.

To fully realise this transformative vision for India's defence sector, it is essential for key stakeholders such as the government, armed forces, industry, research institutions, and academia to align their efforts and expertise. A whole-of-ecosystem approach would be necessary, wherein facilitating free flow of collaboration, knowledge exchange, and synergistic partnerships among these pivotal entities are crucial in propelling the sector towards success

building multi-domain operational capabilities.

Phase 3 (2037–2047): The final transformation into a "world-class military" that is fully digitised, AI-driven, and network-enabled.

THE WAY AHEAD

In essence, achieving enhanced self-reliance in defence capabilities is the foundation upon which the vision stands. By focusing on critical areas for indigenous development, reducing reliance on foreign technology, and fostering innovation through robust domestic R&D, India can build a strong, independent defence infrastructure. This foundational self-reliance ensures that India is well- prepared to handle emerging threats and challenges autonomously.

Striving to become a global export leader in defence equipment and technology is another crucial pillar supporting the vision. By expanding international partnerships, complying with global standards, and actively promoting Indian defence products overseas, India aims to mark its presence in the global defence market. This objective boosts the economic stability of the country whilst enhancing its strategic leverage globally.

To fully realise this transformative vision for India's defence sector, it is essential for key stakeholders such as the government, armed forces, industry, research institutions, and academia to align their efforts and expertise. A whole-of-ecosystem approach would be necessary, wherein facilitating free flow of collaboration, knowledge exchange, and synergistic partnerships among these pivotal entities are crucial in propelling the sector towards success.

In Research and Development (R&D), emphasis needs to be laid on increasing investment to 10-15% of total defence expenditure by 2032, with a strategic focus on critical technologies like AI, quantum computing, and cyber defence. The thought leadership also advocates for the establishment of a National Defence Technology and Innovation Framework (NDTIF) to drive collaboration, innovation, skill development, and bolster indigenous manufacturing for a more competitive defence manufacturing ecosystem.

Simultaneously, efforts in talent and skill development must aim to bridge skill gaps through specialised programs, scholarships, internships, and attractive compensation packages, with a strategic emphasis on incentivising the return of skilled expatriates through appealing roles, relocation support, and global networking initiatives.

Moreover, enhancing defence production capabilities seeks to reinforce India's standing through measures such as financial support, resilient supply chains, quality

Prime Minister Narendra Modi along with the Council of Ministers during a meeting on vision document for the Viksit Bharat 2047 and detailed action plan for the next 5 years

assurance, and export promotion. This includes increased funding, technology transfers, adherence to global standards, and diplomatic engagements to expand exports whilst enhancing the country's reputation as a reliable player in the defence manufacturing industry. Regulatory and procedural reforms play a pivotal role in propelling the sector forward by advocating a transparent framework, adaptive policymaking, streamlined procurement processes, industry-friendly reforms, strong IP protection, and optimising resource allocation to enhance frontline capabilities.

Further, strengthening strategic partnerships with advanced nations, focusing on technology agreements, technology transfer mechanisms, collaborative ventures, and incentivising private sector participation in international collaborations, while also bolstering infrastructure by expanding testing facilities, establishing Centres of Excellence (CoE), enhancing cybersecurity measures, and embracing advanced manufacturing technologies, are also paramount for driving innovation and global competitiveness in India's defence industry.

The commitment to pioneering advancements in niche defence technologies underscores India's dedication to innovation and technological leadership. By fostering collaboration among industry, academia, and government, and investing in advanced R&D, India is poised to lead in developing and deploying next-generation technologies

Overall, the commitment to pioneering advancements in niche defence technologies underscores India's dedication to innovation and technological leadership. By fostering collaboration among industry, academia, and government, and investing in advanced R&D, India is poised to lead in developing and deploying next-generation technologies. Leveraging the strength of the young STEM community in the country, India can aspire to be a pioneer and emerge as a leader in the non-kinetic warfare domain which will define the nature and outcome of future conflicts. This strategic vector ensures that India remains at the forefront of technological advancements, securing its competitive edge in the global arena.

–The writer is a political commentator and media consultant, based in New Delhi. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

"WE SEE SIGNIFICANT LONG-TERM OPERATIONAL RELATIONSHIP POTENTIAL IN INDIA"

Consolidating its position in India with flagship S-100 Unmanned Aerial System and in-country MRO support set-up, Schiebel India is optimistic of expanding its footprint in India in a very substantive manner. Schiebel's upcoming innovations like the S-300 with extended capabilities is well positioned to be the game-changer.

In an exclusive interview with Raksha Anirveda, Schiebel India CEO, Jajati Mohanty (JM), reflecting on the company's resilient journey in the Indian defence market, shares insights into the S-100's global experience, India-Austria cooperation, Schiebel's strategic planning, product innovation, steadfast commitment to the Make in India initiative as long-term industry partner, and much more.

RA: The Camcopter S-100 has proven versatile in naval trials, including with the Indian Navy. What key lessons from its deployments worldwide are informing the design and capabilities of the upcoming S-300 rotary-wing UAS?

JM: The most important lesson from the S-100's global operational experience is that users value a platform that is practical, reliable and adaptable in real missions. Across different theatres and customer requirements, the demand is always for a system that can operate with minimal infrastructure, carry the right payloads for the task, and transition easily between different mission profiles.

That experience is very much reflected in the S-300. It builds on the philosophy behind the S-100, but moves into a higher payload and longer-endurance class. Customers today are looking for more persistence, greater sensor flexibility and the ability to take on increasingly complex roles. The S-300 has been designed with that in mind. It is about extending capability while preserving the operational strengths that have made the S-100 so successful.

RA: With India's growing demand for indigenous drone tech, how is Schiebel India positioning itself to collaborate with local partners under the Aatmanirbhar Bharat initiative, especially for S-100's integration in border surveillance?

JM: Our approach in India is very clear: we want to be seen not only as a technology provider, but as a long-term industrial partner. India's push for self-reliance is creating the right environment for deeper collaboration, and Schiebel India is positioning itself accordingly through local partnerships, growing in-country capability and closer alignment with Indian operational needs.

For border surveillance, the S-100 offers a strong combination of mobility, responsiveness and mission adaptability. Its ability to operate without extensive infrastructure and to support different sensor configurations makes it well suited to dynamic security environments where terrain, weather and operational priorities can shift quickly.

RA: Reflecting on Schiebel's presence in India and consolidation of its position with MRO setup,

how do you visualise Schiebel India's business footprint in the near future amidst the ongoing defence reforms including DAP? Also provide your insights on the positive impacts that government initiatives like Make in India, Aatmanirbhar Bharat and Viksit Bharat have brought to the Indian defence ecosystem.

JM: I see Schiebel India expanding its footprint in a very substantive way over the coming years. That growth is not only about sales, but about building a stronger local base for maintenance, repair and overhaul, deeper industrial cooperation, and closer long-term engagement with customers. This is essential because defence customers increasingly expect not just a platform, but dependable in-country support and the ability to grow capability over time.

The broader direction of India's defence reforms is very encouraging in this regard. Initiatives such as Make in India, Aatmanirbhar Bharat and the wider Viksit Bharat vision have given strong momentum to domestic capability creation. They have increased confidence across the ecosystem, encouraged investment, and created more room for private industry and technology partnerships. For companies like Schiebel, this is important because it supports a more mature and collaborative environment in which long-term programmes can be developed with real local participation.

RA: Prime Minister Narendra Modi's visit to Austria in July 2024 was termed 'historic and immensely productive' considering its focus on strategic partnership, business and building a framework for future collaboration. Do you think that with the visit India-Austria business cooperation has gained momentum and opened up opportunities for Austrian SMEs, MSMEs and startups? Also highlight the key takeaways that would assist in strengthening the overall Indian business environment.

For border surveillance, the S-100 offers a strong combination of mobility, responsiveness and mission adaptability. Its ability to operate without extensive infrastructure and to support different sensor configurations makes it well suited to dynamic security environments

JM: Yes, I do believe the visit gave fresh momentum to India-Austria cooperation. It was significant not only at a diplomatic level, but also because it sent a strong signal that the relationship is ready to move into a more strategic and future-oriented phase. That naturally creates new confidence for Austrian companies looking at India more seriously, including smaller and highly specialised firms.

For Austrian businesses, India is increasingly attractive because it offers scale, ambition and a clear appetite for advanced technology and industrial cooperation. The real opportunity lies in moving beyond a traditional buyer-seller model towards partnerships in manufacturing, engineering, innovation and long-term capability building. From a business perspective, the key takeaways are the importance of policy continuity, transparent frameworks, faster processes and an environment that supports technology collaboration. Those are the factors that will help convert political goodwill into sustainable business growth.

RA: The S-300, with its 650kg MTOW and enhanced endurance, represents a significant leap from the S-100. What timeline are you targeting for its full launch, and how will it address specific operational needs in Asia-Pacific maritime security?

JM: The S-300 already reflects strong programme momentum. Schiebel had secured the South Korean development and delivery contract for the platform at an earlier stage of the programme, establishing an important foundation for its further development. More recently, the aircraft has successfully completed initial flight testing in France, expanding its operational envelope and reaching a total of 100 flight hours. Together, these milestones show that the S-300 is progressing steadily through both customer-backed development and practical flight-test validation.

For Asia-Pacific customers, this is particularly relevant because requirements are evolving towards broader mission flexibility and higher operational effect. The S-300 is intended to answer that demand by enabling more persistent coverage, more capable payload options and a wider range of mission profiles, especially in maritime

environments where endurance and adaptability are increasingly important.

RA: Autonomous navigation via GPS waypoints has been a hallmark of Schiebel's UAS. How are you advancing AI-driven autonomy and payload versatility in the S-300 to handle complex missions like ISR in contested environments?

JM: Autonomy today has to mean more than simply flying from one waypoint to another. The next step is about smarter mission execution - reducing operator workload, handling larger amounts of sensor data and making the platform more effective in complex and contested environments.

That is the direction in which we are evolving. With the S-300, the combination of greater payload capacity and longer endurance opens the door to more advanced sensor mixes, onboard processing and more sophisticated mission management. The aim is not autonomy as an isolated feature, but autonomy as part of a broader mission system: better data handling, better situational awareness and better operational utility. That becomes increasingly important in ISR missions where the value lies not only in collecting information, but in helping users act on it more efficiently.

RA: Operating in India's regulatory drone ecosystem can be complex. What opportunities do you see in recent policy changes, and how has Schiebel India mitigated export control challenges for sensitive tech like the Camcopter series?

JM: India's regulatory environment is detailed, but it is also moving in a constructive direction. The opportunity lies in the fact that policy is increasingly encouraging local industrial participation, domestic capability growth and more serious long-term investment in advanced unmanned systems.

For Schiebel India, the key is to work within Indian framework in a structured and forward-looking way. That means aligning early with Indian requirements, building credible local capability, and creating partnerships that support compliance as well as operational value. Export control considerations are naturally part of any advanced aerospace and defence programme, but these can be managed successfully through transparency, careful planning and trusted cooperation between all stakeholders. In that sense, a stronger and more mature Indian defence ecosystem actually helps make such cooperation more effective.

For Schiebel India, the key is to work within regulatory framework in a structured and forward-looking way. That means aligning early with Indian requirements, building credible local capability, and creating partnerships that support compliance as well as operational value

RA: Beyond hardware, how is Schiebel India building an ecosystem around its products - through data analytics services or training programmes - and what role will this play in securing long-term contracts with India's defence forces?

JM: Long-term success in defence is never based on hardware alone. Customers want a complete capability package: training, support, mission readiness, operational know-how and the ability to keep evolving the system as requirements change.

That is exactly how we view the role of Schiebel India. Building the ecosystem around the platform is just as important as delivering the platform itself. Training is essential because operational effectiveness depends on well-prepared crews and maintainers. Local support and sustainment are equally important because they directly influence availability and customer confidence. Over time, software, data exploitation and mission support will also play a greater role in how unmanned systems deliver value. This broader ecosystem approach is what helps convert an initial procurement into a long-term operational relationship, and that is where we see significant potential in India.

Embraer's KC-390 Millennium Successfully Concludes Cold Weather Campaign in Sweden

Embraer on March 31 announced the successful completion of an intensive cold-weather demonstration campaign of the KC-390 Millennium in Sweden. Conducted at the Vidsel Test Range military facility, the operation showcased the aircraft's exceptional performance, highlighting its capability to operate in Arctic conditions and support Agile Combat Employment (ACE) concepts.

During this cold-weather campaign, the crew quickly started the aircraft's engines and systems before performing short take-offs and landings. The KC-390 also demonstrated its ability to rapidly load and deploy heavy vehicles, such as the SISU GTT military all-terrain vehicles, while still retaining space for troops and additional equipment. This performance confirms the KC-390's perfect suitability for missions requiring high logistical responsiveness in demanding environments.

The KC-390 Millennium stands out as the most capable aircraft in its class, engineered to perform complex missions in the most demanding environments. Designed and built in the 21st century to withstand current and future threats, this medium multi-mission airlift and tanker jet delivers superior performance, operational flexibility, and cost efficiency. Its capabilities include aerial refuelling, Agile Combat Employment, and rapid response across a wide range of mission profiles.

COUNTERING CHINESE INGRESS

By 2035, the Chinese Carrier Battle Groups in the Indian Ocean will present a paramount strategic challenge to India. Indian naval strategists need to focus on converting the hulls of the next-generation, nuclear-powered ballistic missile submarines (SSBNs) into a new class of guided-missile submarines (SSGNs). Armed with the devastating, hypersonic BRAHMOS NG cruise missile, these covert "carrier-killers" could lurk undetected along key choke points, holding China's most potent naval assets at risk

CMDE C P SRIVASTAVA

The evolving maritime security environment in the Indo-Pacific region by 2035 will be shaped decisively by the rising naval capabilities of China, especially through its Carrier Battle Groups (CBGs) and Anti-Access/ Area Denial (A2/AD) strategies. India's strategic response must anticipate these developments with innovative force structuring and platform capabilities. One such transformative initiative could be the conversion of the forthcoming 'upgraded' ballistic missile submarine (SSBN - Ship, Submersible, Ballistic, Nuclear) design into a new class of nuclear-powered guided missile submarine (SSGN - Ship, Submersible, Guided, Nuclear), armed with the next-generation BRAHMOS missile (BRAHMOS NG - BRAHMOS Next Generation).

By focusing on the 2035-time frame, it is prudent to analyse how this SSGN platform, leveraging cutting-edge missile technology and stealth, can reshape naval balances and deterrence postures in the Indo-Pacific. For this, we need to discuss two very significant and comparatively recent RMAs (Revolution in Military Affairs): the near real-time transparency of the surface and air battle space, and the advent and success of SLCM (Sea Launched Cruise Missiles). These two technology-driven transformations have evolved and matured over the last two to three decades and have impacted both the battle at sea as well as influencing the land battle.

BATTLE SPACE TRANSPARENCY- SPACE BASED SURVEILLANCE

Though space-based surveillance has existed for a number of decades, it was hitherto available to only a very few militaries. However, post the Cold War, as we moved from a bipolar to a multi-polar world, there has been a proliferation of these space-based surveillance technologies. Now many more nations either have access to the technologies itself or have access to the satellite imagery in almost real time. The source of the imagery could be either their geo-strategic partners, ideological well-wishers or merely a commercial entity making a financial killing.

The net outcome is that militaries,

including navies, can no longer keep the position of their ships and composition and location of their formation, whether in harbour or at sea, secret from their adversaries. The days of sneaking up on an enemy coastline, harbour, shore-based installation or even an adversaries' CBG, to the weapon release line, will now be an extremely risky proposition, if not near impossible.

ADVENT AND PROLIFERATION OF THE CRUISE MISSILE

Though developed during WWII, the US and Soviet Union invested significantly in cruise missiles during the Cold War era. These missiles are now capable of being launched from ships, submarines, aircraft and land-based launchers. So, while the term SLCM continues to be used 'loosely' to categorise such missiles, the fact is that they are now capable of being launched from sea, air and from land.

Sea Launched Cruise Missile Tomahawk: Introduced in the 1980's, the Tomahawk became the cornerstone of US naval power. It is capable of being launched from submarines and ships and has the ability to carry out precise strikes, with reduced collateral damage, at standoff ranges beyond 1500 km. The precision not only enhances operational effectiveness but also helps in maintaining legitimacy in international conflicts.

During Desert Storm (1991), the US Navy fired over 800 Tomahawk missiles against Iraqi targets. Similarly, during Operation Odyssey (2011), the US Navy used the Tomahawk to neutralise/degrade the Libyan air defence and military infrastructure prior to launching the air campaign.

Cruise Missiles–Crucial Component of Anti Access/Area Denial (A2/AD) Architecture: Long-range cruise missiles are also a critical component of any A2/AD architecture. Anti-Access or A2 can be defined as "actions and capabilities designed to prevent an opposing force from entering an operational area." Conversely, Area Denial or AD is defined as the "capabilities to limit its freedom of action when within the operational area". In simple terms, while A2 is the action/capability to build the 'wall', AD is the intervention required once the A2 wall is breached. Therefore, the scope and range of the former is strategic, and the latter, tactical/operational.

Asymmetric Warfare and Non-State Actors: Unfortunately, cruise missiles have also proliferated and influenced the tactics of non-state actors and insurgent groups. During the initial stages of the ongoing Israeli campaign in Gaza, the Houthis used locally assembled /indigenous 'Quds 1 and Borkan missiles to disrupt shipping and attacked oil

installations, ports and even warships.

Therefore, cruise missiles are a threat in being for all maritime operations and activities, including force projection and any A2 /AD architecture, established to protect a nation's mainland, coastline, and archipelago or island chain.

CHINESE CBG'S DEPLOYMENT IN THE IOR- COMPULSIONS, COMPOSITION AND COUNTER STRATEGIES

The Compulsion of Deployment: Ninety per cent of China's crude oil is transported via the sea route. During a twelve-month period, on average, about 550 million barrels of crude, bound for China, transits through the Indian Ocean. Add to this the non-fossil fuel traffic of primarily, food grain, soya bean (crucial for animal feed), raw material and finished goods, the traffic may be as high as about 200 China-bound ships every day. Therefore, to protect and ensure free passage of these merchantmen, the foray of a Chinese CBG into the Indian Ocean is a given and is their geo-strategic compulsion.

Likely Components Organic to the Chinese CBG: By 2035, China is likely to operate at least six aircraft carriers, including the advanced Type 003 carrier. These 80,000-ton carriers will accommodate a wide range of fighter jets, including the J-35 stealth fighters and KJ-600 early warning aircraft. The CBG will likely include Type 055 destroyers, offering air defence, anti-surface and anti-submarine warfare functions. Nuclear-powered attack submarines (Type 093) and strategic nuclear submarines (Type 094) will form a critical part of the CBG for underwater operations and deterrence capabilities. The inclusion of unmanned aerial vehicles (UAVs) for reconnaissance and combat roles, as well as unmanned underwater vehicles (UUVs), will enhance the operational capabilities and reach of the CBG. Thus, the CBG will have a cruise missile arsenal in excess of 500 to 600 projectiles! Therefore, countering the ingress of the Chinese CBG, attempting to establish sea control in the Indian Ocean Region IOR, will be one of the key maritime challenges of the Indian Navy.

COUNTER STRATEGIES- BRAHMOS VS THE CHINESE CBG

The BRAHMOS Missile: The BRAHMOS missile is notable for its speed (about Mach 3), final active homing, and terminal manoeuvring. This, coupled with its ability to be launched from ships, submarines, aircraft and coastal batteries, makes the BRAHMOS the weapon of 'first choice' against a CBG. The BRAHMOS NG and BRAHMOS-X variants under development, are faster, difficult to intercept and much more lethal.

The Salvo Size of BRAHMOS Missiles to Sink a Chinese Carrier: A recent Digital Combat Simulator by Grim Reapers, a YouTube channel, provides some insights into the number of BRAHMOS missiles needed to sink a carrier. While the simulation was specific to a current version of the missile, launched from a shore-based battery, here are some key outcomes from various scenarios tested.

a. Single Missile Efficacy: A single BRAHMOS missile against a target, like a Chinese destroyer, is likely to be successfully intercepted by advanced systems like the HQ-9B (this was, however, not validated under real-time battle conditions during an exercise like Operation Sindoor, when the system could not intercept a single missile fired by India).

b. Saturation Attacks: A salvo of up to 12 BRAHMOS missiles faced total interception by existing defence systems of the Chinese CBG. However, when increased to 24 missiles, two missiles successfully penetrated the defences of the CBG and sank the carrier.

c. Enhanced Salvo Size: 36 BRAHMOS missiles launched simultaneously, resulted in approximately 12 successful hits, sinking multiple ships of the Chinese CBG. However, when a similar attack was launched at a US CBG, only seven BRAHMOS missiles were able to hit their targets, despite the CBG firing as many as 95 interceptor missiles.

Required Numbers of Missiles: From these simulated scenarios, experts suggest that around 40 to 50 BRAHMOS missiles may be necessary under real combat conditions to guarantee a successful attack on a Chinese CBG. The variance is largely due to interception rates, which can fluctuate based on leadership, tactics, and the technological

state of both the BRAHMOS missiles and the carrier's defences.

Strategic Implications: Notwithstanding the fact that a simulation is a simulation, the findings from such DCS studies are crucial for military planning. They highlight that aircraft carriers, while formidable, are not invulnerable and that modern cruise missiles like the BRAHMOS, when fired in large salvo sizes, pose a significant threat.

SUBMARINE LAUNCHED CRUISE MISSILES - THE CARRIER KILLER

A CBG, centred on an 80,000 -ton plus nuclear-powered power-projection aircraft carrier, will have an air and surface surveillance bubble extending to around 1000-1200 nm in diameter and several thousand feet in height. To penetrate such a surveillance bubble, survive the defences, arrive at the weapon release line in adequate numbers and then bring to bear a weight of attack of significance on the carrier, can possibly be done only by a sub-surface missile carrier like the SSN or SSGN.

In the recently conducted Operation Midnight Hammer, the US Air Force deployed a total of 125 military aircraft, to deliver 14 BGU bunker buster bombs, carried by 7 B-2 Spirit stealth bombers. To deliver a weight of attack of around 30 to 40 BRAHMOS missiles, an aircraft package would be so large that its detection is almost certain and the subsequent attrition rate unacceptable. Due to their limited endurance and all-up weight, drones and UAVs, too are ruled out. The chances of survival of a large, slow-moving surface action group, attempting to close in to the weapon release range, are dismal and not worth contemplating.

Sub-Surface Cruise Missile Carriers: Therefore, the only viable platform to ingress the surveillance bubble of the CBG and launch a successful attack is an SSGN. Even an SSN, with its 'comparatively' limited missile-carrying capacity, may be inadequate. The US Navy appreciated this reality in the late 1990s and they initiated the Ohio Class Conversion Programme - conversion of four Ohio-class SSBNs into SSGNs.

Converting the S5 SSBN hull into an SSGN equipped with BrahMos NG not only leverages India's indigenous strategic assets but also multiplies their operational utility. This hybrid platform enhances deterrence by adding a covert, potent strike capability that complements the strategic nuclear deterrent of SSBNs

The Ohio Class Conversion- SSBN to SSGN: In the early 2000s, the US Navy decided to repurpose four Ohio-class SSBNs into SSGNs. The ballistic missile tubes were removed and the submarine was reconfigured to accommodate a VLS system. Each converted SSGN can now carry up to 154 Tomahawk missiles. This marked a shift in naval strategy, providing a versatile option for land-attack missions and neutralising a heavily defended CBG. SSGNs enhance the strike capability and lethality manifolds, when compared to SSNs.

INDIA'S OPTION FOR A NEW CLASS OF SSGN- 'UPGRADED SSBN' HULL DESIGN AND BRAHMOS NG

An 'Upgraded SSBN' is planned as India's next-generation nuclear-powered ballistic missile submarine, succeeding the Arihant-class, with significantly enhanced stealth, endurance, and missile payload capabilities. It will likely displace over 13,000 tons submerged, making it one of the largest SSBNs globally.

Converting the Upgraded SSBN into an SSGN would involve repurposing the ballistic missile launch tubes for cruise or land-attack missiles. The BRAHMOS NG, an advanced, smaller, and more versatile variant of the BRAHMOS supersonic cruise missile, will provide the SSGN with lethal strike reach, high speed, and precision. BRAHMOS NG is expected to have ranges beyond 400 km with hypersonic speeds (Mach 5+), sea-skimming attack profiles, and enhanced anti-ship and land-attack capabilities. The under-development 200 MW nuclear reactor will ensure high endurance, enabling long deployments in contested waters, with stealth and strategic reach.

While the calculation as to how many missiles the SSGN will carry is a matter of detail and design consideration, a 'realistic estimate' would be around 30 to 40 VLS cells, with a missile hump aft of the sail.

COUNTERING CHINESE CBG INGRESS IN THE INDIAN OCEAN

China's naval modernisation includes a growing fleet of Carrier Battle Groups designed to project power far beyond the Western Pacific into the Indian Ocean Region (IOR). By 2035, multiple Chinese CBGs are expected to transit the Malacca Strait into the Indian Ocean, challenging Indian naval dominance, threatening maritime trade routes, and potentially enabling coercive diplomacy against littoral states.

The Role of S5-Derived SSGN with BRAHMOS NG: Some of the roles envisaged for the SSGN in the IOR are enumerated below:

a. Forward Presence: The SSGN can covertly position itself along likely ingress routes such as the Strait of Malacca and Sunda Strait, undetected for extended periods and provide undisturbed intelligence, surveillance, and reconnaissance (ISR) inputs.

b. Precision Strike on High-Value Targets: With multiple BrahMos NG missiles onboard (potentially 30-40), the SSGN can launch salvo attacks on a Chinese CBG. BRAHMOS NG's supersonic speed and range allows the SSGN to strike

The threat of covert SSGNs imposes a strategic dilemma on Chinese commanders, forcing CBGs to allocate resources to ASW and anti-missile defences, potentially slowing their ingress and reducing operational freedom. This provides a critical area denial and disruption capability for the Indian Navy

from beyond the detection ranges of the ASW components of the CBG.

c. Area Denial and Disruption: The threat of covert SSGNs imposes a strategic dilemma on Chinese commanders, forcing CBGs to allocate resources to ASW and anti-missile defences, potentially slowing their ingress and reducing operational freedom.

d. ISR and Targeting Support: SSGNs could also act as critical nodes in a networked warfare environment, providing real-time targeting data to Indian Navy assets, Indian Air Force maritime patrol aircraft, and allied forces.

e. Deterrence through Ambiguity: Unlike surface strike groups or conventional attack submarines, a nuclear-powered SSGN with long-range cruise missiles presents a persistent, hard-to-locate threat that can hold critical Chinese assets at risk, thereby deterring CBG penetration.

f. Deploying the SSGN in the South China Sea: To Breach the Chinese A2/AD Umbrella and maintain strategic reach into the Western Pacific, including supporting freedom of navigation and monitoring PLA Navy movements.

SSBN TO SSGN CONVERSION - VALUE ADDITION AND STRATEGIC SIGNIFICANCE

The proposed SSBN to SSGN conversion has certain other strategic significances.

a. Force Multiplication and Deterrence: Converting the S5 SSBN hull into an SSGN equipped with BRAHMOS NG not only leverages India's indigenous strategic assets but also multiplies their operational utility. This hybrid platform enhances deterrence by adding a covert, potent strike capability that complements the strategic nuclear deterrent of SSBNs.

b. Cost-Effectiveness and Indigenous Capability: Repurposing the S5 hull is a cost-effective alternative to developing a new SSGN platform, accelerating deployment timelines. It also capitalises on India's advancing missile technology and nuclear propulsion expertise, reinforcing strategic autonomy.

c. Geopolitical Signalling: Deploying such SSGNs sends a clear message to regional actors and China about India's readiness to defend its maritime interests assertively and innovatively, balancing against China's growing blue-water navy.

BOTTOM LINE

By 2035, the strategic maritime landscape of the Indo-Pacific will be defined by high-stakes power projection and advanced A2/AD systems, primarily driven by China's ambitions. The conversion of the S5 SSBN hull into a BRAHMOS NG-armed SSGN presents a transformative opportunity for India to shape this environment proactively. In the Indian Ocean, such SSGNs can covertly counter and neutralise Chinese CBG ingress, bolstering India's maritime defence and regional leadership. In the South China Sea, they provide the strategic reach and strike power to breach Chinese A2/AD umbrellas, enhancing Indo-Pacific security dynamics.

While technical and geopolitical challenges remain, the strategic benefits of this conversion, from deterrence enhancement to operational flexibility and regional power projection, make the SSGN a potential cornerstone of India's naval modernisation and Indo-Pacific strategy, for 2035 and beyond.

–The writer is a veteran submariner. He contributes regularly to various defence journals and professional magazines. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

Q→NU

QNu Labs

PROACTIVELY QUANTUM

World's Only Full-Stack End-to-End Integrated Quantum Security Platform

qnulabs.com

Contact Us

email: info@qnulabs.com

tel: +91 80 4851 4013, +91 98860 41133

India USA Australia Global

UNLOCKING INDIA'S CIVIL-MILITARY TECH FUSION

India does not lack talent or institutions to propel its military advance, what it needs is to connect the civil and military engineering educational institutions with each other. The integration of military knowledge with the nation's civilian innovation ecosystem is no longer optional, it is imperative. Effectively leveraged, these institutions can emerge as powerful hubs of civil–military fusion, catalysing the development of indigenous defence technologies

BRIGADIER P S RAMESH, PhD

While Armed Forces Medical College (AFMC), Pune, is consistently ranked among India's top five medical colleges, the Indian Army's three premier military engineering institutions: College of Military Engineering (CME), Pune; Military College of Telecommunication Engineering (MCTE), Mhow; and Military College of Electronics and Mechanical Engineering (MCEME), Secunderabad have largely remained out of the spotlight. Given the legacy and academic strength of these pre-Independence institutions, they would easily rank among the country's top ten to fifteen engineering colleges. Each arm of the Indian Army has a dedicated institution providing specialised training in specific domains of warfare and technology, as illustrated in Table 1 on facing page.

The Indian Air Force and the Indian Navy also have similar highly specialised training institutions. These military institutions have the potential to serve as powerful fulcrums for civil–military fusion, contributing towards nation building. Ironically, they are amongst the military's best-kept secrets.

INDIAN ARMY'S ENGINEERING COLLEGES: HIDDEN CENTRES OF EXCELLENCE

Having had the privilege of being associated with MCEME both as a student and later as the dean of a faculty, I take great pride in its recognition as the Indian Army's best training establishment on the eve of Army Day 2026. MCEME's recognition as the overall second-best technical institution in India under the AICTE umbrella in 2020, along with the AICTE "New Education Code" award in 2021 and several other distinctions, stands as compelling testimony to its academic excellence. CME and MCTE operate in the same elite league.

Key strengths of these military engineering colleges producing techno-warriors include:

- Academic institutions imbued with the

Table 1: Selected Specialised Training Institutions of the Indian Armed Forces

Institution	Location	Primary Focus Area
National Defence College (NDC)	New Delhi	Strategic studies and national security for senior officers
College of Defence Management (CDM)	Secunderabad	Strategic management and defence resource management
Defence Services Staff College (DSSC)	Wellington	Joint operations, strategic studies, and leadership
Military Institute of Technology (MILIT)	Pune	Inter-service technical courses and military technology
Army War College	Mhow, Madhya Pradesh	Operational art and strategic studies
Armoured Corps Centre and School (ACCS)	Ahmednagar	Armoured warfare and tank operations
Mechanised Infantry Centre and School (MIC&S)	Ahmednagar	Training on Infantry Combat Vehicles (ICVs)
School of Artillery	Deolali (Nashik)	Artillery systems, gunnery, and firepower
Infantry School	Mhow	Specialised infantry tactics and training
College of Military Engineering (CME)	Pune	Military engineering and combat engineering
Military College of Telecommunication Engineering (MCTE)	Mhow	Communication technology and information systems
Military College of Electronics and Mechanical Engineering (MCEME)	Secunderabad	Electronics, mechanical, and aviation technology
EME School	Baroda	Weapon technology
Army Air Defence College (AADC)	Gopalpur	Air defence systems and operations
Army Service Corps Centre and College (ASC)	Bengaluru	Logistics, supply chain, and transport management
Military College of Materials Management (MCMM)	Jabalpur	Materials management and ammunition technology

Army's discipline, blending academic rigour with professional ethos.

- Meticulously crafted and regularly updated curricula tailored to the Indian Army's operational requirements within the framework of All India Council for Technical Education (AICTE).
- Army officers selected as instructors through a rigorous process based on academic credentials, course performance, and distinguished service.
- Dedicated civilian faculty bringing decades of experience to the classroom.
- Field-driven research and projects, with students working on real operational challenges sourced directly from the army.
- State-of-the-art infrastructure that few engineering institutions can match. For instance, MCEME houses a UAV lab equipped with MALE-class UAVs, including stripped-down sub-assemblies, components, and functional cut models, offering hands-on training, a luxury for India's top civilian institutes.
- Concept of integrated class rooms facilitating theoretical and practical training on weapon systems and equipment at a common facility.

These institutions deliver comprehensive engineering education through their M. Tech, B. Tech, and diploma programmes across multiple disciplines, complemented by customised short courses and upgradation programmes. They also prepare officers for competitive M. Tech admissions at leading institutes such as Indian Institute of Science (IISc) Bengaluru and the Indian Institutes of Technology (IITs), where their alumni have frequently distinguished themselves with gold and silver medals.

BUILDING A PRACTICAL FRAMEWORK FOR CIVIL–MILITARY FUSION

Creating Platforms for Innovation: Joint Conferences and Seminars

An annual or biannual conference focused on specific themes should bring together participants from the military, industry, investors, and importantly, engineering students. Military engineers can explain technology needs based on India's security challenges, while students can develop solutions with guidance from industry experts and support from investors. Such a forum can ignite a powerful synergy between defence imperatives and grassroots innovation, turning ideas into impact.

Sustaining Innovation: Collaborative Projects with Academia and Start-ups

Most academic programmes in military engineering institutions culminate in projects addressing operational challenges. However, time constraints and officer postings often limit their scope or leave them incomplete. Engaging nearby students and start-ups can provide continuity and help carry these projects to fruition. Industry support through sponsorship and production enablement, along with investor funding for start-ups, can further accelerate their transition from concept to deployment and scale.

Opening Knowledge Channels: Military Journals as Innovation Bridges

CME, MCTE, and MCEME publish high-quality quarterly journals that disseminate defence-focused engineering advances. These peer-reviewed platforms feature technical papers, case studies, and insights

Effectively leveraged, these distinguished military institutions can emerge as powerful hubs of civil–military fusion, catalysing the development of indigenous defence technologies and providing decisive momentum to the vision of an Aatmanirbhar Bharat

bridging training, research, and army field applications. While a portion of the journals remains classified, unclassified technical content could be shared securely with civil academia and industry via password-protected access. Such access would offer clearer insight into the Army's technological priorities, guiding more aligned and purposeful R&D. Encouraging contributions from academia and industry would further enrich these journals, transforming them into effective bridges between military needs and the broader innovation ecosystem.

Unlocking Research: Military Theses as a Strategic Knowledge Resource

M. Tech programmes at CME, MCTE, and MCEME are affiliated with Jawaharlal Nehru University (New Delhi), Jawaharlal Nehru Technological University (Hyderabad), and other prestigious institutions. For the award of the degree, officers are required to submit theses on unclassified, publicly accessible topics, often linked to military applications. This vast, underutilised research body from military officers could guide students and industry toward focused R&D and impactful innovation.

FROM FRAGMENTED MoUs TO STRATEGIC PARTNERSHIPS

Fragmented collaborations between military institutions and civil academia, largely through MoUs, remain episodic and lack the continuity and institutional depth needed to drive meaningful innovation. This leaves significant potential untapped in advancing military technology and nation-building. There is a compelling case for a more cohesive and structured framework, one that systematically integrates techno-warriors with the Ministry of Education, the headquarters of the Indian Army, Navy, and Air Force, and industry bodies such as the Society of Indian Defence Manufacturers (SIDM). Such an architecture would strengthen research continuity, align academic work with operational needs, and promote industry participation, thereby accelerating self-reliance in defence technology.

UNLOCK THE ARSENAL

Defence Services Staff College (DSSC), Wellington is widely regarded as one of the finest joint services institutions in the world. It trains selected Indian officers from all three services as well as officers from advanced nations such as the United States, United Kingdom, Australia, Japan, and several other friendly countries. Few academic institutions in the country can claim such international participation and reputation. As part of its curriculum, students submit a research thesis or dissertation on strategic, security, or operational issues to University of Madras for the award of an M.Sc. in Defence and Strategic Studies. Many of these theses provide the intellectual foundation for doctrinal innovation and the adoption of new technologies within the armed forces. For those engaged in developing military technologies, the research repository of DSSC offers valuable, insight-rich material, yet it remains largely invisible to the civil domain.

In an era where technological superiority increasingly defines military power, the integration of military knowledge with the nation's civilian innovation ecosystem is no longer optional, it is imperative. Effectively leveraged, these distinguished military institutions can emerge as powerful hubs of civil–military fusion, catalysing the development of indigenous defence technologies and providing decisive momentum to the vision of Aatmanirbhar Bharat. India does not lack talent or institutions; it only needs to connect them.

–The writer is an Army veteran and amongst the pioneers of Unmanned Aircraft Systems (UAS) in India with over 23 years of active association with the technology including a doctorate on UAS. He is currently working as the CEO, Rovonize Systems. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

INTERNATIONAL FIRE INDIA 2026 EXHIBITION & CONFERENCE

28TH 29TH 30TH SEPTEMBER 2026

DELHI

Yashobhoomi, India International Convention & Expo Centre, Dwarka, New Delhi

OVER 60% OF LARGE INFRASTRUCTURE Projects demand advanced Fire & safety systems Fire India 2026

PUTS YOUR SOLUTIONS IN FRONT OF ACTIVE BUYERS

BOOK YOUR SPACE NOW!

ORGANISED BY

SI SERVICES INTERNATIONAL

Institution of Fire Engineers India

Founded 1973

SUPPORTING ASSOCIATION

fpai

INTERNATIONAL EVENT PARTNERS

FIRE AUSTRALIA2026

Fire EXPO KOREA 2026

MEDIA PARTNERS

INDUSTRIAL SAFETY REVIEW

FIRE & SAFETY

LIFE SAFETY & SECURITY

FIREWORLD

ASIA PACIFIC FIRE

SAFE SECURE

DV

FOR DETAILS CONTACT

+91 9711361839

dkushwaha@servintonline.com

011-45055577

www.fireindia.net

IRAN-US-ISRAEL WAR'S NAVAL LESSONS

The Iran–US–Israel conflict has become a live laboratory for 21st-century naval warfare—where swarms of cheap drones outmanoeuvre billion-dollar destroyers, commercial ships become military targets, and the unseen, not the big, survives

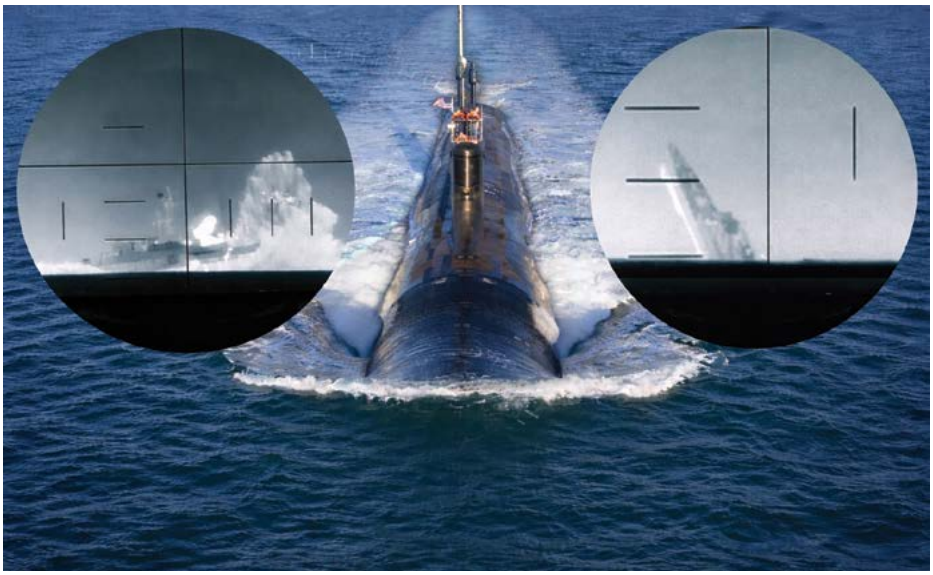
CDR SUMIT GHOSH

"War is the ultimate realisation of modern technologies, tactics and strategies to be adopted"

Decades of hostility, especially after Iran's 1979 revolution, fuelled tensions with the US and Israel. Disputes over Iran's nuclear program, missile development, and regional influence intensified. The 2018 US withdrawal from the nuclear deal and failed negotiations worsened relations. After Israel and Iran clashed in 2025, tensions escalated. Finally, on 28 February 2026, the US and Israel launched major strikes on Iran, triggering retaliation and full-scale war. Naval battles in the ongoing 2026 US–Iran–Israel war have been intense, especially around the Strait of Hormuz. Early strikes destroyed much of the Iranian Navy (over 60 vessels hit and many sunk); its surface fleet was obliterated, severely weakening its sea power. However, Iran continues targeting shipping and blocking key routes, causing global disruption. U.S. and Israeli forces also faced losses, including damaged ships and casualties, but overall, Iran suffered heavier naval losses, yet still poses threats through missiles, drones, and maritime disruption tactics.

The ongoing conflict in the Persian Gulf and wider West Asian theatre has now rapidly evolved into a defining case study in modern naval warfare. What began as a coordinated air and missile campaign has expanded into a multi-domain maritime contest involving drones, mines, asymmetric tactics, and disruption of global sea lanes. Key aspects of the Indian Navy's involvement in the ongoing US–Iran–Israel war include protection of energy routes to ensure uninterrupted energy supplies to India, maritime security operations safeguarding against threats like blockades and attacks, the neutral stance to avoid direct military involvement, and the rescue and humanitarian roles in these situations.

A US Navy submarine carried out a torpedo strike that sank an Iranian warship in the Indian Ocean, off the southern coast of Sri Lanka. The attack marked the first time an enemy vessel had been sunk by a submarine torpedo since the Second World War. This act signified that warring nations can engage targets anywhere in the world, and not only in conflict zones. Hence, for the Indian Navy tasked with safeguarding varied national maritime interests across the Indian Ocean Region (IOR), this conflict offers critical strategic, operational, technological, and doctrinal lessons.



The Indian Navy must transition from a platform-centric force to a network-centric, technology-driven, and resilient maritime power. Large surface combatants are now a thing of the past. Whatever is visible is destructible. Only the hidden, the mobile, the smaller, the faster, and the quieter will survive modern conflicts

As the war rages on, the important concepts coming to the fore are:

Centrality of Maritime Chokepoints

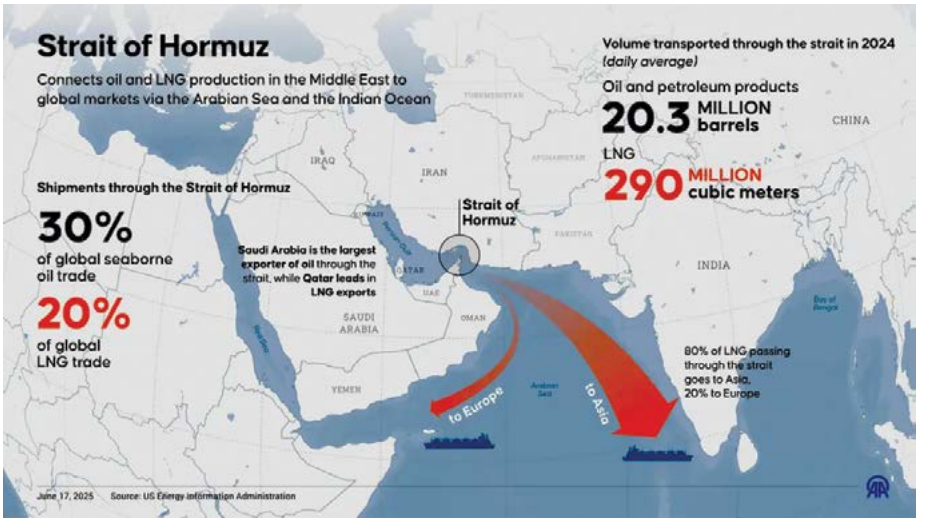
The conflict has reaffirmed the strategic vulnerability of critical chokepoints, particularly the Strait of Hormuz, through which nearly one-fifth (20 per cent) of the global oil trade passes. The war has demonstrated how even a relatively weaker naval power like Iran can threaten global energy flows through denial strategies, including mining, harassment, drone and missile strikes. For India, whose energy lifelines traverse similar chokepoints such as the Strait of Hormuz, Bab el-Mandeb, and the Sunda and Malacca straits, the lesson is clear: sea control is not absolute, and sea denial by adversaries can have highly disproportionate strategic effects. The Indian Navy must enhance its capacity for chokepoint monitoring, rapid mine countermeasure (MCM) deployment, and convoy protection operations.

Asymmetric Warfare & Dominance of the "Small and Smart"

Iran's naval doctrine centred on swarm tactics using fast attack craft, naval mines, and increasingly unmanned systems has proven resilient even under sustained US and Israeli strikes with proven and costly, technologically advanced systems. Despite the obliteration of its Navy and destruction of significant portions of its conventional fleet, Iran continues to pose a credible threat using low-cost, high-impact systems such as drones and missile boats. The Indian Navy, traditionally oriented toward blue water operations with large platforms like aircraft carriers and destroyers, must internalise the growing importance of distributed lethality. Smaller, networked, and autonomous platforms can complicate adversary targeting and enhance survivability in high-threat environments.

Unmanned Systems: The New Maritime Frontier

One of the most significant developments in the conflict is the deployment of unmanned surface vessels (USVs) and drone boats. The US has operationalised autonomous reconnaissance and potential strike platforms capable of extended patrols and swarm operations. Simultaneously, Iran has effectively used inexpensive drones to target commercial shipping and military assets, highlighting the democratisation of maritime strike capabilities. This underscores a vital lesson: the future navy will be hybrid (manned and unmanned). India must accelerate its indigenous development of



The Persian Gulf today offers a glimpse into the Indian Ocean's possible future—chokepoint denial, AI-driven unmanned swarms, and hybrid warfare below the threshold of full-scale war. For the Indian Navy, adaptation is no longer optional

unmanned maritime systems, including USVs, Unmanned Underwater Vehicles (UUVs), and AI-enabled surveillance networks. Integration of these systems into fleet operations will be essential for maintaining Maritime Domain Awareness (MDA) and countering asymmetric threats.

Attack on Commercial Shipping

The conflict has blurred the line between civilian and military domains. Iranian targeting and harassment of commercial vessels, regardless of their flag, has created a high-risk maritime environment, affecting global trade and insurance markets. For India, which relies heavily on maritime trade, this raises the imperative of naval diplomacy and escort operations. The Indian Navy's past experience in anti-piracy missions in the Gulf of Aden provides a template, but future operations will require higher-end capabilities, including electronic warfare, cyber defence, and integrated air defence to protect merchant shipping.

IW and Electronic Disruption

Another critical dimension of the conflict has been the extensive use of electronic warfare, including GPS spoofing and communications disruption in the Gulf. These tactics degrade navigation, targeting, and coordination, especially for technologically dependent navies. The Indian Navy must invest in indigenous, resilient navigation systems, redundancy in communication networks, and robust electronic warfare capabilities. Our alternatives to GPS, such as NavIC, should be fully integrated into naval operations to reduce vulnerability.

Precision Strikes versus Strategic Resilience

The US and Israel have conducted extensive precision strikes targeting Iranian missile bases, naval assets, and industrial infrastructure. While these strikes have significantly degraded Iran's capabilities, they have not eliminated its ability to retaliate. Iran has adapted by decentralising operations and shifting to mobile launch platforms. This highlights a crucial lesson that 'destruction of assets does not equate to neutralisation of capability.' The Indian Navy must plan for adversaries who can absorb initial shocks and continue operations through dispersion and redundancy. It should also seriously implement such a strategy in its bases, its logistics, weapon storage and launch systems.

Joint and Multi-Domain Ops

The conflict has demonstrated high levels of integration between air, naval, cyber, and intelligence assets, particularly on the US-Israeli side. Targeting Iranian

naval infrastructure has relied heavily on intelligence fusion and precision airpower. For India, this reinforces the importance of joint theatre commands and seamless integration between the Navy, Air Force, and space assets. Maritime operations can no longer be viewed in isolation; they are part of a broader multi-domain battlespace.

Leadership Targeting and Decapitation Strategies

The targeted killing of senior Iranian naval commanders has been a notable feature of the conflict, aimed at disrupting command and control. While such actions can create temporary disarray, they do not necessarily cripple institutional capabilities. The Indian Navy must ensure robust command continuity frameworks, including decentralised command structures and secure communication channels, to maintain operational effectiveness under attack.

Logistics and Sustained Operations

The prolonged nature of the conflict underscores the importance of logistics and sustainment. Operating in high-threat environments with disrupted supply chains requires robust logistical planning and forward deployment capabilities. India's focus on developing overseas logistics agreements and bases such as in Duqm (Oman) and Assumption Island (Seychelles) should be expanded to ensure persistent presence and rapid response capability across the IOR.

For India, these implications are significant. The Indian Navy must transition from a platform-centric force to a network-centric, technology-driven, and resilient maritime power

STRATEGIC IMPLICATIONS FOR INDIA

The Iran–US–Israel conflict is not merely a regional war; it is a preview of future maritime conflicts characterised by:

1. Hybrid warfare combining conventional and asymmetric tactics
2. Proliferation of unmanned and AI-driven systems
3. Targeting of economic and civilian infrastructure
4. Persistent grey-zone operations below the threshold of full-scale war

For India, these implications are significant. The Indian Navy must transition from a platform-centric force to a network-centric, technology-driven, and resilient maritime power. Large surface combatants are now a thing of the past. Whatever is visible is destructible. Only the hidden, the mobile, the smaller, the faster, and the quieter will survive modern conflicts.

"A good Navy is not a provocation to war. It is the surest guarantee of peace."
— Theodore Roosevelt

TAKEAWAYS

The lessons emerging from the Iran–US–Israel war are stark and immediate. Control of the seas is increasingly contested, not just by major powers but by determined regional actors employing innovative and asymmetric strategies. The Indian Navy must adapt to this evolving reality by embracing unmanned technologies, enhancing joint-ness, securing maritime trade, and preparing for high-intensity, multi-domain conflict. In an era where the distinction between war and peace is increasingly blurred, the ability to anticipate and adapt will define maritime superiority. The Persian Gulf today offers a glimpse into the Indian Ocean's possible future, and the time to prepare is now.

–The writer is a former Indian Navy Submarine Officer. He is a specialist in missiles, underwater weapons, sensors, anti-submarine warfare, and is a deep sea diver. He writes regularly on strategy, tactics, warfare and modern military technologies. He is an active member of national strategic think tanks, such as the USI, the Chakra Foundation, and STRIVE. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

"AS A TRUSTED INDIAN DEFENCE SIMULATION COMPANY, TECKNOTROVE IS COMPETITIVE WITH GLOBAL OEMS"

Tecknotrove is a leading provider of technology-enabled training solutions. With the successful execution of more than 1,500 projects globally across industries, it has emerged as a leader with a key focus on innovation in simulation, AI, robotics, and futuristic technologies.

In a candid conversation with Raksha Anirveda's Editor; Shantanu Gupta—founder and managing director of Tecknotrove Systems—spoke at length in his impactful and eloquent style. He offered insights into the company's innovation-led growth trajectory, strategic market expansion, product development, and focus on sustainability, while consolidating its leadership position in this challenging and competitive market. Edited excerpts:

RA: As a pioneer in VR and AR simulation technologies in India, what emerging trends in simulation like AI integration or immersive metaverse training, do you see shaping the future of defence and aviation training over the next five years?

SG: Recognised as a pioneer in simulation technologies in India, I believe we are entering a decisive phase where immersive simulation is no longer an adjunct to training. Simulation is becoming the core infrastructure of defence and aviation readiness. Over the next five years, several transformative trends will redefine how forces plan, train, adapt, and operate. Simulation is serving the need for repeatable, high-risk scenario training and research without real-world consequences, making it both safer and more scalable.

This is particularly important for countries like India, where maximising readiness with constrained resources

is critical. The evolution of simulation is increasingly being driven by the need to replicate not just platforms, but operational complexity and decision environments.

Simulation technologies are rapidly growing from individual standalone systems to multiplayer mode enabling crew and group level trainings. At the same time, immersive and networked environments enable distributed training across locations, allowing multiple stakeholders to participate in a shared synthetic environment and train together. Artificial intelligence is also increasing by enabling adaptive, non-templated training scenarios, where systems respond intelligently to user actions.

Overall, the emphasis is surely shifting from isolated simulation to integrated, scalable ecosystems, where immersive realism elevates training standards.

RA: Tecknotrove has expanded into multiple sectors like aviation, mining and construction with domain-specific simulators. How do you plan to scale these solutions globally?

SG: Scaling simulation solutions globally requires a balance between standardisation, innovation and contextual adaptability. While core technologies can be developed with a global outlook, their deployment must reflect local operational realities, regulatory frameworks and training philosophies.

With our experience working across industries globally, we have worked on these aspects and specialise in curating customised and effective solution as per the needs of our clients. Our solutions are modular, interoperable and scalable. This approach has helped us in expanding our portfolio.

Over the years we have designed manufactured and deployed customised simulation solutions across 35+ countries, serving corporates, OEMs,

Our cloud-based TMS is our backbone for global expansion. It is a unique platform that is designed to enable scalable, connected training by integrating simulators, VR systems, and testing environments on a single framework. We are continuously working on upgrading this system to integrate more technologies and create a comprehensive learning environment

governments, and training institutes across sectors like aviation, mining, construction, defence, logistics, oil & gas, and nuclear. That foundation gives us enormous confidence but also responsibility.

We are now looking at technology as a core multiplier. We are actively investing in technologies like AI and machine learning to enhance simulation accuracy, cloud-based simulation platforms, digital twin technologies, and advanced sensor systems. These they directly reduce the cost and complexity of deploying solutions in new geographies and bring scale.

Tecknotrove has been an IP driven company for 20 years. All our development is based on sovereign technology and design-led indigenisation, where core system architecture, software frameworks and integration capabilities are developed indigenously by us in a scalable manner to allow for future upgrades

Our cloud-based TMS is our backbone for global expansion. It is a unique platform that is designed to enable scalable, connected training by integrating simulators, VR systems, and testing environments on a single framework. We are continuously working on upgrading this system to integrate more technologies and create a comprehensive learning environment. This is the infrastructure layer that ties everything together whether you're a mining company in Australia or an airport authority in the Middle East.

We are very focused on expanding our defence product portfolio for the global market. Earlier this year, Tecknotrove was part of delegation for various global seminar and events organised by the Indian Defence Organisations, building connections for defence manufacturing and global trade. Especially for the defence industry, we are looking at early and active collaboration with original equipment manufacturers which plays a critical role in ensuring that new technologies are compatible, deployable, and adopted at scale.

RA: With India's push for 'Make in India' in defence tech, what have been the biggest hurdles in localising advanced simulation hardware and how has Tecknotrove overcome supply chain dependencies on global components?

SG: Tecknotrove prides itself on its 100% indigenous setup with state-of-the-art in-house manufacturing and R&D capabilities. Make in India was a strategic decision made early on in 2005 by Tecknotrove. We invested in building capabilities in-house that others outsourced, specifically so we would never be held hostage by a foreign supplier mid-project. Our software, simulation engines, scenario design tools, and mechatronics are all developed internally.

Today we have built and operate India's largest simulator manufacturing and DSIR recognised R&D facility, situated in Gujarat which allows us to manufacture at scale and with the quality standards that defence demands. We have demonstrated our Make in India capability by executing over 1,500 + simulation projects in over 35 countries across industries like Aviation, Automotive, Mining, Law Enforcement, Police and Defence.

Tecknotrove has been an IP driven company for 20 years. All our development is based on sovereign technology and design-led indigenisation, where core system architecture, software frameworks and integration capabilities are developed indigenously by us in a scalable manner to allow for future upgrades. This approach has not only reduced external dependency for us but also facilitated complete lifecycle management.

We safeguard our Make in India innovations through patents, trademarks, and copyrights, and collaborate with industry partners, academic institutions, and start-ups to

accelerate future-focused development. As we expand globally, our IP portfolio is what prevents commoditization and keeps us differentiated from our domestic and international competitors.

The way forward has been to focus on sovereign technology and design-led indigenisation.

RA: Your simulators, such as those for aviation pushback and truck driving, emphasise realism. Can you share a recent innovation in real-time data integration that's enhanced training outcomes for clients?

SG: Innovation and Product development is not something we do, it's in the DNA of Tecknotrove. One of our most impactful recent innovations is the integration of AI in our simulation systems. AI integration has allowed us to merge real-time performance data and analytics into the simulation loop, transforming simulators from static systems into adaptive, intelligent training platforms. Today, the focus is not just on realism, but on how effectively systems measure, personalise, and continuously improve training outcomes.

At Tecknotrove, we are advancing further through developing digital twins that are integrated with real-time machines and systems, creating living virtual environments that mirror real-world operations. This enables predictive planning, dynamic scenario adaptation, and precise synchronisation between physical feedback and simulation.

Equally important is our latest software upgrades to data capture and after-action analytics, which shifts training from experience-based to evidence-based performance evaluation. The result is smarter decision-making, safer operations, and highly efficient, data-driven training ecosystems.

At Tecknotrove, we are advancing further through developing digital twins that are integrated with real-time machines and systems, creating living virtual environments that mirror real-world operations. This enables predictive planning, dynamic scenario adaptation, and precise synchronisation between physical feedback and simulation

RA: How is Tecknotrove incorporating sustainable practices into simulator manufacturing and what measurable impact have your solutions had on reducing real-world training costs and risks?

SG: We believe that every simulator is a Sustainability Instrument. Simulators replace live equipment training. Every time a soldier trains on a Tecknotrove simulation platform instead of a live weapon, missile or military tank we are eliminating ammunition waste, fuel burn, eliminate carbon footprint, equipment wear, and the risk of injury or death. That is sustainability at its most direct and measurable. Every one of those training hours replace the real-world equivalent that would have consumed fuel, risked equipment, or endangered a trainee.

Defence training around the world is moving towards integrated training and wargaming solutions. With integrated simulation training centres, we are able to offer a complete strategic training environment with measurable results speak clearly: ISTC not only helps the defence forces, it prepares teams for rare and mission-critical situations that are difficult to replicate in real life. It also trains the forces to operate as a team where Army, Navy and Air Force can plan and rehearse together; supports scalable training across large, geographically distributed operations. This is where the real substantiality comes in.

In addition, our manufacturing philosophy reinforces this through energy-efficient electric actuator motion systems, interchangeable convertible kit architectures that minimise hardware waste, and dedicated EV training simulators that support India's green mobility

transition. Recognised with the Aegis Graham Bell Award for Innovation in Immersive Experiences, Tecknotrove's ultimate sustainability metric is simple: accidents prevented, emissions avoided, and workers and soldiers who go home safely every single day.

At Tecknotrove, sustainability is embedded in our core mission. Every simulator we build directly impacts sustainability at a global level and with over 5 million people trained across 1,500+ projects in 35 countries, the impact is enormous in scale.

> **"We chose to build critical capabilities in-house rather than outsource, ensuring full control over execution and eliminating dependency on foreign suppliers, so no project is ever at risk of disruption midstream"**
>
> **Shantanu Gupta, Founder and Managing Director, Tecknotrove Systems**

RA: As a growing simulation company, how do you attract and retain top talent in a competitive tech landscape and what role does Tecknotrove play in upskilling India's workforce through your own training programmes?

SG: The simulation domain sits at the intersection of multiple disciplines engineering, design, data science and domain expertise making talent development a challenge. Tecknotrove attracts talent primarily through the nature and purpose of the work itself. The organisation offers a unique work environment where creative minds work together with a fresh approach on projects that make news, inspiring each other to redefine the standards of virtual reality. Exposure to complex, real-world problem statements and emerging technologies is another reason why many young creative minds are looking to becoming a part of Tecknotrove team

We have passionate people in our team who align with our vision and philosophy of continuous innovation to develop world-class systems that solve real problems

Equally important for us is continuous upskilling. We believe that organisations in the technology space have a responsibility to contribute to the ecosystem by creating structured learning pathways, hands-on training exposure and industry-academia collaboration. We invest in upskilling our team to ensure we are ahead of the curve at all times.

RA: The Indian simulation market has evolved over the past few years and is increasingly becoming competitive. What's your business outlook for next two years? How do you plan to strengthen Tecknotrove brand positioning in near future?

SG: The Indian defence simulation market is entering a phase of strategic maturity, driven by defence modernisation, increased platform complexity, and a strong push for indigenisation under Aatmanirbhar Bharat. Over the next two years, Tecknotrove expects sustained growth in demand for high fidelity, networked, and mission oriented simulation solutions across the armed forces. As training priorities shift toward readiness, realism, and cost efficiency, indigenous players with proven domain expertise and lifecycle support capabilities are well positioned to lead this transition.

At Tecknotrove, sustainability is embedded in our core mission. Every simulator we build directly impacts sustainability at a global level, and with over 5 million people trained across 1,500+ projects in 35 countries, that impact is enormous in scale

We believe that Defence Simulation is transforming from being a niche capability to becoming a mainstream training and operational enabler. Increased policy focus, coupled with growing awareness across sectors, is expected to drive sustained demand over the next few years. In this environment, differentiation will be less about individual products and more about the ability to deliver integrated, scalable and future-ready training ecosystems.

Tecknotrove is creating an architecture to integrate Live, Virtual and Constructive (LVC) training to facilitate seamless training across different levels, types of combat unit and hierarchies to address real-life challenges of the Indian Armed Forces.

We are strengthening our positioning as a complete defence training solutions provider, covering:

- Basic to high-fidelity simulators
- Crew, unit, and collective training solutions

- Mission rehearsal and Wargaming solutions
- Post-exercise analytics and performance assessment
- Long-term lifecycle support and upgrades

We believe that this integrated approach is increasingly valued by the Defence forces. Tecknotrove's vision is to become an end-to-end defence training partner rather than a standalone simulator provider. In the next two years Tecknotrove aims to reinforce its image as a trusted Indian defence simulation company, competitive with global OEMs and committed to long term capability development.

RA: Reflecting on your two decades of journey, do you think Make in India, Aatmanirbhar Bharat and Viksit Bharat initiative by the government has made positive impact on the domestic defence sector? Kindly highlight the key takeaways. Also share you views on the upcoming DAP reform.

SG: Initiatives such as 'Make in India' and 'Aatmanirbhar Bharat' have played a significant role in shifting the focus towards indigenous capability development and greater private sector participation. They have also helped create a more structured and forward-looking procurement environment.

The key takeaway has been the importance of building long-term domestic capability rather than short-term acquisition. Going forward, DAP reforms can further strengthen the ecosystem by simplifying processes, reducing timelines and creating stronger incentives for innovation-driven development

The key takeaway has been the importance of building long-term domestic capability rather than short-term acquisition. Going forward, DAP reforms can further strengthen the ecosystem by simplifying processes, reducing timelines and creating stronger incentives for innovation-driven development. A balanced approach that combines procedural clarity with encouragement for emerging technologies will be critical in sustaining momentum.

In the longer term, I believe that the country has to graduate from the L1 System to a L1-Q1-I1 (cost-quality-indigenous) wherein specifications, cost and indigenisation guide procurement.

BUILDING RELIABILITY: THE CASE FOR SELF-RELIANCE

AKSI Aerospace is translating Aatmanirbharta into reality with its strategic move towards strengthening control over what lies beneath the platform: flight controls, energy systems, structural components, propulsion, and payload stability—thus reducing external dependency

PANKAJ AKULA

As UAV systems expand across defence, agriculture, infrastructure and logistics, the measure of a platform is shifting _ from what it can do, to how reliably it continues to do it. For India's UAV ecosystem, that distinction will define the next phase of growth.

For a long time, the primary question in unmanned aviation was straightforward: can the system perform? How much can it carry? How far can it fly? These were the right questions for a sector still establishing its role. That phase has now evolved. The emphasis today is no longer solely on performance, but on continuity _ on whether a system can keep operating when conditions are not ideal, when components are delayed, or when external support is not immediately available.

This shift is becoming visible across sectors. In agriculture, operations are bound by narrow time windows, and a delay caused by a battery failure or a missing part can disrupt entire schedules. In industrial inspection, even minor inconsistency in output reduces the reliability of data. In logistics, predictability is not optional; small variations, when accumulated, make systems difficult to scale. In each case, the question is no longer whether the drone can perform, but whether the system can continue to perform.

This is where dependency begins to matter. Many UAV systems rely on subsystems and components that originate outside direct control. When conditions are stable, that model holds. But when access becomes uncertain, through supply-chain disruption, export constraints, or geopolitical pressure, even small dependencies can affect operations disproportionately.

This is also where Aatmanirbhar Bharat takes on a more practical meaning. Self-reliance is not defined by where a system is assembled. It is defined by how much of it remains within control when conditions change: the ability to build, support, and adapt systems domestically without being constrained by external sources. That brings the focus to what lies beneath the platform: flight control, energy systems, structural components, propulsion, and payload stability. When these layers depend heavily on external inputs, reliability becomes conditional rather than assured.

A shift is therefore visible in how capabilities are being developed. At AKSI Aerospace, this has translated into a deliberate move towards strengthening control across each of these underlying layers. Flight control is one such area: the KKA Autopilot, developed under the KKAP Drone Autopilot programme, enables system behaviour to be managed internally,

Actual Images of Machines inside the factory

Self-reliance is not defined by where a system is assembled. It is defined by how much of it remains within control when conditions change




allowing UAVs to be adapted to different conditions without dependence on external frameworks.

Energy systems form another critical layer. Through LiHi Smart Batteries, battery systems are developed and manufactured in-house, with the flexibility to customise specifications based on specific operational requirements. This improves predictability across cycles and reduces exposure to external supply constraints. Structural and propulsion capabilities are being built through Roboclave Composites and Motopropel Technologies, with a focus on durability and consistency over repeated use, areas where limitations tend to surface only during sustained operations.

Imaging and payload systems follow the same logic. Through DroneOwl, the focus is on ensuring stable and reliable data capture, particularly in applications where accuracy is not negotiable.

Alongside technology, a parallel gap continues to emerge in how systems are operated. There remains a meaningful difference between certification and operational readiness. Holding a licence does not necessarily prepare an operator for real-world conditions, where variability is constant and responses must be instinctive. This is where training becomes an integral part of the system itself. Through the AKSI Drone Training Academy, the focus is on practical exposure rather than procedural compliance alone, enabling operators to handle systems independently and respond effectively to changing conditions. In agriculture, this extends further through free training initiatives for farmers, ensuring that access to drones is matched by the ability to use them effectively. Without that, adoption remains limited regardless of availability.

The operating environment is unlikely to become more predictable. Supply chains will continue to evolve, and access to critical technologies may remain uneven. In such a context, systems that rely heavily on external inputs will face increasing constraints, while those that operate with greater independence will be better positioned to adapt, sustain performance, and continue functioning when it matters most.

For India, this direction is becoming increasingly clear. The strength of its UAV ecosystem will not be defined only by what it can build, but by how independently those systems can be sustained, adapted, and relied upon over time.

Pankaj Akula and AKSI Aerospace Team with Governor of Telangana, Shiv Pratap Shukla, discussing the role of 'Make in India' in advancing self-reliance in drone manufacturing

Each layer that is brought within control reduces dependency & strengthens reliability. Systems that operate with greater independence will be better positioned to adapt & sustain performance over time

The AKSI team, led by Pankaj Akula, met with the Governor of Telangana, Shiv Pratap Shukla, for a focused discussion on self reliance in UAV systems. The interaction highlighted the importance of building strong domestic capabilities across critical components. As the sector grows, the ability to operate independently is becoming key to reliability. The discussion reflected a shared intent to strengthen India's self reliant and future ready drone ecosystem.

–The writer is Group Managing Director, AKSI Aerospace Group. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

AI AND FUTURE BATTLEFIELD: BUILDING INVISIBLE SHIELD FOR SOLDIERS

Artificial Intelligence is likely to become the most powerful protective force ever introduced into warfare, an invisible shield between soldiers and the chaos of battle. AI will not replace the soldier. Instead, it will ensure that more soldiers return home safely

ANURAG ASTHANA

"In the midst of chaos, there is also opportunity." – *Sun Tzu*

From the trenches of Eastern Europe to the dense urban battlefields of the Middle East, modern warfare is evolving at a speed rarely seen in history. The ongoing Russia-Ukraine War and the continuing conflicts involving the Israel Defence Forces across the Middle East have revealed a new reality: wars are no longer fought only with tanks, artillery, and infantry formations. Algorithms, autonomous systems, and real-time intelligence networks increasingly shape them.

On these battlefields, drones identify targets, satellites track troop movements, and artificial intelligence (AI) systems analyse vast streams of intelligence in seconds. Soldiers are no longer isolated actors navigating uncertainty alone; they are increasingly supported by intelligent digital systems that anticipate threats before they materialise.

For centuries, soldiers have operated under what the Prussian strategist Carl von Clausewitz described as the 'fog of war' — a battlefield environment defined by confusion, limited visibility, and incomplete information. Today, Artificial Intelligence (AI) offers the possibility of dramatically thinning that fog.

Beyond its often-discussed role in enhancing military power, AI carries a deeper and more humane promise: protecting soldiers by transforming how risk, intelligence, and decision-making operate in war. In effect, AI is enabling the creation of an invisible digital shield around the soldier.

FROM THE FOG OF WAR TO ALGORITHMIC AWARENESS

Clausewitz argued that uncertainty is intrinsic to warfare. Commanders must make decisions under immense pressure, often with incomplete information and limited situational awareness.

Modern battlefields generate unprecedented volumes of data. Satellites capture high-resolution imagery, surveillance drones patrol contested areas, ground sensors detect movement, and electronic intelligence systems monitor communications across the electromagnetic spectrum.

The challenge today is not the absence of information — it is the overwhelming abundance of it.

Artificial Intelligence addresses this challenge by rapidly analysing large datasets and identifying patterns that are invisible to human analysts. Machine learning systems can detect unusual troop movements, identify concealed weapons systems, analyse terrain vulnerabilities,

and predict potential enemy actions.

Instead of responding to danger after it appears, AI enables commanders and soldiers to anticipate threats and avoid them altogether.

In this sense, AI represents one of the most important advances in military history — not simply because it enhances combat capability, but because it reduces uncertainty and improves the survivability of soldiers.

THE RISE OF THE COGNITIVE BATTLEFIELD

Modern warfare increasingly unfolds within what military strategists call the cognitive battlefield — a domain where information superiority and decision speed are as decisive as physical firepower. Artificial intelligence acts as a cognitive force multiplier, integrating intelligence across land, sea, air, space, and cyber domains.

For soldiers on the ground, this intelligence may soon be delivered through AI-enabled tactical systems such as smart helmets, augmented reality displays, and digital battlefield interfaces. These technologies can highlight safe routes, identify hostile positions, and provide continuous updates on battlefield conditions.

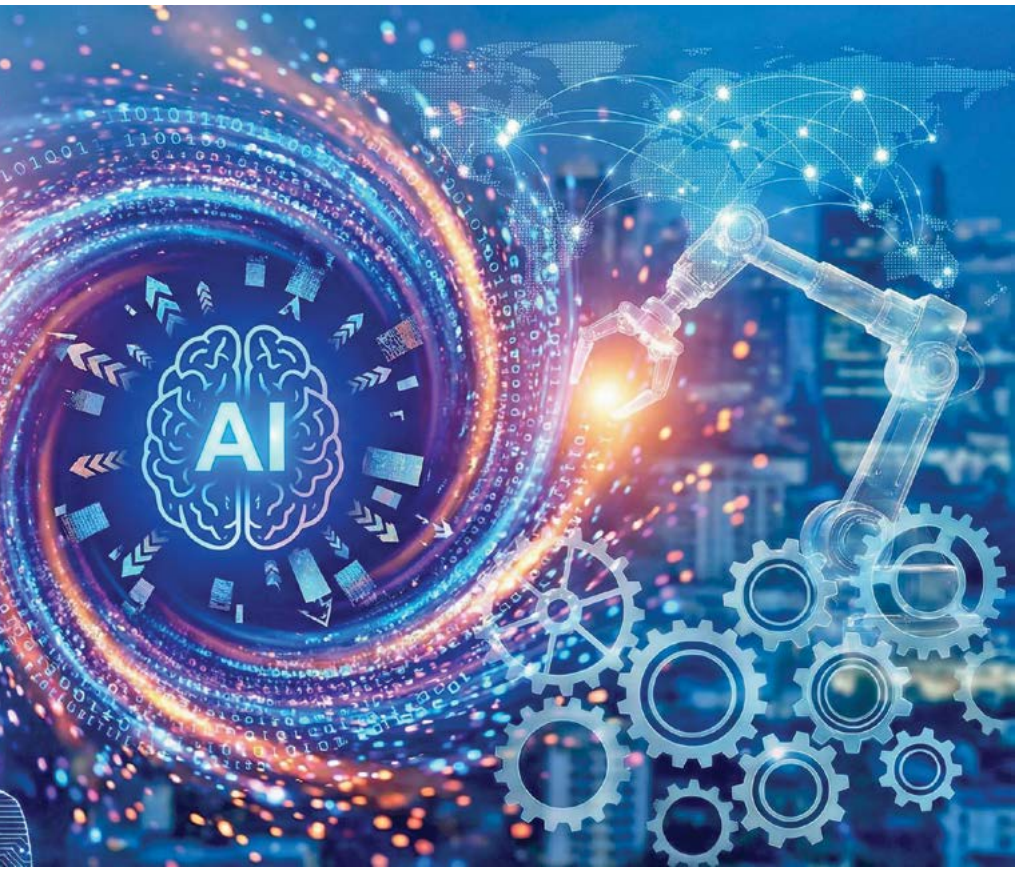
Imagine a soldier navigating unfamiliar terrain while an AI system continuously analyses satellite imagery, drone feeds, and ground sensors. The system alerts the soldier to potential ambush points, sniper locations, or hidden explosive devices.

In such scenarios, AI functions as a constant digital sentinel, dramatically improving situational awareness and reducing battlefield risk.

AUTONOMOUS SYSTEMS: DELEGATING RISK TO MACHINES

Perhaps the most immediate way artificial intelligence saves soldiers' lives is by delegating the most dangerous tasks to machines. AI-powered drones, robotic vehicles, and autonomous surveillance platforms are increasingly capable of performing missions traditionally carried out by soldiers in hazardous environments.

For centuries, soldiers have operated under what the Prussian strategist Carl von Clausewitz described as the 'fog of war', a battlefield environment defined by confusion, limited visibility, and incomplete information. AI offers the potential of thinning the fog



These missions include reconnaissance in hostile areas, explosive ordnance disposal, urban surveillance, and logistics transport through contested territory. Robotic systems can enter buildings suspected of containing explosives. Autonomous drones can scout enemy positions before troops advance. AI-driven vehicles can transport supplies without exposing human drivers to ambush.

Each such deployment represents a fundamental shift in military risk management. Machines absorb danger so that soldiers do not have to.

Strategic thinker Andrew Marshall often argued that revolutions in military affairs occur when technology fundamentally alters the balance between risk and advantage. Artificial intelligence exemplifies this shift by enabling militaries to accept operational risk while protecting human lives.

AI AND THE TRANSFORMATION OF BATTLEFIELD MEDICINE

Artificial intelligence is also reshaping combat medicine, significantly improving survival rates for injured soldiers.

Wearable biosensors embedded in military gear can continuously monitor vital parameters, including heart rate, oxygen saturation, blood pressure, and trauma indicators. If a soldier is wounded, AI systems can immediately detect abnormalities and alert medics.

Algorithms can assess injury severity, recommend treatment protocols, and coordinate rapid evacuation. Autonomous drones equipped with medical supplies may soon deliver blood units, medications, or trauma kits directly to wounded soldiers in remote combat zones.

AI-enabled triage systems can assist medical teams in prioritising treatment during mass-casualty events.

These capabilities dramatically improve survival during the critical "golden hour" following injury.

Perhaps the most immediate way AI saves soldiers' lives is by delegating the most dangerous tasks to machines. AI-powered drones, robotic vehicles, and autonomous surveillance platforms are increasingly capable of performing missions traditionally carried out by soldiers in hazardous environments

GLOBAL MILITARY AI: LESSONS FROM ISRAEL AND THE UNITED STATES

Several countries have already integrated artificial intelligence into operational warfare. Two of the most prominent examples are Israel and the United States.

ISRAEL: AI IN OPERATIONAL WARFARE

The Israel Defence Forces have aggressively adopted AI-driven intelligence platforms to improve situational awareness and decision-making. One example is the Gospel AI targeting system, which analyses large-scale intelligence datasets — including satellite imagery, communications intelligence, and surveillance feeds — to identify threats rapidly.

Another system, the Fire Weaver battlefield network, integrates sensors, intelligence platforms, and combat units into a unified battlefield network. AI algorithms rapidly match detected threats with appropriate response systems, significantly shortening the time between detection and response.

For soldiers on the ground, these systems translate into faster intelligence, earlier warnings, and greater battlefield awareness.

UNITED STATES: ALGORITHMIC WARFARE AND MULTI-DOMAIN INTEGRATION

The United States Department of Defence has made artificial intelligence a central pillar of its modernisation strategy. One major initiative is Project Maven, which uses machine learning algorithms to analyse massive volumes of imagery collected by surveillance drones.

Beyond individual systems, the United States is developing Joint All-Domain Command and Control (JADC2) — an ambitious effort to connect military assets across land, sea, air, space, and cyberspace

into a unified decision network.

This approach enables the fusion of intelligence from satellites, aircraft, ships, and ground units in real time, thereby improving operational coordination and situational awareness.

INDIA'S STRATEGIC OPPORTUNITY

For India, artificial intelligence represents a powerful opportunity to strengthen national security while safeguarding soldiers.

Organisations such as the Defence Research and Development Organisation are actively developing AI-enabled technologies for surveillance, robotics, and battlefield decision support.

Innovation initiatives such as Innovations for Defence Excellence (iDEX) foster collaboration among startups, technology firms, and the armed forces to accelerate indigenous defence innovation.

AI is already being explored for border monitoring, drone reconnaissance in high-altitude environments, maritime domain awareness, and cyber defence.

Given India's complex security environment — from the Himalayan frontier to the Indian Ocean — AI-driven surveillance and predictive intelligence systems could significantly enhance operational effectiveness while reducing risks faced by soldiers deployed in extreme conditions.

ETHICS AND RESPONSIBLE DEPLOYMENT

Despite its immense promise, artificial intelligence also raises important ethical considerations. Autonomous systems capable of lethal action must operate within clear legal and ethical frameworks. Human judgement must remain central to military decision-making.

Despite its immense promise, artificial intelligence raises important ethical considerations. Autonomous systems capable of lethal action must operate within clear legal and ethical frameworks. Human judgement must remain central to military decision-making

Maintaining human-in-the-loop oversight, in which commanders retain ultimate authority over operational decisions, is essential to ensure the responsible deployment of AI technologies. Technology should augment human judgement — not replace moral responsibility.

A NEW COVENANT BETWEEN TECHNOLOGY AND THE SOLDIER

Every nation asks its soldiers to accept extraordinary risks in defence of national security. Artificial intelligence offers an opportunity to redefine how societies honour that sacrifice.

By deploying intelligent surveillance networks, predictive analytics, autonomous systems, and AI-enabled medical technologies, militaries can create battlefields where soldiers are better informed, better protected, and better supported than ever before.

The true measure of technological progress in warfare should not be the destructive power of weapons alone, but the number of lives preserved through intelligent innovation.

If harnessed wisely, artificial intelligence may become the most powerful protective force ever introduced into warfare — an invisible shield standing between soldiers and the chaos of battle.

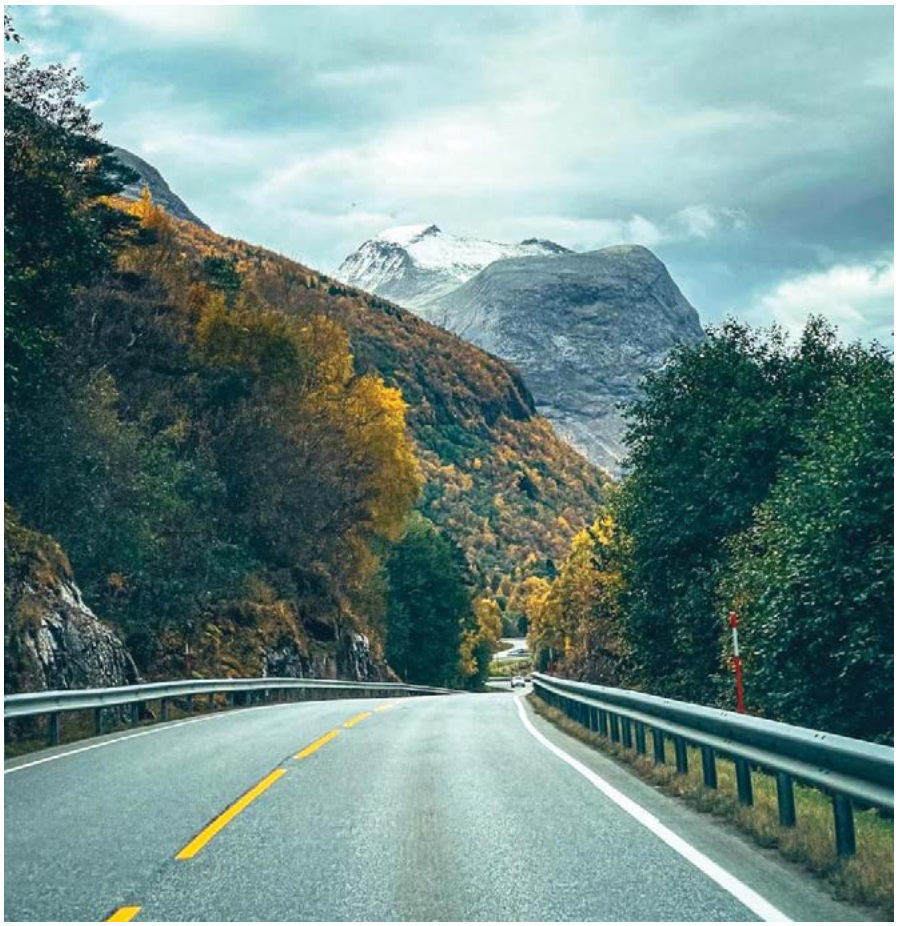
Ultimately, AI will not replace the soldier. Instead, it will ensure that more soldiers return home safely.

–The writer is a global technology strategist with extensive experience in advanced engineering, artificial intelligence, and innovation ecosystems. His work focuses on the intersection of emerging technologies, national security, and human-centred technological transformation, with particular interest in the role of AI in enhancing operational effectiveness while safeguarding human lives. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

THE MISSION MODE DECADE: REINVENTING INDIA'S NORTHERN FRONTIERS

Over the past decade, India has undertaken a decisive transformation in the development of strategic infrastructure along its Northern borders. For years, limited connectivity and slow project execution have constrained operational mobility across the Himalayan frontier. This article examines the shift from the pre-2014 infrastructure deficit to the mission-mode decade of 2014–2024, and explores the opportunities and challenges shaping India's border infrastructure vision for the decade ahead

LT GEN RAJEEV CHAUDHRY



The Silent Strategic Front: In the Himalayas, sovereignty is not secured merely by the presence of troops but by the ability to sustain them. Roads, bridges, tunnels and airfields form the logistical backbone of military power in high-altitude regions. The strategic geography of the Himalayan frontier ensures that mobility and logistics determine the balance of power as much as weapon systems.

For decades, the infrastructure gap between India and China along the Line of Actual Control (LAC) created a structural asymmetry. China developed extensive highways, rail links and airfields across the Tibetan plateau, enabling rapid mobilisation of troops and heavy equipment. India, constrained by difficult terrain and cautious strategic thinking, progressed far more slowly.

However, over the last decade, particularly after 2014, India has undertaken a major transformation in its frontier infrastructure strategy. What was once viewed as a logistical vulnerability is increasingly becoming a strategic instrument of deterrence and negotiation.

STRATEGIC INFRASTRUCTURE BEFORE 2014: THE YEARS OF HESITATION

Until the early 2010s, India's border infrastructure development remained slow and fragmented. Multiple institutional constraints — environmental clearances, limited budgets, fragmented planning and procedural delays — impeded project execution.

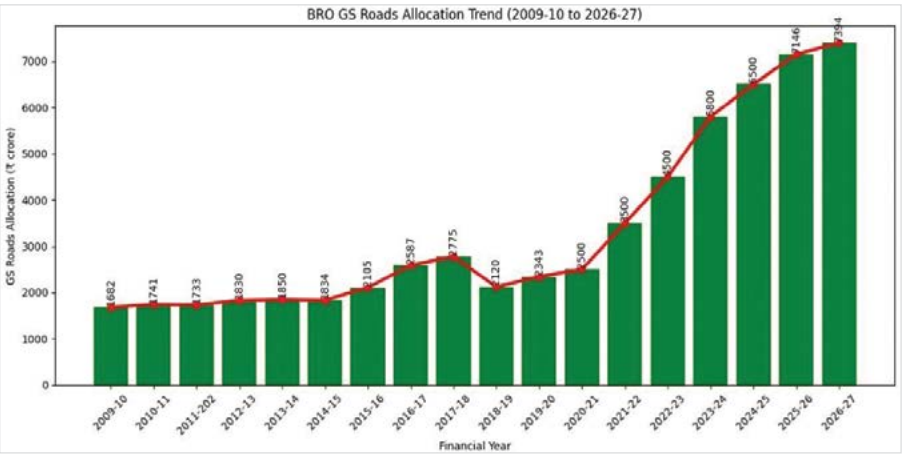
The primary responsibility for border road construction rested with the Border Roads Organisation (BRO). Despite its engineering expertise and operational experience in extreme terrain, the organisation often faced funding limitations and cumbersome approval processes.

Equally important was a long-standing strategic hesitation. Policymakers feared that building roads too close to the frontier could potentially aid an adversary's advance in the event of conflict. As a result, several critical road projects remained delayed for years. This cautious approach resulted in a growing infrastructure differential with China. In many sectors of the frontier, troop deployment relied heavily on air maintenance and seasonal road access, limiting the speed and flexibility of operational mobilisation.

POLICY RESET AFTER 2014: FROM CAUTION TO CAPABILITY

The period after 2014 marked a decisive shift in India's approach to border infrastructure. The government initiated a series of reforms to accelerate construction, including placing BRO directly under MoD and approving the use of the Engineering Procurement and Construction (EPC) mode against the only departmental mode of execution permitted earlier. Funding allocations for the BRO increased significantly, while administrative procedures were simplified to allow faster clearances and project approvals.

Budgetary support for border infrastructure also saw a substantial



Funding almost tripled post Galwan conflict period

expansion. The organisation's allocation increased sharply, reflecting the government's strategic priority on frontier connectivity. Simultaneously, new construction technologies and modern equipment were introduced, enabling engineering activity even in extreme climatic conditions. This transformation gradually shifted border infrastructure development from routine engineering to mission-mode execution.

THE MISSION MODE DECADE (2014–2024)

The decade from 2014 to 2024 can rightly be described as a mission-mode phase for Himalayan infrastructure development. The BRO dramatically expanded its operational output. Over the past five years alone, more than 6,500 km of roads have been constructed along the China border, significantly improving connectivity in remote frontier sectors.

The annual rate of road construction also increased considerably. Infrastructure output rose to approximately 845 km of roads per year, compared to about 632 km annually in earlier years, representing a major improvement in execution capacity. Bridge construction also accelerated, with nearly 3,020 metres of bridges built annually, compared to 1224 metres annually in earlier years, to connect remote and strategically sensitive locations. Several landmark projects symbolise this transformation and have strengthened operational mobility across multiple sectors of the LAC. This expansion marked the beginning of India's serious attempt to narrow the infrastructure gap with China.

GALWAN: THE INFLECTION POINT

While the infrastructure push had already begun earlier, the 2020 Galwan Valley clash served as a strategic wake-up call. The confrontation highlighted the central role of logistics and mobility in high-altitude standoffs. In response, India significantly intensified its infrastructure development across the Northern borders. Thousands of additional workers were mobilised to accelerate construction projects in Ladakh and other frontier sectors.

The government simultaneously increased funding and institutional support to sustain this acceleration. Over the following years, the budget for frontier infrastructure expanded by around 160%, reflecting the urgency of closing the infrastructure differential along the northern borders. Galwan, therefore, marked not merely a tactical confrontation but a strategic inflection point, after which border infrastructure development entered a phase of unprecedented momentum.

This transformation has strengthened India's negotiating

Umling La: World's highest motor-able road (19024 ft)

posture during the prolonged military standoff with the People's Liberation Army. In strategic terms, infrastructure has evolved from being a purely developmental tool to becoming an instrument of calibrated deterrence. Rather than escalating tensions, it enhances India's capacity to hold ground and negotiate from a position of confidence. The infrastructure push over the last decade has begun to reshape the strategic geography of the Himalayas.

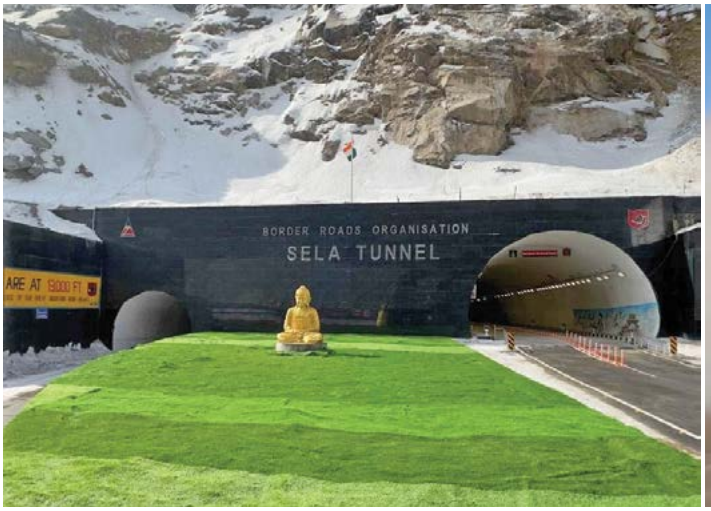
HARD POWER OF STEEL AND CONCRETE

To understand how steel and concrete translated into National Power, one must look at four specific milestones that have redefined the Himalayan balance of power in 2026.

The Four Pillars of Himalayan Deterrence. The following four projects illustrate how engineering feats translate directly into strategic dominance.

- **The Road to the Sky at Umling La.** At 19,024 feet, the road through Umling La is the highest motorable road in the world, surpassing the height of the Everest Base Camps. It connects the sensitive village of Demchok directly to the logistics hubs of Nyoma and Leh. This road directly threatens Chinese logistics in the Demchok sector, which was previously considered a secure flank for the PLA.
- **Saser Brangsa Bridge: Lifeline to DBO.** The Saser Brangsa Bridge is a critical node on the road to the Saser La pass, providing a Plan B for the Darbuk-Shyok-Daulat Beg Oldie (DSDBO) road. The bridge facilitates an alternate route that ensures the DBO remains supplied even if the primary road is cut. The bridge is designed to support 70-tonne loads. It is the world's highest (14,900 ft) multi-span bridge with a span of 345 m, having seven massive piers, each anchored and supported by 47 micro-piles to withstand the shifting glacial silt and high-velocity currents of the Shyok River.
- **Sela Tunnel:** All-Weather Access to Tawang. The Sela Tunnel is the world's longest twin-lane tunnel above 13,000 feet. It bypasses the treacherous and snow-clogged Sela Pass in Arunachal Pradesh. While China's roads on the plateau are often blocked by winter drifts, India's Sela tunnel ensures that the Tawang sector is never cut off from the mainland. Now, India can move an entire mountain division from the plains to the LAC in under 48 hours, a feat that previously took weeks.
- **Nyoma Airfield:** The High-Altitude Sentinel. Nyoma, the world's highest fighter base located at an altitude of 13,710 feet, is just 25 km from the LAC. It has been constructed at neck-breaking speed during the stand-off period, thereby increasing India's strategic reach in the Tibetan Plateau. By


Saser Brangsa Bridge: World's highest multi-span bridge (14900 ft)



Left: Sela Tunnel: World's longest twin tube tunnel above 13000 feet (right) Nyoma: World's highest operational fighter air base (13700 ft)

hosting Su-30MKI and Rafale jets, Nyoma allows the Indian Air Force (IAF) to scramble and reach the border in minutes, effectively countering Chinese airbases at Hotan and Ngari Gunsa. China has been compelled to counter this by building massive underground hangars at its airbases to protect assets from initial strikes.

THE ROAD TO 2034: INDIA'S DECADE OF BORDER CONNECTIVITY

If the period from 2014 to 2024 represented a decade of rapid catch-up, the next decade is likely to focus on consolidation and technological integration. India's long-term vision for border infrastructure will increasingly emphasise all-weather connectivity across the Himalayan frontier. Tunnels beneath high mountain passes will reduce seasonal disruptions, while improved road alignments will enable faster movement of heavy equipment and logistics convoys.

Equally important will be the development of border villages under programmes such as the Vibrant Villages Programme, which aims to revitalise settlements along India's Northern borders. By improving livelihoods and connectivity in these areas, the initiative seeks to transform border villages into the country's 'first villages' rather than its last.

CHALLENGES AHEAD AND THE WAY FORWARD

Despite remarkable progress, significant challenges remain in sustaining the pace of infrastructure development along the Northern borders. The Himalayas represent one of the most difficult construction environments in the world. Extreme weather, high altitude, fragile geology and environmental sensitivity make large-scale engineering projects both complex and costly. Landslides, avalanches and seismic risks frequently disrupt construction activity.

To address these challenges, India will need to adopt a combination of technological innovation, institutional reform and long-term planning. Advanced tunnelling technologies, modular bridge systems and prefabricated construction techniques can significantly accelerate project timelines. Greater integration between civilian agencies and the armed forces will also ensure that infrastructure planning aligns with operational requirements.

Equally important is the need for sustained financial commitment. Border infrastructure must remain a strategic priority in national planning, supported by predictable funding and streamlined project approval mechanisms.

CLOSING REFLECTION

The transformation of India's border infrastructure over the past decade represents one of the most consequential strategic shifts in the country's defence preparedness. Where the Himalayas once exposed logistical vulnerabilities, they are increasingly becoming zones of connectivity and resilience. Roads, bridges, tunnels and airfields now form the silent architecture of national security along the northern frontier.

In the geopolitics of high mountains, sovereignty is not secured by military presence alone. It is sustained by the ability to move, supply and reinforce forces across some of the world's most challenging terrain. And in that sense, every kilometre of road carved into the Himalayas is not merely an engineering achievement — it is a statement of strategic resolve. Strategic Infrastructure is not just about moving troops and tanks; it is about moving a nation's will to its frontiers.

–The writer is an army veteran and writes on contemporary national and international issues, strategic implications of infrastructure development towards national power, geo-moral dimensions of international relations, and leadership nuances in a changing social construct. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

INDIA'S RESILIENCE TEST IN THE NEXT DECADE

Resilience must sit beside deterrence as a central pillar of national security. Deterrence prevents conflict by shaping an adversary's calculations, whereas resilience ensures that if deterrence is tested, the nation does not unravel–enabling it to remain steady during an attack. India's challenge in the next decade (2026-2036) lies in its resilience

MAJ GEN SANJEEV DOGRA

Deterrence will remain necessary in the years ahead, but it will no longer be sufficient. The decisive advantage in the next decade may belong not to the state that can threaten the heaviest punishment, but to the one that cannot be broken. Victory, in its deeper strategic sense, will favour the resilient nation: a nation built on self-reliance, adaptation, institutional depth, and decentralised command. The side that can absorb shock without losing coherence, continue to function under strain, and preserve clarity of judgement amid disruption will hold the true advantage. That, perhaps, is the real test before India between 2026 and 2036.

For much of modern history, power was measured in visible terms: divisions, fleets, airframes, guns, and missiles. Those metrics still matter, and they will continue to matter. Yet the character of conflict is changing in ways that make older assumptions insufficient. War, if it comes, is less likely to unfold as a linear contest between clearly defined beginnings and endings. It is more likely to arrive in fragments: a cyber intrusion before a border incident, a wave of disinformation before a military response, drone attacks before formal escalation, economic coercion before a diplomatic rupture. The opening blows of the next conflict may not come only from the battlefield. They may fall upon power grids, financial systems, communications networks, transport hubs, public psychology, and political resolve.

This is why resilience must now sit beside deterrence as a central pillar of national security. Deterrence seeks to prevent conflict by shaping an adversary's calculations. Resilience ensures that if deterrence is tested, the nation does not unravel. In a world of prolonged uncertainty, distributed threats, and accelerated decision cycles, resilience is what allows a country to remain steady while under assault. It is what separates temporary disruption from strategic defeat.

India's challenge in the next decade lies precisely here. It is not only a question of whether India can strike back. It is also a question of whether India can continue to think clearly, govern effectively, mobilise resources rapidly, protect public confidence, and sustain combat power after the first shock has landed. The coming years will test not merely the strength of the Indian military but the endurance of the Indian state and the adaptability of its institutions.

The first and most unforgiving

phase of any future crisis will be the phase of shock. In the opening hours and days, hostile action will seek as much to induce confusion as to inflict damage. Decision-makers may be flooded with contradictory information. Communications may be degraded. Civil systems may be disrupted. Rumour will travel faster than fact. A limited tactical episode may be presented to the public as a strategic humiliation or a manageable disruption made to appear like national paralysis. In that moment, the essential contest is not merely one of firepower. It is a contest of coherence. A resilient state does not panic when struck. It absorbs the blow, restores order, and denies the adversary the psychological dividend of chaos. That requires hardened systems, redundant communications, continuity-of-government protocols, trusted public messaging, and institutions that know how to function under pressure. In modern conflict, confusion is not a byproduct. It is often a weapon in itself. A state that remains composed in the first seventy-two hours has already won half the battle.

Beyond the opening shock comes the harder test of adjustment. This is the stage at which the adversary probes for hesitation, for friction between services and ministries, for gaps between political intent and operational execution. Modern conflict moves too quickly, and disruption is too likely, for every tactical decision to await perfect clarity from above. A nation that depends excessively on central direction risks losing tempo at the very moment when tempo becomes decisive. This is where mission command assumes its importance — not merely as an administrative concept, but as a philosophy of war. It rests on trust, training, and a shared understanding of intent. It allows commanders at lower levels to act with initiative when communications falter or circumstances change. In an age of electronic warfare, cyber disruption, and compressed decision cycles, the nation that can decentralise execution without losing strategic coherence will prove far harder to dislocate than one that remains rigidly hierarchical.

The question is not only whether India can strike back, but also whether it can continue to think clearly, govern effectively, mobilise resources rapidly, protect public confidence, and sustain combat power after the first shock has landed. The coming years will test not merely the strength of the Indian military but the endurance of the Indian state and the adaptability of its institutions

Resilience is not only military. It is industrial, technological, civic, and intellectual. Modern wars are sustained not only by soldiers in the field but by supply chains, repair ecosystems, energy availability, manufacturing depth, and social confidence. The industrial base is no longer in the background of strategy. It is part of the strategy. A nation unable to replenish critical stocks, repair damaged systems quickly, substitute vulnerable imports, or scale production in crisis will discover that battlefield performance is inseparable from economic preparedness. Self-reliance, properly understood, does not mean autarky. It means assured access in a world where access can no longer be taken for granted. India must develop depth in those domains without which sustained operations become impossible: electronics, ammunition, sensors, propulsion, communications systems, batteries, software, and maintenance capability. Procurement cannot remain a peacetime accounting exercise. It must increasingly be judged by resilience in wartime.

The battlefield itself is changing in ways that make resilience more central than ever. Low-cost drones and loitering munitions have altered the geometry of attrition, allowing inexpensive systems to threaten high-value assets and impose disproportionate costs. Nations that rely only on exquisite platforms without building affordable mass, layered defences, and repair capacity may find

Resilience is not only military, but it is also industrial, technological, civic, and intellectual. Modern wars are sustained not only by soldiers in the field but by supply chains, repair ecosystems, energy availability, manufacturing depth, and social confidence. The industrial base is no longer in the background of strategy, it is part of the strategy

themselves tactically sophisticated but strategically exhausted. Cyber and electronic warfare will deepen this challenge. Future conflicts are unlikely to permit the luxury of uninterrupted communications or uncontested data flows. India must therefore train not only for optimal conditions, but for degraded ones through jamming, incomplete information, and intermittent communication. Systems can fail; judgement cannot.

There is another dimension of resilience that receives less attention than it deserves: the resilience of national thought. Adversaries will seek to overload India's decision-making with ambiguity, provocation, and narrative manipulation, aiming to trigger either paralysis or overreaction. A mature strategic culture must distinguish signal from noise, tactical loss from strategic setback, and public anger from sound policy. Nations are often defeated first in their thinking, and only then on the battlefield. War-gaming must become more realistic. Red-teaming must become more institutionalised. Exercises must examine what actually happens when logistics come under attack, when communications are degraded, and when the information environment turns hostile. Strategy cannot be built on optimistic assumptions. It must be forged against friction.

The deeper truth is that resilience is a design principle for the state, not a slogan about toughness. It asks whether institutions can bend without breaking, whether society can remain composed under strain, whether industry can regenerate power, whether the military can sustain tempo, and whether leadership can remain calm in the face of uncertainty. In the decade ahead, these questions may matter as much as the number of platforms India fields.

The way forward begins with a simple recognition: resilience must be built deliberately. It will not emerge automatically from growth, nor can it be improvised in crisis. India must strengthen resilient joint operational networks across the services and test them repeatedly under conditions of disruption. It must invest in hardened and redundant communications, continuity mechanisms, contested logistics, and distributed warfighting capacity. It must deepen its domestic industrial base in critical military and dual-use technologies. Counter-drone, electronic warfare, and cyber defence must move from niche capability to a broad habit. Civil defence, strategic communication, and continuity of essential services deserve far greater attention, for these are no longer peripheral to national security.

The resilient state is not one that is never hit. It is one that remains standing, thinking, and acting after the hit. The India that will command respect between 2026 and 2036 will be defined not only by its ability to punish but by its ability to endure, regenerate, adapt, and lead under stress. Deterrence will remain vital, but the future belongs to the nation that couples deterrent power with staying power. In the end, the strongest message a nation can send is not merely that it can strike hard, but that even after the storm begins, it will continue to function, decide wisely, and prevail.

–The writer is an Indian Army veteran and expert in Operations Research and Systems Analysis. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

SAFESURE®
Runflat Systems

SAFESURE PROUDLY CELEBRATING 10 YEARS OF TRUST, RELIABILITY & EXCELLENCE 2008 - 2018

Sanathan Allied Industries an ISO 9001-2008 certified company, specialized in the manufacturing of SAFESURE® Runflat Systems, Bead locks for the continuous mobility of bullet proof and armored vehicles used by VIP's, Police, Protection Forces, Special vehicles carrying high value assets and Monorails.

Innovation and technology is paired together to deliver cost-effective, application-suitable, customized reliable Runflat and Beadlock Solution.

SAFESURE® Runflats are servied in more than 15 countries for a decade since 2008. SAFESURE® Runflat Systems are time-tested, proven, acclaimed for its unique and innovative manufacturing process, high quality Runflats and Beadlocks are manufactured in Hyderabad, India.

RUNFLATS

FORGED ALUMINUM WHEELS

SAFESURE 2 PIECE BEADLOCK SYSTEM

To Enhance Mobility, Traction And Steering Control For Vehicle Operation In Soft Terrains Such As Sand, Mud And Snow

RUNFLAT WHEEL ASSEMBLY

UNIT - I
Plot No. 31/B IDA,
Balanagar, Hyderabad
Telangana, India - 500 037.

UNIT - II
C-18, Industrial Estate,
Sanathnagar, Hyderabad
Telangana, India - 500 018.

UNIT - III
Plot No. B-30, Technocrat Industrial Estate,
Balanagar,Hyderabad Telangana,
India - 500 037.

Phone: +91 40 2307 7537, +91 40 2307 7917 Mobile: +91 90005 67917, +91 85000 29898
E-mail: sales@safesure.co.in / visujapala@safesure.co.in **web: www.safesure.co.in / www.safesurerunflat.com**

SAMAY SE AAGE:
ORBITAL ISR COMPUTE PLATFORM

India's EO satellites are already watching the terrain, the coastlines, and the sea lanes that define its strategic perimeter. The sensor is not the problem. The problem is how long it takes for what the sensor sees to become something a commander can act upon. Moving the computation into orbit—and the relay into the stratosphere—compresses that time from hours to minutes. The sensor is ready. The question is whether the intelligence architecture

DR SHIVA RAMASWAMY

In modern ISR, the satellite is not the bottleneck. The pipeline is. India operates an increasingly capable constellation of Earth Observation (EO) satellites – optical, SAR, hyperspectral – collecting imagery of extraordinary fidelity across its strategic geography. Yet despite the sensor quality, a frustrating latency persists between the moment a satellite captures an image of interest and the moment a commander receives an actionable intelligence product. That gap – measured in hours in the conventional architecture – is where operational advantage is lost. Orbital Data Centres exist to close it.

THE PIPELINE PROBLEM

The conventional remote sensing ISR chain is sequential and ground-dependent. A satellite collects raw data and stores it onboard. It waits for a pass over a ground station – which may be minutes away or hours away depending on orbital geometry. It downlinks the raw data, which for a high-resolution SAR or optical pass can be several hundred gigabytes. That data enters a ground-based processing pipeline: radiometric correction, geometric calibration, AI inference, analyst review, and finally dissemination. Each step introduces delay. The aggregate latency from collection to intelligence product routinely runs from one to several hours.

The volume problem compounds the latency problem. As EO constellations grow, the data generated per day increasingly outpaces the capacity of terrestrial infrastructure to absorb and process it. A significant fraction of collected imagery is never processed at all – not for lack of intelligence value, but because processing queues are congested and downlink bandwidth forces triage. In ISR, unprocessed data is the same as no data.

For India specifically, the challenge is compounded by geography. Surveillance requirements span two contested land borders, a vast maritime domain across both the Arabian Sea and the Bay of Bengal, and an extended area of interest across the Indian Ocean Region. Ground station contact windows are finite. An adversary with knowledge of satellite pass schedules and downlink gaps can time activities to exploit the blind spots between collection and intelligence delivery. Pipeline latency is not merely an inconvenience – it is a vulnerability.

WHAT AN ORBITAL DATA CENTRE DOES DIFFERENTLY

An Orbital Data Centre is a space-based compute node – a satellite platform hosting AI accelerators, storage, and high-bandwidth inter-satellite link capability – designed to process sensor data in orbit rather than relay it raw to the ground. It is, in essence, a data centre co-located within the same orbital environment as the sensors it serves.

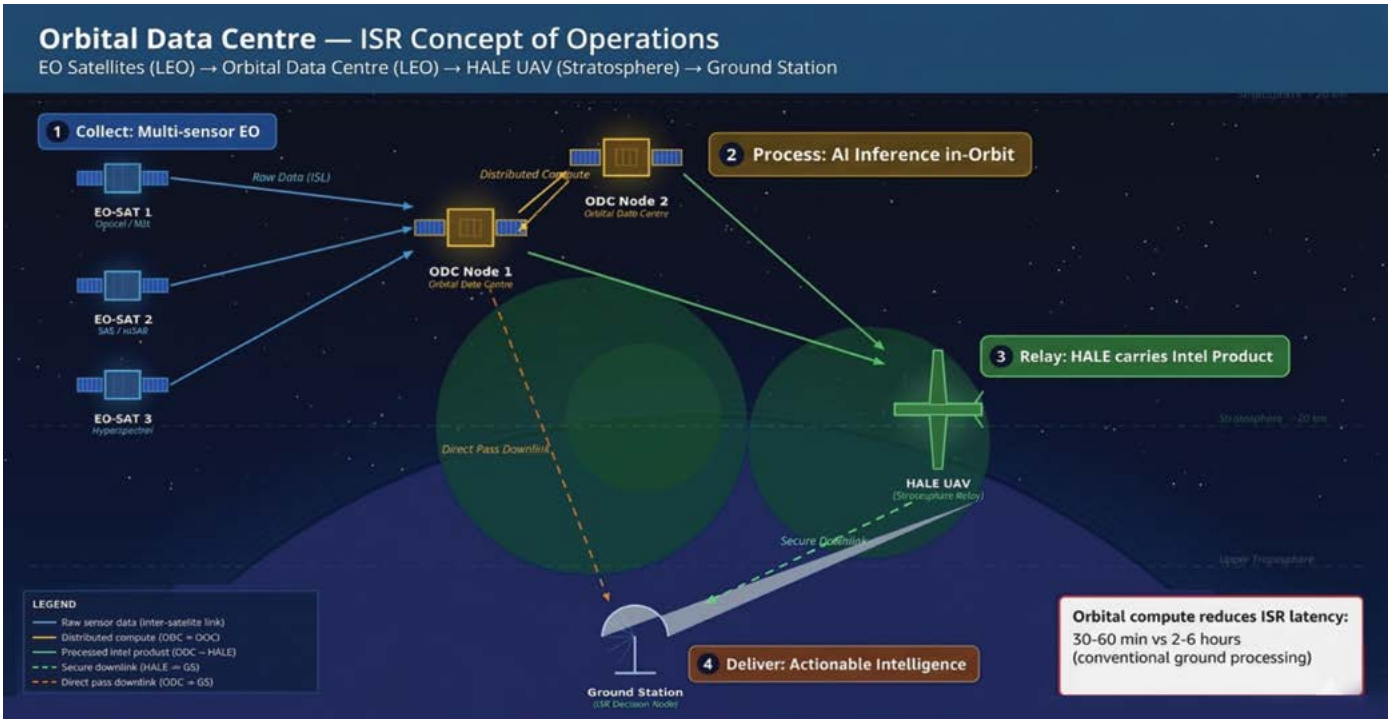
The operational logic is direct. An EO satellite completes a collection pass and transfers raw data via an inter-satellite link to the Orbital Data Centre node orbiting in proximity. The node runs onboard AI inference – change detection, object classification, multi-sensor fusion, threat flagging – and produces a structured intelligence product. That product, orders of magnitude smaller in data volume than the raw imagery, is then passed down the chain to a ground receiver. The ground receives not raw pixels but processed intelligence: a target list, a change map, an anomaly alert.

The reduction in what must travel to the ground is transformative. A detection and classification output for objects of interest in a large-area SAR collection might be expressible in kilobytes – compared to hundreds of gigabytes for the raw image. This does not merely reduce downlink time; it reduces the bandwidth requirement at every link in the chain, making reliable delivery possible over communication links that would be entirely inadequate for raw data transfer.

MULTI-SENSOR FUSION: WHERE THE REAL ADVANTAGE LIES

No individual sensor provides complete situational awareness. Optical sensors are constrained by cloud cover. SAR provides all-weather, day-night penetration but produces imagery requiring specialist interpretation. Hyperspectral sensors reveal material composition and defeat camouflage. The intelligence value of combining these streams in near-real-time is substantially greater than the sum of any individual feed.

In the ground-processing pipeline, multi-sensor fusion is inherently delayed because data from different satellites arrives at different times, travels through



separate pipelines, and must be co-registered before fusion algorithms can run. An Orbital Data Centre receiving data from multiple co-orbiting EO satellites via inter-satellite links can perform fusion as data arrives – maintaining a continuously updated, multi-layer intelligence picture. An AI model onboard can correlate a SAR-detected anomaly with a hyperspectral change indicator, producing a fused threat assessment that no single sensor could generate – and doing so before the data ever reaches the ground. This capability is particularly consequential for tracking time-sensitive targets: mobile missile assets, naval vessels under electronic deception, or covert logistics operations employing camouflage and concealment.

SOVEREIGNTY, RESILIENCE, AND THE HALE ADVANTAGE

For defence ISR, data sovereignty is non-negotiable. In a conventional pipeline, raw collected intelligence must traverse terrestrial networks and processing centres – each a potential node for interception or compromise. An Orbital Data Centre keeps the most sensitive step of the ISR chain – the processing of raw collection – within a controlled, sovereign space asset. Raw imagery never touches commercial or foreign infrastructure. Intelligence products are generated in orbit, encrypted at the point of production, and relayed via a sovereign HALE platform to authorised receivers.

The HALE layer adds a further resilience dimension. In a contested environment, fixed ground stations and terrestrial data centres may be targeted. A mobile, airborne relay that can reposition to maintain connectivity with both the orbital node and a forward ground receiver provides continuity of ISR delivery that a fixed ground architecture cannot guarantee. The combination of orbital compute and stratospheric relay creates an ISR pipeline that remains functional across a range of degraded-environment scenarios.

THE NEED OF THE HOUR

The technology enabling this architecture has matured rapidly. AI accelerators have been miniaturised to spacecraft-compatible form factors. Radiation-hardened computing is available. Inter-satellite optical and RF link technology is proven in operational constellations. HALE platforms with stratospheric endurance are an established capability. The space environment itself offers engineering advantages that terrestrial data centres cannot replicate: the vacuum enables radiative thermal dissipation without water-cooling infrastructure, and unattenuated solar irradiance provides a stable, scalable power source. The engineering path to an Orbital Data Centre is demanding but entirely within reach of India's emerging new-space industrial base.

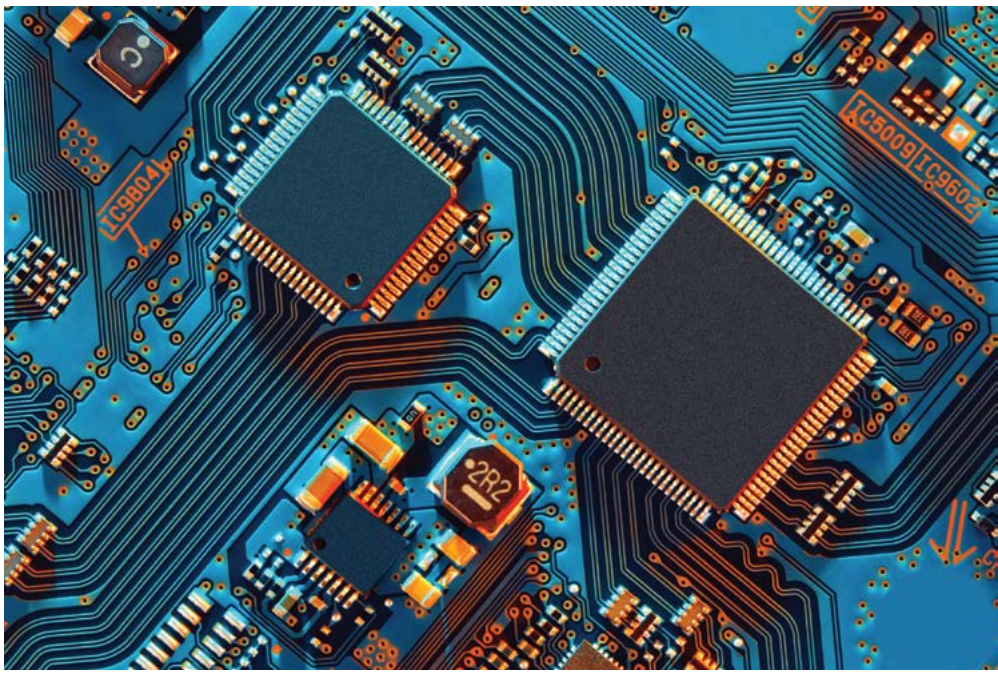
What is required is a deliberate architectural commitment. ISR capability is not only a question of how many satellites India procures, but how the entire data chain from sensor to decision-maker is engineered. The latency gap in that chain exists today. Every hour that raw EO data waits for a ground station pass, every hour it sits in a processing queue – is an hour in which an adversary operates beyond effective Indian ISR coverage. Orbital compute, paired with stratospheric relay, is the most direct architectural response available.

–The writer is the Co-Founder and CTO of Big Bang Boom Solutions, India's first profitable deep-tech defence contractor and the first iDEX startup to export defence systems to a friendly foreign country. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

FROM CATCH-UP TO LEAPFROG: INDIA'S MISSION MODE DECADE

To achieve technological sovereignty and economic strength, India must transform the coming decade into a builder's era — closing capability gaps with global leaders while positioning itself at the frontier of emerging industries

RAKESH KRISHNAN SIMHA



Mission-mode programmes are government initiatives designed to achieve clearly defined, high-priority objectives within a specified timeframe. They are characterised by concentrated resource allocation, streamlined decision-making, and rigorous monitoring mechanisms. Originally conceived to advance long-term national goals — such as the Chandrayaan lunar missions and the Digital India initiative — these programmes have, over the past decade, evolved into a key policy instrument for accelerating improvements in public service delivery.

In the context of India's evolving geopolitical landscape, the Mission Mode Decade (2026–2036) represents a critical window to achieve elusive objectives that structural constraints have historically derailed. These goals are essential for bolstering India's military capabilities, economic resilience, strategic autonomy, and global influence amid rising tensions with neighbours like China and Pakistan, as well as broader uncertainties in the international order.

However, the success of such a mission-mode decade will depend not only on policy design and funding but also on a deeper shift in national mindset. To make this decade transformative rather than incremental, India must move beyond a predominantly profit-oriented business approach towards a builder's mindset — one that prioritises long-term capability creation, national capacity building, and technological sovereignty.

LESSONS FROM THE GLOBAL POWERHOUSES

Historical experience shows that nations that achieved technological and industrial leadership did so through deliberate long-term capability building. South Korea's transformation from a war-ravaged economy in the 1960s into a global industrial powerhouse was driven by coordinated state support for strategic industries such as shipbuilding, electronics,

and automobiles. Similarly, China's rise in advanced manufacturing and digital technologies was not purely market-driven but guided by sustained industrial policy, large-scale public investment, and strategic technology acquisition. In the United States, the Defense Advanced Research Projects Agency (DARPA) pioneered a mission-driven innovation model that funded high-risk, high-impact research, producing breakthroughs such as the internet, GPS, and stealth technologies.

These examples illustrate that national power in the modern era is built through sustained strategic investments and institutional commitment rather than short-term commercial incentives alone.

India's aspirations align with its national strategy for Artificial Intelligence and the India Semiconductor Mission, emphasising self-reliance (Aatmanirbhar Bharat) while navigating global dependencies. Yet the strategic logic guiding this decade must combine two complementary approaches: competing head-on in critical sectors where global parity is necessary, while simultaneously preparing for leapfrogging opportunities in emerging technologies and new economic paradigms.

POLITICAL BLOCKAGES: DERAILING MISSION MODE PLANS AND THE NEED FOR PRIORITISED REFORMS

One of the most persistent barriers to India's long-term strategic goals is political fragmentation, often intensified by regime changes that interrupt policy continuity. India's federal polity, characterised by coalition governments and frequent electoral shifts, has historically stalled ambitious projects.

Comparatively, countries that successfully implemented long-term industrial strategies often ensured policy continuity across political cycles. In South Korea during the 1960s-1980s, industrial policy was sustained through successive administrations, enabling conglomerates such as Samsung and Hyundai to mature into global competitors. Similarly, China's multi-decade planning cycles allowed it to execute ambitious programmes in

infrastructure, manufacturing, and digital technologies with remarkable consistency.

India's democratic system naturally introduces policy contestation, yet mission-critical sectors must be insulated from short-term political disruptions. The experience of the United States offers one model: despite political polarisation, institutions like DARPA and NASA have historically maintained continuity in strategic research programmes across administrations.

To replicate such stability, India could institutionalise long-horizon strategic programmes under autonomous mission agencies with cross-party oversight. Such institutions would embody the builder's mindset — ensuring that national capability-building efforts continue regardless of electoral changes.

LEADERSHIP IN EMERGING TECHNOLOGIES: AI AND SEMICONDUCTORS

India's quest for leadership in artificial intelligence and semiconductors is central to its economic and strategic ambitions. For instance, the IndiaAI Mission, approved in March 2024 with a ₹10,371.92 crore budget, aims to establish a sovereign AI

The United States' leadership in computing and AI was significantly shaped by DARPA-funded research programmes beginning in the 1960s. These programmes supported foundational advances in computer networking, machine learning, and robotics, eventually enabling the emergence of Silicon Valley's innovation ecosystem

ecosystem under the vision "Making AI in India and Making AI Work for India." It focuses on computing infrastructure (38,000+ GPUs), developing indigenous Large Multimodal Models (LMMs), boosting startups and nurturing talent to position India as a global AI leader. The IndiaAI Mission aims to democratise access to AI while fostering innovation across sectors, with projections suggesting that AI could contribute hundreds of billions of dollars to India's economy by 2030. However, global competition in these domains illustrates the importance of state-backed technological ecosystems.

The United States' leadership in computing and AI was significantly shaped by DARPA-funded research programmes beginning in the 1960s. These programmes supported foundational advances in computer networking, machine learning, and robotics, eventually enabling the emergence of Silicon Valley's innovation ecosystem.

China, meanwhile, has pursued a state-coordinated strategy combining industrial policy, domestic market scale, and talent mobilisation to achieve rapid progress in semiconductors, AI, and quantum technologies. While still dependent on foreign semiconductor equipment, China has dramatically expanded its chip manufacturing capacity through large-scale public investment.

South Korea offers another instructive example. Through sustained government support and strategic protection during the early stages, firms such as Samsung and SK Hynix evolved into global leaders in memory chips.

For India, the India Semiconductor Mission represents a critical step towards establishing domestic manufacturing and design capabilities. Yet to compete effectively, India must cultivate a full ecosystem encompassing research institutions, fabrication facilities, supply chains, and skilled talent.

Here, a blended strategy becomes essential: competing head-on in established semiconductor manufacturing while leapfrogging into emerging domains such as AI accelerators, chiplet architectures, and specialised processors optimised for edge computing.

STRATEGIC AUTONOMY AND GLOBAL POWER: INDIGENOUS JET ENGINES, SPACE, AND NUCLEAR TECHNOLOGIES

Strategic autonomy in defence and energy technologies remains one of India's most enduring challenges. Indigenous jet engine development illustrates both the complexity of such efforts and their importance for national security.

Historical precedents show that

aerospace engine development requires sustained national commitment. The United States achieved global leadership through decades of government-funded research and defence procurement supporting firms like General Electric and Pratt & Whitney. China invested heavily in its domestic engine programmes for decades before achieving significant breakthroughs in military aviation propulsion.

India's GTRE Kaveri engine programme, despite delays, represents a critical step towards reducing dependence on imported propulsion technologies. Mission-mode investments and international co-development partnerships could accelerate progress, particularly if combined with institutional reforms that encourage risk-taking and long-term experimentation.

India's space programme provides a powerful demonstration of what mission-mode thinking can achieve. The steady progression from satellite launches to lunar exploration reflects a builder-oriented approach similar to the early decades of the US space programme.

Looking ahead, India's ambitions — including human spaceflight missions, an indigenous space station, and expanded deep-space exploration — could position the country as a major player in the global space economy.

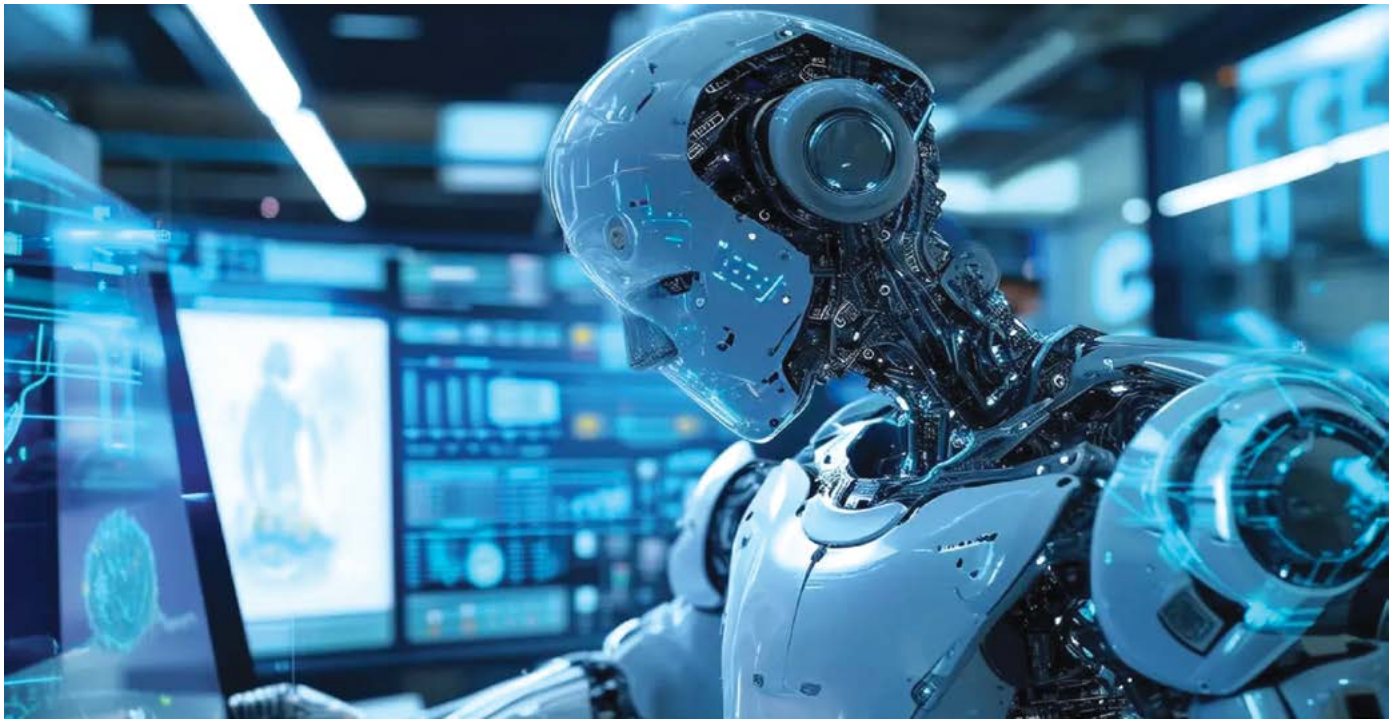
Nuclear energy development offers another long-term strategic opportunity. India's thorium-based nuclear programme, unique in its design, reflects decades of scientific planning aimed at achieving energy independence. While the 500 MW Prototype Fast Breeder Reactor (PFBR) is set for 2026 operations using plutonium, the final stage aims for thorium-based reactors, including the Advanced Heavy Water Reactor. If successfully scaled, this programme could provide a stable low-carbon energy foundation for India's industrial expansion.

India's economic trajectory suggests it could become the world's third-largest economy within the next decade. Yet, the nature of that growth will determine whether India becomes merely a large market or a true technological and industrial power

Meanwhile, China has achieved significant breakthroughs in thorium-based molten salt reactor (TMSR) technology, becoming the first country to operate such a reactor, the TMSR-LF1, in the Gobi Desert. In 2025, China achieved 100% operational capacity and successfully converted thorium into uranium-233, demonstrating a sustainable closed fuel cycle that allows online refuelling without shutdowns.

ENHANCED ECONOMIC POWER: STRATEGIES AND PROJECTIONS

India's economic trajectory suggests it could become the world's third-largest economy within the next decade. Yet the nature of that growth will determine



whether India becomes merely a large market or a true technological and industrial power.

Countries that successfully transitioned into advanced economies often prioritised strategic manufacturing capabilities and export competitiveness. South Korea's industrial rise was built on electronics, automobiles, and shipbuilding — industries that required long-term investments before yielding global profits.

China followed a similar path by developing large-scale manufacturing ecosystems and gradually moving up the technological value chain.

For India, programmes such as infrastructure expansion, production-linked incentives, and digital public infrastructure provide a strong foundation. However, the next phase must focus on building globally competitive industrial ecosystems in emerging technologies.

A builder-oriented economic strategy emphasises not just GDP growth but the creation of durable technological capabilities. Combining direct competition in established sectors with leapfrogging opportunities in green energy, advanced manufacturing, and digital technologies will allow India to shape the next wave of global innovation.

Historical experience from South Korea, China, and the United States demonstrates that sustained technological leadership emerges from coordinated state support, patient capital, and institutional commitment to ambitious national missions

CONCLUSION: SHIFT TOWARDS LONG-TERM STRATEGIC BUILDING

India's Mission Mode Decade offers a transformative opportunity to secure its future amid global technological and geopolitical competition. Achieving this transformation requires more than policy adjustments — it demands a shift in the national mindset towards long-term strategic building.

Historical experience from South Korea, China, and the United States demonstrates that sustained technological leadership emerges from coordinated state support, patient capital, and institutional commitment to ambitious national missions.

India's strategic doctrine for the coming decade should therefore integrate two complementary approaches: competing head-on with established powers in critical sectors while simultaneously preparing to leapfrog into emerging technological frontiers.

By embracing this builder-oriented vision and sustaining mission-mode investments across political cycles, India can lay the foundations for realising the vision of Viksit Bharat by 2047 and emerge as a decisive force in shaping the global technological and geopolitical order.

–The writer is a globally cited defence analyst based in New Zealand. His work has been published by leading think tanks, and quoted extensively in books on diplomacy, counter terrorism, warfare and economic development. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

AEROSPACE & DEFENCE SYSTEMS

AVIRATA DEFENCE SYSTEMS
a SASMOS company

Design, Develop, Qualify and Build Mission Critical Systems

CONCEPT ▶ DESIGN ▶ DEVELOP ▶ SCALE

- Electronics / Electrical / Electro-Mechanical Systems: Design and Integration
- Customized Product Solution
- Develop Mission Critical Systems
- Hardware Design, Software & Firmware Development
- Qualification & Prototyping
- Compliance to MIL, Space & Nuclear Standards

Customize Photonic Integrated Systems & Fiber Optics Interconnectivity Solutions

RUGGEDIZED OPTOELECTRONICS SYSTEMS

- Microware Photonics / RF Over Fiber
- Optical Transmitters and Integrators
- Optical modulators controllers
- Photodetection Circuitry
- Leaser Controllers

FOCUS SEGMENTS

Weapon Communication Systems

Naval Communication & Defence Systems

Military Ground Tactical Communication & Surveillance Systems

Air Defence & UAV Communication Systems

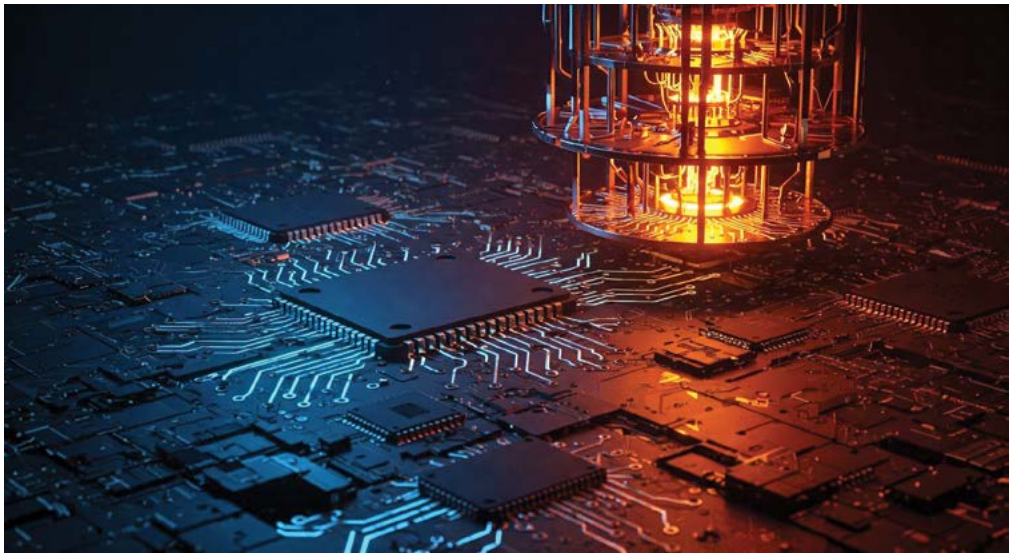
AVIRATA DEFENCE SYSTEMS

sales@aviratadefsys.com 080-4060 4800 www.aviratadefsys.com

INDIAN DEFENCE FORCES 'VISION 2047': SHARPENING ITS SWORD FOR A QUANTUM AGE

A strategic analysis of the HQ IDS roadmap: what it signals for India, the world, and the quantum security sector

SUDIPTAA PAUL CHOUDHURY



India just told the world something important. It's not through a diplomatic communiqué or a missile test, but through a 34-page document released by Headquarters Integrated Defence Staff on March 10, 2026. The Defence Forces Vision 2047 is India's most comprehensive military transformation blueprint, framed around the centenary of independence and the overarching national ambition of Viksit Bharat - a fully developed India by 2047. This is a landmark document that demonstrates the Indian military's clarity of strategic intent and its willingness to confront the complexities of 21st-century warfare head-on.

This document maps the journey of India's armed forces through three phases:

- The Era of Transition (now to 2030)
- The Era of Consolidation (2030–2040), and
- The Era of Excellence (2040–2047).

Reading it carefully reveals the depth of strategic thinking behind it — and the scale of ambition India is now prepared to commit to.

A WORLD THAT NO LONGER PLAYS BY THE RULES

The document opens with an unflinching assessment of the global security environment — one marked by uncertainty and volatility, where the boundary between war and peace is dissolving. *Grey zone activities, proxy conflicts, disinformation campaigns, and the weaponisation of trade and technology are no longer fringe tactics, they are now mainstream instruments of statecraft.*

For India, the neighbourhood is particularly complex. Nuclear-armed adversaries, proxy wars, terror groups, drug trafficking, and religious extremism cast a long shadow. The technological environment section is where the document gets genuinely forward-looking -calling out hypersonics, robotics, stealth, drones, quantum technologies, and Artificial Intelligence as forces redefining the battlespace.

Critically, it identifies the world as standing not on the threshold of one Revolution in Military Affairs (RMAs), but on the verge of multiple simultaneous RMAs - the term used to describe paradigm shifts in warfare driven by transformative technology (AI, quantum technology, cyber warfare etc.), doctrine, and organisation, a sophisticated observation.

THE VISION: ONE STATEMENT, THE WEIGHT OF EVERYTHING

The Vision Statement reads: *"To be an integrated all-domain force, dynamic and self-reliant in thought and capabilities, ready to respond across the full spectrum of conflict, to protect and promote national interests, in concert with all elements of national power."*

As India looks toward Defence Strategy 2047, the battlefield is no longer just physical—it is digital and quantum. Securing our communications with indigenous quantum-safe technologies will be fundamental to national security. India has a unique opportunity to lead the world in next-generation defence technologies. Strategy 2047 must prioritise deep-tech innovation here - quantum, cyber, AI and space converge to redefine security and sovereignty"

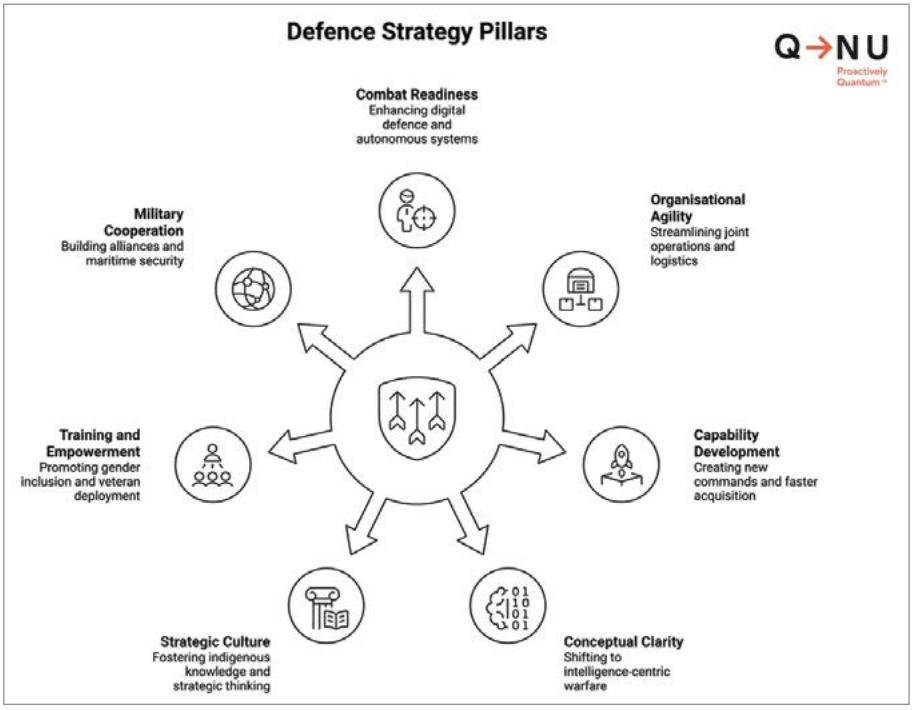
Sunil Gupta, CEO, QNu Labs

Three words carry the strategic load: integrated, self-reliant, and all domains. *These reflect a clear-eyed acknowledgement of where transformation is needed, and a bold commitment to achieving it.* The vision explicitly acknowledges that future conflicts will be fought simultaneously across land, sea, air, space, cyber, and the cognitive domain and that cross-domain capability economises force, strengthens deterrence, and creates strategic surprise.

The commitment to Aatmanirbharta runs through every chapter - meaningfully expanded beyond defence manufacturing to encompass strategic thinking and doctrine development. Indigenous thought, not just indigenous hardware.

SEVEN PILLARS AND WHAT THEY ACTUALLY MEAN

1. Combat Readiness and Responsiveness call for intelligent platforms, autonomous systems, drone and counter-drone capabilities, and critically — *self-healing cyber defence networks*. The language here is that of a force that expects to be attacked in the digital domain and must survive it.
2. Organisational Agility and Interoperability formalises tri-service jointness through a Joint Headquarters, Joint Operations Coordination Centre, and integrated logistics architecture — structural reforms debated for years, now formally mandated.
3. Capability Development and Sustenance is operationally specific. It calls for revamping the Defence Acquisition Procedure (DAP) (also known as QNu Defence Solutions), Defence Procurement Manual, and Delegation of Financial Powers to create faster acquisition cycles aligned with technological change. It also proposes raising a Space Command, Cyber Command, Data Force, Drone Force, and Cognitive Warfare Action Force - five new institutional structures that would fundamentally reshape India's military architecture.
4. Conceptual and Doctrinal Clarity signals a maturation from Network Centric to Data Centric to ultimately Intelligence Centric warfare, mirroring the trajectory of the world's most advanced militaries.
5. Strategic Culture and Climate calls for shedding colonial practices and grounding India's strategic outlook in indigenous knowledge and culture. This is where the document's most underreported proposal sits: the establishment of the Indian Defence University (IDU) as a Centre of Excellence - not merely to train officers, but to cultivate strategic thinkers rooted in Indian civilisational knowledge. The *Arthashastra* reference in the document's own imagery is deliberate. India is not borrowing its strategic identity from Clausewitz or Sun Tzu alone. It is reaching into its own heritage to produce warriors who think in Sanskrit and act in the quantum age. The IDU, if realised, could become the



> **When the Vision calls for self-healing cyber networks and intelligence-centric operations, it is describing an architecture that only quantum-secure communications can underpin. The technology exists indigenously; what is needed now is the doctrine and procurement pipeline to deploy it at scale"**
>
> **Dilip Singh, CTO, QNu Labs**

intellectual forge of India's 21st century military doctrine.

6. Training, Education and Empowerment addresses human capital with notable ambition, including a progressive mandate for gender inclusion in leadership roles without sacrificing operational efficiency. This is a meaningful signal from an institution not historically known for rapid cultural change. Equally significant is the Vision's treatment of veterans as strategic national assets, not pensioners to be managed, but skilled, patriotic human capital to be actively deployed toward nation-building through re-employment, self-employment, healthcare, and empowerment mechanisms, policy conversation.
7. Military Cooperation and Defence Diplomacy frames India's global role through *Vishwabandhu* (friend of the world) and the *MAHASAGAR* vision of India as a preeminent maritime security provider in the Indian Ocean Region. The concept of *Vasudeva Kutumbakam* animates the diplomatic framework: a web of like-minded nations aligned with Indian views on collective security.

"As India looks toward Defence Strategy 2047, the battlefield is no longer just physical—it is digital and quantum. Securing our communications with indigenous quantum-safe technologies will be fundamental to national security. India has a unique opportunity to lead the world in next-generation defence technologies. Strategy 2047 must prioritise deep-tech innovation here - quantum, cyber, AI and space converge to redefine security and sovereignty," commented Sunil Gupta, CEO, QNu Labs.

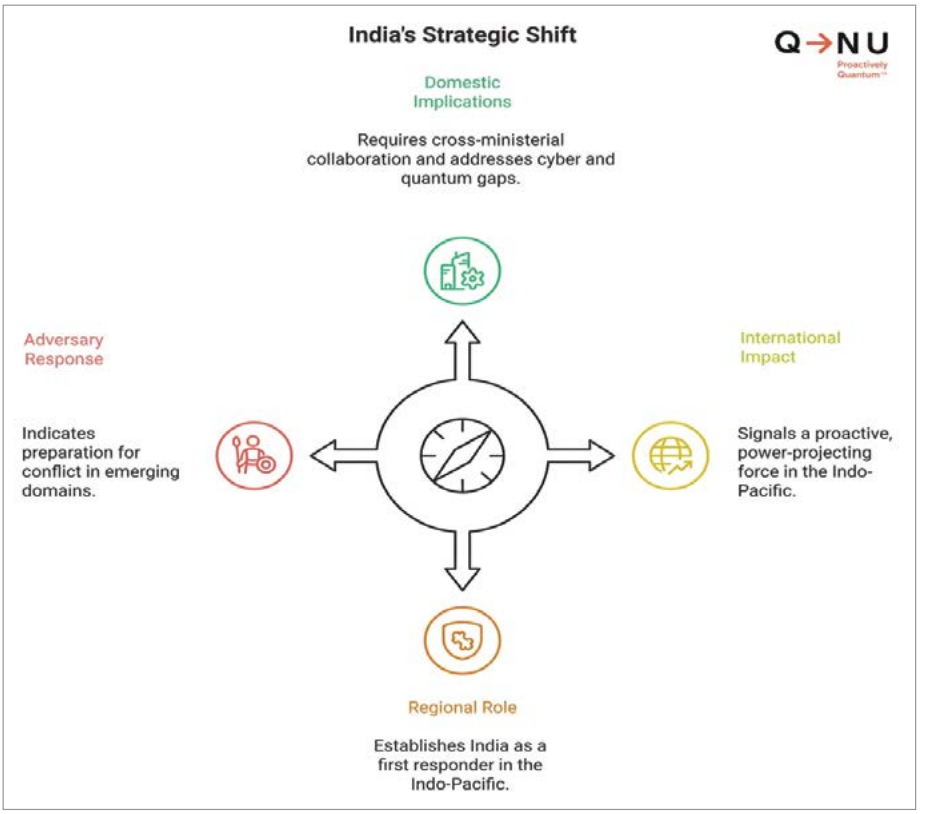
WHAT THIS MEANS FOR INDIA AND THE WORLD

Domestically, the Vision sets an inspiring and credible agenda - one that demands cross-ministerial collaboration, sustained investment, and institutional courage to execute.

The document is candid that many of its goals fall outside the Defence Forces' own purview and will require cross-ministerial support. The emphasis on self-healing cyber networks, cognitive warfare capabilities, and quantum technologies reflects assessed gaps in India's current defensive architecture, not aspirational decoration.

For the international community, the signal is clear: India is accelerating its transition from a reactive, defence-in-depth posture to a proactive, multi-domain force capable of projecting power and shaping regional order. The creation of Space and Cyber Commands tells every Indo-Pacific stakeholder that India intends to be a first responder, not a bystander.

For adversaries, the combination of Aatmanirbharta-driven capability development, a Cognitive Warfare Action Force, and doctrine evolving toward intelligence-centric operations signals that India is preparing for conflict in domains where the rules are still being written — and intends to help write them.



WHAT THIS MEANS FOR QUANTUM SECURITY AND QNU LABS

For QNu Labs, India's pioneering indigenous quantum cybersecurity company, this document is both validation and a call to urgency.

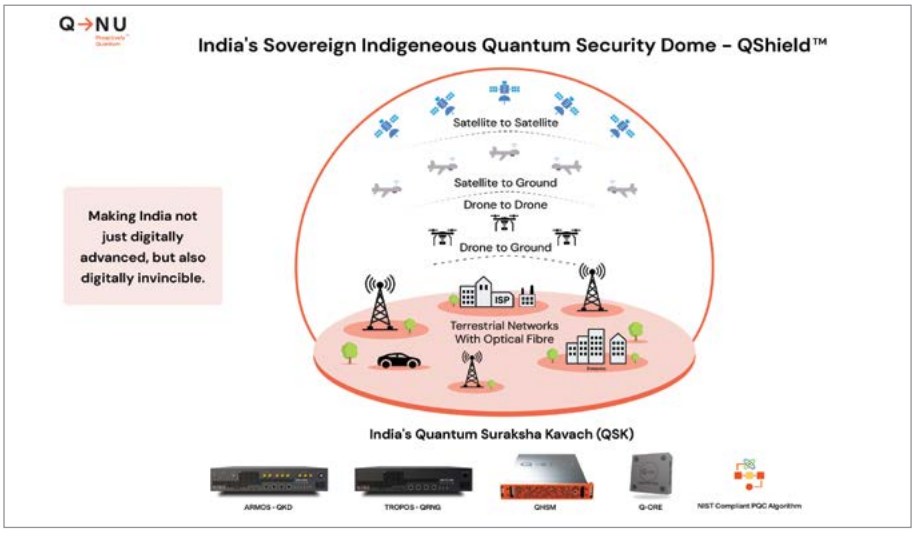
The Vision implicitly identifies quantum technologies as transformative, alongside AI and hypersonics, stating they promise *"breakthroughs in secure communication and advanced computing."* For a country that has spent nearly a billion dollars towards quantum technology and a company that has spent millions of dollars over a decade building Quantum Key Distribution networks, quantum random number generators, and post-quantum security infrastructure for India's most sensitive defence sectors, this is a significant and welcome affirmation. Because this aligns national strategic intent with the indigenous quantum security capabilities India has already built.

India's National Quantum Mission (NQM) policy for quantum safe migration is focused on the era of transition as mentioned in this Defence Force Vision Document. By 2030, India will extend its leadership in quantum-safe technology and will establish itself as a leading player in the world.

"When the Vision calls for self-healing cyber networks and intelligence-centric operations, it is describing an architecture that only quantum-secure communications can underpin. The technology exists indigenously; what is needed now is the doctrine and procurement pipeline to deploy it at scale," remarked Dilip Singh, CTO, QNu Labs.

The mandate for self-healing cyber defence and intelligence-centric warfare directly maps to what QNu has already deployed:

- Armos QKD systems
- Intercity QKD Networks across 500+ KM in India's critical infrastructure
- Naval QKD installations
- The world's first quantum-secure satellite communications launch
- Quantum-secure data centre infrastructure



- Quantum Secure Drone Communications for critical command and control layers.
- The Quantum-Safe VPN further extends quantum-hardened secure communications across distributed defence networks
- Quantum secured web browsers and quantum encryption

The proposed Cyber Command, Data Force, and Cognitive Warfare Action Force create institutional demand for quantum-grade communications security at command and control layers, precisely the mission-critical use case QNu's QShield platform (Quantum *Suraksha Kavach*) is designed to serve.

Also, know more about "Zero Trust Architecture"

QNu believes more assertiveness on technology mandates, particularly for the world's third-largest economy. DAP reform is the mechanism that could finally enable quantum-secure technologies to move from pilot deployments into large-scale, mission-critical defence infrastructure. That reform is overdue, and its success will determine whether Vision 2047's ambitions remain aspirational or become operational.

A VISION THAT MUST NOT REMAIN A GUIDELINE

The document acknowledges something important in its own introduction: this Vision is "a guideline and not a directive." That is an honest statement, and a warning. India has produced visionary defence strategy documents before. What has lagged is the institutional will, acquisition agility, and inter-agency coordination to translate them into capability on the ground.

The Defence Forces Vision 2047 is a document India should be proud of - intellectually rigorous, strategically honest, and civilisationally grounded. It deserves to be treated not as a guideline but as a living mandate. India has the strategic clarity. It has indigenous technology. It has the institutional frameworks taking shape. What it now needs is the execution velocity to match the ambition, because in a world of multiple simultaneous Revolutions in Military Affairs - where quantum-safe communications, cognitive warfare, and autonomous systems are present realities, the gap between vision and capability is itself a vulnerability. India's adversaries are not waiting for 2047.

The forge is lit. Now India must run it at full heat, and the quantum age will not wait.

–The writer is CMO, QnU Labs. An IIM-Calcutta alumnus with 22+ years of global marketing leadership, she has led quantum security thought leadership initiatives positioning India's "Made in India, Made for the World" quantum capabilities across defence, government, and enterprise sectors globally. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

THE WORLD IN INTERREGNUM

American unipolarity is eroding, but no coherent multipolar order has yet emerged. The morbid symptoms abound: unwinnable wars, unilateral sanctions, and global institutions that have lost their legitimate authority. India and Russia carry a special responsibility to navigate this storm together

MAJ GEN DEEPAK MEHRA

The word *Interregnum* comes from Latin, inter (between) and regnum (reign or rule). In ancient Rome and medieval Europe, it described the dangerous legal vacuum between the death of one ruler and the formal accession of the next. As per historical records, these power vacuums, even temporary ones, are rarely peaceful (Wallerstein, 2004). It was an Italian scholar, writing in a prison cell, who transformed the concept into a powerful analytical tool in modern political thought. Antonio Gramsci, confined by Mussolini's government, wrote in his Prison Notebooks (1929–1935) the words that resonate even today:

"The crisis consists precisely in the fact that the old is dying and the new cannot yet be born; in this interregnum a great variety of morbid symptoms appear."

For Gramsci, an interregnum was not merely a political transition ; it was a crisis of hegemony. The ruling class loses its cultural and moral authority and its capacity to lead through consent rather than coercion, before an alternative leadership has organised itself sufficiently to take its place. The 'morbid symptoms', as Gramsci predicted — the rise of irrational ideologies, purposeless wars and the collapse of shared norms and values — are the predictable occurrences that fill the vacuum of legitimate authority (Gramsci, 1971). Similarly, Immanuel Wallerstein's world-systems theory characterised the post-Cold War moment as a structural crisis of the capitalist world order. He described it as a long interregnum between American hegemonic decline and an uncertain successor configuration (Wallerstein, 2004). The question this article poses is candid: Is the world of 2026 living through an interregnum?

1991: THE UNIPOLAR MOMENT AND POWER WITHOUT WISDOM

The collapse of the Soviet Union in 1991 was received in Western capitals not as a call for humility and inclusive institutional design, but as an ideological vindication requiring further consolidation. Francis Fukuyama's much celebrated The End of History and the Last Man (1992) declared that liberal democracy had won the contest of ideologies. Charles Krauthammer coined the phrase 'the unipolar moment' in Foreign Affairs (1990), predicting that American primacy would shape the coming century. The mood was triumphal to say the least, and triumph has a dangerous tendency to produce strategic blindness.

The most revealing document of this period is the Defence Planning Guidance of 1992, drafted under Under-Secretary of Defence Paul Wolfowitz and leaked to the New York Times. Its language was candid to the point of being disconcerting. It stated that America's primary strategic objective was to prevent the emergence of any rival power capable of challenging US supremacy, in Europe, Asia or the former Soviet space. The document explicitly targeted preventing Russia's re-emergence as a great power and deterring European strategic sovereignty. Subsequent national security strategies of 1994, 1995, and 1999 maintained this logic beneath the softer veneer of 'engagement and enlargement'.

Looking back, rather than using the unipolar moment to embed Russia and other emerging powers in a multilateral architecture that they had a genuine stake in preserving, the United States treated 1991 as a geopolitical dividend to be exploited. Russia was neither included as

a legitimate partner in the post-Cold War order, nor in the security architecture of Europe. It was treated as a defeated power whose interests were negotiable only on Washington's terms. Vladimir Putin, in his landmark Munich Security Conference speech of 2007, captured this grievance with measured precision:

"What is a unipolar world? No matter how we embellish this term, it ultimately refers to one type of situation, one centre of authority, one centre of force, one centre of decision-making ... It is a world in which there is one master, one sovereign ..." (Putin, 2007)

Putin was not complaining; it was a structural diagnosis that would prove, in retrospect, to be the clarion call for the multipolar challenge.

MEARSHEIMER'S TRAGEDY: WHY UNIPOLARITY GENERATES DESTRUCTION

To understand why American unipolarity degenerated into the pattern of conflict that has defined the post-1991 era, one needs to engage with John Mearsheimer's Offensive Realism, laid out in The Tragedy of Great Power Politics (2001). The theory rests on five structural premises: international anarchy (no authority above states), offensive military capability (all great powers possess tools of coercion), uncertainty (no state can fully know another's intentions), survival (the primary goal of every state), and rationality (states calculate to maximise security). From these five premises flows a tragic conclusion: States are structurally compelled to maximise power, not merely defend it (Mearsheimer, 2001).

The 'tragedy' is not that states are vindictive. It is that the structure of the international system makes aggressive behaviour rational and sometimes inevitable. Security-seeking or consolidation itself produces insecurity. As one great power accumulates capabilities,

neighbouring powers feel threatened and respond in kind, generating the very conflicts that each party sought to avoid (Mearsheimer, 2001).

Applied to American behaviour after 1991, the theory of Offensive Realism is more enlightening than any other assessment. The Wolfowitz Doctrine was not an aberration; it was, as seen through the Mearsheimer's framework, the textbook behaviour of a hegemon using a temporary window of unchallenged dominance to foreclose the emergence of any future challenger. Mearsheimer himself observed: "States that achieve regional hegemony seek to prevent great powers in other regions from duplicating their feat. Regional hegemons, in other words, do not want peers." (Mearsheimer, 2001, p. 41). NATO expansion, regime-change operations, colour revolutions and the weaponisation of international financial institutions are all explicable through this structural lens.

The tragedy was that this very behaviour sent a clear message to Russia and China that no sphere of influence would be appreciated, thereby leading to accelerated military modernisation and strategic alignment with one another. Mearsheimer's 2014 Foreign Affairs article, "Why the Ukraine Crisis Is the West's Fault," applied this logic directly. NATO expansion was structurally intolerable to Russia not because Putin is uniquely aggressive, but because any great power would respond similarly to a hostile military alliance expanding to its borders (Mearsheimer, 2014). He further writes, 'US and European leaders blundered in attempting to turn Ukraine into a Western stronghold on Russia's border. Now that the consequences have been laid bare, it would be an even greater mistake to continue this misbegotten policy'. How true! The prophecy was vindicated in 2022.

CATASTROPHIC WARS, BOMBINGS, SANCTIONS, AND SUBVERSION

Kenneth Waltz warned in Theory of International Politics (1979) that unipolarity is inherently unstable. He argued that an unchecked hegemon will inevitably overextend, generating balancing coalitions. A unipolar world produces more wars, not fewer, because the hegemon faces no systemic restraint (Waltz, 1979). An analysis of the post-1991 record of the world brings about this painful reality.

The Gulf War I (1991) established the template of US-led 'coalitions of the willing' that would increasingly bypass multilateral legitimacy. The Yugoslavia (1999) saw NATO conduct a sustained bombing campaign without a UN Security Council mandate — truly a watershed moment in the erosion of international law. The Afghanistan (2001–2021) after 9/11 did initially attract international support, but its twenty-year occupation ended in the most visible military failure, restoring the Taliban to power and shattering American prestige worldwide. The Iraq II (2003) was launched on the fabricated pretext of weapons of mass destruction, in explicit defiance of the UN Security Council, leading to large-scale radicalisation and jihadist recruitment (Crawford, 2019).

In Libya (2011), NATO's 'responsibility to protect' mandate, obtained with Russian and Chinese abstentions (measured as support in diplomatic language), was weaponised for regime change, transforming a functional state into a failed one in which open-air slave markets eventually operated. Similarly, in Syria, Venezuela, Iran, and Cuba, the United States has deployed the full spectrum of unrestrained unilateral coercive power, including military force, aerial bombardment, proxy warfare, economic strangulation and diplomatic isolation, breaking those very international laws that it beckons others to uphold.

Where outright military intervention was deemed too costly or conspicuous, Washington developed and systematically deployed a sophisticated toolkit of what may be called 'democracy promotion by other means' — so called colour revolutions, as if democracy was a panacea for all evils. These were not organic uprisings but a carefully prepared, generously financed, choreographed and strategically coordinated set of operations designed to replace governments that refused alignment with US interests (Norden, 2014).

The "Bulldozer Revolution" in Serbia (2000), "Rose Revolution" in Georgia (2003), "Orange Revolution" in Ukraine (2004), "Tulip Revolution" in Kyrgyzstan (2005) and many other instances followed a pattern that was similar, although with

dissimilar names betraying the uniformity of their external sponsorship.

Perhaps most revealing was the response of America's closest Western allies to this comprehensive pattern of interventions, much against the tenets of international law. Nations that had lectured the world about international law and the sanctity of sovereignty fell remarkably silent during the Venezuelan and Cuban strangulations, the Iranian assassinations and the Kosovo bombings, only to discover their indignation when a NATO member, Denmark, was itself threatened by the very hegemon they had long enabled. The selective application of principles is not an international rules-based order. It is, as Russian Foreign Minister Sergei Lavrov has stated on various occasions with characteristic directness, that The West has never liked the order based on the central role of the UN and respect for international law, because it is used to living in a neo-colonial paradigm ..... It has created for the privileged few a 'rules-based order', to the detriment of international law ..... a self-referential system in which the West writes the rules, interprets the rules, and applies them or suspends them. The UN Security Council has been systematically bypassed, the International Criminal Court has been instrumentalised to suit a few, and the World Trade Organisation's dispute settlement mechanism has been effectively crippled by sustained US obstructionism.

THE STRUCTURAL DECLINE OF AMERICAN POWER

The cumulative cost of these interventions has been staggering and self-defeating. Wars and overseas deployments have cost the United States an estimated eight trillion dollars without producing a single durable strategic victory (Crawford, 2019). The Pentagon's own assessments have concluded that the US military can no longer claim assured victory in a conflict with peer competitors China or Russia — a noteworthy public acknowledgement for a defence establishment that once spoke confidently of 'full-spectrum dominance'.

Weaponising the dollar and global trade mechanisms has been counterproductive. The arbitrary freezing of approximately 300 billion dollars of Russian sovereign reserves held under international legal frameworks in 2022 has alarmed central banks worldwide. The message received was clear: dollar-denominated assets held in Western financial institutions are not safe from political seizures. The result has been an accelerated de-dollarisation process. BRICS nations are actively developing alternative payment systems, Saudi Arabia has begun pricing oil sales in non-dollar currencies, and global central bank gold purchases have reached multi-decade highs (Eichengreen, 2022).

Alternative institutional frameworks are simultaneously consolidating. The Shanghai Cooperation Organisation (SCO), now encompassing over 40 per cent of the world's population, has emerged as a security and political forum explicitly committed to multipolarity and non-interference. The New Development Bank and the Asian Infrastructure Investment Bank offer infrastructure financing without the ideological conditionality embedded in IMF and World Bank programs. The BRICS grouping, expanded in 2024 to include Saudi Arabia, the UAE, Iran, Ethiopia and Egypt, represents the formal institutionalisation of the Global South's collective desire to construct alternatives to the Bretton Woods order (Stuenkel, 2020).

A unipolar world produces more wars, not fewer, because the hegemon faces no systemic restraint (Waltz, 1979). An analysis of the post-1991 record of the world brings about this painful reality

IS THE WORLD OF 2026 LIVING THROUGH GRAMSCI'S INTERREGNUM?

Considering the current geopolitical milieu, Gramsci's century-old diagnosis now corresponds precisely with the present international system (Bauman, 2012).

The old is dying. American military credibility has been damaged by decades of inconclusive wars. Dollar hegemony is eroding. Western-led institutions face deepening legitimacy crises. NATO's internal coherence is strained. The moral authority once derived from championing democracy and human rights has been severely compromised by unconditional support for military campaigns that international courts have found to violate fundamental humanitarian norms.

The new cannot yet be born. China is an

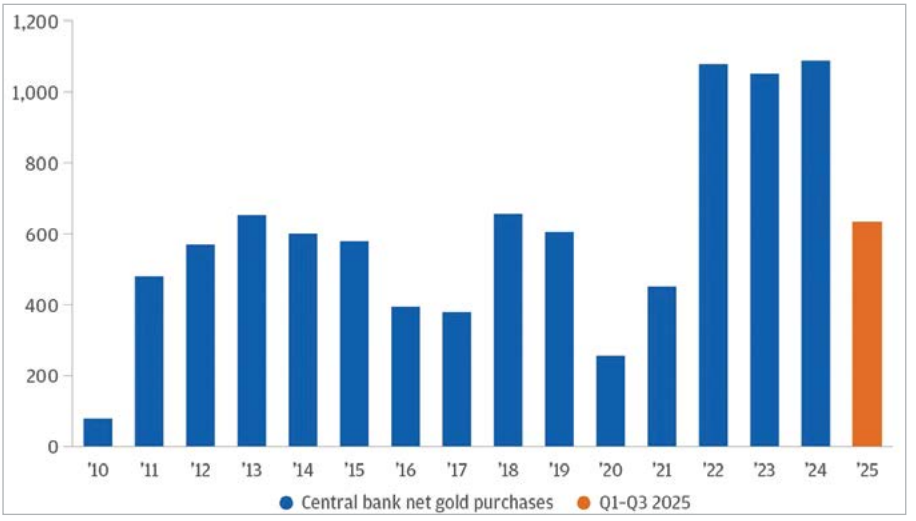


Figure 1: Central Bank Net Gold Purchases from the year 2010 to 2025.
Sources: World Gold Council, Bloomberg Finance L.P., J.P. Morgan. Data as of September 30, 2025

economic giant but, as scholars observe, a political pygmy, with its global leadership claim undermined by governance deficits, Belt and Road debt concerns, and territorial assertiveness that has alienated many neighbouring states. Russia possesses strategic nuclear capability and battlefield experience but insufficient economic weight for global leadership. BRICS lacks the institutional cohesion to govern the global economy, and the SCO has no collective security mechanism comparable to NATO (Stuenkel, 2020).

The morbid symptoms abound. The proliferation of regional wars, the rise of authoritarian nationalism across every continent, the collapse of arms control architectures and the weaponisation of currencies and resource supply chains, are precisely the symptoms Gramsci predicted. The wars in Ukraine, Gaza, and Iran , and the gathering confrontations over Taiwan, Greenland, Cuba and unilateral tariffs, are not isolated incidents. These are consequences of a hegemonic system in transition, without adequate institutional guardrails.

INDIA AND RUSSIA: NAVIGATING THE INTERREGNUM TOGETHER

No bilateral relationship is more consequential for navigating the current interregnum than the partnership between India and Russia. Rooted in six decades of strategic cooperation, elevated to the Special and Privileged Strategic Partnership in 2010, the India-Russia relationship carries a depth of institutional memory, mutual trust and convergent geopolitical vision that no current great power realignment has been able to erode (MEA India, 2025; Joshi, 2020).

The 23rd India-Russia Annual Summit of December 2025 reaffirmed this convergence in explicit terms. The Joint Statement positioned the bilateral relationship as "an anchor of global peace and stability, grounded in the principle of equal and indivisible security ". It committed both nations to "strive for global peace and stability in a multipolar world as well as in a multipolar Asia" (MEA India, 2025).

SHARED VISION OF MULTIPOLARITY

At the normative level, both India and Russia share a foundational commitment to a multipolar world order governed by the UN Charter's principles of sovereign equality, non-interference in internal affairs and peaceful settlement of disputes. As a post-colonial democracy of continental scale, India has always been allergic to unilateral Western prescriptions. As a great power excluded from the post-Cold War settlement, Russia has consistently championed the construction of multilateral alternatives. Together, India and Russia represent the two most credible advocates of a

reformed multilateral system that gives genuine voice to the non-Western world (International Journal of Legal Research and Development, 2025).

Lavrov's articulation of this vision aligns precisely with India's longstanding diplomatic position:

"There is actually a situation when the West with its insatiable hegemonic ambitions has entered, as they say, a clinch, with the desire of the world majority to overcome existing challenges on the basis of equality, justice or in other words on the basis of the principles of the UN Charter." (Lavrov, 2023)

India has consistently echoed this principle while maintaining its own voice at the UN, G20, SCO, and BRICS. Its abstentions on Ukraine-related Security Council resolutions were not expressions of indifference but of principled commitment to the belief that the UN Charter's norms must apply universally, not selectively (Jankar, 2025).

INSTITUTIONAL LEADERSHIP OF THE GLOBAL SOUTH

Where India and Russia are most powerfully positioned to act together is in the institutional reform of the multilateral order itself. Russia's permanent membership of the UN Security Council and India's imminent permanent membership, actively supported by Russia, France, and the United Kingdom, would transform the Council from a relic of 1945 power distribution into a body more genuinely reflective of today's world.

Within BRICS, encompassing the world's largest economies by purchasing power parity, India and Russia can jointly champion the construction of alternative financial architectures. These could include: a BRICS currency and payment system that reduces vulnerability to dollar weaponisation, a BRICS development finance institution with robust governance standards, and a BRICS-SCO security dialogue that offers the Global South a forum for conflict resolution outside Western-dominated mechanisms (Stuenkel, 2020).

India's Voice of Global South Summit initiative and Russia's Greater Eurasian Partnership concept are, in practice, complementary frameworks that together span the civilisational breadth across the continents. India brings democratic legitimacy and Global South moral authority whereas Russia brings strategic depth, energy resources and Eurasian continental connectivity (CNA, 2025). The combination, if managed with strategic patience and mutual respect, is greater, as they say, than the sum of its parts.

TRAVERSING THROUGH THE TENSIONS

Intellectual honesty demands acknowledging that the India-Russia partnership operates under some stress. India's deepening defence and technology cooperation with the United States and its border dispute with Russia's closest strategic partner, China, complicate the relationship. However, with maturity and mutual understanding, as in the past, these stresses could be managed amicably. In this transactional world, where the geopolitical realignments amongst nations have shifted rapidly, India-Russia friendship has been one constant that has only become stronger with the passage of time.

NAVIGATING THE TURBULENT TIMES

Gramsci wrote that when the old is dying and the new cannot yet be born, monsters appear. The monsters of our interregnum are unwinnable wars, unilateral sanctions, global institutions that have lost their legitimate authority, and great powers that enforce rules that they themselves routinely violate. The genuine path out of the interregnum is not the restoration of American unipolarity or of Chinese hegemony, but the patient, deliberate construction of a reformed multilateral order. An order in which the voices of the majority of humanity are genuinely heard and in which the UN Charter's norms of sovereign equality apply to the powerful as rigorously as to the weak.

India and Russia, as the two largest non-Western democracies and great powers with the deepest bilateral institutional relationship in the developing world, carry a special responsibility. Their partnership is not a relic of the Cold War; it is a forward-looking strategic alignment calibrated to the demands of these changing times.

It is unlikely that this period of interregnum will end quickly. The morbid symptoms, however, need to be contained long enough for new legitimate institutions to be born or redefined. India and Russia, navigating together with strategic patience, principled commitment to international law, representing the civilisational wisdom of many millennia and the genuine aspirations of the world majority, must walk the path together to navigate this Storm of the Interregnum.

–The writer, Kirti Chakra, AVSM, VSM recipient, is an Indian Army veteran. He has also served as the Indian Military Attaché in Moscow. He is the Founding Director and CEO of ThorSec Global. An accomplished scholar, he specialises in Geopolitics with a focus on Russian Studies and is currently pursuing his PhD. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

INDIA'S RAMJET RENAISSANCE

The recent successful test of the Solid Fuel Ducted Ramjet (SFDR) technology by the DRDO is a crowning achievement for India. This supersonic leap into the elite air-to-air domain fundamentally alters the balance of power in the Indo-Pacific. Additionally, it offers a compelling blend of sustained kinetic energy, massive range, and strategic autonomy, effectively ending the era where Indian pilots had to worry about being "out-sticked" by foreign adversaries

DR MATHEW SIMON

The successful flight test of the Solid Fuel Ducted Ramjet (SFDR) technology by the Defence Research and Development Organisation (DRDO) on February 3, 2026 marks a decisive inflection point in India's quest for aerospace autonomy. By mastering the intricate fluid dynamics of ramjet propulsion, India has effectively shattered the technological glass ceiling that previously limited its air-to-air missiles to conventional rocket motors.

This breakthrough transitions the Indian Air Force (IAF) from a reactive posture to one of proactive dominance, placing the nation within an ultra-exclusive club of powers - alongside the United Kingdom, France, and Russia - capable of fielding long-range, high-supersonic interceptors like the Astra Mk-3. The SFDR is not merely a mechanical upgrade; it is a strategic guarantor that ensures Indian fighter jets can outrange and outpace the most sophisticated threats in the contemporary battlespace.

THE PHYSICS OF PERSISTENCE: EXPANDING THE NO-ESCAPE ZONE

At the heart of the SFDR's tactical advantage is its radical departure from traditional solid-fuel propulsion. Conventional missiles carry their own oxidiser, which adds significant weight and causes the motor to burn out rapidly, leaving the missile to coast on kinetic energy during its terminal phase. In contrast, the SFDR acts as an "air-breather", scooping oxygen from the atmosphere to burn its fuel. This engineering masterstroke allows the missile to maintain a sustained, high-speed thrust throughout its flight profile.

For a pilot, this translates into a vastly expanded "No-Escape Zone", where the target cannot simply outmanoeuvre the incoming projectile because the missile retains the energy required for high-G turns right up until the moment of impact. With the Astra Mk-3 projected to achieve a range exceeding 350 kilometres, India can now neutralise enemy high-value assets - such as Airborne Early Warning and Control (AEW&C) aircraft and tankers - well before they can provide support to frontline fighters.

SHATTERING THE RANGE DEFICIT AND STRATEGIC CONSTRAINTS

The primary benefit of this technological mastery is the neutralisation of the range advantage previously held by the Chinese People's Liberation Army Air

Force (PLAAF) with its PL-15 and PL-21 missiles. Historically, Indian pilots faced a "range deficit" when patrolling the Himalayan borders, often forced to operate under the shadow of longer-reaching adversary systems.

The SFDR-powered Astra Mk-3 levels this playing field, offering a symmetrical response that complicates the adversary's operational calculus. Furthermore, the indigenous nature of this technology serves as a potent hedge against the vagaries of international arms markets. By developing the SFDR internally, India avoids the restrictive "end-use monitoring" clauses often attached to Western systems like the MBDA Meteor, ensuring that the IAF has total sovereign control over its most lethal air-superiority assets during a conflict.

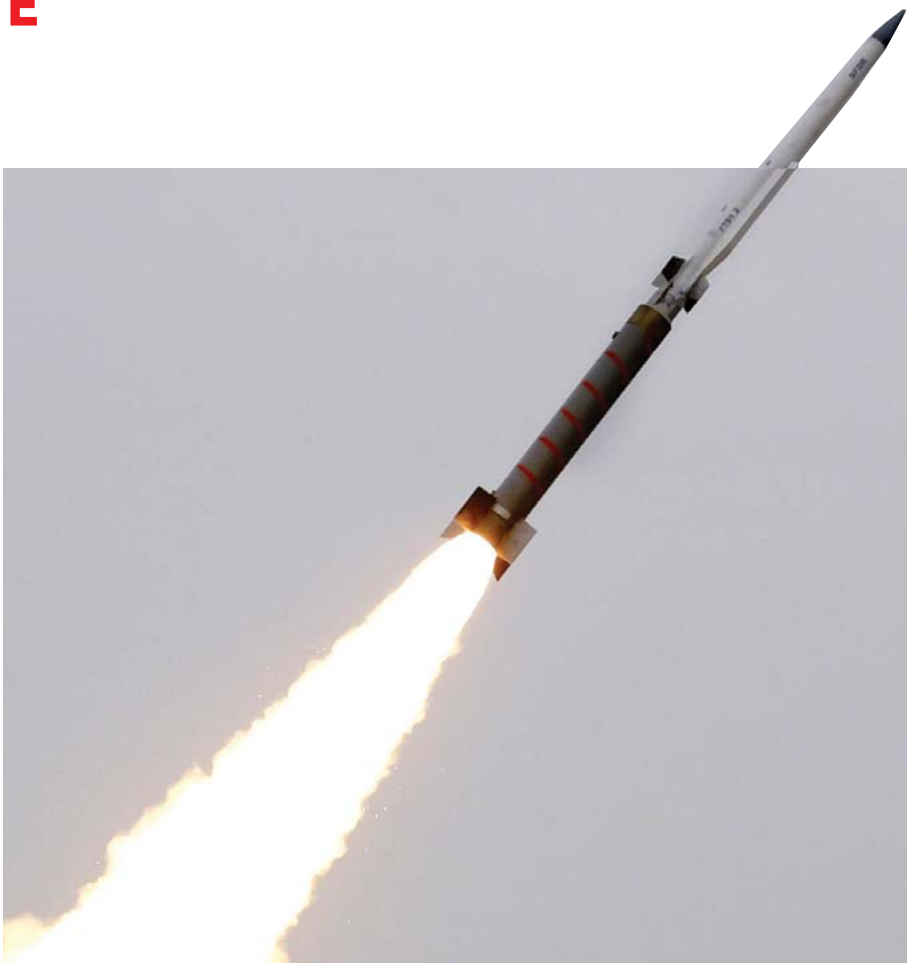
THE COMPLEXITY PENALTY: ENGINEERING AND LOGISTICAL HURDLES

However, the path to operationalising SFDR technology is fraught with significant technical and logistical challenges. One major hurdle is the inherent complexity of ramjet ignition and sustenance at varying altitudes. A ramjet does not produce static thrust; it requires a booster to reach supersonic speeds before the air-intake can function effectively. This necessitates a two-stage propulsion system that increases the physical dimensions and weight of the missile, potentially limiting the number of rounds a single fighter can carry compared to smaller, conventional missiles.

Additionally, the extreme thermal stresses generated by sustained supersonic flight require advanced materials and coatings to prevent the missile's airframe from warping or the seeker electronics from failing under intense heat. The development of these high-temperature materials remains an expensive and time-consuming endeavour that could delay the mass production of the Astra Mk-3.

THE SENSOR-TO-SHOOTER SYNERGY: A NETWORKED NECESSITY

From an analytical perspective, the successful test of the ramjet in February must be viewed within the broader context of India's integrated deterrence strategy. While the SFDR technology is a triumph of Indian science, its true value will only be realised if it



The SFDR provides a maritime "stand-off" capability, allowing Indian naval MiG-29Ks or the future TEDBF to engage enemy strike packages long before they reach the fleet's defensive perimeter. However, India must remain wary of the quantitative gap. While the SFDR provides qualitative excellence, the sheer volume of missiles produced by China's industrial base means that India cannot afford to treat the Astra Mk-3 as a boutique weapon

is integrated into a robust network-centric warfare environment.

A missile with a 350-kilometre range is only as effective as the radar and sensor data that guides it. To fully exploit the SFDR's potential, India must simultaneously accelerate the deployment of its indigenous AEW&C "Netra" platforms and enhance the data-link capabilities of its Su-30MKI and Tejas Mk-2 fleets. Without a "sensor-to-shooter" loop that matches the missile's reach, the Astra Mk-3 risks becoming a high-tech tool without a clear vision, capable of flying further than the eye can see but unable to distinguish friend from foe at such extreme distances.

COUNTERING THE DRAGON: QUALITY VERSUS QUANTITY

A matured assessment also requires a comparison with the rapidly evolving Chinese naval and aerial threats. As the People's Liberation Army Navy (PLAN) expands its carrier-borne aviation capabilities in the Indian Ocean, the ability of India's land-based and carrier-based fighters to strike from a distance becomes paramount.

The SFDR provides a maritime "stand-off" capability, allowing Indian naval MiG-29Ks or the future TEDBF to engage enemy strike packages long before they reach the fleet's defensive perimeter. However, India must remain wary of the quantitative gap. While the SFDR provides qualitative excellence, the sheer volume of missiles produced by China's industrial base means that India cannot afford to treat the Astra Mk-3 as a boutique weapon.

Success will depend on the "Make in India" ecosystem's ability to transition this laboratory success into high-rate industrial production, ensuring that the IAF has the depth of inventory required for a high-intensity, multi-front war.

SOVEREIGN DOMINANCE IN THE INDO-PACIFIC CANOPY

Overall, the February 2026 SFDR test is a crowning achievement for DRDO that fundamentally alters the balance of power in the Indo-Pacific air domain. It offers a compelling blend of sustained kinetic energy, massive range, and strategic autonomy, effectively ending the era where Indian pilots had to worry about being "out-sticked" by foreign adversaries.

While the challenges of thermal management, integration, and mass production are non-trivial, the opportunities for regional deterrence and industrial growth far outweigh the risks. As India integrates this ramjet technology into its burgeoning arsenal, it sends a clear message to the world: the Indian canopy is no longer just defended; it is dominated by a silent, supersonic, and sovereign force that refuses to be outdistanced.

–The writer is an Assistant Professor, at ICFAI University, Jaipur. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

BE A PART AS SPONSOR, EXHIBITOR, DELEGATE, TRADE VISITOR

SUPPORTED BY

Defence Research and Development Organisation
Ministry of Civil Aviation
Directorate General of Civil Aviation
Department of Defence Production*
Council of Scientific & Industrial Research
Government of India

*Requested

AEDEX AEROSPACE & DEFENCE EXPO + Airport Expo

Thu. 10th - Sat. 12th, September, 2026

Yashobhoomi, IICC, Dwarka, New Delhi, India

www.aedexandairportexpo.com

43% BOOKED

Where Domains Converge for Business Growth (Aerospace, Defence & Civil Aviation)

ORGANISED BY

TAFCON

In Association with

SIATI

Expected Participation:

- 300+ Exhibitors
- 10+ Countries
- 600+ Delegates
- 12,000+ Footfalls

Visitor Badges & Lanyards Sponsor

DIVYANSHI AVIATION – WHERE EXPERTISE MEETS AGILITY
VANDANA AIRCRAFT

Industry Support

Digital Marketing Partner

purple sketch digital

MEDIA SUPPORT

Electronics For You | Electronics B2B | Defence Electronics | Engineering Newsware | Spinex Corestory | Forgings Today | India Strategic | Industry Outlook | Life of Soldiers | Maintonia | Rail Analysis | Raksha Anirveda | South Asia Defence

SCAN QR CODE
To Enquire for Exhibiting

SCAN QR CODE
To Download Sponsorship Brochure

Contact at: Email: aedexandairportexpo@tafcon.in / Tel: +91-11-49857777 (50 Lines) | Email: v.menon@siati.org / Tel: +91-80-25275262

Follow us : AEDEX+AIRPORT Expo | aedexandairport | aedexairportexpo2026 | aedexairportexpo

General Atomics Aeronautical Systems, Inc. (GA-ASI)'s MQ-9B provides India with long-endurance, multi-mission capabilities across land and maritime domains.

FROM MQ-9B TO COLLABORATIVE COMBAT AIRCRAFT: ADVANCING INDIA'S AIR DOMINANCE

India's evolving security doctrine emphasises deterrence, situational awareness, and operational flexibility across domains. The MQ-9B and CCA platforms strengthen each of these pillars, addressing critical security challenges while enhancing India's strategic posture

DR. VIVEK LALL

India stands at a pivotal moment in its defence evolution, navigating a complex geopolitical landscape marked by border tensions, maritime challenges, and the rise of multidimensional threats.

As the world's largest democracy and an emerging global power, India requires cutting-edge solutions to safeguard its sovereignty and project strength across its various domains. The country's recent acquisition of the MQ-9B Unmanned Aircraft System (UAS), developed by GA-ASI represents a significant leap forward in achieving these objectives.

The MQ-9B offers India a best-in-class, versatile, multi-mission Intelligence, Surveillance, and Reconnaissance (ISR) platform, along with a training pipeline designed to evolve with emerging threats. It also serves as a bridge to implementing innovative operational concepts informed by recent conflicts — concepts that integrate traditional crewed aircraft with layers of uncrewed systems.

Combining systems designed to establish an intelligence picture with Collaborative Combat Aircraft (CCA), such as GA-ASI's Gambit Series, allows forces to penetrate advanced air defences and effectively spread out and stretch an adversary's resources. This, in turn, opens opportunities for friendly forces to strike decisive blows, all while radically reducing the threat to irreplaceable human lives and major capital assets.

Together, MQ-9B and CCA would provide India's military with enhanced capability to surveil the battlespace and establish air superiority. These advanced platforms would not only address India's immediate security needs but also position the nation as a global leader in defence.

MQ-9B WILL STRENGTHEN INDIA'S NATIONAL SECURITY ARCHITECTURE

India's national security priorities are shaped by its unique challenges, including contested borders with nuclear-armed neighbours, expansive maritime zones, and internal security concerns.

The MQ-9B, with its unmatched endurance, advanced sensors, and

Deployed worldwide, GA-ASI's MQ-9B is the highest-performing UAS in its class

multi-mission versatility, is tailor-made to address these areas of focus:

Border Security and Territorial Integrity: The MQ-9B's ability to operate for over 30 hours provides persistent surveillance over India's vast and often rugged border regions. Equipped with multi-intelligence capabilities — including electro-optical/infrared cameras — the platform ensures comprehensive situational awareness.

This is critical for monitoring activities along the Line of Actual Control with China and the Line of Control with Pakistan, where real-time intelligence can deter incursions and prevent escalation.

Maritime Domain Awareness: India's maritime interests span the Indian Ocean, a region vital for global trade and energy security. The MQ-9B's maritime variant, SeaGuardian®, offers specialised capabilities such as a 360-degree maritime radar, an automatic identification system, and sonobuoy dispensers.

These features enhance India's ability to monitor shipping lanes, detect illegal activities, and counter potential threats from adversarial naval forces. By bolstering maritime domain awareness, the MQ-9B supports India's vision of becoming a net security provider in the Indo-Pacific.

Together, MQ-9B and CCA would provide India's military with enhanced capability to surveil the battlespace and establish air superiority. These advanced platforms would not only address India's immediate security needs but also position the nation as a global leader in defence

Airborne Early Warning and Control (AEW&C): The proliferation of stealthy cruise missiles, advanced fighter aircraft, and drone swarms necessitates robust AEW capabilities. Acquiring MQ-9B aircraft with the AEW&C mission package, developed in collaboration with Saab, would enable India to detect and track threats across its airspace.

This cost-effective solution complements traditional AEW platforms, greatly extending their reach and ensuring interoperability with allied systems. The MQ-9B with AEW&C can also operate in areas deemed too dangerous for large, costly crewed AEW&C aircraft — preserving lives and giving the enemy fewer places to hide.

AUTONOMOUS INNOVATION FOR COLLABORATIVE COMBAT

GA-ASI's Gambit Series represents the future of tactical airpower, pairing autonomous aircraft with human-crewed fighters.

Built with a modular design, Gambit aircraft share approximately 70 percent common components, streamlining production and reducing costs. The platform includes multiple variants tailored to specific missions, from ISR and air-to-air combat to stealth reconnaissance and naval operations.

Gambit Variants:

- **Gambit 1:** Optimised for long-endurance ISR missions, featuring fuel-efficient engines and high-aspect wings for extended patrols in contested airspace
- **Gambit 2:** Equipped with air-to-air weapons for engaging hostile aircraft,

Gambit 6 is the latest in GA-ASI's line of Gambit Series uncrewed fighter jets, delivering precision strike capabilities for air-to-ground missions. Artist's rendering

prioritising combat capability over endurance

- **Gambit 3:** Designed for adversary air roles in training scenarios, reducing operational costs for warfighter preparation
- **Gambit 4:** A stealth combat reconnaissance model with a tail-less design, ideal for high-risk missions in contested environments
- **Gambit 5:** Developed for carrier-based operations, featuring enhanced durability and a compact design for maritime missions
- **Gambit 6:** Focused on air-to-ground roles such as electronic warfare, suppression of enemy air defences, and deep precision strikes

The Gambit Series exemplifies GA-ASI's commitment to delivering cost-effective, mission-tailored solutions that enhance survivability and operational efficiency.

By collaborating with GA-ASI on CCA development, India can push the boundaries of unmanned systems and reinforce its role as a key player in next-generation airpower.

A COHESIVE FORCE FOR MULTIDIMENSIONAL THREATS

The true strength of the MQ-9B and CCA lies in their ability to operate as part of a cohesive force. Together, these platforms create a comprehensive defence architecture capable of addressing a wide range of missions:

- **MQ-9B:** Provides persistent ISR coverage across land and sea domains, ensuring real-time intelligence and precision targeting
- **CCA:** Acts as a force multiplier, expanding magazine depth, improving sensing capabilities, and enhancing survivability in contested airspace
- **Interoperability:** Both platforms are fully compatible with U.S. and NATO-standard systems, enabling seamless integration into joint operations and enhancing India's role in multilateral defence initiatives

This synergy ensures that India can respond effectively to evolving threats while maintaining operational flexibility and cost efficiency.

ESTABLISHING INDIA AS A DEFENCE TECHNOLOGY LEADER

The acquisition of MQ-9B UAS and the potential integration of CCAs are more than just strategic investments — they are statements of intent.

By fielding some of the most advanced UAS in the world, India is demonstrating its commitment to innovation and its readiness to lead in the realm of defence technology. Moreover, the existing partnership with GA-ASI is driving the growth of India's aerospace industry, creating opportunities for deeper collaboration and future advancements.

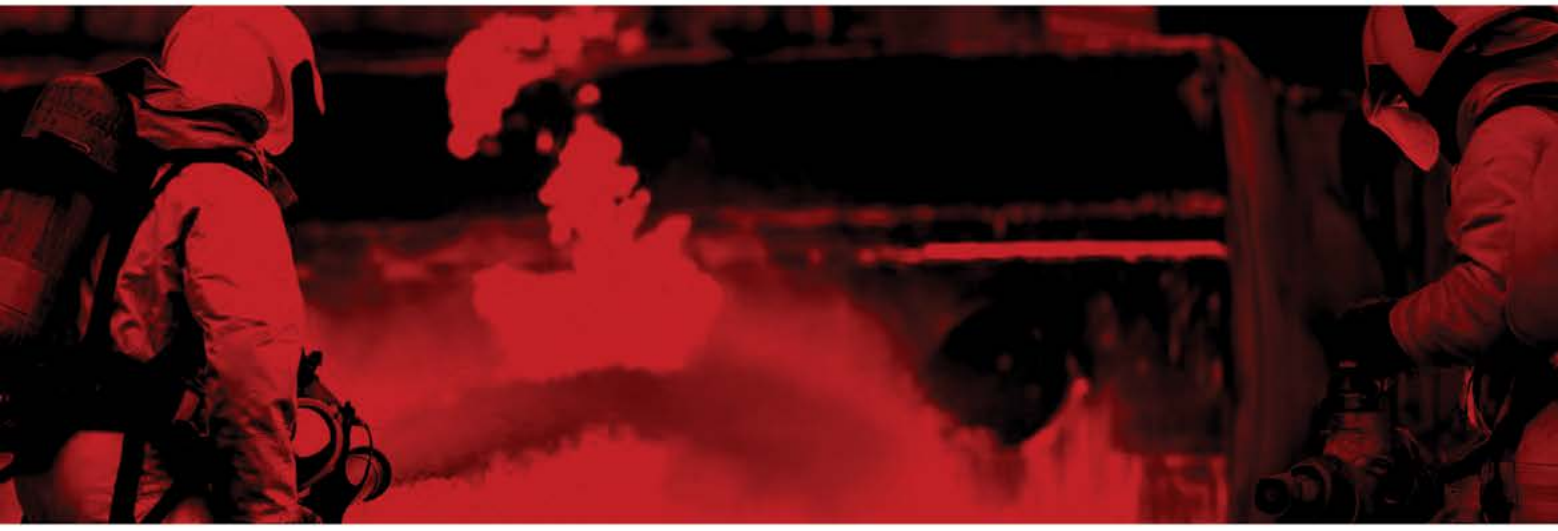
GA-ASI's YFQ-42A aircraft on the flight line at the company's High Desert Test Range as part of the U.S. Air Force's CCA flight test campaign

India's evolving security doctrine emphasises deterrence, situational awareness, and operational flexibility across domains.

The MQ-9B and CCA platforms strengthen each of these pillars, addressing critical security challenges while enhancing India's strategic posture. By investing in these cutting-edge technologies, India is safeguarding its sovereignty while also shaping the future of air dominance in the Indo-Pacific.

As the partnership between India and GA-ASI continues to grow, the benefits extend far beyond immediate operational needs. Together, they are building a foundation for long-term innovation, fostering indigenous capability, and positioning India as a global leader in defence technology.

BIG BANG BOOM SOLUTIONS
Your Friendly Neighbourhood Defence Company



AGNI QUELL

Suppresses Class A and B fires

High Expansion Firefighting Foam

Indigenously Engineered for enclosed **Naval Spaces**

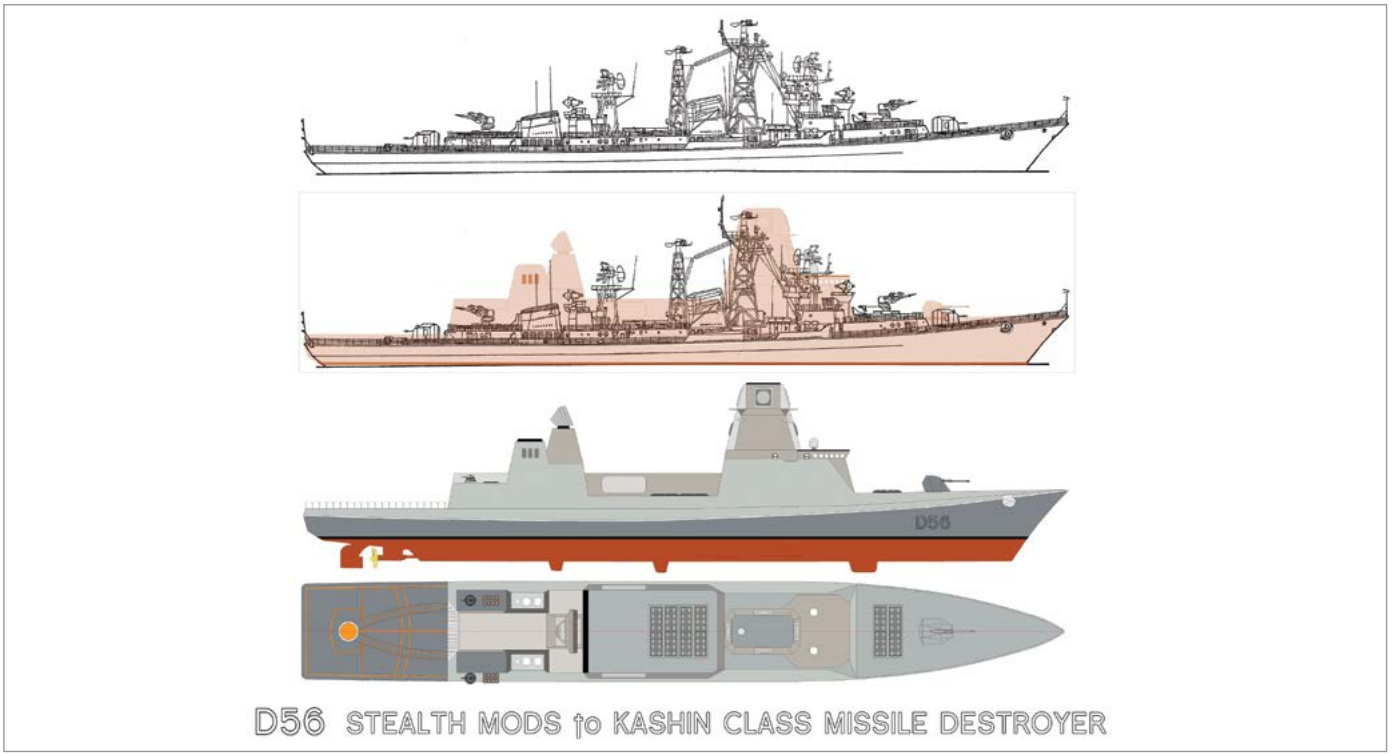
800x Expansion | Tested by the Navy | No toxic legacy.

IMO International Maritime Organization Certified

ISO

iDEX Innovations for Defence Excellence
PM Awardee

www.bigbangboom.com +91 96259 12345



RE-ENGINEERING THE RAJPUT CLASS DESTROYERS

The Rajput class destroyer modernisation programme represents a conscious, high value investment in extending the operational relevance of four legacy hulls at a fraction of new construction cost. By targeting a 10 to 12 years life extension, the programme bridges the capability gap between current surface combatant strength and the arrival of next generation destroyers, for the Indian Navy

RAHUL VATSYAYAN

The redesigning of Rajput class destroyer centres on transforming the Rajput from a Soviet era platform into a contemporary, multi mission combatant capable of contributing meaningfully to fleet level operations. This is achieved through a comprehensive structural and systems overhaul that preserves the class's proven seakeeping and endurance while replacing outdated combat systems with modern, network centric architecture.

REDESIGNED RAJPUT

At the heart of the upgrade is a stealth optimised superstructure that reduces radar cross section and improves survivability in contested environments. This redesigned topside integrates a universal 96 cell Vertical Launch System, dramatically increasing missile density and enabling a balanced mix of long range air defence, point defence, anti ship, and land attack weapons.

The shift to a universal VLS

architecture also future proofs the platform, allowing seamless integration of emerging missile families and next generation interceptors. Complementing this firepower is a next generation sensor and electronic warfare suite built around fixed panel AESA radar, advanced ESM/ECM systems, and distributed computing nodes. Together, these upgrades elevate the Rajput class into a capable sensor shooter node within a networked maritime battlespace.

The Rajput class destroyers — INS Rajput, INS Rana, INS Ranjit, INS Ranvir, and INS Ranvijay — represent a pivotal chapter in the Indian Navy's transition from Soviet era platforms to a more indigenous, network centric force. Commissioned between 1980 and 1988, these modified Kashin II–class ships were once among the most capable surface combatants in the Indian Ocean. Over the decades, they have undergone incremental upgrades, including BrahMos integration, improved sensors, and electronic warfare enhancements. Yet, the fundamental architecture of the class remains rooted in Cold War design philosophies.

As India accelerates its naval modernisation—anchored by the P15A, P15B, and upcoming P17B/P18 programmes—the Rajput class faces obsolescence in signature management, missile capacity, survivability, and digital integration. However, the underlying hulls remain structurally sound, with significant remaining fatigue life if appropriately refurbished. This opens the door to a bold proposition: a deep modernisation programme that transforms the Rajput class into stealth optimised, VLS heavy multi role combatants capable of contributing meaningfully to fleet operations for another decade.

RATIONALE FOR MODERNISING THE RAJPUT CLASS

Strategic Imperatives

The Indian Navy's surface fleet is expanding, but the pace of new construction is constrained by shipyard capacity, budget cycles, and the complexity of modern destroyer programmes. Meanwhile, the Indo Pacific security environment is evolving rapidly, with:

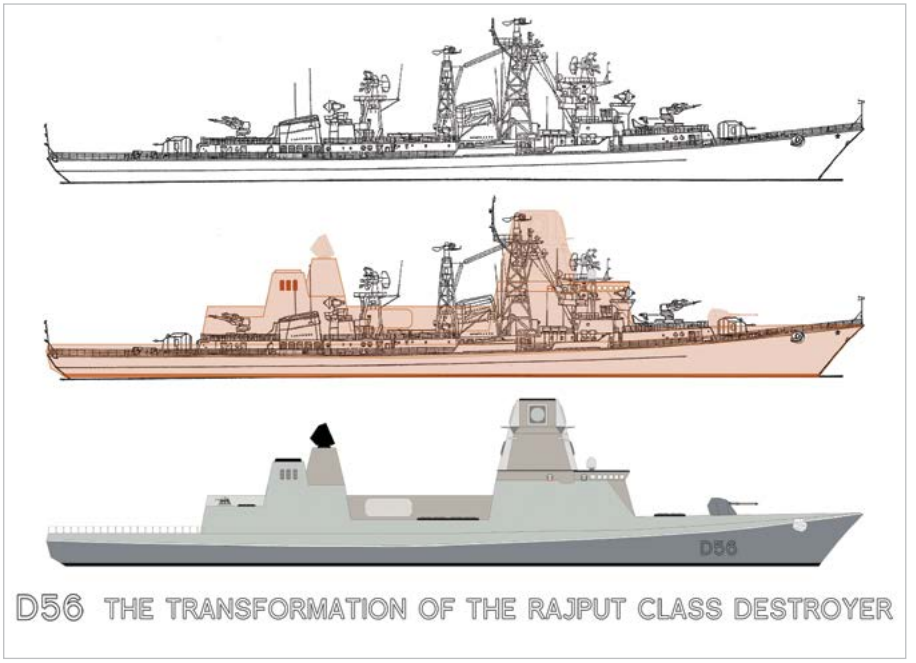
- The PLA Navy deploying increasingly sophisticated destroyers (Type 052D, Type 055)
- Expanding submarine activity in the Indian Ocean
- A growing need for distributed lethality and multi axis strike capability
- The requirement for layered air defence across carrier battle groups and independent task forces

A modernised Rajput class destroyer with 96 VLS cells would significantly enhance the Navy's ability to field high volume missile shooters without waiting for new hulls.

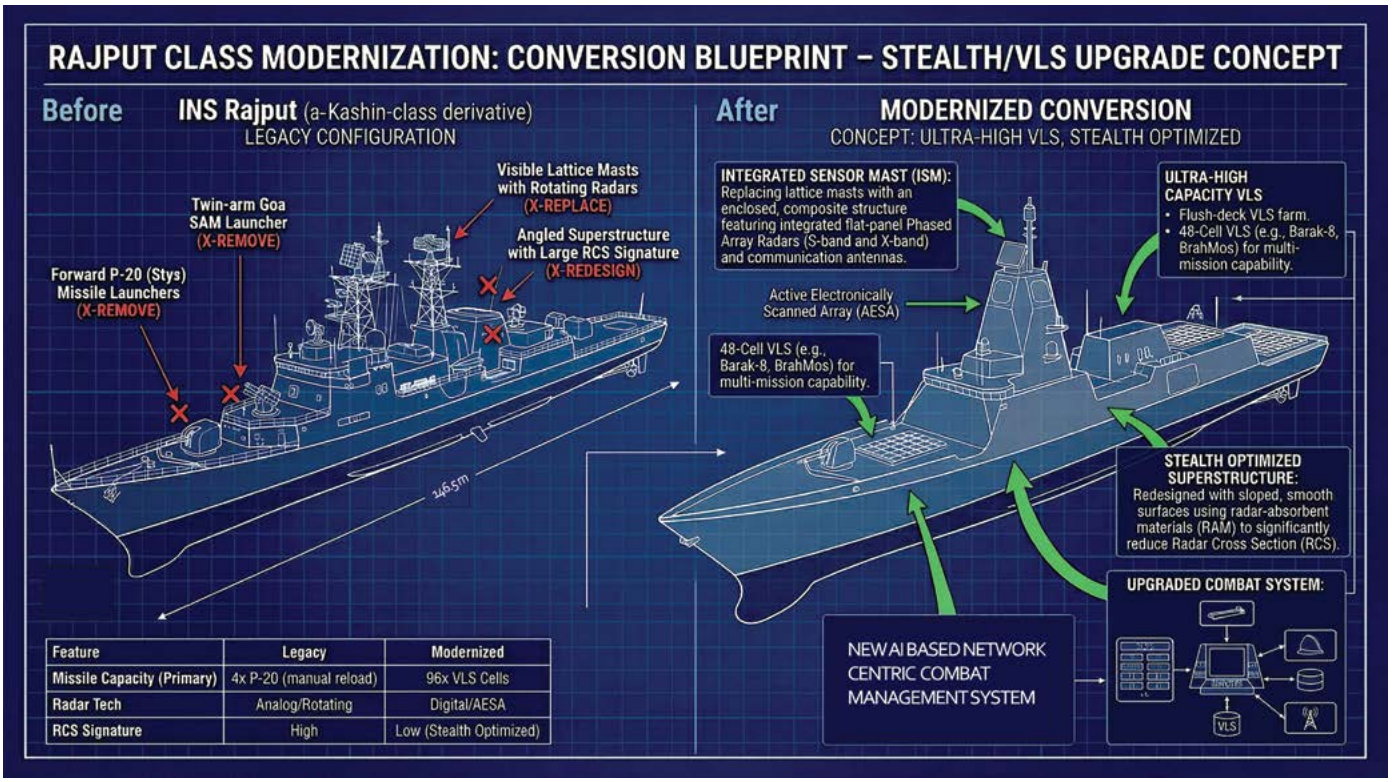
THE 96 CELL VLS ARCHITECTURE

Adopting a 96 cell Vertical Launch System (VLS) architecture for the upgraded Rajput class reflects a deliberate balance between firepower, survivability, and hull form constraints. Modern naval combat is defined by saturation attacks, long range engagements, and the need for rapid, multi axis defensive responses. A destroyer that cannot sustain high missile expenditure rates, risks becoming tactically irrelevant in contested environments. With global peers fielding between 64 and 128 cells, a 96 cell configuration positions the Rajput class squarely within contemporary norms while avoiding the structural penalties associated with extreme cell counts.

At the heart of the upgrade is a stealth optimised superstructure that reduces radar cross section and improves survivability in contested environments. This redesigned topside integrates a universal 96 cell Vertical Launch System, dramatically increasing missile density and enabling a balanced mix of long-range air defence, point defence, anti-ship, and land attack weapons



D56 THE TRANSFORMATION OF THE RAJPUT CLASS DESTROYER



It provides the volume needed to support layered air defence, land attack, and anti ship missions without overwhelming the ship's displacement or stability margins. The operational advantage of 96 cells lies in its flexibility.

A 96 cell grid allows the Rajput class to carry a diversified missile suite—such as a combination of long range SAMs, quad packed point defence rounds, and strike weapons—while still retaining surge capacity for high intensity engagements. This ensures the ship can defend itself, protect high value units, and contribute to offensive operations without relying excessively on escorts or replenishment.

The configuration also supports future missile growth, including larger boosters or next generation hypersonic systems, by providing the necessary vertical volume and modularity.

From an engineering standpoint, 96 cells represent the upper limit that can be integrated into the Rajput hull without major reconstruction. The forward deck can accommodate a 32 VLS, while 64 VLS Midships fits within existing structural envelopes once legacy systems are removed.

SENSOR AND COMBAT SYSTEMS MODERNISATION

Modernising the Rajput class demands a decisive shift toward contemporary sensor architectures, with the primary radar forming the backbone of the ship's combat system revival.

A modern Active Electronically Scanned Array (AESA) suite — preferably integrated into the ship's new Integrated Mast Structure (IMS) — enables persistent 360 degree coverage, rapid beam steering, and high resistance to jamming. This transition is not merely a hardware upgrade; it redefines the destroyer's ability to act as a networked sensor node within a carrier battle group.

Among viable options, the EL/M 2248 MF STAR stands out due to its proven service record with the Indian Navy and its compatibility with Barak 8 class interceptors. Its mature software ecosystem and demonstrated maritime performance reduce integration risk. Revathi Mk2, an indigenous AESA evolution, offers a compelling alternative by leveraging domestic supply chains and aligning with long term self reliance goals.

Integrating a fixed panel AESA suite also unlocks broader combat system modernisation. Higher track refresh rates and improved low altitude discrimination enhance the effectiveness of upgraded surface to air missiles, while precision cueing supports long range anti ship and land attack weapons. When fused with new ESM, EO/IR, and combat management software, the radar becomes the anchor of a revitalised kill chain.

PROPULSION AND POWER GENERATION UPGRADES

Upgrading the Rajput class propulsion plant is central to extending the service life and operational relevance of these destroyers.

Replacing the aging turbines offers several pathways, each shaped by geopolitical realities and industrial capacity. Ukrainian Zorya Mashproekt turbines remain the most direct drop in successors, given their lineage and compatibility with the existing gearbox and shafting arrangements. However, availability and supply chain stability are uncertain. An indigenous alternative — the Kaveri Marine Gas Turbine — represents a

strategic long term solution, aligning with national self reliance goals and enabling deeper integration with Indian shipbuilding programmes.

A modernised propulsion system also enables a broader electrical upgrade. Improved fuel efficiency and higher power margins support advanced radars, combat system processors, and potential hybrid electric auxiliaries.

SURVIVABILITY ENHANCEMENTS

Structural survivability forms the foundation of this transformation. Improved compartmentalisation — particularly around engineering spaces, magazines, and C2 nodes — reduces the risk of progressive flooding and fire spread. Integrating Kevlar spall liners in critical zones such as CIC, machinery rooms, and missile magazines significantly increases crew protection against fragmentation from near misses or penetrating hits.

Automated damage control systems, including intelligent fire suppression networks, remote operated valves, and distributed sensor arrays, allow the ship to maintain combat effectiveness even under degraded conditions. Together, these measures shift the Rajput class from a platform reliant on manual response to one capable of rapid, semi autonomous recovery.

Signature reduction is equally vital in an era where detection often precedes destruction. A faceted superstructure — applied through modular add on panels or partial reconstruction — can meaningfully reduce radar cross section, especially when paired with low observable materials and reshaped mast elements. Infrared suppression systems, including exhaust cooling and plume mixing technologies, lower vulnerability to heat seeking weapons and improve survivability during high power operations.

Acoustic dampening, achieved through resilient machinery mounts, hull treatments, and propeller refinements, reduces detectability by submarines and passive sonar arrays. These signature management upgrades collectively reposition the Rajput class as a harder to track escort capable of operating closer to contested littorals and high threat environments.

Redundancy completes the survivability triad by ensuring the ship can fight through damage and maintain mission critical functions. Dual redundant power buses prevent single point electrical failures from crippling propulsion or combat systems. Distributed computing nodes — aligned with modern combat management architectures — ensure that sensor fusion, weapons control, and navigation remain functional even if primary processors are compromised.

Fire resistant cable routing, with segregated pathways for essential systems, further enhances resilience against heat, shock, and fragmentation. These measures collectively transform the Rajput class into a more robust, fault tolerant combatant capable of sustaining operations under fire and contributing meaningfully to fleet level endurance.

As India accelerates its naval modernisation—anchored by the P15A, P15B, and upcoming P17B/P18 programmes—the Rajput class faces obsolescence in signature management, missile capacity, survivability, and digital integration. However, the underlying hulls remain structurally sound, with significant remaining fatigue life if appropriately refurbished

DISTRIBUTED LETHALITY

Distributed lethality strengthens the Indian Navy by dispersing offensive firepower across a wider set of platforms, ensuring that no single ship becomes the fleet's primary missile shooting node. By equipping more surface combatants, submarines, and unmanned systems with long range strike weapons, the Navy multiplies its ability to generate simultaneous, multi axis attacks at extended ranges. This distribution also creates meaningful redundancy: even if one or two shooters are neutralised, the fleet retains substantial strike capacity, preserving deterrence and warfighting resilience under attrition.

Equally important, distributed lethality imposes severe complexity on adversary targeting cycles. Instead of focusing surveillance and strike assets on a handful of high value units, an opponent must now track and classify a much larger, more dispersed set of threats. This dilutes their ISR resources, slows their kill chain, and

increases the probability of misallocation or delayed response.

FEASIBILITY, COST, AND TIMELINE

Modernising the Rajput class remains a demanding but entirely achievable engineering undertaking, provided the programme is governed by disciplined systems engineering and rigorous configuration control. The most significant feasibility considerations revolve around managing weight growth, preserving stability margins, and ensuring propulsion integration without compromising structural integrity.

These interventions require a holistic naval architecture approach rather than piecemeal upgrades, but none exceed the technical competencies already demonstrated in India's recent destroyer programmes.

Overall, the most prudent path forward for the Rajput class modernisation programme is to begin with a full scope prototype conversion on a single hull. This approach allows the Navy and shipyards to validate the most technically demanding elements of the upgrade — structural integration of the 96 cell VLS, reshaped superstructure, and new mast architecture — before committing to all four ships.

The prototype phase is essential for confirming stability margins after weight redistribution, especially given the combined impact of new sensors, survivability enhancements, and propulsion changes. It also enables real world testing of compartmentalisation improvements, automated damage control systems, and signature reduction measures, ensuring that the upgraded design meets modern survivability standards rather than relying solely on simulations.

This modernisation programme offers the Indian Navy a rare combination of strategic payoff, industrial learning, and cost efficiency. It extends the life of valuable hulls, strengthens the fleet during a critical transition period, and enhances India's maritime deterrence posture

This phase will also clarify the true cost and schedule profile of the programme. Early identification of integration bottlenecks, supply chain constraints, or unexpected structural work allows planners to refine budgets and timelines with far greater accuracy. By treating the first hull as a systems engineering demonstrator, the Navy ensures that subsequent conversions proceed with reduced risk and predictable outcomes.

Once the prototype proves successful, scaling the modernisation to the remaining three hulls becomes a disciplined, repeatable process. Lessons learned from the first conversion will shorten refit durations, reduce rework, and streamline procurement.

Standardising the upgrade across all ships ensures commonality in training, logistics, and combat system operation, effectively adding a cohesive squadron of high firepower destroyers to the fleet. This phased approach balances ambition with realism, delivering a modernised Rajput class that enhances fleet missile density, operational flexibility, and long term force resilience.

By integrating a stealth optimised superstructure, a universal 96 cell vertical launch system, and a next generation sensor and electronic warfare suite, the Rajput class can be transformed from aging Cold War combatants into potent, multi role platforms capable of shaping the maritime battlespace well into the next decade.

Ultimately, this modernisation programme offers the Indian Navy a rare combination of strategic payoff, industrial learning, and cost efficiency. It extends the life of valuable hulls, strengthens the fleet during a critical transition period, and enhances India's maritime deterrence posture. By embracing this transformation, the Navy not only preserves capability — it amplifies it, ensuring that the Rajput class continues to serve as a credible, lethal, and relevant force multiplier in the evolving Indo Pacific security landscape.

—The writer is an architect by profession with 37 years of experience with leading corporates in the Indian real estate industry. However, his passion is naval matters, likely due to his family ties with the Indian Navy. He has been drawing warships since the age of 12 and has been following warship design in the Indian Navy for a considerable time. Recently, he completed a study on designing new Mine Countermeasure Vessels (MCMVs) adopting modular design technology, which is both cost-effective and time-effective. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

BITING THE SILVER BULLET: SHOOTING BETTER, TRAINING WITH THE HANDGUN

Continuing the series, 'Biting the Silver Bullet', the writer in this article focuses on firearm safety and the drills that build shooting skills

SANJAY SONI

The previous article culminated with drill 5. Continuing further, this article details drill 6 to drill 12 while summing up the lessons and emphasising on consistent training and practice.

DRILL 6: CHASE THE SHOT

This is a fun drill that Caylen has his students do in pairs; in order to focus on sight alignment and you guessed it, trigger control. Hang a blank piece of cardboard on the target stand at 5 yards.

BEGIN DRILL 6:

1. Each shooter starts with the same amount of ammo in the magazine.
2. The first shooter fires and makes a hole in the target.
3. The second shooter must now aim at the hole and touch the shot of the first shooter.
4. If the shooter touches the first hole, that person now fires a shot to establish the new aiming point.
5. This continues until the shooters are out of ammo.

END DRILL

A final tip that Caylen offered relates to the grip. Most shooters do not grip the handgun hard enough. This really becomes apparent as shooters begin to go faster. If you notice shots beginning to go low, you can likely attribute it to not enough grip pressure.

As you begin shooting fast, if your grip is not hard enough, the trigger begins to act as a fulcrum and as the trigger is slapped the muzzle drops and your shots go low.

Tip: grip the gun hard. Really hard, through your entire shot string.

DRILL 7: HALF AND HALF DRILL

This is a live-fire drill that I discussed with Kyle Lamb, owner of Viking Tactics. Shoot this drill with a standard silhouette target. With a handgun the drill is conducted in the following manner:

- 20 yards, 10 rounds, 12 second par time
- 10 yards, 10 rounds, 6 second par time
- 5 yard, 10 rounds, 3 second par time

You will need a timer for this drill.

BEGIN DRILL 7:

- Set your par time to the appropriate range you are shooting at. If you're shooting alone, program the timer for a random start signal.
- The drill is fired from Position Three,

meaning the gun is out of the holster and you have a proper two-handed grip.
- When the timer sounds, you press the gun to the target and fire ten rounds.
- Move up half the distance, reset the time for half the time and fire ten rounds, and so on.

END DRILL

Every round inside the "A" zone on a silhouette target counts 10 points. For rounds outside the "A" zone, we subtract 10 points. The shooter also loses 10 points for every round fired beyond the par time.

I shot this drill with a Sig 22 LR and a Springfield Sub-Compact 40 S&W, just to see how I could perform.

First, when that buzzer sounds, all you think about is getting the rounds off before the time is up. The first couple of runs my shots were high on the target, meaning I was squeezing the trigger before my sights we fully realigned on my target. I found that after a few runs, I could get my shots off in the time allowed, but not necessarily keep them all in the "A" zone.

Kyle reinforced that trigger manipulation is critical in this drill. With a proper grip, the shooter should see the front sight lift off the target and come back on the target after recoil. The biggest challenge is trigger squeeze.

DRILL 8: TRIPLE NIPPLE DRILL

This is another drill that Kyle uses to induce stress and force shooters to really think and concentrate on the trigger as they run the drill. Here we will use the same "A" zone on the silhouette target as our scoring ring.

BEGIN DRILL 8:

1. 15 yards, 10 rounds, 10 second par time. Draw from holster, two-handed grip.
2. 10 yards, 10 rounds, 10 second par time. Draw from holster, strong hand only.
3. 5 yards, 10 rounds, 10 second par time. This one is tricky. Gun holstered on the strong side. Draw from the holster with your weak hand - no drawing with the strong hand and switching to weak hand - fire ten rounds. This part of the drill forces you to think through your draw, build your grip then fire ten accurate shots.

END DRILL

When coming from the holster, this means we develop snappy movements through the draw, building the grip and pushing out the gun, then slow down, achieve proper sight alignment and execute a perfect trigger squeeze to send our rounds onto the intended target.

DRILL 9: SIG SAUER ACADEMY QUARTER DRILL

This drill combines precision with speed and perfecting your magazine changes. Shoot this drill from three yards. You need a target with a quarter-sized dot as your aiming point. The par time for this drill is 6.5 seconds.

BEGIN DRILL 9:

1. Start with your handgun loaded with one round and in your holster. You will need two additional magazines for reloads with one round in each magazine. The magazines should be in the magazine holder you use for everyday carry.
2. When the timer starts, draw and fire one shot at the quarter-size target.
3. Drop magazine one, reload, slingshot your slide and fire shot two.
4. Drop magazine two, reload, slingshot your slide and fire shot three.

END DRILL

The goal is to have all three shots in the quarter-sized target. Your sight alignment and trigger squeeze must be perfect for this drill.

Adding the stress of the timer and reloading for each shot really forces you to think through each movement, moving quickly during the reload and presentation, and slowing down when aiming and pressing the trigger.

DRILL 10: BALL AND DUMMY DRILL

This is a drill that is used to diagnose flinching and anticipating the shot. If you notice that your shots tend to be hitting below the point of aim, chances are you are flinching.

BEGIN DRILL 10:

1. The shooter hands the gun to a partner or lays it on the bench and turns away from the firing line and target.
2. The partner then readies the gun either by loading with a single live round or by leaving the chamber empty.
3. Shooter turns back to the target, picks up the gun, points in and fires the shot.
4. If the gun is empty and there is a flinch, the partner- and very likely the shooter- will see a noticeable dip in the front sight, the moment the trigger breaks.

END DRILL

This drill is best done with about 75% of the shots on an empty chamber. Live rounds are introduced randomly to keep the shooter a bit off balance.

As this training progresses, the shooter will eventually overcome the flinch and begin to put more shots on target.

DRILL 11: THE FIVE TO GLOCK DRILL

This drill was developed in the Glock Sport Shooting Foundation matches. For this drill, you need 5 targets spaced from 5 yards to as far as 25 yards from the shooter. Each target requires 2 shots.

If you don't want a penalty, every shot needs to be inside the 8-inch circle of a 10-point ring. You could do the same thing with 8-inch paper plates on a cardboard backer. Every shot needs to be on the plate at every distance.

BEGIN DRILL 11:

1. To begin, just time yourself and train until all your shots are on all the plates.
2. Keep track of your improvement in your journal.

END DRILL

As you improve, begin to add stress by decreasing your par time setting and strive to make every hit within your time limit.

DRILL 12: READY-UP DRILL

This drill is used to develop proficiency with your chosen handgun. It's simple, effective, and easy to track your improvement in your journal.

Start with the target no more than 5 yards downrange. Your handgun should be loaded with a round in the chamber and holstered. Begin this training without a timer.

BEGIN DRILL 12:

- Facing the target, draw the handgun and fire one round as soon as the front sight covers the scoring area of your target.
- Re-holster your handgun and repeat until the magazine is empty.
- Perform a combat reload and continue firing one round at a time.

END DRILL

As your skill develops, your confidence in trusting your front sight increases because you know when the front sight is on the target, your fired rounds will be on the target as well.

For added training, have a partner yell out a number for each repetition. This means you may shoot one round, then 4 rounds, then 2 rounds, then 1 round.

The purpose is to train for the eventuality that you may need to fire more than one shot in a defensive situation and put all those rounds on the target.

PUTTING IT ALL TOGETHER

The drills above are proven to improve your shooting accuracy with a handgun. But you must walk before you run.

Work on your basics first:

- Stance
- Grip (grip the gun firmly!)
- Sight Alignment
- Sight Picture
- Breathing
- Trigger Control
- Follow-through

Start with the drills that you can work on without a timer and place your targets close. When the groups start shrinking, move the target back and begin placing some time limits on your shot strings. Only work on a couple of drills on each trip out.

Don't make your range time so regimented, you aren't having fun. End each session on a high note and keep track of your progress so you know where you start next time.

Which is More Effective- Shooting with One Eye Open or Two?

When new shooters learn to fire a gun, they usually start like most people do—closing one eye to aim while looking towards the target downrange. However, some experienced gun owners actually prefer to shoot with both eyes open.

Here are the pros and cons of shooting both ways.

Do You Shoot with One Eye Open?

Let's start with the most familiar way to new shooters: closing one eye and looking through the scope or down the iron sights with the open eye. Which eye you close depends on whether you're right or left-handed, but you generally want the dominant eye closest to the gun to be open.

What Are the Benefits of Shooting with One Eye Open?

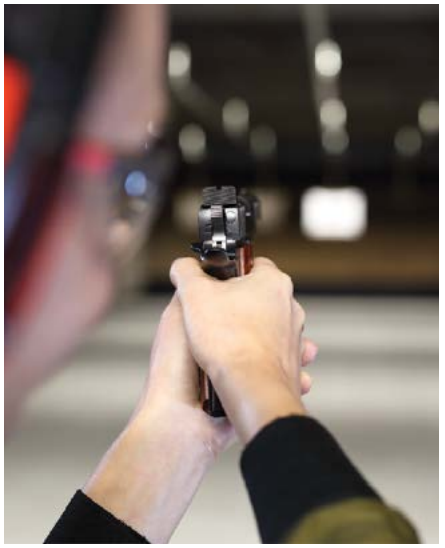
There's a reason why most people learn how to shoot like this—it's incredibly natural. Most of us have what's called a dominant eye, which is, without getting into too much technical detail, the eye that's better at interpreting visual data and relaying it to your brain.

Also, closing one eye makes it easier to direct your focus solely on your sights or what you see in the scope and blocks out everything else.

Are There Disadvantages to Shooting with One Eye Open?

The previously listed benefit of directing your focus is a negative in the opinion of a growing number of shooting instructors and experts. Many people train to use guns and own them for self-defence or recreational hunting. In a situation in which you're using your firearm for these purposes, you want to be able to see everything around you.

Although it may be easier to focus on one thing, closing one eye significantly reduces your field of vision and your ability to see your surroundings thoroughly.



SHOOTING WITH ONE EYE OPEN – SUMMARY

- More natural for most people
- Allows for the use of your dominant eye
- Easier to direct your focus
- Reduces overall field of vision

How Do You Shoot with Two Eyes Open?

First, aim as you usually would with one eye slightly closed, then open the closed eye completely. Work on focusing with your dominant eye while both eyes are open. This will take some getting used to, but blinking your non-dominant eye a few times will help you focus as you get more familiar with the process.

If you're shooting with safety glasses on, which you should always do, a neat trick is to lightly coat the lens of your non-dominant eye with a bit of lip balm to blur the image. This will eventually help your brain to disregard any double-vision affects you might be experiencing and allow you to focus on your target with both eyes open.

What are the Pros of Shooting with Both Eyes Open?

The increased field of vision is arguably the most important and notable benefit of shooting with both eyes open. Hunters scanning the sky or horizon appreciate being able to spot the mallard that's currently in their scope as well as the one 50 feet away from it for the next shot.

Shooting with both eyes open significantly increases repeatability and allows you to move on to the next target quickly without possibly disorienting yourself from making rapid switches between one eye being open and both.

What are the Cons of Shooting with Both Eyes Open?

Shooting with both eyes open can take some getting used to, especially if you were taught to shoot with one eye closed. When going to the range for the first few times and shooting with both eyes open, the urge to "cheat" and slightly or entirely close your non-dominant eye will be strong.

Don't fight it! The urge will slowly go away with practice as you become more used to focusing and aiming guns with both eyes open.

SHOOTING WITH BOTH EYES OPEN – SUMMARY

- Increased field of vision
- Increased ability to move on to the next target
- Can be difficult to get used to
- May cause a double-vision effect at first

JUST DO IT – TRAINING CONSISTENTLY

Too much range practice, in the beginning, is sometimes detrimental. That's because you haven't built up good

muscle memory. Instead, you build up a flinch reaction.

Don't worry if that's you. With some quality dry firing at home, you can overcome it.

If you are going to carry a handgun for defensive purposes, you're obligated to know how to run that gun and how to shoot it accurately. Your range journal may prove to be a valuable tool in the courtroom if you ever have to deploy your handgun to protect yourself or a loved one. Showing that you are diligent in your training and constantly improving means you're not some vigilante nut job.

Most of us can't get to the range every week. But all of us have time to dry fire for 15 minutes in our office. Master the drills in this article and when you hit the range with live ammo, your shooting will show definite improvement on every trip.

Shooting well is an obligation, but it's also fun. The better you shoot, the more fun you have. Like any skill worth developing, shooting a handgun well and improving handgun accuracy is going to take study, training, and practice.

–The writer is the Managing Director of Hughes Precision Manufacturing Pvt Ltd, India's first small-calibre manufacturer in the private sector. An MBA from the Indian Institute of Management (IIM), Bangalore, he has been involved with the ammunition industry in India and abroad for more than a decade

India has moved from being the world's largest defence importer to a country exporting advanced systems such as the BrahMos missile to global markets. Still, the rot remains at the foundation i.e. procedural paralysis. The 'Game Changer' policies often hit a wall of 'File Shufflers'. India has the talent; it must know how to use it

THE DECADE OF DEFIANCE: FROM 'NO-GO' TO 'AATMANIRBHARTA'

SAYED MOHAMMAD SHAHNAWAZ HAMID

The Indian defence sector has gone through a significant transformation, or better call it a seismic shift, over the last ten years. For decades after our independence, the military-industrial complex behaved like a fortress — not against enemies, but against domestic innovation. It was a 'no-go' zone for startups, characterised by a monopolistic market where only the Defence Public Sector Undertakings (DPSUs) and the DRDO held the keys, or maybe some major international player. If you were a young engineer with a breakthrough in drone swarms or encrypted communication, your only path was to join an established player and hope your idea survived thirty years of committee reviews.

Kudos to the late Defence Minister Manohar Parrikar for changing the game. He was the man behind the turning point. As Defence Minister, he didn't just tweak the policy; he hacked the culture. Parrikar understood that a nation cannot be a superpower on 'borrowed strength'. He introduced the Defence Procurement Procedure (DPP) 2016, which for the first time classified 'Buy (Indian-IDDM)' (Indigenous Design, Developed and Manufactured). He stripped away the layers of suspicion that viewed private entrepreneurs as mere 'middlemen' and transferred them to strategic partners. His move opened up the way for the launch of iDEX (Innovations for Defence Excellence) in 2018, which finally gave startups a seat at the high table.

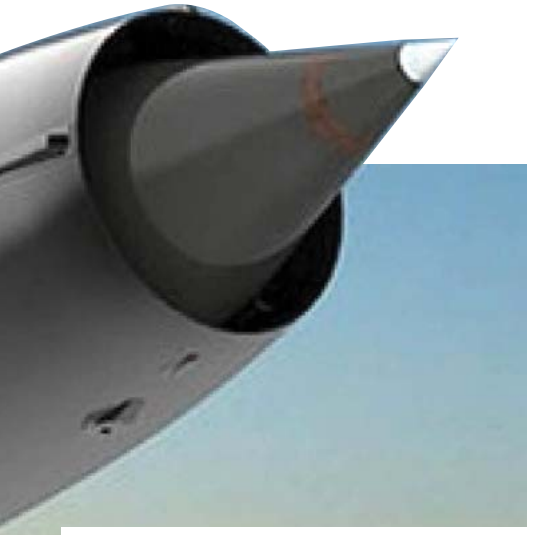
THE GROWTH STORY: BY THE NUMBERS

The statistical transformation of the last decade is staggering. In 2014, the contribution of the private sector to defence production was negligible, and exports were an afterthought.

Today, nearly 21-23% of India's total defence production comes from the private sector. We have moved from being the world's largest importer to a country that exports advanced systems like the BrahMos missile and more to global markets, and this is just a beginning.

THE INVISIBLE ENEMY: BUREAUCRACY AND THE 'REPLY-LESS' CULTURE

Despite these soaring numbers, a rot remains at the foundation: procedural paralysis. The 'Game Changer' policies



Metric	FY 2013-14	FY 2023-24/25	Growth Factor
Total Defence Production	₹46,000 Cr	₹1.27 Lakh Cr	2.7x
Defence Exports	₹686 Cr	₹23,622 Cr	34x
Active Defence Startups	Near Zero	1,000+	-
iDEX Contracts Signed	0	430+	-

often hit a wall of 'File Shufflers'.

In the United States, DARPA (Defence Advanced Research Projects Agency) operates on a 'fail-fast' philosophy. Their programme managers are known to respond to technical queries within 48 to 72 hours. I myself have sent them the query and got the reply in 24 hours, that too in detail. They have also aligned me with the department to which I should contact for a particular research fund.

In contrast, an Indian startup founder often faces a wall of silence. Emails to procurement agencies frequently vanish into a digital abyss. The bureaucracy still operates on a compliance-first, outcome-second mindset. A startup giving their 100% in building cutting-edge equipment for warfare cannot survive a 3-4 year 'Request for Proposal' (RFP) cycle.

By the time the government signs the contract, the technology will become obsolete, or there will be a new mature technology ready to take its place. While the top leadership speaks of 'Aatmanirbharta', the middle-level bureaucracy remains risk-averse, terrified that a quick decision might be flagged by the CAG or CVC years later.

To truly compete, we need a 'Digital DARPA' kind of model where the response time is measured in hours, not seasons.

THE BRUTAL LESSON: UKRAINE, RUSSIA, THE US, IRAN, AND ISRAEL

The upcoming decade will be defined by the quickly changing geopolitical realities that we are witnessing today. The escalating conflict between Iran and the US-Israel duo has shattered the illusion of 'reliable allies'.

The recent encounters between Ukraine and Russia, Iran and the US-Israel must have taught us a bitter lesson: In a real war, friends provide 'prayers and statements', but only your own industry provides 'parts and software'.

Priority is National, Not Regional: When the US supports Israel, it does so through the lens of its own domestic politics and global hegemony. When Iran retaliates, it targets regional stability without a second thought for the economic fallout on neutral neighbours like India.

- **The Chokepoint Risk:** India imports nearly 85% of its crude oil. A conflict in the Strait of Hormuz could weaken our economy in a few weeks.
- **Equipment Sovereignty:** The conflict showed that even the most advanced platforms (like the F-35 or Iron Dome) can be of minimal to no use. In disparate time, your friends can remove the protection missiles and transfer for their own good cause. As we have seen, the missile stocks have been removed from Japan.

If India does not achieve Strategic Autonomy through local development, we will remain a 'vassal state' to foreign supply chains. We cannot afford to have our fighter jets grounded because a sub-component from a 'friendly' nation is withheld due to a diplomatic disagreement.

THE ROAD TO 2035: CRYSTAL GAZING

The next decade must be about moving from Assembly to Invention.

- **Algorithms over Armour:** The wars of 2030 will not be won by the thickest steel, but by the smartest code. We must empower startups in AI, Quantum Computing, and Directed Energy Weapons (DEWs).
- **Institutionalised Agility:** The Ministry of Defence must create a 'Fast Track' lane for startups where the entire lifecycle — from prototype to procurement — is completed in under 18 months.
- **The Private Prime:** We need an Indian 'Lockheed Martin' or 'SpaceX'. The government must stop treating DPSUs as children and the private sector as outsiders. True self-reliance comes when a local startup can outbid a global giant on pure merit.

The last decade was about opening the door. The next decade must be about owning the house. We have the talent, and we should know how to use it. The only thing standing between India and global defence leadership is the speed of a 'Reply' button.

–The writer is an Innovator specailising in AI-Powered Weapons & Hard-Kill Robotics, Reverse Engineering, Defence Systems, Real-Time Targeting & Control Systems, R&D, Embedded AI and Sensor Fusion & Mission Autonomy. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

MAKE IN INDIA IS NATIONAL SECURITY IN ACTION

In a world where technology can be restricted, supply chains can be politicised, and economics can be weaponised, the path forward is clear – industrial sovereignty through partnership. "Make in India" embodies this principle. It is bold. It is necessary. National security in the 21st century will be secured by the ability to pursue the initiative – confidently, collaboratively, and at home

RONEN HAMUDOT

As global supply chains fracture and technology becomes a lever of geopolitical pressure, "Make in India" must be understood for what it truly is – not merely an economic initiative, but a national security doctrine for the 21st century. In an era defined by strategic competition, industrial capability is no longer just about growth; it's about sovereignty.

"Make in India" has rightly been viewed as a catalyst for job creation, industrial growth and foreign investment. But in today's world – where supply chains are weaponised, access to technology is restricted and economic leverage is used as geopolitical pressure – domestic defence manufacturing is far more than an economic policy. It is strategic insurance.

Across the globe, we are witnessing the rise of economic and technological coercion as tools of statecraft. Nations that rely excessively on foreign defence supply chains can find themselves exposed at critical moments. In such an environment, the ability to design, develop, manufacture and sustain defence systems domestically is not optional; it's existential.

This is why "Make in India" has global relevance. It represents a model for how countries can strengthen sovereignty without retreating from global partnerships. It signals that international collaboration must evolve from simple buyer-seller relationships to genuine co-development and co-production.

At IWI, we understand this shift deeply. Rooted in Israel's defence ecosystem, we have long operated in an environment where national survival depends on technological agility and industrial resilience. Israel's experience has demonstrated that innovation, speed and domestic capability are decisive advantages in asymmetric and conventional conflicts alike. We see powerful parallels with India's strategic trajectory.

Our commitment in India is not transactional. It is transformational.

We work closely with the Ministry of Defence, the Indian Armed Forces and a growing network of Indian private and public-sector partners to ensure that advanced small arms and defence technologies are not simply imported

– but manufactured, maintained and continuously improved within India.

This partnership is built on three pillars – technology transfer, joint innovation and ecosystem development.

First, a true technology partnership means transferring know-how, not just hardware. It means enabling Indian engineers, technicians and innovators to master production processes, quality assurance systems and next-generation design principles. It means embedding intellectual capital locally so that capability is sustained even in the face of external shocks.

Second, joint innovation is the future of defence manufacturing. Modern battlefields evolve rapidly. Soldiers require lighter systems, smarter integration, modular upgrades and digital connectivity. These demands cannot be met through static procurement cycles. They require collaborative research and development between global technology leaders and the domestic industry. Together with "our Indian counterparts, we are advancing precisely this kind of innovation-driven manufacturing."

Third, the ecosystem development ensures that "Make in India" strengthens the broader industrial base. Defence manufacturing drives precision machining, electronics integration, optics and advanced materials. By anchoring production in India, we help cultivate a supply chain that supports not only military readiness but also civilian industry.

This approach enhances operational readiness in tangible ways. When production lines, spare parts and maintenance capabilities are located within national borders, turnaround times shrink. Logistical dependencies diminish. Costs become more predictable. And, critically, the armed forces gain confidence that their equipment will be available when needed most.

But there is another dimension that deserves attention: deterrence.

A nation that demonstrates the capacity to sustain its defence requirements internally signals resilience. It communicates that attempts at economic pressure or supply disruption will not cripple its preparedness. In this sense, industrial capability itself becomes a strategic asset.

A nation that demonstrates the capacity to sustain its defence requirements internally signals resilience. It communicates that attempts at economic pressure or supply disruption will not cripple its preparedness. In this sense, industrial capability itself becomes a strategic asset

For global defence companies, this new paradigm requires humility and adaptation. The era of simple export dominance is fading. The future belongs to companies that are willing to integrate into national industrial strategies, share expertise responsibly, and co-create solutions aligned with sovereign priorities.

At IWI, we embrace this future. We view India not as a market, but as a strategic partner. We believe that aligning with "Make in India" contributes not only to India's growth but also to a more balanced and secure global defence ecosystem.

In a world where technology can be restricted, supply chains can be politicised, and economics can be weaponised, the path forward is clear – industrial sovereignty through partnership.

"Make in India" embodies this principle. It is bold. It is necessary. And it is a model that other nations would do well to study. National security in the 21st century will not be secured by weapons alone. It will be secured by the ability to build them – confidently, collaboratively and at home.

– The writer is the Vice-Chairman of SK Group, a leading holding company known for driving innovation across multiple strategic industries. Its portfolio comprises globally recognised companies, such as Israel Weapon Industries (IWI), Meprolight, Camero-Tech, ELVO, Israel Shipyards, Israel Shipyards Port, Uni-Scope Optical Solutions, and Oshira. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

INDIA'S TACTICAL MOBILITY INDEPENDENCE: THE A-THON STORY

The ASHVA series, India's first indigenous family of all-terrain vehicles (ATVs), is designed specifically for military and extreme terrain applications. A-THON was the only Indigenously Designed, Developed and Manufactured (IDDM) vehicle platform in the Exercise Kharga Shakti 2026

HARSHIT MODI

There is a question that has stayed with me since the day I first visited a forward military post in the Indian Himalayas. Why does one of the world's largest and most operationally experienced armies depend on imported vehicles for all terrain light tactical and logistics mobility?

Eighty percent (80%) of Earth's landmass is inaccessible to conventional vehicles. For India, this is not a statistic. It is an operational reality. From the glaciers of Ladakh to the deserts of Rajasthan, from the riverine terrain of the Northeast to the high passes of Uttarakhand, the Indian soldier operates in conditions that would disable most machines on the planet. And for decades, the vehicles carrying them into these environments were designed in the United States and Canada. Platforms built for American ranches and Canadian trails, were adapted, not designed, for the Indian theatre. From Scandinavian Arctic operations to Middle Eastern desert patrols, from Australian outback missions to South American border security, militaries across the globe have relied on these imported platforms, underscoring both the scale of global demand and the absence of indigenous alternatives.

That question became the founding impulse behind A-THON All-Terrain Private Limited.

BEGINNING WITH A BLANK SHEET

We started in 2022 in Bengaluru with nothing but a conviction: India has the engineering talent, the manufacturing capability, and the strategic necessity to build its own all terrain mobility platforms from the ground up. Not assemble. Not manufacture under licence. Not rebadge a foreign design. Author.

A-THON was never meant to be an automobile company that happens to sell to the military. It was conceived as a defence technology company that thinks in terms of terrain. Our Discovery Engine is meant for mobility beyond roads, where only humans and quadrupeds can tread. Every platform we build starts with a single question: what does the Indian soldier need in the field that does not exist today?

The vision for this architecture came from Irfann Sheriff, A-THON's Chief Visionary and Architect. While I was obsessed with what the vehicle should do on the ground, Irfann was thinking five years ahead about what the entire mobility ecosystem should look like. The product roadmap, the institutional partnerships, the alignment with national defence policy, the technology integration philosophy, all of that carries his imprint. Irfann builds the future they drive into.

THE ASHVA SERIES

The result is the ASHVA series, India's first indigenous family of all-terrain vehicles

designed specifically for military and extreme terrain applications.

The ASHVA 4x4 2S is a two seater 4WD platform with tethered drone integration for persistent surveillance and targeting, capable of 72 hour independent operations. Recovery winch, radio set, battery pack, foldable ladder, integrated cargo. Armoured customisation available with LMG, MMG, and ATGM mount capability.

The ASHVA 4x4 4S is a four seater configured for rapid deployment of troops and mission critical equipment into forward areas where conventional vehicles simply cannot go.

The ASHVA 4x4 5S is a five seater with integrated fixed wing VTOL drone. Drone carrying, drone charging via three redundant power systems: engine power take off, silent generator, and battery pack. Closed cabin, five fully equipped operators, 72 hour independent operations.

And then there is the ASHVA 6x6 2S. The world's only 6x6 all-terrain side by side vehicle. Six-wheel drive, two primary seats, two auxiliary seats, gun mounts on top. This platform goes where nothing else can. It is not a variant. It is a category virtually absent from the global landscape until A-THON engineered it.

Beyond ASHVA, A-THON's product line includes ATATS (All-Terrain Artillery Tug System), a specialised platform for towing and deploying artillery including 105mm light field guns across terrain where conventional tug vehicles cannot operate, and RAKSHAK, an armoured patrol vehicle for border security and internal security applications.

Every one of these platforms is indigenously designed, developed, and manufactured. Indian IP. Indian engineering. IDDM category.

20,000 FEET AND THE SOLDIERS WHO LIVE THERE

Before any of our platforms saw a military exercise, they had to survive something harder: four months of continuous trials across the most demanding terrain India can offer.

We started in Ladakh. Pangong Tso at 14,270 feet, the lake that sits on the Line of Actual Control. Then Marsimik La, the fourth highest motorable pass in the world at 18,314 feet, where atmospheric pressure drops to roughly half of sea level. Then Chusul Heights, above 20,000 feet.

A-THON was never meant to be an automobile company that happens to sell to the military. It was conceived as a defence technology company that thinks in terms of terrain. Our Discovery Engine is meant for mobility beyond roads, where only humans and quadrupeds can tread. Every platform we build starts with a single question: what does the Indian soldier need in the field that does not exist today?

We moved to Uttarakhand. Raiwala, Joshimath, Malari, Sumna, Lapthal, Atisen, Rimkhim, and Sidhitop at 16,500 feet. Every location was a different test. River beds, mountain switchbacks, snow, slush, rock. In Jammu, we added military grade terrain validation at Aanganpatri and Tri Star at over 12,000 feet. At Agra, the Technical Evaluation Centre put the platforms through formal assessment. TEC approvals were completed.

We spent four months in conditions that tested every limit of human endurance. Minus 25 degrees. Oxygen at half of sea level. Passes where you cannot walk ten steps without gasping. The ASHVA ran through all of it without complaint. The machine was ready long before we were. That experience gave us something no test bench ever could: an understanding of what the Indian soldier endures daily, and a conviction that they deserve equipment built to match their courage.

At Babina Fire Range, we conducted something no other company has: assisted autonomous defence trials with the ASHVA 6x6. The platform was demonstrated to the Vice Chief of the Indian Army and Army Design Bureau. This was not just remote controlled operation but a testament of assisted autonomous navigation technology developed through our partnership with ARTPARK at the Indian Institute of Science, Bengaluru.

KHARGA SHAKTI: WHEN INDIA CHOSE INDIAN

In February 2026, the Indian Army's Western Command conducted Exercise Kharga Shakti at the Mahajan Field Firing Ranges in Rajasthan. This was the Kharga Corps' biennial strike corps exercise, and the first major combat drill since Operation Sindoor. It was reviewed by Lt Gen Manoj Kumar Katiyar, GOC in C Western Command. Drones at every echelon. Precision fires. Networked command and control. Bhairav battalions. Ashni Platoons. Lessons from modern warfare put to the test.

Four A-THON vehicles were there. Four different ASHVA configurations, customised to Western Command's operational requirements for drone carrier integration.

A-THON was the only IDDM vehicle platform in the exercise.

Times of India posted the images. DD News broadcast the vehicles nationally. The Indian Army's Western Command shared them from their official channels. Millions saw the ASHVA tearing across the Rajasthan desert with a drone on its roof. They saw it before they knew its name.

Its name is ASHVA. The company is A-THON. The city is Bengaluru. The country is India.

THE ECOSYSTEM THAT MAKES IT POSSIBLE

A-THON did not build ASHVA in isolation. Our rise from a 2022 startup to deployment in a Western Command exercise is the product of India's defence innovation ecosystem working exactly as it was designed to.

The first pillar is ARTPARK at IISc, Bengaluru, the AI and Robotics Technology Park promoted by the Indian Institute of Science, seed funded by the Department of Science and Technology under NM-ICPS and the Government of Karnataka. A-THON is an industry partner at ARTPARK, and the collaboration extends to assisted autonomous technology integration for our platforms. The autonomous 6x6 has been demonstrated to HD Kumaraswamy, Minister of Heavy Industries, and to DST officials at the ARTPARK facility.

The second pillar is IIT Ropar's Defence Research Innovation Foundation (DRIF), a Section 8 company bridging the Armed Forces, Defence Industry, and Academia. Our MoU with DRIF is central to the development of ATATS and broader defence R&D collaboration.

The third pillar is the Army Design Bureau (ADB). A-THON works directly with ADB to address problem statements defined by the end user, the Indian Army. We are also designing and developing robotic mobility platforms for the Army under the ADB compendium jointly with ARTPARK and DRIF. The ASHVA series was not designed and then pitched. It was developed in response to specific capability gaps identified by the Army itself.

This three pillar model, IISc for autonomous technology, IIT Ropar for defence R&D, and ADB for end user requirements, is how India's defence innovation architecture was meant to function. A-THON is proof that it works.

DAP 2026: THE POLICY CATCHES UP

On February 10, 2026, the Ministry of Defence released the draft Defence Acquisition Procedure 2026. The single most consequential change: the elimination of the 'Buy (Indian)' procurement category entirely. Under DAP 2020, this category allowed Indian vendors to supply equipment with at least 60% indigenous content, even when the design and core intellectual property belonged to a foreign OEM. DAP 2026 closes that door. The only preferred procurement path is now 'Buy (Indian IDDM)', where equipment must be indigenously designed, developed, and manufactured. The Ministry has framed this as a shift from 'Made in India' to 'Owned by India.'

A-THON was already there.

Every ASHVA deployed with the Indian Armed Forces conserves foreign exchange, strengthens indigenous intellectual property, and extends India's vision of Make in India and Innovate in India into the most demanding operational environments on Earth. The policy and the product have converged.

For defence startups and MSMEs that have invested in genuine indigenous R&D, DAP 2026 is the framework they have been waiting for. It rewards those who took the harder path, the path of designing from scratch rather than assembling under licence. A-THON took that path from day one. Not because the policy told us to. Because the Indian soldier deserved it.

WHAT COMES NEXT

The ASHVA series has been proven at every altitude, across every terrain, in the Indian Army's own exercises and trials. But this is not the destination. It is the starting point. ATATS will address the Indian Army's modernising artillery regiments. RAKSHAK will serve border security and internal security applications. The autonomous variants, developed through our ARTPARK partnership, will address the future of unmanned ground operations. The international market, where demand for proven, cost effective, and politically unencumbered tactical mobility platforms is growing, is on our horizon.

Recently, A-THON participated at AeroDef India 2026 and the Defence Mobility Manufacturing Expo at Yashobhoomi, New Delhi, from April 8-10, 2026. The overwhelming response to its showstopper platforms were encouraging.

We do not follow a category. We are creating one.

– The writer is the Founder of A-THON All Terrain Private Limited, an IDDM category defence technology company headquartered in Bengaluru, Karnataka. A-THON is an industry partner at ARTPARK, IISc Bengaluru, with defence R&D collaboration through DRIF, IIT Ropar. The company's ASHVA series was the only IDDM vehicle platform deployed in Exercise Kharga Shakti 2026. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

French Navy Further Expands CAMCOPTER® S-100 Fleet

The French Navy, through the French Government defence procurement and technology agency (Direction Générale de l'Armement, DGA) and Naval Group, has ordered five additional CAMCOPTER® S-100 systems under the Navy's unmanned aviation programme. Naval Group, as prime contractor and lead system integrator, will deploy and integrate the systems on the Frégates Européennes Multi-Mission (FREMM) including mission management through the Steeris® MS system.

Each system consists of two CAMCOPTER® S-100 Unmanned Air Vehicles (UAV), increasing the French Navy's total fleet to eight S-100 systems, once deliveries are completed. The systems will be delivered progressively, starting 2026. The French Navy has operated and deployed the CAMCOPTER® S-100 globally at sea since 2012, when the system was first fully integrated aboard the Gowind-class L'Adroit Offshore Patrol Vessel (OPV). In 2019, it was integrated on the Mistral-class amphibious helicopter carrier Dixmude, marking the first operational integration of a rotary-wing Unmanned Air System (UAS) into a European naval Combat Management System (CMS). In 2020, the French Navy expanded its capability with the acquisition of two additional S-100 systems, deployed aboard the Mistral and Tonnerre.

The CAMCOPTER® S-100 provides maritime Intelligence, Surveillance and Reconnaissance (ISR) capabilities and is operated from naval vessels without the need for launch or recovery equipment. Its compact footprint and proven shipborne performance enable flexible deployment across a wide range of missions, and different classes of ships. Schiebel's CAMCOPTER® S-100 Unmanned Air System (UAS) is an operationally proven capability for military and civilian applications. The Vertical Takeoff and Landing (VTOL) UAS requires no prepared area or supporting equipment to enable launch and recovery. It operates by day and by night, under adverse weather conditions, with a beyond line-of-sight capability out to 200 km / 108 nm, over land and sea. Its carbon fiber and titanium fuselage provides capacity for a wide range of payload/ endurance combinations up to a service ceiling of 5,500 m / 18,000 ft.

In a typical configuration, the CAMCOPTER® S-100 carries a 34-kg / 75-lbs payload up to 10 hours and is powered with AVGas or JP-5 heavy fuel. High-definition payload imagery is transmitted to the control station in real time. In addition to its standard GPS waypoint or manual navigation, the S-100 can successfully operate in environments where GPS is not available, with missions planned and controlled via a simple point-and click graphical user interface.

Amara Raja Enters Defence Electronics to Power India's Naval Sonar Systems

Amara Raja Design Alpha (ARDA), a specialised engineering R&D firm and a part of the $2 billion Amara Raja Group, has developed an indigenous Power Conditioning Cabinet (PCC) for naval sonar systems, marking the company's first deliverable in mission-critical defence electronics.

About 61% of system's components will be indigenous, enabling around 40% cost efficiencies through advanced power engineering and local manufacturing. In the next phase, ARDA will expand into the design of Power Amplifiers, Signal Interfaces and Power Amplifier Cabinets, helping build a comprehensive indigenous ecosystem for naval sonar systems. The initiative represents a meaningful contribution by a private sector technology company to India's growing naval indigenisation efforts.

The units developed by ARDA will comply with global standards such as MIL-STD-901D and MIL-STD-461 for EMI/EMC and shock, ensuring reliability in demanding naval environments. The PCC will support loads of up to 160 kW, delivering stable, high-reliability power distribution for sonar systems, where acoustic detection equipment requires extremely high-power quality during sustained maritime operations.

The announcement comes at a strategically significant moment. The Indian Navy's budget has grown from ₹49,623 crore in 2020–21 to over ₹1,03,548 crore in 2025–26, reflecting India's expanding investment in maritime capability. Within this architecture, sonar systems form a critical layer of underwater surveillance and anti-submarine warfare across the Navy's fleet.

FLYING SAFE: CBRN SECURITY AND AVIATION INDUSTRY

Airports are vulnerable to CBRN threats due to their open access, high footfall, large cargo handling, and symbolic value as national critical infrastructure. Security measures should include a multi-layered approach to detecting Chemical, Biological, Radiological and Nuclear materials and respond effectively, which involves enhanced screening, risk assessment, and robust planning

COL RAM ATHAVALE

In the past few decades, since aviation has become a major travel option, airports and aeroplanes have become desirable targets for terrorist attacks. Many of these attacks have been carried out with the use of explosive devices or weapons, which has driven the focus towards the detection and prevention of such incidents in the airport complex, its environment and beyond.

CBRN (Chemical, Biological, Radiological, and Nuclear) security in the aviation industry focuses on detecting and responding to threats posed by CBRN materials at airports, air cargo hubs and on aircraft to protect public health, safety, and national security. This includes developing and deploying advanced detection and protection equipment for crews, ground staff, passengers and cargo. It also requires training aviation and security personnel to identify symptoms and threats, and implementing robust decontamination and emergency relief response strategies. The goal is to prevent the use of CBRN materials for terrorism or attack, mitigate consequences if an incident occurs, and maintain passenger confidence in air travel.

CBRN Teams Conduct Threat Identification at Airports

THREATS AND VULNERABILITIES

- **Terrorist Threats:** Terrorist groups may seek to acquire or use CBRN materials to cause widespread panic and destruction, escalating attacks beyond conventional means. Just the hype of use or possible use of CBRN material can raise paranoia and cause chaos. From smuggling CBRN material onboard aircraft to the release of toxic materials in airports, all have been tried in the past.
- **Delivery Mechanisms:** CBRN agents can be delivered through various means, potentially exploiting vulnerabilities in the complex aviation system to affect many people in confined spaces. Aerial dispersion, waterborne transmission and contact contamination are all means to target travellers.
- **Psychological Impact:** The potential for large-scale destruction, long-term health effects, and paranoia (psychological fear) makes CBRN threats particularly concerning for the aviation sector.

Large Airport Crowds and Aviation Cargo Terminals Enhance Vulnerabilities to CBRN Threats

NATURE OF CBRN THREATS

- **Chemical agents:** Substances like nerve agents or choking agents in small quantities can be concealed in luggage or sprayed/released in confined spaces like airport lounges and aircraft cabins.
- **Biological agents:** Pathogens such as anthrax or engineered viruses pose stealthy, delayed threats. Contagious biological agents can be deployed without any immediate signs.
- **Radiological materials:** Dirty bombs—or radiation-emitting devices (REDs) (using radioactive isotopes)—can cause panic and long-term contamination.
- **Nuclear threats:** Though rare, the consequences of nuclear material misuse are catastrophic.

WHY AIRPORTS ARE HIGH RISK CBRN TARGETS

- **High visibility:** Airports are symbolic and strategic targets for terrorism. They are major communication hubs and any CBRN incident will have wide-ranging visibility and scrutiny.
- **High Population Density and Heavy Footfall environments:** Millions of people travel by air. In addition, there are thousands of people employed in a variety of roles at airports. Such a large concentration of people makes them ideal targets for mass disruption.
- **Complex logistics:** Multiple entry points and baggage systems complicate threat detection. Aviation cargo hubs handle thousands of tons of cargo daily. Screening such heavy loads and responding to a possible release or detection is a major effort.
- **Global connectivity:** A CBRN incident at one airport can ripple across international borders. With the tourism industry booming and global trade and corporate businesses expanding, a single incident in any major airport has worldwide ramifications.

Substances like nerve agents or choking agents in small quantities can be concealed in luggage or sprayed or released in confined spaces like airport lounges and aircraft cabins. Contagious biological agents can be deployed without any immediate signs. Dirty bombs—or radiation-emitting devices (REDs)—can cause panic and long-term contamination

NOTABLE CBRN-RELATED AVIATION INCIDENTS

CBRN incidents in aviation are rare but deeply concerning due to the potential for mass disruption and casualties. While most documented cases involve threats or hoaxes, there have been a few notable events that highlight vulnerabilities in the aviation ecosystem

- **Tokyo Subway Sarin Attack (1995) – Aviation Implications:** Although not at an airport, this attack by Aum Shinrikyo in Tokyo raised global awareness of chemical threats in public transport hubs. Airports worldwide responded by upgrading chemical detection systems and emergency protocols.
- **2001 Anthrax Scare – Impact on Air Cargo:** After anthrax-laced letters were mailed in the U.S., fear spread to air cargo systems. Airports and airlines began screening mail and packages more rigorously for biological agents.
- **2015 Radiation Scare at IGI Airport, New Delhi:** In May 2015, a radiation scare occurred at the Indira Gandhi International Airport cargo terminal in New Delhi when a leaking liquid from a separate, non-radioactive box dripped onto a radioactive medical consignment. Authorities confirmed there was no radioactive leak, and the consignment, which was containing Iodine131 and Mo99-Tc99m isotopes, was not compromised. The incident caused no operational disruption and posed no risk to passengers, though airport and atomic energy officials investigated the incident.
- **2016 Radiation Incident at IGI Airport, New Delhi:** In October 2016, a radioactive 'leak' occurred at the T3 terminal of IGI Airport in Delhi, causing

NDRF Teams Conduct CBRN Mock Drills at Airports

panic and confusion. However, officials quickly confirmed that the material was a regular shipment of cancer treatment radiation medicine (Mo99-Tc99m isotopes) arriving from France that had a leak but was within safe, permissible limits and posed no danger to passengers or the public. The incident was handled by the National Disaster Response Force (NDRF), Department of Atomic Energy (DAE) and other agencies, and there was no radioactive leakage in the passenger area.

- **2018 Ricin Threat at JFK Airport:** A suspicious package containing ricin was intercepted at JFK Airport in New York. Though no exposure occurred, it triggered a full-scale hazmat response and highlighted the risk of chemical and biological agents in luggage.
- **Radiological Material Smuggling Attempts:** Several cases have involved attempts to smuggle radioactive materials via air transport. These incidents prompted tighter controls on cargo and passenger screening for radiological threats.
- **CBRN Hoaxes and False Alarms:** Airports frequently face hoaxes involving fake chemical or biological threats. Even false alarms can cause mass evacuations, flight delays/cancellations, and economic losses.

KEY DESIGN FEATURES AND SECURITY MEASURES FOR CBRN RESILIENCE

Airports are a maze of complex facilities and systems. Deliberate and extensive research needs to be undertaken to cover all areas and aspects to prevent, protect and respond to a CBRN incident. Designing airports for CBRN resilience means building infrastructure that can detect, contain, and respond to invisible, high-impact threats — without disrupting the flow of passengers and cargo. It's a delicate balance of security, engineering, and emergency planning. Here's how modern airports should prepare and are evolving to meet this challenge:

Airports are a maze of complex facilities and systems. Designing airports for CBRN resilience means building infrastructure that can detect, contain, and respond to invisible, high-impact threats, without disrupting the flow of passengers and cargo. It is a delicate balance of security, engineering, and emergency planning

- **Advanced HVAC Systems:** Heating, Ventilation, and Air Conditioning (HVAC) systems are adapted to filter and isolate contaminants. Originally used for smoke control, these systems now help remove or contain airborne biological or chemical agents.
- **Zoned Architecture:** Terminals should be divided into containment zones to isolate affected areas quickly. This allows for targeted evacuation and decontamination without shutting down the entire airport. Such zones can have segregated HVAC systems, which can be shut down/diverted to avoid cross-contamination flows in the whole complex. Some halls can have dedicated CBRN filtered HVAC and appropriate sealing to serve as temporary holding areas before safe evacuation. Detailed plans for mass evacuation in an orderly manner need to be worked out. Priority routes for ambulances and fire/response services need to be earmarked.
- **Detection Infrastructure:** Installation of fixed and mobile sensors for chemical, radiological, and biological

agents. These systems are often placed at entry points, security screening checkpoints baggage areas, and cargo terminals. Additionally discrete portal monitors and standalone sensors can be placed in key areas and aircraft boarding gates. Non-invasive CBRN sensors, which can detect toxic substances inside baggage, bottles and sealed containers, are becoming the norm. Use of new technologies like Spatially Offset Raman Spectroscopy (SORS) are gaining acceptance. Small Robotic vehicles with a CBRN sensor suite onboard can be used to patrol the airport passenger lounges and walkways. Similar patrolling can be instituted in the baggage areas and check-in halls.

- **Water and Food Safety Controls:** Airports implement containment protocols to protect water supplies and food services from contamination. This includes secure entry, storage, filtration systems, and routine testing. Airports could use food irradiators and scanners to disinfect and make food safe before entry into airports.
- **Emergency Response Integration:** Response and Mitigation includes dedicated zones for decontamination (with adequate water supplies), triage, evacuation measures and emergency response teams. Toilets should not be used for decontamination. Rescue and Firefighting Services (RFFS) are integrated into the airport's layout for rapid deployment. They need to be adequately trained and equipped for CBRN response.
- **Medical Support:** All airports have a scalable medical aid facility. These facilities need streamlining and staff trained to handle CBRN casualties. Isolation bags, Atropine and other antidotes and drugs need to be stocked. Ambulances, Triage kits and an adequate number of trained paramedics also need to be positioned.
- **Training and Simulation Zones:** Some airports include dedicated training areas for CBRN drills. Ground Staff, airport security, air crew and support personnel are trained to recognise CBRN exposure symptoms like eye irritation, nausea, or disorientation, and respond accordingly.
- **Risk assessments and System Audits:** Regular reviews of threat landscapes and response capabilities must be carried out. Continuous monitoring and awareness of evolving CBRN threats and delivery methods are key to proactive security. Periodic and random CBRN security audits by qualified third-party security auditors are a must.
- **Multi-Agency Coordination:** Multiple agencies work to ensure the smooth functioning of airports. Coordination with national agencies and integration with intelligence and health authorities is essential for swift action during CBRN incidents. Such coordination includes shared command centres, compatible and standardised response mechanism and interoperable communication systems.
- **International Cooperation:** Enhanced security cooperation, such as through evolving threat scenarios, intelligence sharing, training initiatives and knowledge (best practices) exchange, is crucial for building global capacity to counter CBRN threats.

GMR Hyderabad International Airport Hosted CBRN Emergency Training Programme

Both fixed and mobile sensors should be installed to detect chemical, radiological, and biological agents. These systems are often placed at entry points, security screening checkpoints baggage areas, and cargo terminals. Additionally discrete portal monitors and standalone sensors can be placed in key areas and aircraft boarding gates

KEY CHALLENGES

- **Low Probability, High Impact:** CBRN events are low-probability but high-impact incidents, which can make it challenging to justify and maintain extensive preparedness measures.
- **Evolving Technologies:** The emergence of new technologies poses new emerging threats and requires ongoing investment in advanced detection, protection and response capabilities.
- **Coordination:** Effective CBRN security relies on strong coordination between airports, airlines, logistic companies, government agencies (including foreign ones), and emergency services.

TRAINING BY NDMA FOR SECURING AIRPORTS AGAINST CBRN THREATS

The National Disaster Management Authority (NDMA) in India offers basic training on CBRN emergency management for Airport Emergency Handlers (AEHs). This training is designed to enhance the preparedness of first responders and equip them to handle threats and incidents involving CBRN materials.

Core components of the training. The NDMA's basic CBRN training is a multi-day program that includes a combination of lectures, field exercises, and practical demonstrations. Key topics typically covered in the training include:

- Fundamentals of CBRN emergencies
- Response protocols.
- Medical and psychological support
- Coordination and Mock Drills and Exercises

To provide comprehensive training, the NDMA collaborates with subject matter experts from various government agencies and research institutions, including:

- Bhabha Atomic Research Centre (BARC)
- Defence Research and Development Organisation (DRDO)
- Institute of Nuclear Medicine & Allied Sciences (INMAS)
- National Disaster Response Force (NDRF)

The Coalition for Disaster Resilient Infrastructure (CDRI) has been studying how airports incorporate CBRN resilience into their design. Their findings show that CBRN-specific resilience is not yet a priority. In India, CBRN security is still at a nascent stage. While many efforts are being made, the focus has been on major international airports

GLOBAL PERSPECTIVE AND INTERNATIONAL COOPERATION

The Coalition for Disaster Resilient Infrastructure (CDRI) has been studying how airports worldwide incorporate resilience (including CBRN resilience) into their design. Their findings show that while many airports are prepared for natural disasters, CBRN-specific resilience is still emerging as a priority. In India, CBRN security at airports is at a nascent stage. While many efforts are being made, the focus has been on major international airports.

INDUSTRY TRENDS

The global CBRN security market is booming, projected to grow from $20.5 billion in 2024 to $35.7 billion by 2033. This reflects rising awareness and investment in detection systems, protective gear, and rapid response technologies.

CONCLUSION

The intersection of the aviation industry and CBRN security is a high-stakes domain where safety, technology, and preparedness converge. Airports are uniquely vulnerable to CBRN threats due to their open access, high foot traffic, large cargo handling, and symbolic value as national critical infrastructure. Security measures should include a multi-layered approach of prevention, detection, and response, which involves enhanced screening, risk assessment, and robust emergency response planning. Key to these efforts are advanced technologies for detection and filtration, as well as comprehensive training for airport and first-responder personnel to handle incidents effectively. Making flying safe is a multi-agency and multi-stakeholder effort.

– The writer is a prominent CBRN expert, prolific writer, visiting faculty at select universities, and an in-demand speaker at international seminars and conferences. He holds a PhD in CBRN Security and Incident Management and has authored a pioneering book titled "Toxic Portents" on 'CBRN Incident Management in India'. Presently, he is a freelance CBRN Security and Risk Mitigation Professor and Consultant based in Pune, India. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

Shield AI to Acquire Software Simulation Company Aechelon, Raise $2 Billion at $12.7 Billion Valuation

Shield AI March 26 announced it is raising $1.5 billion in Series G funding at a $12.7 billion post-money valuation and $500 million in fixed-return preferred equity financing.

The Series G is led by Advent International and co-led by the Strategic Investment Group of JP Morgan Chase's Security and Resiliency Initiative, with participation from existing investors Snowpoint Ventures, InnovationX, Riot Ventures, Disruptive, Apandion, and others. Funds managed by Blackstone are investing $500 million of preferred equity financing, as well as committing an additional $250 million delayed draw facility to support future growth.

Advent's Chairman David Mussafer will join Shield AI's Board of Directors and JP Morgan Chase's Todd Combs will join as a Board Observer.

A portion of the proceeds will help fund the company's planned acquisition of Aechelon Technology Inc, a Sagewind Capital portfolio company. Aechelon is a defence software company known for its high-fidelity simulation, physics-based sensors, and synthetic reality applications. Aechelon's technology is used by the US military and allies to train pilots and

test advanced aircraft and autonomous systems before live flight, and supports a range of critical national security platforms, including the Pentagon's Joint Simulation Environment (JSE).

Together, these investments reflect a fundamental shift in how defence capabilities are built: increasingly shaped in software, trained in simulation, and improved through use.

Following closing, Aechelon will join Shield AI, continuing to operate independently while serving customers across the defence ecosystem. Aechelon co-founder and CEO Ignacio (Nacho) Sanz-Pastor will report directly to Gary Steele and remain responsible for Aechelon's product and customer roadmap.

Today, Hivemind software has already piloted 26 classes of vehicles including F-16s, jet-powered UAVs, helicopters, drone boats, and ground vehicles. It was recently selected by the US Air Force as a mission autonomy provider for Collaborative Combat Aircraft (CCA) and is actively conducting a flight test campaign of Hivemind onboard the Anduril YFQ-44A CCA.

First Batch of IWI Negev 7 Light Machine Guns Delivered to India

The first batch of 2,000 Israel Weapon Industries (IWI), a global leader in small arms manufacturing, NEGEV 7.62x51 light machine guns (LMG) will be delivered to India on March 28. The delivery will be carried by PLR Systems, the joint venture between IWI and Adani Defence and the first private company in India to manufacture small arms and ammunition. This marks the first shipment under a larger contract for 41,000 units, with an additional 4,000 scheduled for delivery this year. The milestone follows the successful completion of the technology transfer process under India's "Make in India" initiative and reflects IWI's commitment to delivering advanced systems in accordance

with contractual schedules and the highest quality standards, while supporting India's defence manufacturing ecosystem.

The NEGEV 7.62x51, one of the lightest 7.62mm light machine guns in its class with a semi-automatic mode, epitomises IWI's engineering excellence. Extensively deployed by the Israel Defence Forces (IDF), it delivers robust performance and exceptional reliability in harsh operational environments, ensuring superior target acquisition and precision. Its lightweight design, combined with powerful 7.62mm ammunition capable of penetrating fortified cover, makes it especially effective in urban combat environments and a premier choice for critical missions by military forces worldwide. The NEGEV 7.62x51 offers dual modes – semi-automatic for close-quarter battle (CQB) and fully automatic for maximum suppressive fire – and supports helicopter, vehicle and naval mounts for versatile operations.

DRONE SUPREMACY CHALLENGES AIR DEFENCES

Drone warfare has dominated the ongoing Israel-US-Iran war. Escalating since early March 2026, both sides have deployed massive swarms that challenge traditional air defences. Whereas the Russia-Ukraine war has been dubbed the first drone war, the Middle East conflict can be considered the second drone war—wider in scale and with more advanced technologies in use

ARIE EGOZI

The latest ongoing war launched by US-Israel against Iran, ignited on February 28, 2026, with joint US-Israeli strikes under Operations Roaring Lion and Epic Fury, assassinating Iran's Supreme Leader Ali Khamenei and targeting Iranian military sites, including air defences and missile facilities. Iran retaliated via Operation True Promise IV, launching hundreds of drones and missiles at Israel, US bases in the Gulf, and American allies like Saudi Arabia and Qatar.

By early April 2026, US-Israeli airstrikes had hit hundreds of targets across 26 Iranian provinces, degrading ~200 air defence systems and naval assets like 17 warships. Iran pioneered large-scale drone swarms, deploying up to 2,340 Shahed-136 drones in a single March 2 salvo against Israel, Bahrain, Kuwait, UAE, and Saudi Arabia—history's largest drone campaign. These low-cost ($20,000) UAVs aim to overwhelm defences like Iron Dome, with reports of hits on Ben Gurion Airport fuel tanks and US radar in Bahrain, forcing expensive $3M Patriot intercepts. Israel countered with AI-driven drone swarms from mother launchers, enabling facial recognition strikes on IRGC Basij checkpoints in Tehran.

Iran's strategy shifted to saturation attacks, firing waves (for example: 21st wave on Tel Aviv) with cluster munitions to deplete interceptors, raising hit rates to 27% by late March. Israel-US achieved air superiority early, suppressing defences for precise drone ops, but faced interceptor shortages amid ongoing barrages. Casualties include ~800-2,400 Iranian civilians and military, 10+ Israelis, and disruptions like Strait of Hormuz closure spiking oil prices by 40%.

As of April 2026, Iran sustains drone or missile waves, but launch rates dropped 83-92% due to strikes on production sites. Iran has primarily deployed the Shahed-136 and Shahed-131 drone models in its major attacks on Israel during the ongoing 2026 war. Meanwhile, the US costs have exceeded $18B, with Trump eyeing regime change amid Iranian resilience.

The Shahed-136, a low-cost ($20,000) loitering munition with a 40-50kg warhead, forms the backbone of Iran's swarms. The smaller Shahed-131 shares similar kamikaze design but with lighter payloads, enabling saturation tactics to overwhelm defences like Iron Dome and Patriot systems.

Iran has also utilised the Shahed-129 for longer-range reconnaissance and precision strikes with Sadid missiles, capable of 24-hour endurance and 1,700km range from Iranian soil. Other reports mention Mohajer-6 stealth drones for penetrating defended airspace, though in smaller numbers amid the swarm-focused strategy.

The Ukraine war was a wake-up call for all major armed forces. One main conclusion forced these forces to adapt to the new reality – drones. In many cases very cheap ones, are challenging very advanced systems that carry a high price tag. While trying to develop efficient systems that can effectively intercept drones, armed forces started to develop their own relatively cheap drones.

The experience gained by the US army in the use of LUCAS drones, reverse-

engineered from Iran's Shahed-136, will result in the development of more low-cost armed drones for the US Army.

According to Israeli sources, these low-cost armed drones have proven highly effective in early strikes against Iranian targets during Operation Epic Fury. They are launched from ground platforms by Task Force Scorpion Strike since February 28, 2026. They have hit IRGC command centres, air defences, missile sites, and airfields with a 500-mile range and 40-pound payload.

CENTCOM commander Admiral Brad Cooper called LUCAS, indispensable on March 4, praising their role in repeated salvos that flip Iran's low-cost swarm tactics against it. Enhanced with nose-mounted cameras, satellite links, and AI for mid-flight retargeting or swarming, they have saturated Iranian radars, creating openings for pricier US-Israeli assets like stealth bombers. At $35k per unit, they enable attrition warfare without exhausting expensive munitions.

What will probably result in newer versions of low-cost attack drones is the fact that they have been developed in a very short time. LUCAS features a triangular delta-wing shape and piston engine, visually resembling Iran's Shahed-136 "kamikaze" drone (also known as Geran-2 in Russian use). Both are designed for loitering munition roles with the ability to saturate air defences through mass deployment.

The LUCAS drone is classified as a Group 3 UAV, with a launch weight ranging from 70 to 100 kg and capable of operating at altitudes up to 5,500 metres. LUCAS employs a modular, open-architecture design. This enables the integration of different payloads — allowing it to switch between reconnaissance, electronic warfare, strike, or communications relay roles rapidly in the field.

LUCAS supports Rocket-Assisted Take-Off (RATO) and truck-based deployment for fast, flexible field launches with minimal specialised training or infrastructure. While the development of the mass-produced armed drones has gained, the protection results against these cheap and deadly weapons remain a problem.

As previously reported by Raksha Anirveda, Israel has developed some very advanced interception systems, but in-spite of all the highly advanced technology, these systems are not always effective. This forced the Israeli Air Force (IAF) to use AH-64 Apache to shoot down armed drones, including kamikaze types from Hezbollah, Iran, and Houthis, as a close-range supplement when other systems failed.

Israeli Apaches have downed Hezbollah kamikaze drones with M230 chain guns, as seen in November 2024 footage. In June 2025, they targeted Iranian Shahed drones, exploiting the helicopter's speed advantage. A single Apache downed six drones in minutes during June 2025 operations. Recent uses include smuggling drones from Egypt in December 2025 and Shahed-types as late as March 2026. Pilots use helmet-mounted sights to slave the 30mm cannon to hit slow and low flying targets. This new role for the Apache helicopter's evolved post-October 2023, proving Apache's value against small UAVs despite high costs. The Longbow radar and EO/IR sensors detect low and slow Shahed type armed drones even in poor weather, allowing Apache's 200+ mph speed to close gaps.

During the ongoing war, Rafael's Iron Beam laser air defence system has been operationally deployed for the first time. Sources said that the system that is designed to work in conjunction with kinetic air defence systems is still in an evaluation phase. In addition to the armed drones used in the ongoing war, mainly by Iran and its proxies, Israel has expanded the use of its long-endurance UAVs.

The Israeli Air Force (IAF) is operating some very advanced types of UAVs in the Iranian airspace since the war broke out on February 28. The Israeli and American air forces are using fighter aircraft and bombers to hit nuclear sites and ballistic missiles production installations. The armed UAVs are performing accurate strikes on selected targets. Israeli armed UAVs are actively operating in Iranian airspace as part of ongoing military operations, targeting missile launchers, air defences, and related infrastructure amid heightened Israel-Iran tensions in early April 2026.

Israeli forces deploy persistent drone fleets for real-time surveillance, target identification, and precision strikes over areas like Tehran and western Iran. A leading UAV in this operation is the Israel Aerospace Industries' (IAI) Heron TP. This heavy UAV variant, has been spotted in operations over regions like Tabriz; and it supports maritime and strategic armed missions with long-range capabilities.

Sources say that in the current operation in the Iranian airspace, Israel is using at least one advanced, highly classified UAV designed for what is dubbed Special Missions. Israel is a leading force in the development of UAVs and in recent years, the industry has worked to satisfy the IAF's new operational needs

The Elbit Hermes-900 is also very active in the Iranian airspace, armed with special payloads and weapon systems. These UAVs loiter for hours, enabling non-stop hunts after IAF jets establish air superiority by neutralising Iranian SAMs. They update target banks in real-time, striking facilities in Tehran and Isfahan as part of continuous powerful strikes.

Sources say that in the current operation in the Iranian airspace, Israel is using at least one advanced, highly classified UAV designed for what is dubbed Special Missions. Israel is a leading force in the development of UAVs and in recent years, the industry has worked to satisfy the IAF's new operational needs.

Unmanned aerial systems of all types, from FPVs, armed drones and strategic long-range UAVs, are changing the way wars are being fought. Without any doubt, the protection against armed drones with new solutions all the time is still a major problem as they are not enough to deal with this continuous and evolving threat.

–The writer is an Israel-based freelance journalist. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

QNU LABS WITH VIAVI VALIDATES REAL-WORLD PERFORMANCE OF ARMOS QKD

The study demonstrates secure key generation over 200 KM (40 dB loss), sub 4 per cent error rates and seamless coexistence with 10 Gbps networks

QNu Labs, a global leader in end-to-end hybrid quantum cybersecurity solutions, has announced the findings of a research study conducted in association with VIAVI Solutions, a global leader in network test and measurement. The study leverages VIAVI's industry-recognised MAP-300 platform to assess the real-world performance and deployment readiness of QNu Labs' patented, certified and globally deployed Quantum Key Distribution platform, ARMOS.

The study establishes ARMOS as a robust, field-ready solution capable of enabling quantum-safe communication across enterprise and critical infrastructure networks. Evaluated under controlled conditions using VIAVI's advanced test environment, the system demonstrated secure key generation over distances of up to 200 KM of standard telecom fibre (40 dB loss) without signal amplification, while consistently maintaining Quantum Bit Error Rates below 4 percent, well within safe operating thresholds.

At typical metro distances (~50 km), ARMOS achieved secure key generation rates of up to 8,000 secure bits per second, enabling real-time encryption for high-value data flows. Even at extended ranges of 200 KM, the system sustained performance at approximately 200 secure bits per second, reinforcing its ability to operate reliably across varying network conditions.

A key highlight of the study is ARMOS' ability to operate seamlessly alongside 10 Gbps classical data traffic on the same fibre, with no measurable degradation to the quantum channel, effectively addressing a major barrier to QKD adoption by enabling integration without network redesign.

The platform also demonstrated strong operational resilience, autonomously detecting and recovering from simulated fibre cuts within minutes, while maintaining stable performance (i.e. self-restored secure key generation) without any manual intervention under real-world conditions such as attenuation and polarisation fluctuations, reinforcing its readiness for large-scale deployment.

The report also outlines the next phase of research, including testing under higher classical data loads, extended link performance beyond current benchmarks and deeper modelling of hybrid quantum-classical networks. These efforts are expected to support further the development of scalable and deployable quantum-secure communication frameworks.

Developed in India, ARMOS reflects QNu Labs' continued focus on advancing quantum-safe technologies aligned with both national priorities and global security requirements.

INDIA'S BIGGER TEST: CARRIER-BORNE FIGHTERS

INS Vikrant achieved a significant operational milestone with 1,000 arrested landings, signalling that India's carrier aviation ambitions are entering a new and more confident phase, as Rafale-M fighters are on the horizon and the indigenous TEDBF programme is making steady progress

JOSEPH P CHACKO

India's first indigenously built aircraft carrier, INS Vikrant, has crossed a significant operational benchmark by completing more than 1,000 arrested landings of carrier-borne aircraft. The milestone emphasises the rapid growth of India's carrier aviation programme and signifies an important milestone in the warship's operational maturity.

The 45,000-tonne aircraft carrier, commissioned into the Indian Navy in September 2022, is an important accomplishment in the domestic defence manufacturing ecosystem of India. The carrier, which was built by Cochin Shipyard as part of the nation's overarching initiative to achieve defence self-reliance, is a testament to India's aspiration to establish an indigenous maritime power capable of operating throughout the Indo-Pacific.

The carrier's flight deck systems, arresting gear, aviation infrastructure, and crew training have now achieved a level that is suitable for sustained operational deployments, as demonstrated by the 1,000 arrested landings mark. It also illustrates that the naval aviation ecosystem in India is progressively maturing into a dependable and strong capability.

THE INTRICACY OF ARRESTED LANDINGS

One of the most technically challenging forms of aviation in the world is carrier aviation. While approaching at a high rate of speed and descending at a precise glide path, aircraft must land on a relatively short and continuously moving deck. A missed landing or a potentially hazardous situation can result from even minor miscalculations.

To facilitate these operations, carrier-based fighter aircraft are equipped with a tailhook that catches one of the many arrestor wires that are strung across the flight deck. The aircraft is brought to a complete stop within a brief distance by the rapid deceleration of the aircraft, which is facilitated by the powerful hydraulic systems that are connected to these steel cables.

INS Vikrant operates using the Short Take-Off But Arrested Recovery (STOBAR) system. In this configuration, the ski-jump runway located at the bow of the carrier is

used by aircraft to take off under their own engine power. The aircraft must maintain a meticulously controlled descent angle and align precisely with the arresting wires in order to land.

The pilots and deck personnel have acquired considerable experience in managing these demanding operations, as demonstrated by the fact that they have completed over one thousand successful arrested landings. It also illustrates the increasing proficiency of India's naval aviators and the dependability of the ship's aviation support systems.

OPERATIONS OF THE MIG-29K ON VIKRANT

Currently, the Russian-built MiG-29K carrier-borne fighter serves as the foundation of fixed-wing operations at INS Vikrant. These multirole aircraft are capable of carrying out reconnaissance duties, maritime strike operations, and air superiority missions from the carrier deck.

The MiG-29K was integrated with Vikrant during the carrier's initial sea trials. The initial landings and takeoffs were executed by test pilots to verify the aircraft's compatibility with the flight deck systems of the carrier. The Indian Navy progressively increased the frequency and scale of flight operations following these initial trials.

The accumulation of 1,000 arrested landings is the outcome of ongoing training sorties, operational exercises, and deck landing practice missions that have been conducted over the past several years. These operations enable pilots to acquire experience in the demanding carrier aviation environment, while also assisting engineers in the refinement of maintenance procedures and deck management protocols.

This experience is crucial for guaranteeing that the carrier can maintain high-tempo operations during protracted deployments.

DECK PREPARATION FOR RAFALE-M FIGHTERS

The milestone comes at a time when the Indian Navy is preparing to induct a new generation of carrier-borne fighter aircraft. In order to enhance its carrier aviation capabilities, India has formalised plans to acquire 26 Rafale-M naval fighters from France.

The Rafale-M is one of the most advanced fighters in service, capable of operating from a carrier. It is equipped with sophisticated electronic warfare suites, powerful radar systems, and compatibility with precision strike weapons and long-range air-to-air missiles.

Nevertheless, the introduction of a new aircraft type onto a carrier necessitates an in-depth amount of preparation. To facilitate the new platform, aircraft elevators, maintenance facilities, deck procedures, and aviation support systems must be configured.

The Indian Navy is effectively preparing INS Vikrant for the transition to Rafale-M operations by conducting thousands of deck operations with the MiG-29K. The knowledge acquired from these exercises will facilitate the integration of the new combatants as they arrive later in the decade.

INDIA'S INDIGENOUS TEDBF FIGHTER: THE FUTURE

The Rafale-M will serve as a sophisticated interim solution; however, India's long-term objective is to create its own carrier-based fighter aircraft. The Twin Engine Deck Based Fighter (TEDBF)

programme is in development and will serve as the foundation of Indian naval aviation in the future.

It is expected that the TEDBF will be a twin-engine multirole fighter specifically designed for aircraft carrier operations. The aircraft will integrate technologies and lessons acquired from previous Indian programmes, such as the naval variant of the Light Combat Aircraft.

Specialised flight control systems, reinforced landing gear, and structural modifications are necessary for carrier-based fighters to survive the high stresses of ski-jump takeoffs and arrested landings. Consequently, the TEDBF's development is regarded as a critical stage in the pursuit of complete independence in carrier aviation.

Upon its operationalisation, the aircraft could serve as a domestically produced solution specifically designed to meet the operational needs of India's aircraft carriers, thereby replacing imported fighters.

ENHANCING INDIA'S CARRIER STRIKE CAPABILITY

INS Vikrant is presently in operation in conjunction with INS Vikramaditya, the other aircraft carrier of India. These ships collectively enable the Indian Navy to rapidly project air power when necessary and sustain a carrier presence throughout the Indian Ocean.

Aircraft carriers are among the most potent instruments in modern naval strategy. They enable nations to deploy fighter aircraft, surveillance platforms, and strike capabilities beyond their native territory without the need for land bases.

Carrier strike groups offer India a mobile and adaptable method of protecting maritime trade routes, conducting surveillance missions, and promptly responding to emergent threats as geopolitical competition in the Indo-Pacific region escalates. Therefore, the operational maturation of INS Vikrant is a critical factor in the enhancement of India's overall maritime deterrence capability.

THE NEXT PHASE OF NAVAL AVIATION

It is a significant milestone in the operational voyage of INS Vikrant to have achieved 1,000 arrested landings. It illustrates that the carrier's operational procedures, personnel training, and aviation systems are operating efficiently in real-world scenarios.

Each landing provides the naval aviation community of India with valuable experience that will facilitate future developments, such as the implementation of new aircraft and the continued development of indigenous technologies.

It is expected that INS Vikrant will become a central pillar of India's maritime strategy as it proceeds to broaden its operational envelope. Future carrier designs, aircraft development initiatives, and naval aviation doctrine will be influenced by the lessons acquired from its operations.

The milestone attained by INS Vikrant signals that India's carrier aviation ambitions are entering a new and more confident phase, as Rafale-M fighters are on the horizon and the indigenous TEDBF programme is making steady progress.

–The writer is the publisher of Frontier India and has authored the book, Foxtrot to Arihant: The Story of Indian Navy's Submarine Arm. The views expressed are personal and do not necessarily reflect the views of Raksha Anirveda

ADANI DEFENCE DELIVERS FIRST BATCH OF PRAHAR LIGHT MACHINE GUNS

Marking a significant milestone in India's small arms manufacturing capability, Adani Defence and Aerospace has delivered 2,000 indigenously manufactured 7.62-mm Prahar-light machine guns (LMGs) to the Indian Army.

Ahead of the contracted schedule, the delivery of the first batch was completed in seven months. The First-of-Production Model (FOPM) was realised in six months against a stipulated 18-month development timeline. Later, Bulk Production Clearance (BPC) followed, enabling a rapid transition to full-scale manufacturing.

The 7.62x51 mm Prahar-Light Machine Gun is an accurate, robust and reliable LMG, which can be fired from open bolt, gas impact on piston head, and rotating bolt locking. Besides, it has safe, semi-automatic and automatic mode of firing.

Manufactured at the Adani Defence's Small Arms Facility in Gwalior, Madhya Pradesh, India's first fully integrated private-sector small arms manufacturing hub, the Prahar LMG significantly reduces reliance on imported infantry weapons and strengthens self-reliance in the defence sector.

Spread across 100 acres, the facility integrates barrel manufacturing, bolt carrier and receiver fabrication, advanced computer numerical control (CNC) machining, robotics, surface treatment, precision metrology, a metallurgy laboratory and a 25-metre underground firing range.

Each weapon undergoes lifecycle testing, ballistic assessment and environmental trials before deployment, ensuring adherence to the operational and reliability standards required by the Indian armed forces.

Designed for scale, the Gwalior facility has an annual production capacity of up to 1,00,000 weapons, with more than 90 per cent domestic sourcing. The facility is contributing to a broader industrial ecosystem in MP by generating skilled employment and supporting micro, small and medium enterprises (MSMEs) across the supply chain. The Gwalior facility is also geared to manufacture close quarter battle (CQB) weapons for the Indian armed forces, further expanding India's indigenous small arms capability.

The manufacturing capability is also supported by Adani Defence's ammunition complex in Kanpur, Uttar Pradesh (UP), which was commissioned in 2024. The facility has an annual capacity of around 300 million rounds of small calibre ammunition, with plans to expand its capabilities to manufacture large and medium calibre ammunition, strengthening the integrated weapons and ammunition ecosystem.

This integrated approach across design, manufacturing and supply chains enhances resilience, improves execution timelines and supports long-term self-reliance in defence production.

Lt Gen Dhiraj Seth Takes Charge as Vice Chief of the Army Staff

Lieutenant General Dhiraj Seth, PVSM, UYSM, AVSM assumed the appointment of the Vice Chief of the Army Staff (VCOAS) on April 01, 2026. An alumnus of the National Defence Academy, Khadakwasla, he was commissioned into the Armoured Corps in December 1986. Over nearly four decades, he has built an exceptional operational profile across diverse terrain and conflict environments, including counter-insurgency experience. He has commanded an Armoured Regiment in the desert sector, an Armoured Brigade in the developed sector, and a Counter Insurgency Force in Jammu & Kashmir. On promotion to Lieutenant General, he commanded the Sudarshan Chakra Corps, and later served as General Officer Commanding, Delhi Area, where he oversaw major national and international engagements. On elevation to the rank of Army Commander, he served as General Officer Commanding-in-Chief, South Western Command and Southern Command, gaining the rare distinction of commanding two operational commands along the Western Front.

Lieutenant General Seth has held key staff and strategic appointments, including Brigade Major of an Independent Armoured Brigade in Jammu & Kashmir, Operations Officer with the United Nations Mission in Angola, Assistant Military Secretary at Army Headquarters, Brigadier General Staff Operations at Headquarters South Western Command, and Director General Discipline, Ceremonial and Welfare. A distinguished contributor to capability development and modernisation, he has tenanted key appointments in Strategic Planning and Capability Development Directorates, including Colonel Capability Development for Mechanised Forces, Brigadier Perspective Plans and Acquisition, and Additional Director General Capability Development, contributing significantly to the Indian Army's Long-Term Integrated Perspective Plan and modernisation roadmap.

Lt Gen Pushpendra Pal Singh Takes Charge as GOC-in-C, Western Command

Lieutenant General Pushpendra Pal Singh, formerly the Vice Chief of the Army Staff (VCOAS) has assumed command as the General Officer Commanding-in-Chief, Western Command on April 01, 2026. An officer of the Parachute Regiment (Special Forces), Lieutenant General Pushpendra Pal Singh was commissioned into 4th Battalion, The Parachute Regiment (Special Forces) in December 1987. He is an alumnus of the Indian Military Academy, Dehradun and Lucknow University.

With a career spanning nearly four decades, the General Officer has held a wide spectrum of command and staff appointments. He has commanded formations in high-altitude and sensitive operational sectors along both the Northern and Western borders. His operational experience includes participation in Operation Pawan, as well as multiple tenures in counter-insurgency operations along the Line of Control and the International Boundary.

Prior to his appointment as VCOAS, he served as Director General Operational Logistics (DGOL) at Army Headquarters, where he played a key role in enhancing operational mobility, logistics integration and sustainment capabilities. As VCOAS, he contributed significantly to force structuring, capability development and overall operational preparedness of the Indian Army.

Lt Gen Sandeep Jain Assumes Command as GOC-in-C, Southern Command

Lieutenant General Sandeep Jain assumed command as the General Officer Commanding-in-Chief, Southern Command on April 01, 2026. An alumnus of the National Defence Academy, Lieutenant General Sandeep Jain was commissioned into the MAHAR Regiment in June 1988. Over a distinguished career spanning nearly four decades, he has held a wide range of command and staff appointments across diverse operational environments.

The General Officer has commanded an Infantry Battalion in semi-developed terrain as well as in the United Nations Mission in South Sudan, an Infantry Brigade in a Strike Corps, a Counter Insurgency Force and a Pivot Corps in Northern Command. His operational experience includes participation in Operation Pawan, service as a Military Observer with the United Nations Mission in Ethiopia and multiple tenures in high-altitude areas and counter-insurgency operations along the Line of Control and in the North East. He is also the Colonel of the MAHAR Regiment. Prior to assuming command of Southern Command, he served as Chief of Staff at Headquarters Southern Command, where he contributed significantly to capability development, force restructuring and overall operational preparedness.

The General Officer has attended the Higher Command Course at the Army War College and the National Defence Course in Kenya. In recognition of his distinguished service, he has been awarded the Ati Vishisht Seva Medal and the Sena Medal.

Lt Gen VMB Krishnan Assumes Command as GOC-in-C, Eastern Command

Lieutenant General VMB Krishnan assumed the appointment of General Officer Commanding-in-Chief, Eastern Command. Commissioned into the Indian Army in June 1988, Lieutenant General Krishnan brings nearly four decades of rich and varied military experience to this critical theatre. His career encompasses a wide range of command, staff and instructional appointments across some of the most challenging operational environments in the country. An alumnus of premier military institutions, the General Officer has commanded an Infantry Battalion and an Infantry Brigade in the super high-altitude terrain of Siachen. He has also served as the General Officer Commanding of an Infantry Division and later commanded the elite Brahmastra Corps.

In the strategic and institutional domain, he has served as Director General Information Technology at Integrated Headquarters of Ministry of Defence (Army) and as Defence Attaché at the High Commission of India in London. Prior to assuming his present appointment, he served as the Quarter Master General at Army Headquarters, where he spearheaded key reforms in supply chain management and infrastructure, significantly enhancing operational sustenance and overall combat readiness.

Lieutenant General Krishnan also holds the prestigious appointments of Colonel of The Dogra Regiment and the Dogra Scouts. His tenure as Commandant of the Counter Insurgency and Jungle Warfare School set high benchmarks in specialised training and doctrinal development.

Lockheed Martin Names Jenna McMullin as Senior Vice President, and Chief Communications Officer

Lockheed Martin Corporation has announced Jenna McMullin as senior vice president and chief communications officer, effective immediately. In this role, McMullin will lead the company's global communications organisation and oversee enterprise communications strategy, media relations, brand, digital engagement, employee communications and stakeholder communications in support of Lockheed Martin's business priorities and mission.

McMullin brings more than 20 years of extensive experience in strategic communications, reputation management and organisational leadership across aerospace, defence and technology after beginning her career in communications as a civilian public affairs officer for the Air Force. She will work closely with senior leadership across the company to advance Lockheed Martin's communications strategy and strengthen engagement with employees, customers, partners and communities around the world.

General Atomics Promotes Mike Rucker to Vice President of Weapons Programmes

General Atomics Electromagnetic Systems has announced the promotion of Mike Rucker to vice president of the Weapons Programmes Division. Rucker, who has held positions of increasing responsibility since joining General Atomics in 2003, will have overall leadership and day-to-day operations responsibilities for GA-EMS' Missile Defense and Advanced Weapons Systems portfolio.

In addition, Rucker will be responsible for growth leadership and programme management to transition next-generation munitions and advanced weapons technologies into production to enhance the safety and effectiveness of US and allied forces. Rucker's appointment reflects GA-EMS' continued commitment to accelerate development and delivery of advanced weapon systems.

Rucker has more than 20 years of experience overseeing the development, integration and deployment of advanced weapon systems. He holds an MBA and bachelor's degree in mathematics and computer science from the University of California, San Diego.

BonV Aero Brings Combat-Proven Hard-Kill Counter-Drone System to India

Indian unmanned systems company BonV Aero has entered a strategic alliance with ParaZero Technologies to bring 'DefendAir', a hard-kill counter-drone system which primarily functions as a drone catcher, to serve India's defence and security agencies. The partnership gives BonV Aero exclusive rights to deploy the system in the Indian market now and subsequently manufacture it locally, a significant addition to the country's counter-drone arsenal at a time when the threat landscape is evolving faster than existing measures can keep pace with.

The move comes as drone incursions along land borders, UAV-enabled smuggling across coastal zones, and the growing use of first-person-view platforms in conflict theatres have laid bare gaps in existing counter-drone measures. For now, radio-frequency jamming is the primary line of defence. But autonomous and encrypted drones do not rely on external signals, which blunts the effectiveness of such systems considerably. Regulatory constraints add another layer of difficulty, jammers cannot be used near airports, nuclear facilities, or other critical infrastructure where uninterrupted spectrum access is non-negotiable. 'DefendAir' works around this through a kinetic approach. Its net-launcher intercepts and neutralises hostile drones' mid-flight without touching the electromagnetic spectrum, making it deployable in sensitive zones without disrupting communications or navigation systems.

Indigenous D4 Anti-Drone Shield Inducted to Secure Subcontinental Skies

India's naval expansion has reached a pivotal juncture with the formal induction of the indigenous D4 Anti-Drone Shield, developed by the Defence Research and Development Organisation (DRDO) and manufactured by Bharat Electronics Limited (BEL). This counter-unmanned aerial system (CUAS), dubbed "Drone Detect, Deter, and Destroy," embodies New Delhi's "Make in India" ambitions amid escalating regional tensions.

The system's rapid deployment underscores a strategic pivot towards advanced electronic warfare capabilities. Framed by Indian officials as a triumph of self-reliance, the D4 integrates multi-sensor fusion for comprehensive 360-degree surveillance, leveraging active phased-array radars, radio frequency (RF) sensors, and electro-optical/infrared (EO/IR) trackers. At its core, the D4 employs a layered response protocol. Detection occurs through real-time scanning of drone signatures, followed by soft-kill measures

such as GPS spoofing and high-power electronic jamming to disrupt command links. For hardened threats, it escalates to hard-kill options, including directed energy weapons (DEWs) like high-energy lasers capable of neutralising targets at ranges exceeding several kilometres.

This induction follows heightened hostilities, particularly the high-altitude skirmishes of 2025, retrospectively labelled "Operation Sindoor" in Indian discourse. Deployments are now prioritised at key naval dockyards, coastal installations, and forward bases along the North Arabian Sea frontier, enhancing protection against low-cost, asymmetric drone incursions.

India Successful Tests Indigenously Developed Floating LiDAR Buoy System

India has achieved a notable milestone in ocean observation technology with the successful testing of an indigenously developed Floating LiDAR Buoy System. The National Institute of Ocean Technology (NIOT) conducted the trial. This innovation promises to revolutionise weather forecasting and offshore wind energy development. A Floating LiDAR Buoy integrates a buoyant platform with Light Detection and Ranging (LiDAR) technology. This setup enables precise measurement of wind conditions over the sea. Unlike land-based systems, it operates in harsh marine environments, capturing data directly from offshore locations.

The system excels in measuring wind speed and direction profiles up to 300 metres above sea level. This high-resolution data surpasses traditional methods, providing vertical wind profiles essential for accurate modelling. Scientists emphasise its potential to refine atmospheric and oceanographic predictions. Improved weather forecasting stands to benefit immensely from this technology. High-quality offshore wind data will enhance cyclone tracking, storm intensity forecasts, and marine safety advisories. Coastal communities and maritime operations will gain from more reliable predictions. The Buoy System, developed, will significantly enhance the Indian Navy's operational effectiveness in the Indian Ocean Region (IOR) by improving weather-ocean situational awareness, mission-planning quality, and maritime-domain awareness. This also supports coordination with the Coast Guard and other agencies under the National Disaster Management Authority (NDMA) framework, aligning with the Navy's peacetime Humanitarian Assistance and Disaster Relief (HADR) role. Offshore wind energy features prominently in India's clean energy transition. The government targets substantial capacity additions by 2030.

Smart Shooter Secures $2.4 Million Contract for SMASH Fire Control Systems

Israeli company Smart Shooter has secured US $2.4 million contract to supply its SMASH fire control systems to the US Department of Defence. In May 2025, the company's US subsidiary received a $13 million US Army contract for SMASH 2000L systems to integrate into the Army's Transformation in Contact forces for counter-drone capabilities. SMASH 2000L is a lightweight, rifle-mounted fire control system using AI, computer vision, and tracking algorithms to detect, track, and hit drones and ground targets with high precision.

It's combat-proven by the IDF and adopted by US Army, Air Force, and other NATO forces for enhanced soldier accuracy in complex scenarios. The SMASH 2000L is Smart Shooter's lightest handheld fire control system, designed for rifles like the M4 or AR-15, enhancing precision against drones and ground targets. It integrates AI, computer vision, and advanced tracking algorithms to automatically detect, lock on, and compute firing solutions for static or moving targets up to 300 metres. The system performs real-time ballistic calculations, compensates for shooter movement and target motion, and only releases the shot at the optimal moment for a hit. Last year, the SMASH targeting system was integrated with the Steadicopter's Golden Eagle unmanned rotor craft, equipped with a weapon system.

MoD and BEL Sign ₹1,950 cr Contract for Mountain Radars for IAF

Strengthening India's indigenous defence capabilities under Aatmanirbhar Bharat and Make-in-India, Ministry of Defence (MoD) has inked a major capital acquisition contract with Bharat Electronics Limited (BEL) for the procurement of two Mountain Radars, including associated equipment and required infrastructure for the Indian Air Force, at a cost of around Rs 1,950 crore. The contract, under Buy (Indian-Indigenously Designed Developed and Manufactured) category, was signed in the presence of senior officials of MoD and BEL in New Delhi on March 31, 2026. This Mountain Radar is indigenously designed and developed by Electronics & Radar Development Establishment of DRDO and will be manufactured by BEL. The installation and commissioning of these radars will boost the country's air defence and strengthen national security. The procurement will also reduce the dependency on foreign equipment.

ST Engineering Secures ADSB Sub-Contract for Kuwait's New Missile Gun Boat Fleet

ST Engineering's Marine business has secured a six-year sub-contract valued at about S$600 million from Abu Dhabi Ship Building (ADSB) to design and supply the platform systems for a fleet of eight Missile Gun Boats that ADSB is constructing for the Kuwait Naval Force. In addition to delivering the full suite of platform design, integration and technical expertise, ST Engineering will build three of the vessels at its Singapore shipyard. This win highlights the strong partnership with ADSB, as well as the Group's deep naval engineering capabilities and its proven track record in delivering complex naval platforms.

BEL Achieves Record Turnover of Rs 26,750 Crore

Defence PSU Bharat Electronics Limited (BEL) has achieved a turnover of around Rs 26,750 crore (Provisional & Unaudited), during the Financial Year 2025-26, against the previous year's turnover of Rs 23,024 crore registering a growth of 16.2%. This includes Export sales of around US$ 141.9 million during FY 2025-26, as against the previous year's export turnover of US$ 106.17 million, registering a growth of 33.65%. During the fiscal year 2025-26, BEL secured orders worth Rs 30,000 crore including export orders worth USD 346 million. Some of the major orders

received during the year in defence include Avionics for LCA, Mountain Radars, EW suite for Helicopters, Air Defence Radars, EOIR Payloads for Airborne and Naval platforms, EW systems for Naval platforms, Fire Control & Sighting System for Tanks, Mobile Communication Terminal, Network systems, Counter Unmanned Aerial System, Upgrades, Spares and Services.

The major orders in non-defence sector include communication equipment, IT Infra for AIIMS, Airport Surveillance Radars, Software solutions, Automatic Train Supervision System, EVM, etc. On the export front, the major orders received include communication equipment, Satellite communication network, TR modules, electronic fuzes, drones, etc.

First Demo Flight of Airbus' Uncrewed Bird of Prey Interceptor Successful

The Airbus 'Bird of Prey' interceptor drone successfully completed its first demonstration flight at a military training area in northern Germany. In a realistic mission scenario, it autonomously searched, detected and classified a medium-sized one-way attack (kamikaze) drone. After successful identification, the Bird of Prey interceptor engaged the target with a Mark I air-to-air missile developed by defence tech start-up partner Frankenburg Technologies. The demonstration flight took place just nine months after the project started. Based on a modified Airbus Do-DT25 drone, the Bird of Prey prototype used in the flight features a wingspan of 2.5 metres, a length of 3.1 metres, and a maximum take-off weight of 160 kg. While the prototype was equipped with four Mark I air-to-air missiles, the operational version will be able to carry up to eight of them. The high-subsonic, fire-and-forget missiles have an engagement range of up to 1.5 kilometres, measure 65 centimetres in length and weigh less than 2 kg each, making them the lightest guided interceptors developed to date. They are equipped with a fragmentation warhead designed to neutralise targets at short proximity. This will enable the reusable Bird of Prey to engage and neutralise multiple kamikaze drones per mission, at a comparably low cost per kill.

Merlinhawk Composites to Launch Advanced Aerospace Facility in Tamil Nadu

Merlinhawk Composites and Engineering Pvt. Ltd., a joint venture between Merlinhawk Aerospace Pvt. Ltd., India, and Vega Composites, Italy, March 31 marked an important milestone with the ceremonial pooja ahead of the commissioning of its advanced composites manufacturing facility at Shoolagiri in the Tamil Nadu Defence Industrial Corridor.

The state-of-the-art facility will focus on the manufacture of advanced composite aero structures and materials for aerospace and defence applications, supporting both domestic programmes and international aerospace supply chains. The formal inauguration of the facility is tentatively scheduled for mid-April 2026. The facility represents a significant step in strengthening India's capabilities in high-performance composite manufacturing, an increasingly critical technology for next-generation aircraft, unmanned systems, radar structures, and mission-critical defence platforms. The Shoolagiri facility has been designed as a globally compliant manufacturing centre, incorporating advanced composite production technologies, specialised cleanroom environments, precision machining, and aerospace-grade quality systems. The initiative is expected to contribute to the development of the Tamil Nadu Defence Industrial Corridor as a strategic hub for aerospace and defence manufacturing.

Beyond manufacturing infrastructure, the facility is expected to contribute to skill development in advanced materials engineering, creating opportunities for specialised training and capability development in the region. The upcoming commissioning of the Merlinhawk Composites facility represents a strategic expansion of Merlinhawk's broader aerospace ecosystem, complementing its existing capabilities in avionics, microwave systems, embedded solutions, and integrated aerospace manufacturing services.

GRSE Hits New High in Turnover, Declares Interim Dividend of 129%

Garden Reach Shipbuilders & Engineers Limited (GRSE), sustaining its strong growth momentum, has recorded the highest annual turnover in its history for FY 2025-26, amounting to ₹6,400 crore (Provisional & Unaudited), as against ₹5,076 crore in FY 2024–25. The shipyard has also declared an interim dividend @ 129% of paid-up share capital against 89.5% in FY 2024–25.

FY 2025–26 saw key milestones in naval shipbuilding, with the commissioning of five vessels during the year, including INS Himgiri, the first Project 17A Advanced Frigate, INS Ikshak, the third Survey Vessel (Large) and the first three Anti-Submarine Warfare Shallow Water Crafts (ASW-SWC)—INS Arnala, INS Androth and INS Anjadip. Marking a significant year in execution and delivery, GRSE delivered a total of eight vessels to the Indian Navy during FY 2025–26, comprising two Project 17A (P17A) frigates, two Survey Vessel Large (SVL) ships and four Anti-Submarine Warfare Shallow Water Crafts (ASW-SWC). Notably, these delivery milestones include the simultaneous delivery of three warships—Dunagiri, Sanshodhak and Agray—to the Indian Navy on the same day. GRSE is also in the advanced stages of concluding a prestigious contract for the construction of five Next Generation Corvettes.

HUGHES PRECISION

ALWAYS ON TARGET

WWW.HUGHESPRECISIONM.COM

Strike First. Strike Fast.

SINDOOR

OPERATION SINDOOR

TRUE SEAL™

Sealed to provide shelf life > 10 years Packaging to your custom requirements

PERFECT SHOT™

High accuracy ammunition for on-target performance shot after shot

NO JAM™

Non-jamming finish so you can fire with confidence. Will not let you down ever!

Empowering the Indian Army and Air Force with the world's best ammunition.

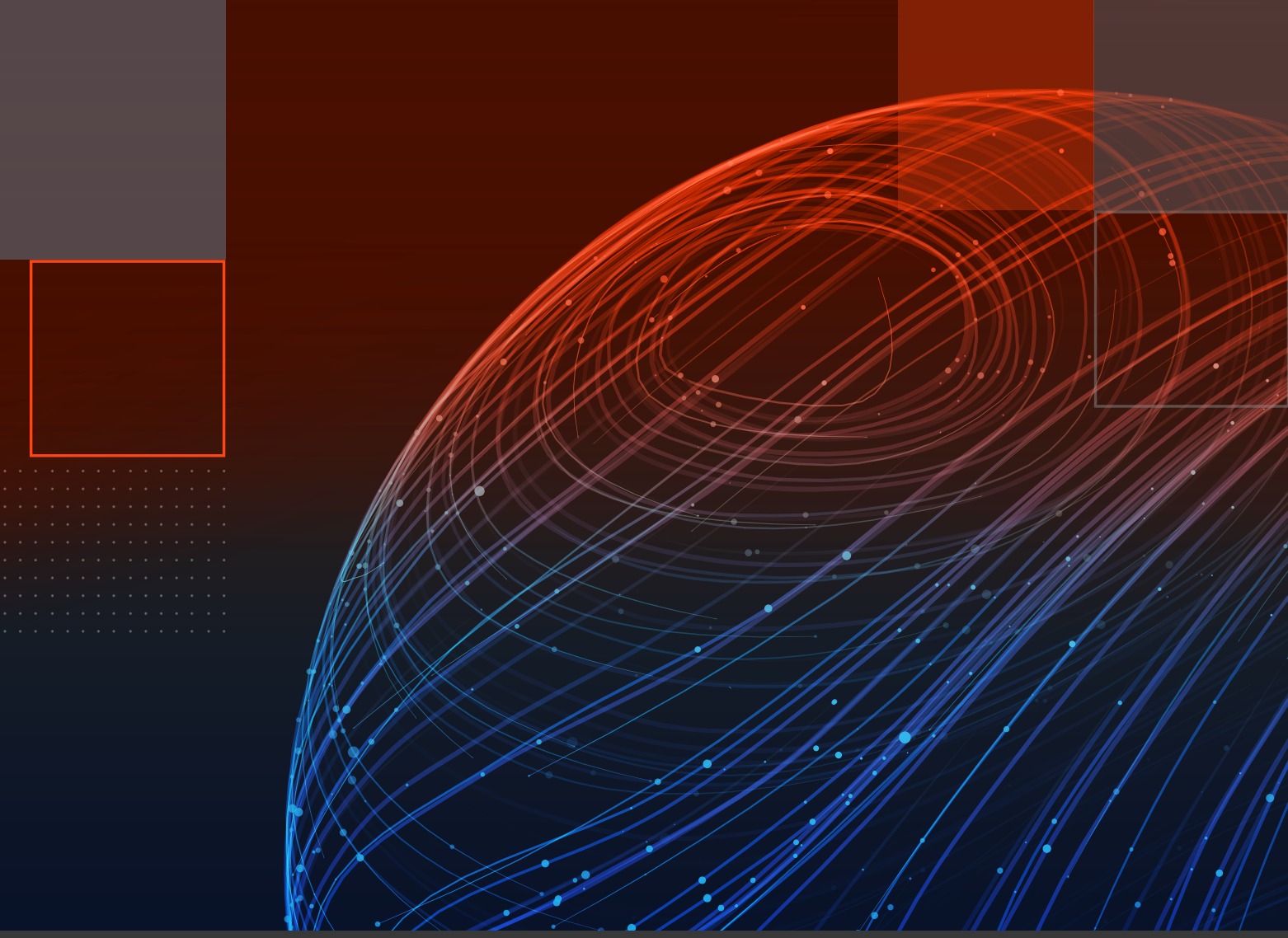
MAKE IN INDIA

MARKETING OFFICE:

No 111, 1st Floor, Mercantile House, K G Marg, Connaught Place, New Delhi, 110 001

FACTORY:

Goa : 100-102, Verna Industrial Estate, Goa, 403 722



EDGE

Always Ahead. Always Above.

Proven where it matters most—EDGE systems are engineered for dominance in the toughest environments. Our autonomous platforms operate longer, faster, and with greater precision, integrating seamlessly across multiple-domains.

EDGE redefines modern defence—showcasing autonomous air platforms, precision munitions, air defence, electronic warfare, secure communications, and more. From AI to radars, electro-optics to precision engineering, secure communications to space technology, we deliver integrated systems for decisive advantage.

Stay Always Ahead. Always Above.

Visit edgegroup.ae