July - September 2025

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raksha ANIRVEDA

DECODING SELF-RELIANCE & DEFENCE DYNAMICS

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EDITORIAL

Ajit Kumar Thakur
Editor & Business Director

WORLD IN FLUX—SEIZE THE MOMENT

The fast-paced developments in the second quarter of 2025 kept everyone—media, military strategy planners, security experts, defence industry players, and policymakers—fully engaged. Reflecting on them clearly shows that, with intensified global conflicts, the capacity, desire, and diplomatic intent of superpowers to mediate, counsel, or intervene have been limited and diminished. History is not merely a study of the past; it explains the present. The Israel-Iran and Russia-Ukraine wars illustrate this well. Despite temporary silences of the guns and fragile ceasefires, predicting the final outcome remains difficult.

The turbulence, ongoing rivalry between major powers, and uncertainty in the world order have created a significant void in global leadership. This has opened a rare opportunity for India to emerge as a global change maker. India is well positioned with its wisdom, balanced approach, and strategic resolve. Can India deliver and rightfully fill this global leadership void while facing multi-directional pressures? The cover feature in *Raksha Anirveda*'s July-September 2025 edition seeks to answer this.

India's assertive and well-controlled Operation Sindoor was a major highlight of the past quarter. It showcased the success of seamless integration of indigenous innovation and the combination of old and new equipment/platforms, demonstrating a bolder display of India's military strength and deterrence strategy. The world took notice of the remarkable technological advancements and their effective deployment in combat, as well as the rapid pace of kinetic action.

Overcoming chronic policy inertia, India has shifted its focus towards strategies that ensure a smooth path to realising Viksit Bharat goal by 2047. Recognising that a glorified past is not beneficial for the present or future, India's pragmatic approach lies in aligning the ecosystem across policy, industry, and diplomacy to ensure long-term success. Efforts focus on investing in impact, readiness, and potential, with a strong commitment to inclusion and creating a future-ready emerging power. India's transition from a talent repository to a vibrant testing ground of new ideas and technologies is rapidly gaining momentum.

Recognising the importance of Research and Development (R&D) in critical sectors, the government, having made a decisive move, is preparing to embrace high-risk investments and incentivise R&D. India must seize these opportunities by positioning itself as a global innovation leader. The forward momentum should be based on visionary policies, strategies and real-world performance, blending swift adaptation with creativity, and creating opportunities amid threats.

With a focus on the space defence domain, the Government of India's initiatives, such as the Defence Space Agency (2018), Mission DefSpace Challenge (2022), and the Space Based Surveillance – Phase III mission in 2024, have boosted private sector participation in the country's defence capabilities. Collaborative synergies among stakeholders will enable the private sector to transition from vendors to partners in national security. The initial disruption in India's space defence industry is steadily strengthening India's space security, as this ultimate frontier increasingly becomes an active militarised region. It is anticipated that India's 2023 Civilian Space Policy and the upcoming Military Space Doctrine will share synergies in space defence, with both military and civilian space sectors learning innovation and creativity from each other, while leveraging the dual-use potential of their infrastructure.

To continue to provide our readers with relevant and insightful content, *Raksha Anirveda*'s July-September 2025 edition—curated diligently—covers a wide range of defence and security matters, along with in-depth analyses' of contemporary issues. Your feedback is vital to us, as it is an essential and indispensable element in shaping future editions of the magazine. Happy reading!

Happy Reading! Jai Hind!!

(Ajit Kumar Thakur)

> "India has shifted its focus towards strategies that ensure a smooth path to realising Viksit Bharat goal by 2047. Recognising that a glorified past is not beneficial for the present or future, India's pragmatic approach lies in aligning the ecosystem across policy, industry, and diplomacy to ensure long-term success."

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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*

LEAD STORY

STRATEGIC NEW NORMAL: A DEFINING MOMENT FOR INDIA

With Operation Sindoor, India has redefined the rules of military engagement amplifying the dictum that any future armed provocation will be prohibitively unbearable. The world needs to take note of the fact that India will not provoke but will neither tolerate nor renege its constitutional responsibility and shall never be afraid to walk through fire to secure it. India's military action has propelled it into a new orbit of global superpowers

Press briefing on Operation Sindoor

MAJ GEN G SHANKARNARAYANAN

Operation Sindoor: Operation Sindoor launched in response to a terror carnage on April 22, 2025, has redefined India's politico-military strategy in terms of its scope, intensity, ferocity, and escalation matrix. It displays a tectonic shift in military retribution leading to a paradigm shift in foreign policy across domains that exemplified its oft-touted policy of Strategic Autonomy in all its dimensions, propelling India into a new orbit of global superpowers. In the regional and tactical domain, this moment is a testament to India's unflinching resolve and strength to deal with cross-border terrorism.

The lethality of the four-day onslaught exceeded any previous kinetic response, addressing specific targets in the adversary's strategic depth including Pakistan's strategic airfields, which in effect is a calibrated increase in the scope and depth of engagement. The scale of devastation of terror strongholds and strategic assets of Pakistan seems unprecedented prompting a call for an immediate ceasefire.

As the fragile cessation of firing and military action in land, air and sea came into effect on May 10, Indian armed forces clearly dictated the escalation ladder with Pakistan seeking peace. The cessation of hostilities at the behest of the adversary marks not just the end of a confrontation, but the emergence of a new strategic doctrine — one that signals India's rise as a formidable, self-assured power, capable of defending its sovereignty with precision, purpose, and poise.

THE NEW NORMAL

Unlike the shadows of prolonged wars of death and destruction witnessed in Ukraine and Gaza, leaving behind monumental ruins and generations

From the strategic perspective, Operation Sindoor was a sharp, clear, and unambiguous message to Pakistan. It was obvious that for the first time since 1971, Pakistan felt the full weight of Indian strength beyond contested borders. The myth of impunity for terror proxies and nuclear sabre rattling has been shattered

of sorrow, India acted with unmistakable resolve and calibrated precision only to avenge the heinous terrorist carnage resulting in the barbaric slaying of 26 innocent tourists in Baisaran Valley. In the annals of history, India's response was far beyond the normal. It was a decisive trans-border attack based on hard intelligence executed with precision that was a notch higher than previous responses, aimed at terrorist and military assets which may have included a few perceived nuclear storage sites as well. It was a marked departure from the past and one that fundamentally propounded India's aggressive retaliatory posture unmindful of an escalation to a full-blown conventional confrontation.

From a strategic perspective, it was no mere military operation but a message to Pakistan — sharp, clear, and unambiguous. It was obvious that for the first time since 1971, Pakistan felt the full weight of Indian strength beyond contested borders. The myth of impunity for terror proxies and nuclear sabre rattling has been shattered. India did not just retaliate, it redefined the rules of engagement amplifying the dictum that any future armed provocation will be prohibitively unbearable and that the world needs to take note of the fact that India will not provoke, but will neither tolerate nor renege its constitutional responsibility and shall never be afraid to walk through fire to secure it.

This response is now the New Normal under full international glare. Moving forward, the swift recourse to a cessation of military actions at the behest of Pakistan was a testament to India's strategic maturity and humanitarian restraints that arrived after achieving the stated politico-

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military objectives. The supervened doctrine as a consequence was India's firm stand of treating any terrorist incident as an act of war and the response shall be as such.

THE LULL

While the eerie silence along the frontiers between the two states lingers, it is just a temporary pause. Hence, it would be naive to assume that Operation Sindoor will usher in lasting peace or expect Pakistan to refrain from fostering trans-border terrorism as an instrument of state policy. That apart, the fiery speech by Pakistan Army Chief Gen (now Field Marshal) Asim Munir reinvoking the postulates of the two-nation theory and espousing a national commitment to the people of Kashmir, only speaks of the deep routed ideological animosity and unhealed scars of Partition. Therefore, as a face-saving measure, the Pakistan Government and the Army's recourse to promoting the Army Chief to the rank of 'Field Marshal' are visible signs to suggest the obvious. In fact, the fierce propaganda and false narratives of its military successes across all media platforms speak of national desperation. Hence, it will sooner or later embark on misadventures in India to buttress their rhetoric of a victory that was never unfounded.

However, in the current engagement, the fundamental intrigue is why Pakistan indulged in this heinous misadventure at a time when its internal security, political and economic situation is extremely precarious. Many security analysts have cited reasons chiefly as, Pakistan's attempt to sabotage the notion of normalcy returning to the Valley, restore international attention to the disputed nature of the territory, and externalise its own socio-political and economic implosion at home.

That apart, the Pakistan army, which had assumed the reputation of a unifying force, has progressively lost credibility and legitimacy under the ideologically deranged Asim Munir, after the incarceration of its most popular political leader Imran Khan, and uncontrolled unrest in Baluchistan, Khyber Pakhtunkhwa and POK. Unconfirmed reports of the death of Imran Khan, the former Prime Minister, in custody is a matter of grave concern and one that will rattle the current political dispensation and the military.

WHAT NEXT?

Given the politico-military environment that is pregnant with uncertainty, humiliation and mistrust between Pakistan's leadership and the masses, expecting Pakistan to remain dormant and not avenge this humiliation would be an understatement. There shall be a repeat – only the location and scale may be ambiguous. Therefore, India's counter-strike strategy needs to be Hobson's choice of either reactive or proactive. Reactive justifies India's punitive action

while proactive may lead to escalation including a nuclear response by a rogue state.

Nonetheless, whatever the choice, the kinetic retribution against terror outfits and their perpetrators must be swift and intense blurring the fundamental distinction between sub-conventional and conventional aggression. The concept of strategic restrain, hesitancy, and ambiguity should be replaced by strategic assertion, clarity and precision.

Under this climate of India's assertive autonomy, the role of world powers in advising restraint and pursuing the course of dialogue has been relegated to the background with most of the G5 nations remaining non-committal if not supportive. However, Trump in his quest for political showmanship has made a veiled reference to his conciliatory efforts to broker the current ceasefire. India's firm retort has forced him to tone down his claim.

That apart, a new axis seems to emerge consisting of China, Pakistan and Turkey including Azerbaijan who have expressed their solidarity with Pakistan. The US on the contrary seems to be non-committal except to encourage and fester a military hardware market thus remaining out of the ring so to speak, while Russia, a trusted long-term ally of India, has strong leanings towards China. Under the circumstances, the South Asian power play will be interesting to observe how it unfolds.

THE ROAD AHEAD

The very survival of Pakistan as a nation is premised on its belligerency towards India on the basis of Kashmir. The Defense Intelligence Agency (DIA) of the US Defense Department, in its World-Wide Threat Assessment report for 2025, has said that Pakistan sees India as an 'existential threat'. On the contrary, India regards Pakistan as an 'ancillary security problem' while China remains its 'primary threat'. Whereas, the Pakistani army continues to pursue its military modernisation effort, "including a notch higher in the development of battlefield nuclear weapons" to offset India's conventional military advantage. Coincidentally, in a dramatic escalation of global military tensions, Russia seems to be flexing its nuclear capabilities by equipping fighter Jets Su-57 with mach 6 air-to-air nuclear missiles, a variant of R-37M missile, seems to spark a global alarm over hypersonic "First-Strike Capability".

Axiomatically it will only be a matter of time before Pakistan will fill capability voids with these missiles through its China connection. In the interim, it is unlikely that Pakistan will cease to perpetuate terrorism in India in view of its subservience to jihadist proxies and its ease of perpetrating proxy war. That apart, the internal dynamics of Pakistan are abysmally low and the country is on the brink of an economic collapse but for external monetary support. The secessionist outcry by the Baluchistan Liberation Army (BLA) and a reversionary trend by POK are recipes for the collapse of Pakistan as a nation.

Under these circumstances, the retributory actions by Pakistan and its Armed Forces can be explosive and diversionary as long as the Army plays an overarching role in its governance. Hence, this articulation must be seriously taken note of given the fact that India of late has accelerated its 'Act East policy' in all its dimensions. At the international level, India has to be vociferously vocal in exposing Pakistan's fraudulent diversion of a large part of IMF's economic bail-out on militarisation against India. Inadvertently it is tantamount to terror funding which is grossly against its principles and primary objectives. Therefore, it is for the global community to take note that this pipeline of disproportionate funding over decades has made no meaningful improvement in the economic stature of Pakistan, instead it has been squandered over military modernisation and abject corruption. This must stop forthwith and should be carefully calibrated on a need basis with a very strict monitoring apparatus in place.

Therefore, India must remain vigilant and in the event of a recurrence of a terror strike, employ all elements of national power to impose punitive costs that are extremely prohibitive and self-defeating for Pakistan. As the PM said in his address on May 12, 2025, India will decide the scale, location (including roots) and intensity of its future responses on its own terms. The response to a terrorist attack will no longer be based on the elimination of terrorists but will include its linkages to perpetrators and infrastructure across the LoC/border at the cost of escalation to a conventional conflict. The new normal is therefore a declaratory compulsion of using military power across the LOC/IB as a response to any future terrorist action on Indian soil. The world must take serious note of this paradigm.

DYNAMICS IN THE VALLEY

While the new doctrine of response has been clearly articulated, the efforts to consolidate the socio-economic gains made thus far must not be retarded. The Central and state governments must crank their machinery to reinvigorate and revitalise the climate of normalcy in the Valley that was shattered by this

At the international level, India has to be vociferously vocal in exposing Pakistan's fraudulent diversion of a large part of IMF's economic bailout on militarisation against India. Inadvertently, it is tantamount to terror funding, which is grossly against its principles and primary objectives

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carnage. It is no doubt an uphill task but has to be instituted by way of visible deployment of CAPF (Central Armed Police Force) in instilling confidence besides assuring a high degree of physical security. Coupled with this is the recalibration of a strong non-porous counter-terrorism grid by regular security forces necessitating additional deployment. Under the current dispensation of no war no peace, this security framework should not be diluted for petty political gains. The necessity is not to appease domestic/internal dynamics of governance but to ensure a strong deterrence against external inimical forces, be it non-state actors or the Pakistan Army.

In addition, the fundamental social fabric that has undergone a radical change over the past couple of years must be strengthened. Kashmiri society, particularly the youth, is clearly showing signs of disengagement from violent extremism. Job aspirations, digital connectivity, and tourism have altered the local economic structure. The government's unambiguous long-term objective of irreversible integration of the Kashmiri society through a mix of security control, economic development, and information dominance must not be slowed down. The government's ability to maintain calm in the face of a crisis of this magnitude is a testimony to this perceptual change in the Valley.

In addition, efforts must be taken to prevent any hyphenation between India and Pakistan, even while keeping the POK narrative intact albeit at the cost of preventing any plebiscite that Pakistan will attempt to shore up at the international level. It is in this context that the all-party delegations sent across the globe will be able to state the obvious in its truest profile while highlighting the insidious and heinous actions of Pakistan both internally in Baluchistan, KPK and POK and externally against India, Afghanistan and elsewhere in the neighbourhood.

Under Trumpism, the world is turning into a dark, fretful, and more dangerous place where treaties and laws are no longer respected, alliances are broken, trust is fungible, principles are negotiable and morality is a dirty word. This is an ugly and disordered world of raw power, brute force, selfish arrogance, dodgy deals, and brazen lies

BATTLING THE AXIS OF CHAOS

The tacit support to Pakistan in the aftermath of Operation Sindoor needs deliberation. Regional dynamics have always remained extremely volatile with two traditional belligerent neighbours. This stand precipitated with Bangladesh joining the fray. Militarily it may be inconsequential but an unstable neighbour with its growing proximity to China will be a cause for concern. That apart, the larger threat matrix is the socio-military support of Turkey to Pakistan and its ideology of Islamic brotherhood goes beyond the bilateral engagement between them. China on the other hand has been a strong patron of Pakistan to counter India in more than

one way. Its Belt and Road initiative has common grounds with Pakistan and Turkey, the latter being the gateway to Europe.

It clearly outlines an evolving tripartite alignment between Communist China, Islamist Turkey, and a militarised Pakistan. It symbolises a symbiotic emergence of a Strategic Convergence of an Islamic-Communist Axis. This emerging 'Islamic-Communist Axis' is driven not just by shared ideology but also by a converging strategic ambition to restrain India's ascent, erode the Western-dominated global order, and assert the rising stature of China as the next alternative to the US.

This theoretical alignment has now manifested into concrete cooperation across nuclear, defence, ideological, and economic domains. China provides the required funding, technology, and weapons, Turkey delivers ideological legitimacy and drone warfare capabilities, and Pakistan, the weakest but the most dangerous player, serves as the operational theatre for proxy wars against India and elsewhere in the world. The operationalisation of the rail link between China and Iran is a game changer in trade between the two countries. Its power play will slowly but surely manifest in the regional

Pakistani soldiers inspecting a building damaged by Indian missile attack

dynamics in the near terms, although India does enjoy favourable relations with Iran.

Muddled in this axis of chaos, Washington remains duplicitous. The fact remains that the world's most admired democracy is being held hostage by a clique of far-right wingers led by a fanatic whose financial clout and bitter racial insinuation brought him to the White House despite a federal conviction, unprecedented in American History. Under Trumpism the world is being turned into a dark, fretful, and more dangerous place where treaties and laws are no longer respected, alliances are broken, trust is fungible, principles are negotiable and morality is a dirty word. On the global stage, it is an ugly, disordered world of raw power, brute force, selfish arrogance, dodgy deals and brazen lies. It is a shameless imposition on hot spots across the globe mired in potential trade wars precipitating a recipe for disaster. That the US President's tenets of his campaign trail on ending the bitter wars in Ukraine and Gaza have failed is an American embarrassment and sheer frustration on display. Trump's recent gigantuous three-nation tour of the Middle East was a raw display of his fetish for glitter and gold-seeking personal business investments followed by American interest. An unfeeling and irresponsible man who cares nothing for his people except to see them merely as an audience for his vulgar showmanship and display of power.

In a world where human values have plummeted and institutions compromised, India's path forward lies in strong military deterrence, self-reliance, and stoic strategic autonomy. Its economic stature as the fourth largest economy will foster credibility in a chaotic world order. With reliable partners like Russia, Israel, and France, and a growing arsenal of home grown weapons and doctrine, backed by a surging industrial economy, India is poised to not only withstand the axis of chaos but to dismantle it when required. The age of strategic ambiguity is over. India rises not just as a regional power, but as a sovereign pole in a multipolar world. India's response to the Pahalgam terror strike has proven that this axis while being dangerous, is not infallible and retains the propensity to script its history and redefine global power balance.

–The writer is a former GOC of the Indian Army and presently serves as a Strategic Consultant and Principal Advisor. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

With reliable partners like Russia, Israel, and France, and a growing arsenal of home grown weapons and doctrine, backed by a surging industrial economy, India is poised to not only withstand the Axis of Chaos, which includes China, Pakistan and Turkey, but to dismantle it when required

INSIGHT

DRAGON'S GIGANTIC

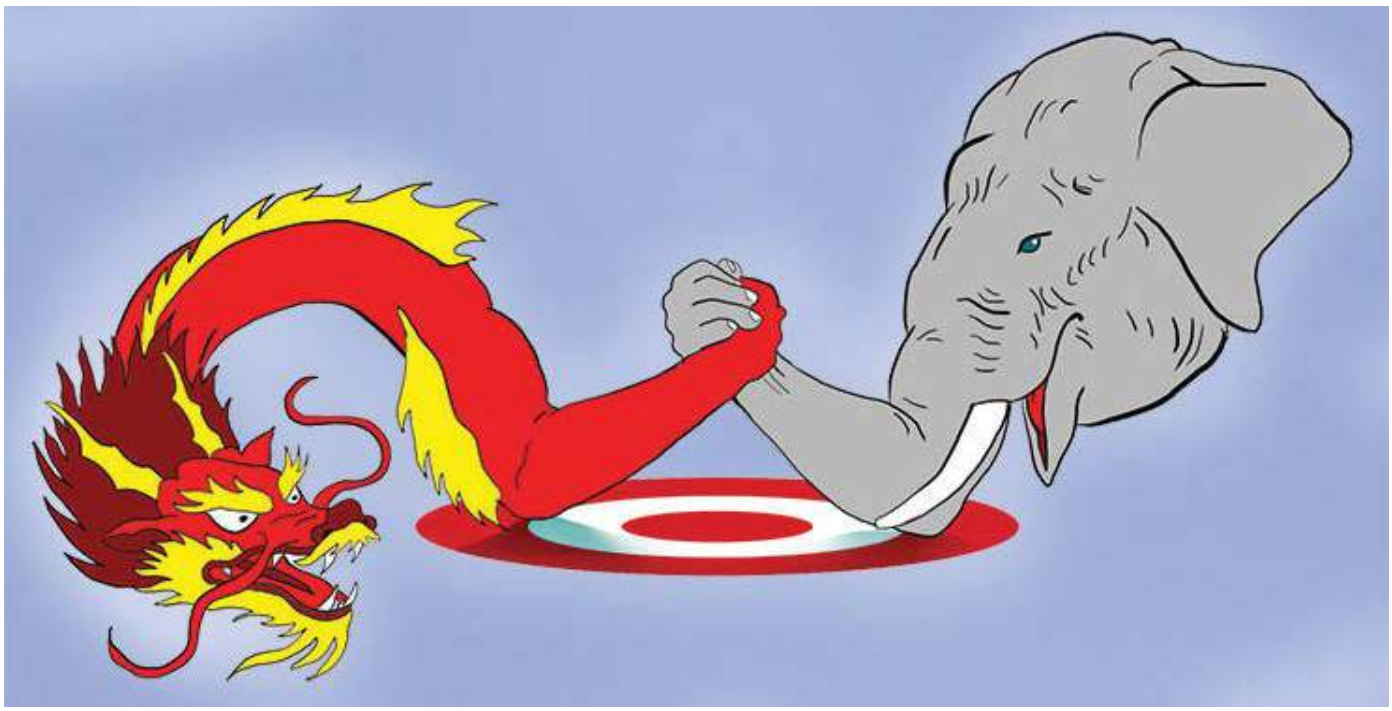
China's discovery of massive rare earth deposits along a 1,000-kilometre Himalayan belt in Tibet has set off alarm bells in New Delhi. With 92 per cent global refining control and new mines near contested borders, Beijing could weaponise these critical minerals against India's tech and defence sectors

NEERAJ SINGH MANHAS

Rare earth elements (REEs) are a group of 17 minerals critical to modern technology, from smartphones and electric vehicles (EVs) to defence systems and renewable energy infrastructure. China's dominance in the global REEs supply chain—accounting for approximately 61 per cent of extraction and 92 per cent of refining—has raised concerns worldwide, particularly for nations like India that rely heavily on these materials. Recent discoveries of vast potential REEs reserves in the Himalayas, particularly in Tibet, have intensified geopolitical and economic tensions. It becomes crucial to explore the implications of China's REEs activities in Tibet for India, focusing on strategic, economic, and environmental dimensions, while examining India's efforts to counter this dependency.

CHINA'S RARE EARTH DOMINANCE AND THE HIMALAYAN DISCOVERY

China has strategically positioned itself as the world's leading supplier of REEs, leveraging decades of state investment, lax environmental regulations, and export controls. In 2023, Chinese geologists identified significant REEs deposits along a 1,000-kilometre (km) Himalayan belt in Tibet, potentially exceeding China's existing reserves. These deposits, including minerals like neodymium, dysprosium, and lithium, are located



GAMBIT

in a geopolitically sensitive region near the Line of Actual Control (LAC), where China and India have ongoing territorial disputes. The discovery strengthens China's grip on the global REEs market, where it already controls nearly 100 per cent of heavy REEs like dysprosium and terbium, essential for high-temperature applications in electric vehicles (EVs) and defence technologies.

The Tibetan reserves are not only economically significant but also strategically vital. China's control over these resources could enhance its ability to influence global supply chains and exert pressure on nations dependent on REEs imports. For India, which imports 53,748 metric tons of rare earth magnets annually, primarily from China, this development amplifies vulnerabilities in its automotive, renewable energy, and defence sectors.

STRATEGIC IMPLICATIONS FOR INDIA

China's REEs dominance, now bolstered by the Himalayan deposits, poses a strategic challenge for India. The proximity of these reserves to the LAC raises concerns about China's ability to militarise resource extraction. Infrastructure development, such as roads and power supply networks required for mining, could enhance China's strategic presence in the region, potentially escalating tensions along the disputed border. A Beijing-based researcher has warned that a "rare earth rush" could heighten geopolitical risks, particularly given the environmental and territorial sensitivities involved.

China's history of using REEs exports as a geopolitical tool further complicates the situation. In 2010, China restricted REEs exports to Japan during a territorial dispute, and in 2025, it imposed export controls on seven REEs and magnets in response to US tariffs. These actions disrupted global supply chains, including India's automotive industry, where manufacturers like Maruti Suzuki scaled back electric vehicle (EV) production due to magnet shortages. For India, reliance on Chinese REEs creates a strategic vulnerability, as supply disruptions could hinder critical industries and national security.

ECONOMIC IMPACT ON INDIA

India's economy, heavily dependent on imported REEs, faces significant risks from China's export restrictions.

Global Rare Earth Reserves (2024 Estimates)

COUNTRY	RESERVE (MILLION METRIC TONS	SHARE OF GLOBAL RESERVES (%)
CHINA	44.0	34
BRAZIL	21.0	16
INDIA	6.9	5
AUSTRALIA	4.2	3
UNITED STATES	2.3	2
OTHERS	41.6	40

Source: US Geological Survey

In 2025, India's demand for REEs is projected to reach 4,010 metric tons, with EVs and wind turbines accounting for over 50 per cent of consumption. By 2030, this demand is expected to double to 8,220 metric tons. The automotive sector, a key driver of India's economic growth, is particularly vulnerable, as neodymium-based magnets are essential for EV motors. China's export curbs, introduced in April 2025, have already caused alarm among Indian manufacturers, prompting calls for bilateral negotiations.

The economic implications extend beyond manufacturing. India's renewable energy ambitions, including its target of 500 gigawatts (GW) of non-fossil fuel capacity by 2030, rely on REEs for wind turbines and solar panel components. Supply chain disruptions could delay these projects, undermining India's climate goals. Moreover, the high cost of developing domestic REEs processing—due to energy-intensive and environmentally hazardous methods—poses a financial challenge. China's cost advantage, built on decades of investment and less stringent environmental standards, makes it difficult for India to compete without significant government support.

China's April 2025 export controls have already disrupted Indian manufacturing, with automakers like Maruti Suzuki scaling back EV production due to magnet shortages. India imports 53,748 metric tons of rare earth magnets annually – 90 per cent from China

ENVIRONMENTAL CONCERNS AND REGIONAL STABILITY

The environmental impact of REEs mining in Tibet is a significant concern for India. REEs extraction is notoriously polluting, involving toxic chemicals like ammonium sulphate that contaminate soil and water. In China's Baotou region, a major REEs hub, mining has led to severe environmental degradation, including

India's Rare Earth Demand Projections

Year	Demand (Metric Tons)	Key Sectors
2025	4,010	EVs, Wind Turbines, Defence
2030	8,220	EVs, Renewables, Electronics

INSIGHT

The National Critical Mineral Mission aims to produce 450 metric tons of neodymium by 2026, but challenges remain. Processing REEs costs 40 per cent more in India than China, while environmental concerns plague domestic mining projects

cancer clusters and neurological disorders among local communities. Similar activities in Tibet could exacerbate environmental damage in the Himalayan ecosystem, which is critical for India's water security. The region's rivers, such as the Brahmaputra, originate in Tibet, and pollution from mining could affect downstream communities in India.

Furthermore, large-scale mining could increase China's population and infrastructure presence in Tibet, potentially altering the region's demographic and geopolitical dynamics. This could heighten tensions along the LAC, where India and China have clashed in recent years. Environmental degradation and territorial disputes could thus intertwine, complicating bilateral relations.

INDIA'S RESPONSE: BUILDING A DOMESTIC REE ECOSYSTEM

Recognising the risks of dependency, India is taking steps to develop its REEs sector. With 6.9 million metric tons of reserves—the world's third-largest—India has significant potential. The government has launched the National Critical Mineral Mission (NCMM) in 2025 to enhance self-reliance. Indian Rare Earths Limited (IREL), a state-owned enterprise, is central to these efforts, operating extraction plants in Odisha and refining units in Kerala. IREL plans to produce 450 metric tons of neodymium by 2026, with ambitions to double output by 2030.

India is also exploring international partnerships to bolster its capabilities. The US-India Critical Minerals Partnership, part of the Minerals Security Partnership (MSP), aims to diversify supply chains through technological and financial collaboration. Australia, a major REEs producer, and Japan, which reduced its reliance on China post-2010, are also potential partners. Additionally, India's Khanij Bidesh India Ltd (KABIL) is acquiring overseas mineral assets, such as lithium blocks in Argentina, to secure alternative supplies.

The government is incentivising private sector participation through a proposed Rs 3,500–5,000 crore scheme, including production-linked incentives (PLIs) for REEs magnet manufacturing and recycling. Amendments to the Mines and Minerals (Development and Regulation) Act (MMDR Act) are expected to streamline regulations and boost domestic production. However, challenges remain, including limited private investment, technological gaps, and environmental concerns associated with REEs processing.

India's Key REE Initiatives

Initiative	Description	Timeline
National Critical Mineral Mission	Framework for REE self-reliance	2025
IREL Neodymium Production	450 MT by 2026, doubling by 2030	2026-2030
KABIL Overseas Acquisitions	Lithium blocks in Argentina	Ongoing
PLI Scheme for REEs	Rs 3,500-5,000 crore for domestic production	2025

Source: Various Indian Government Reports

THE ROAD AHEAD FOR INDIA

India's efforts to reduce its reliance on Chinese REEs are ambitious but face significant hurdles. Developing a domestic supply chain requires substantial investment in technology and infrastructure, which could take years to mature. Recycling REEs from electronic waste and investing in research and development (R&D) for alternative materials are promising but costly and time-intensive. Geopolitical constraints also limit the feasibility of alternative import sources, such as Kazakhstan or Australia, due to logistical and diplomatic challenges.

To counter China's dominance, India must prioritise mining and processing capabilities while leveraging international partnerships. Collaborations with Quad nations (US, Australia, Japan) could provide technological know-how and capital. Additionally, India should invest in sustainable processing methods to mitigate environmental risks, learning from China's costly cleanup efforts in regions like Longnan.

TAKEAWAYS

China's discovery of REEs deposits in Tibet strengthens its global monopoly, posing strategic and economic challenges for India. The proximity of these reserves to the LAC, combined with China's willingness to weaponise REEs exports, underscores the urgency for India to diversify its supply chains. While India's reserves and proactive policies offer hope, overcoming technological and environmental barriers will require sustained effort. By fostering domestic production and international collaboration, India can reduce its vulnerability and emerge as a key player in the global REEs market, ensuring economic resilience and strategic autonomy.

–The writer is a Special Advisor for South Asia at the Parley Policy Initiative, Republic of Korea. He regularly provides commentary on India-China border issues, water security, and transboundary river challenges in South Asia. You can follow his updates on X at @The_China_Chap. The views expressed are personal and do not necessarily reflect the views of ***Raksha Anirveda***

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ANALYSIS

INDIA'S EXPANDING ROLE IN WEST ASIAN CROSSROADS

The recent Israel-Iran confrontation has given an opportunity to India to act as a stabilising force in the region. India is well placed to do so, enjoying good relations from Gulf states to Iran and Israel. This approach apart from fulfilling India's own economic aspirations will also help it to further emerge as a dependable regional power

VINAY KAURA

The so-called '12-Day War' between Iran and Israel stands as a seminal event compelling India to reconsider its place and purpose in the shifting architecture of West Asian geopolitics. For New Delhi, this was not a distant conflagration; it was a moment that illuminated both its vulnerabilities and its latent potential to shape the destiny of a region once considered peripheral to its core interests.

The stunning air attacks by Israel, followed by spectacular US strikes on Iranian nuclear sites, were extremely risky and destabilising. The reverberations of "Operation Midnight Hammer" will continue to be felt across the region which is dominated by regimes – monarchies, theocracies, and military strongmen – whose legitimacy is often fragile. The US and Israel assert that their bold actions have dealt a severe blow to Iran's nuclear command capabilities, although some reports dispute these claims.

Yet, what remains beyond doubt is that a new phase in West Asian conflict has begun, marked by unprecedented unilateralism, shifting alliances, and the visible erosion of the rules-based international order.

The American strikes, in the later stages of the Iran-Israel conflict, served as a brutal reminder of Washington's enduring military primacy in West Asia. Israel, for its part, viewed this not as alliance politics but as existential necessity – a reflection of the unrelenting logic that governs its security calculus.

Yet, even as Israeli jets punctured Iranian airspace with impunity, the outcome has not produced a decisive realignment of regional power. Iran, though degraded, remains defiant, with the IAEA warning it could resume uranium enrichment within months. Israel has certainly emerged militarily triumphant, yet seems diplomatically isolated. A political resolution remains elusive.

Israeli Prime Minister Benjamin Netanyahu; Iran's Supreme Leader Ayatollah Ali Khamenei and US President Donald Trump

In contrast to Pakistan's incoherent grandstanding – including the surreal nomination of President Donald Trump for the Nobel Peace Prize even as missiles rained down on Iran – India displayed maturity and restraint. This posture reflected a deeper evolution in New Delhi's strategic culture, one that recognises the importance of ambiguity, timing, and non-linear power projection in a fractured geopolitical environment.

Yet, perhaps the most important lesson India must absorb is this: Strategic success in this volatile theatre demands a synthesis of hard power, intelligence precision, and diplomatic agility. Israel's campaign, stretching from Gaza to Lebanon and culminating in Iran, was a case study in what may be termed as 'strategic sanitisation.' But the costs, both material and reputational, are mounting. And as this episode shows, no regional actor – not even Israel or Iran – can afford the luxury of unilateral escalation without incurring long-term blowback.

Amidst this storm, China has adopted a low-profile posture best described as diplomatic minimalism – a studied passivity masquerading as prudence. Despite deep economic entanglements with Iran through the Belt and Road Initiative (BRI), Beijing's response was confined to ritualistic calls for de-escalation. This inertia revealed a central truth: infrastructure alone does not confer influence. In regions like West Asia, presence without credibility is a hollow asset. And yet, China's caution is not without shrewd calculation.

Rather than relying upon the blunt instruments of military intervention, Beijing has chosen instead the subtler, more transactional levers of economic engagement. By purchasing a significant share

The so-called '12-Day War' between Iran and Israel stands as a seminal event compelling India to reconsider its place and purpose in the shifting architecture of West Asian geopolitics. What remains beyond doubt is that a new phase in West Asian conflict has begun, marked by unprecedented unilateralism, shifting alliances, and the visible erosion of the rules-based international order

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of Iran's oil and brokering the rapprochement between Tehran and Riyadh, China subtly clams to have provided Iran not merely with lifelines, but with the means to endure and adapt amid the battering winds of American sanctions.

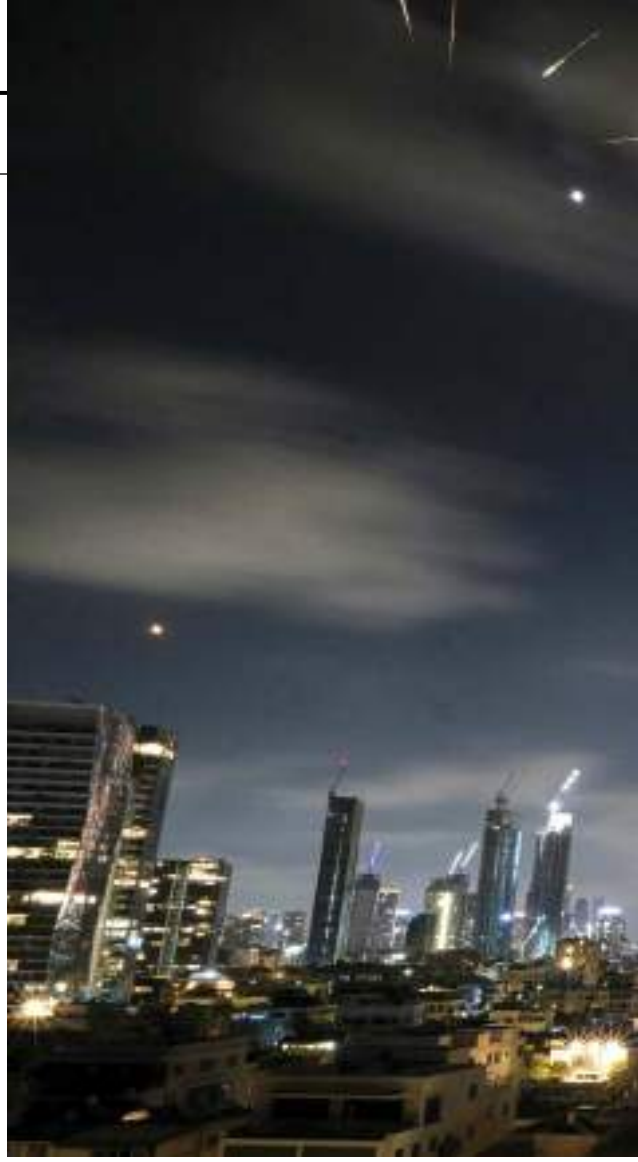
The recent convulsions in the region have also opened new opportunities that are no less consequential. Iran's antiquated air defence, starkly exposed by Israel's technological superiority, has laid bare excruciating vulnerabilities. The acquisition by Pakistan of Chinese J-10C fighters and advanced air defence systems has not gone unnoticed in Iranian strategic circles. Should Iran reengage with China in arms procurement, Beijing would be direct beneficiary of a lucrative, low-risk entrée into a defence market hungry for renewal.

For India, these developments carry both warning and promise. The contest for influence in West Asia is no longer waged solely by force of arms, but by the patient accumulation of trust, commerce, and strategic foresight. In this theatre, India's own tradition – rooted in non-alignment, pragmatic engagement, and the pursuit of stability – finds new relevance. Yet, the path ahead is defined by a clear choice: India can either follow China's narrowly focussed, economics-only model, or it can chart its own course that prioritises integration of commercial interests with diplomatic responsibility and strategic depth.

Initiatives such as the Chabahar Port and the International North-South Transport Corridor exemplify this approach; they cannot be viewed as mere infrastructure projects, but must be underpinned by active diplomacy, sustained regional engagement, and, when necessary, credible security assurances. Only by embracing this holistic strategy can India truly realise its potential as a stabilising and influential force in West Asia.

India's strategic calculus must internalise the centrality of the Strait of Hormuz. This narrow maritime passage is not merely a distant chokepoint; it is the lifeline of India's energy security. Roughly 60% of India's crude oil passes through it. Any conflict-induced disruption – be it Iranian retaliation or broader naval instability – could send shockwaves through India's economy.

But energy security is only part of the picture. The millions-strong Indian diaspora in the Gulf constitutes a human bridge of vital significance, contributing almost 40% of the country's remittances. Their safety and stability must be integrated into India's national security architecture. These communities are not footnotes in India's West Asia policy; they are its anchors.



In the wake of the '12-Day War', India has an opening – perhaps a narrow one, but real nonetheless – to assert itself as a responsible, neutral actor in a fractured region. Unlike Washington, Beijing, or even Tel Aviv, New Delhi carries little historical baggage and enjoys working relationships with all the principal actors: Iran, Israel, the Gulf monarchies, and the West.

This rare positioning gives India the potential to be more than a balancer. India should proactively focus on sectoral agreements (energy, security, migration) and targeted bilateral frameworks, while fast-tracking implementation of the India-Middle East-Europe Economic Corridor (IMEC). Moreover, quiet backchannel diplomacy, rapid response capabilities, and real-time strategic communication must define New Delhi's approach.

As the region teeters between further escalation and tentative diplomacy, New Delhi's behind-the-scenes role could also prove decisive. It should leverage its strategic autonomy to facilitate dialogue between Washington and Tehran, advocating for a successor to the JCPOA that incorporates stringent safeguards while accommodating Iran's legitimate

The Israeli Iron Dome air defence system intercepting missiles during an Iranian attack over Tel Aviv

economic aspirations.

With growing energy and economic interdependence with the Gulf, India is well-placed to reassure Riyadh and Abu Dhabi about the long-term non-militarisation of Iran's nuclear program. In doing so, it could act as a 'diplomatic bridge' – helping to orchestrate a framework where sanctions relief is matched by verifiable nuclear restraint.

Two forward-looking initiatives could help cement this role:

1. Chabahar as Commons: By internationalising the Chabahar Port – invitation to other regional and global stakeholders such as some Central Asian nations and European partners to participate in governance and operations – New Delhi can reposition it from a strategic foothold into a neutral, multinational hub. This could help dilute Chinese influence while offering an alternative to Pakistan's obstructionism, positioning India as a stabilising force in a volatile geography.
2. West Asia Crisis Diplomacy Taskforce: India must seriously think of setting up a dedicated, multi-agency unit – with representatives from the Ministry of External Affairs, Ministry of Home Affairs, Ministry of Defence, intelligence agencies, and the National Disaster Management Authority – for real-time crisis management, diplomatic outreach, and evacuation logistics. Such a taskforce would ensure India is proactive when the next flashpoint emerges.

India's expanding role – bridging the Arabian Gulf, Indian Ocean, and Southeast Asia – is no longer a matter of choice but of strategic necessity. The Iran-Israel war underscored the fragility of energy corridors, the importance of diaspora resilience, and the unpredictability of regional escalations. As great power contests play out over Iranian skies and maritime lanes, West Asia awaits the intervention of smart diplomacy to shape a more stable order. Hence, India cannot stand on the sidelines. It must be the quiet, yet an influential strategist.

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The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

IN PERSPECTIVE

SILENT WARS: BATTLEFIELDS BEYOND BULLETS AND BORDERS

From China's "Win without Fighting" doctrine to Pakistan's "Thousand Cuts" strategy, adversaries are leveraging sub-threshold warfare to destabilise without detection. But India is turning the tide in the shadows, weaponising cyberspace, and rewriting the rules of engagement in the 21st century well prepared to tackle clear and present danger of Silent Wars

MAJ GEN LAV B CHAND

Silent wars is not a new terminology in the art of warfare. "*Tushnimyudhha*" (meaning silent war) was a strategy elucidated in the *Arthashastra* of Kautilya. However, recent conflicts have demonstrated that silent wars are the preferred form of warfare when dealing with a matching or superior force. Even advanced countries resort to this form of escalatory warfare to contain their adversaries. Grey Zone warfare, Low-Intensity Conflict (LIC), and many such categories all refer to waging sub-threshold wars against an adversary. Silent war encompasses many facets, such as cyber warfare, economic warfare, information war, proxy war, and internal conflicts sparked by covert actions of governments and non-state actors. The covert actions take full advantage of existing fault lines in a society and political divides. Narratives are built to further deepen these fault lines, aiming to divide a nation. A uniquely diverse nation like India is particularly vulnerable to such exploitation.

Silent Warfare is a vast canvas; this paper will focus on Cyber Warfare and Artificial Intelligence (AI) domains of Silent Wars. The terms *Silent Wars and No War No Peace* will be used interchangeably herein.

China has successfully prevented full-scale conventional warfare by employing a strategy based on Sun Tzu's philosophy of *"Win without Fighting"*. It utilises the full spectrum of methods while adhering to a sacrosanct rule: not crossing the threshold of overt military conflict. The primary aim is to achieve expansionist objectives and increase its influence in the realms of economics, trade, and technology across the globe. China realised that hard power and technological superiority were critical to dictating an adversary's response in a conflict. To bridge the gap with the technologically superior Western world, China adopted a strategy of exploiting their overdependence on technology—primarily computers and cyber systems.

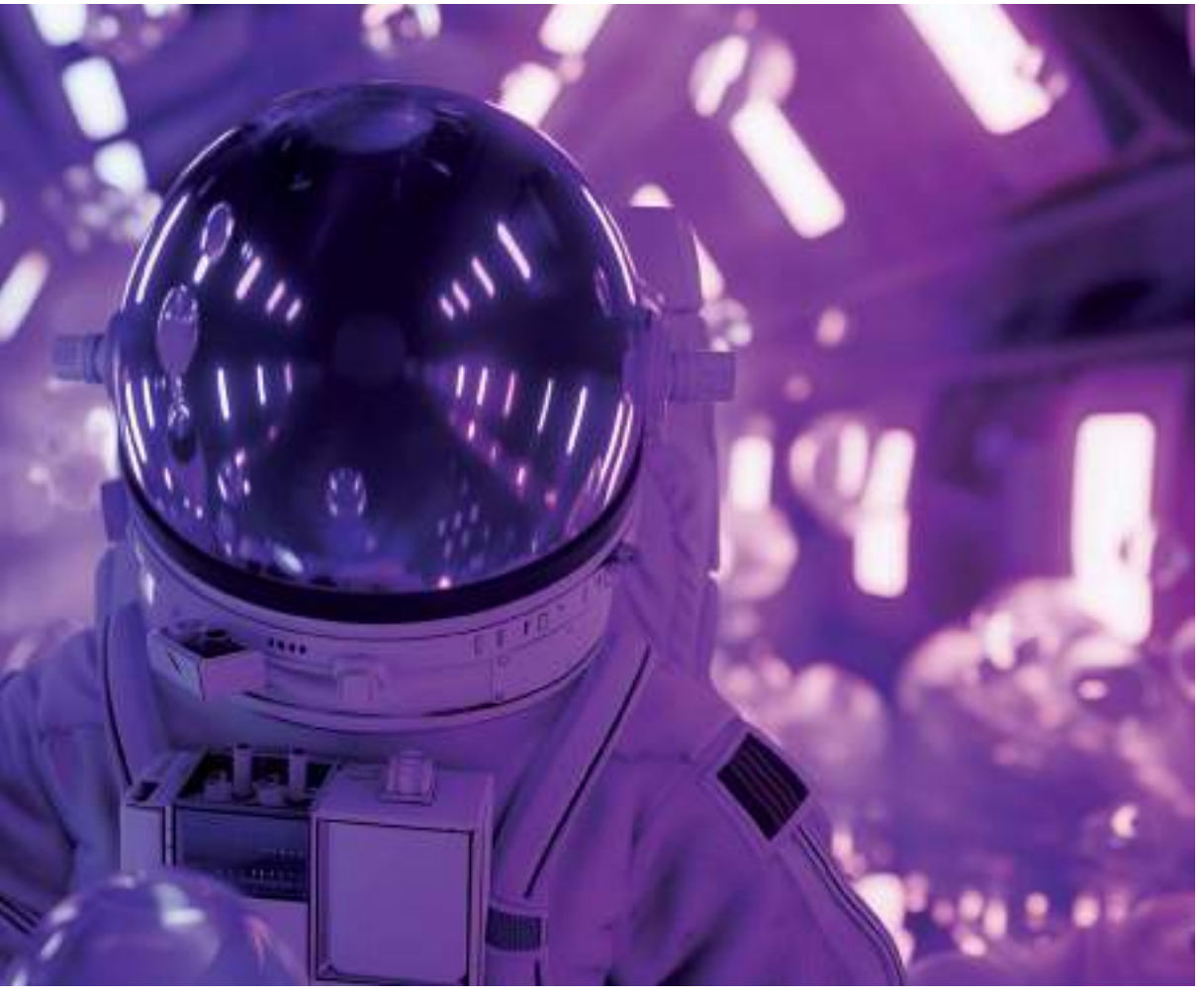
Under this strategy, China has not only substantially bridged the technology gap with the West but also developed superior cyber-attack capabilities to target an adversary's critical information technology (IT) infrastructure. This partially negated the impact of Western technological superiority. A major advantage for China was that since the United States (USA) was the primary target of this strategy, the People's Republic of China (PRC) emerged as a leader in industrial espionage and cyber-attacks.

Pakistan has similarly pursued a strategy of a thousand-year war with India. Since no country can withstand a prolonged conventional war, Pakistan adopted the *"Bleed India with a Thousand Cuts"* doctrine—a low-intensity conflict waged militarily, diplomatically, and economically over an extended period without provoking international intervention. It keeps the threshold just below the defined threshold of aggression. Unfortunately, due to vested interests of global powers, this issue remains unaddressed by the United Nations General Assembly (UNGA) or the United Nations Security Council (UNSC). *This capability gives the PRC a significant advantage in waging silent wars. Pakistan and the PRC are likely to collaborate in waging Silent Wars against India with impunity.*

INDIA'S SILENT WARFARE

India has long been aware of cyber threats, but until recently, cyberspace was not prioritised. With finance, economics, messaging, and retail markets shifting entirely online, digitization has become the underbelly of Indian civil and military operations. India, which initially focused on cyber defence, has now been compelled to develop offensive cyber capabilities. The integration of AI and cyberspace has further compounded cyber threats, merging the two into an inseparable whole. This convergence also presents India with opportunities to weaponise cyberspace.

Social media enables instantaneous dissemination of messages and multimedia. The widespread use of internet-enabled mobile devices among Indian adults makes them a prime target. Cyber operations blur the lines with psychological warfare. India must



The covert actions take full advantage of existing fault lines in a society and political divides. Narratives are built to further deepen these fault lines with an aim to divide a nation. A uniquely diverse nation like India is particularly vulnerable to such exploitation. In silent wars, he who controls the narrative is the victor

IN PERSPECTIVE

India must not only protect the critical information infrastructure but also remain in control of the narrative, perception, and public trust. Narrative, both national and international, is the first step into cyberspace. Its impact surpasses the cost by miles. IT cells of Indian political parties are effectively using these soft tools to wage silent wars on each other

protect its Critical Information Infrastructure (CII) while controlling the narrative, perception, and public trust. Narratives—both national and international—are the first battleground in cyberspace, with impact far outweighing cost. In silent wars, victory belongs to those who control the narrative. Narrative scripting is orchestrated by highly specialised state and non-state actors who wield significant influence over public trust. Unregulated web media, fake news, and propaganda directly erode public trust. The power of social media was evident during the anti-Citizenship Amendment Act (CAA) and Article 370 protests. The Government of India's withdrawal of farm laws was influenced by sentiment and narrative manipulation. The IT cells of Indian political parties effectively leverage these tools to wage silent wars against one another. Social media and narrative manipulation thrive under the guise of *Freedom of Speech*, so long as posts avoid inciting riots or unrest.

CYBER SPACE AND PHASES OF SILENT WARS

Phase 1: Cyber Space Exploitation in Peace Time: There are no friends or enemies in cyberspace exploitation. Every nation—without exception—and its law enforcement and intelligence agencies monitor cyberspace for threats. Even licensing for Information and Communication Technology (ICT) infrastructure includes provisions for metadata access by authorities. The PRISM program of the National Security Agency (NSA), USA, along with the Foreign Intelligence Surveillance Act (FISA), and the ongoing case against whistleblower Edward Snowden remain fresh in memory. Only Russian citizenship saved Snowden from extradition to the USA. Under FISA, even close allies like German Chancellor Angela Merkel was placed under surveillance.

When social media platforms promised end-to-end encryption, the Trump administration mandated visa applicants to declare social media accounts and switch settings from private to public—justified under USA-specific Digital Personal Data Protection (DPDP) laws. The lack of global consensus on DPDP laws in an interconnected world creates opportunities for Cyberspace exploitation to one's own advantage.

Phase 2: Cyber Space Exploitation in No War No Peace: This phase targets current and potential adversaries. The scale of cyber tools deployed depends

on the adversary's threat potential and capabilities. The focus expands beyond sentiment management to identifying vulnerabilities in technology, processes, procedures, and personnel. The entire cyber domain is scanned for entry points, psychological weaknesses, and intellectual gaps. A comprehensive spectrum analysis of Cyber Electromagnetic Activities (CEMA)—military and non-military—is conducted and recorded. Non-contact exercises at tactical, operational, and strategic levels refine strategies for exploiting enemy vulnerabilities and formulating contingency plans. This phase also includes capability development and the force structuring of cyber warriors. However, in Counter-Intelligence and Counter-Terrorism (CI/CT) or low-intensity conflicts (LICs)—as seen in Jammu & Kashmir (J&K) and parts of Northeast India—Phases 1, 2, and controlled Phase 3 are implemented.

Phase 3: Cyber Space Exploitation in Limited Conflict: This adopts a whole-of-nation approach, mobilising government, private, and expert resources to safeguard the Cyber Radio Frequency (RF) domain. All autonomous assets—Intelligence, Surveillance, and Reconnaissance (ISR), ICT, Information Warfare (IW), Electronic Warfare (EW), Defence Intelligence Agency (DIA), NSA, National Technical Research Organisation (NTRO), etc.—are deployed in conflict zones. Global-scale perception management, narrative control, and sentiment shaping are executed. Full-scale war remains a last resort, reserved for existential threats.

ORGANISING SILENT WAR IN CYBER AND AI SPACE

Having outlined the phases of cyberspace in silent wars, the following force structuring is recommended:

(a) **ISR entities:** Develop systems and AI tools for land, sea, air, and space operations, capable of Multi-Domain Operations (MDO).

(b) **Information Warfare (IW) entities:** Serve as influencers in propaganda and outreach across military and national defence domains.

(c) **Unconventional Operations Infantry Brigade Group:** Comprising Special Covert Operation Forces.

(d) **Electronic Warfare (EW) units:** Operate across the full electromagnetic (EM) spectrum to protect and exploit India's EM domain while providing Communication Information Support to combat divisions.

(e) **Joint Cyber RF (Cyber and Electro Magnetic Activities):** Integrated at the Higher National Defence Organisation level.

TAKEAWAYS

Not every flare-up is as it appears. Containment at sub-threshold levels is advisable, with a clear escalation matrix. India has exemplified this approach. Parallels can be drawn between statements by Indian Director General of Military Operations (DGMOs) and US Secretary of Defence Pete Hegseth after the 22 June 2025 B2 strikes on Iranian nuclear sites. In both cases, the initial escalation targeted terror/nuclear infrastructure—not military or civilians. India's textbook sub-threshold warfare was later politicised, overshadowing its strategic restraint. A wise adversary provides an escape route to weaker opponents; misinterpreting this as weakness is a tactical error.

A weaker opponent's potent weapon is silent war—bleed by a thousand cuts. To counter this, India must respond in kind while maintaining escalation control. Operation Sindoor exemplified this finesse.

–The writer, a member of the Corps of Signals, brings extensive expertise in Electronic Warfare, Strategic ICT Infrastructure implementation, and Tactical ICT infrastructure development. With a PG in Computer Science from IIT Madras and another in AI for Leaders from Austin University, his current focus lies in ICTEC, AI and Robotics. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

Global-scale perception management, narrative control, and sentiment shaping are executed. Full-scale war remains a last resort, reserved for existential threats

STRATEGIC INITIATIVE

INDIA'S SBS-3 PROGRAMME: A TEST CASE FOR PRIVATE INDUSTRY'S ACTIVE ENGAGEMENT

Under the Space-Based Surveillance-3 (SBS-3) programme, India will launch a constellation of 52 satellites in the next five years to enhance the surveillance capabilities of the armed forces. Nearly half of these satellites are expected to be developed by private companies, a milestone for India's space sector. The constellation is expected to be operational by the end of 2026

DR AJEY LELE

The Indian National Space Promotion and Authorisation Centre (IN-SPACe) is an independent and autonomous agency under the Department of Space (DoS). It is tasked with promoting, enabling, authorising, and supervising the space activities of Non-Governmental Entities (NGEs) in India. IN-SPACe is a single-window interface between ISRO and private players, facilitating their active participation in the Indian space ecosystem. The organisation primarily focuses on fostering the growth of India's space industry.

In May 2025, the Chairman of IN-SPACe announced that India plans to launch 52 spy satellites over the next five years under the Space-Based Surveillance-3 (SBS-3) programme. This plan was also revealed by the Chief of Defence Staff (CDS) while addressing the Indian DefSpace Symposium 2025. This ambitious initiative underscores the increasing involvement of private industry in establishing the country's strategic satellite network. Of these, nearly 25 to 26 satellites are expected to be developed and delivered by private

companies, a significant milestone that marks a major boost for India's space sector.

It is important to recognise this programme as a test case on how private industry could assist the military in the domain of space. At the same time, this is a strategic initiative, and its implications must be assessed through a broader national security and geopolitical lens, rather than merely from a commercial standpoint. This proposal to launch a constellation of 52 satellites over the next five years to enhance its space-based surveillance capabilities aims to bolster the surveillance capabilities of the Indian Army, Navy, and Air Force. This satellite network would enable the Indian armed forces to track enemy movements, monitor borders, and improve real-time coordination during military operations. India is actively enhancing its space-based surveillance capabilities through this proposed network under the SBS-3 programme.

This strategic initiative is expected to be based on the critical lessons learned from recent military operations globally, most notably India's Operation Sindoor. Today, we know about the existing gaps in India's space domain capabilities and what needs to be done to develop and design a future-ready military space architecture. The focus appears to be on developing a layered satellite surveillance network aimed at providing comprehensive geo-intelligence, monitoring potential threats from space.

COLLABORATION WITH ISRO

The third phase of India's space-based surveillance programme is expected to be based on the joint contribution from the Indian Space Research Organisation (ISRO) and India's private space sector. Companies like Ananth Technologies, Centum Electronics, and Alpha Design Technologies are known to be collaborating with ISRO. The constellation is expected to be operational by the end of 2026.

ISRO has developed the Small Satellite Launch Vehicle (SSLV) to deliver payloads of up to 500 kg to low Earth orbit (LEO) at an altitude of 500 km. This vehicle is capable of delivering up to 300 kg to a Sun-synchronous orbit (SSO) at the same altitude. Key features of the SSLV include low cost, a quick turnaround time of approximately 72 hours or less (as per some reports, it could even be 24 hours), flexibility in accommodating multiple satellites, and minimal launch infrastructure requirements. The vehicle has undergone successful test launches.

Recently, ISRO identified Hindustan Aeronautics Limited (HAL) as the agency for the technology transfer of the Small Satellite Launch Vehicle (SSLV), marking a significant milestone in India's journey toward space commercialization. HAL has been awarded the full contract to manufacture, market, and launch the SSLV. It is important to note that HAL had previously secured a contract for the production of the Polar Satellite Launch Vehicle (PSLV), in partnership with Larsen & Toubro (L&T).

SBS-3 aims to provide comprehensive geo-intelligence, enabling India to monitor activities on Earth, including those from other satellites, with increased precision, agility, and responsiveness. The project operates under a compressed timeline, with full deployment expected by the end of 2026, driven by the urgent security needs to counter potential threats in space. This advanced space-based surveillance network is a key element in India's broader efforts to enhance national security capabilities, especially amid shifting geopolitical dynamics and the increasing militarisation of space.

Realising the importance of satellite technologies for the armed forces, around 2008, a 'Space Cell' was created by the Indian government in the office of the 'Integrated Defence Service' (IDS). The purpose was to provide the necessary coordination for any requests to use Indian space assets for support of Intelligence, Surveillance, and Reconnaissance (ISR) objectives in the domain of security. During 2019, the Defence Space Agency (DSA), a tri-services agency, was established to operate and protect India's space assets and interests. This agency spearheads India's military space agenda today.

The third phase of India's space-based surveillance programme is expected to be based on the joint contribution from the Indian Space Research Organisation and India's private space sector. Companies like Ananth Technologies, Centum Electronics, and Alpha Design Technologies have collaborated with ISRO earlier

SBS-3 is the third phase of India's Space-Based Surveillance (SBS) programme. The previous two phases played a significant role in supporting the Indian Armed Forces with critical intelligence inputs. SBS-1, launched in 2001, included four satellites of the Cartosat and RISAT series. Its primary objective was to monitor activities along India's borders and key military installations of adversaries. SBS-2, launched in 2013, expanded these surveillance capabilities, particularly in maritime domain awareness, by incorporating additional remote-sensing satellites into the surveillance network.

India is rapidly advancing its space security capabilities, driven by the growing importance of space as a critical domain for national defence

STRATEGIC INITIATIVE

ISRO will transfer SSLV technology to the private sector. Six companies are working to acquire this technology, while at least ten companies and consortia have expressed interest in manufacturing the vehicle

and the increasing militarisation of space globally. Recognising the need for secure and reliable communication across its armed forces, India has already taken key steps in this direction. The Indian Navy and Indian Air Force currently benefit from dedicated satellites launched by ISRO.

RISK OF BLIND SPOTS

Meanwhile, the Indian Army is also expected to receive its dedicated satellite in the near future. However, much more needs to be done in this field. In June 2025, former ISRO chief S Somanath warned that without a massive satellite boost, India's armed forces risk blind spots in a crisis. According to him, space has emerged as the decisive domain for national defence. Today, threats from hypersonic weapons have become a reality. Recently, the US announced that it will create around 500-satellite constellations for its Golden Dome programme.

In India's case, the military would require hundreds of satellites to meet the demands of real-time defence surveillance. Also, from the perspective of any missile defence system, which requires addressing not only the ICBM threat but also a hypersonic missile threat, more than 50% of the space-based systems would be needed to build a missile defence architecture.

The modern-day battlefield is rapidly evolving, with space emerging as a critical domain for national security. In this context, India's SBS-3 programme represents an important, yet limited, step towards securing the country's strategic interests. While SBS-3 builds upon earlier phases to enhance surveillance capabilities, the current satellite network remains minimal when measured against the scale and complexity of India's security challenges. With growing threats such as hypersonic missiles, cross-border terrorism, and maritime vulnerabilities, a more robust and comprehensive satellite constellation is essential.

The need of the hour is a dense network of defence-specific satellites that can offer real-time intelligence, persistent surveillance, and early warning capabilities across all terrains and domains. To keep pace with global military advancements and ensure self-reliance in crisis scenarios, India must significantly expand and upgrade its space surveillance infrastructure under future phases of the SBS programme.

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STRAIGHT DRIVE

DRONE WARFARE: AN UNCONVENTIONAL STRATEGIC LEAP

Drones or the Unmanned Aerial Vehicles (UAVs), have completely transformed the face of traditional warfare. While initially perceived as asymmetric or unconventional, drone warfare has now institutionalised itself as a mainstream operational modality in both regular and hybrid conflict scenarios. Drones recently played a crucial role in the successful Operation Sindoor. India's strategic trajectory in drone warfare reflects a vision where drones are no longer auxiliary assets but central to achieving multi-domain dominance

LT COL NARENDRA TRIPATHI

Optical Fiber Drone for Kamikaze, *(Pic Courtesy: Francis Farrell / The Kyiv Independent)*

In the dynamic landscape of contemporary warfare, Unmanned Aerial Vehicles (UAVs), commonly referred to as drones, have transitioned from auxiliary support platforms to core components of modern military operations. Technically defined as aircraft systems operated without a human pilot onboard, UAVs integrate avionics, propulsion, communications, and mission-specific payloads (electro-optical, infrared, EW modules, loitering munitions, etc.) into a remotely piloted or autonomous system capable of executing precision operations in contested and denied environments. Their ability to provide real-time Intelligence, Surveillance, and Reconnaissance (ISR), perform kinetic strikes, conduct electronic warfare, and support logistics in high-risk zones has significantly redefined force projection and tactical engagement doctrines.

Drone warfare encompasses the systematic use of Drones to execute offensive, defensive, and support missions within a theatre of operations. Unlike traditional manned platforms, UAVs offer persistent situational awareness, reduced reaction cycles, and precision engagement with minimised risk to personnel. This form of warfare, while initially perceived as asymmetric or unconventional, has now institutionalised itself as a mainstream operational modality in both regular and hybrid conflict scenarios. The increasing reliance on unmanned systems by state and non-state actors alike, reflects a broader doctrinal shift toward network-centric, unmanned, and autonomous combat systems.

I. THE RISE OF DRONE TECHNOLOGY IN WARFARE

The rapid evolution of drone platforms has transformed them from simple reconnaissance tools into multi-role, mission-critical systems capable of executing complex operations across land, sea, and air. Today's drones are modular, scalable, and central to modern military strategy. Ranging from hand-launched nano drones for urban surveillance to large HALE (High Altitude Long Endurance) systems that loiter for over 40 hours, drones now offer persistent ISR and precision strike capabilities. A key enabler of this transformation is AI-driven autonomy. Equipped with inertial navigation systems (INS), Global Navigation Satellite System (GNSS), and visual-inertial odometry, modern UAVs can operate in GPS-denied environments. Onboard AI allows real-

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time object detection, terrain-aware navigation, autonomous routing, and swarm coordination via mesh network protocols, enhancing responsiveness in fluid combat scenarios.

Payload versatility is another core strength of drones. Surveillance drones use EO/IR sensors and Synthetic Aperture Radar (SAR) for all-weather intelligence gathering, while electronic warfare variants deploy jammers and spoofers. Armed UAVs carry loitering munitions, laser-guided weapons, and kinetic payloads. India's ALFA-S, for example, is a loitering munition capable of autonomous target engagement. UAVs can also be configured for CBRN detection, supporting operations in high-risk environments. Advanced communication systems, including SATCOM, secure RF links, and 5G modules, ensure robust command and control. Software-defined radios (SDRs) and Frequency-Hopping Spread Spectrum (FHSS) protocols provide resistance to jamming. Integrated with C4ISR networks, drones enable rapid intelligence dissemination and decision-making.

From a systems engineering perspective, drones benefit from innovations in propulsion, ranging from brushless DC motors in micro drones to turboprop and hybrid-electric systems in HALE platforms. Modular batteries and automated recharging enhance endurance and field utility. Cost-effective, agile, and survivable, drones have become indispensable to future warfare. For India, this shift presents a strategic opportunity to build a self-reliant, autonomous, and future-ready UAV ecosystem.

II. GLOBAL USE CASES: FROM SURVEILLANCE TO STRIKES

Globally, drones have emerged as decisive enablers of modern warfare, offering unmatched versatility across tactical and strategic domains. No longer limited to surveillance, they now support precision strikes, electronic warfare, logistics, and real-time intelligence operations, fundamentally reshaping conflict dynamics. Armed forces worldwide are restructuring their C4ISR frameworks and Rules

STRAIGHT DRIVE

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FPV image of the Ukraine's spider web operation against Russia
(Pic Courtesy: themoscowtimes.com)

of Engagement (RoE) to fully integrate UAV-led missions as standard elements of modern combat.

In the 2020 Azerbaijan-Armenia conflict, Bayraktar TB2 drones, equipped with laser-guided MAM-L munitions, played a critical role in disabling Armenian armoured formations and air defences. Azerbaijan also deployed Israeli-made Harop loitering munitions, capable of autonomously targeting radar emissions. This combination of strike and loitering drones allowed Azerbaijan to dominate the battlefield with minimal reliance on manned aircraft, highlighting the cost-effectiveness and impact of networked drone warfare.

The ongoing Russia-Ukraine war provides the most comprehensive example of drone warfare to date. Ukraine's innovative use of commercial FPV drones, assembled from off-the-shelf parts and modified with explosive payloads, has been notable. These drones, piloted using head-mounted displays, enable precise targeting in trench assaults, urban operations, and vehicle strikes. Ukraine has also experimented with tethered FPV drones via optical fibre, which offer secure, interference-resistant control in GPS- and RF-denied environments. In a major escalation, Ukraine conducted coordinated drone strikes on Russian airbases, damaging strategic bombers like the Tu-22M3 and Tu-95, demonstrating the effectiveness of low-cost asymmetric saturation attacks.

In the Israel-Hamas conflicts, the Israeli Defence Forces (IDF) deployed a layered drone strategy using Hermes 900 and Skylark UAVs for ISR and fire coordination. Israel also leads in autonomous drone swarm research, working toward systems capable of data-sharing, decentralised navigation, and cooperative engagement.

These global examples signal a shift in military doctrine; drones are no longer peripheral tools but central to operational dominance. As FPV drones, loitering munitions, and AI-enabled swarms evolve, they redefine warfare, blurring the lines between air, cyber, and kinetic domains, with unmanned systems at the forefront of future battlefields.

Hermes 900 of Israel *(Pic Courtesy: Wikipedia)*

III. NEW WARFIGHTING METHODS ENABLED BY DRONES

Modern drones have ushered in a fundamental transformation of combat tactics and military doctrines, enabling a new generation of warfighting methods that blend precision, autonomy, and adaptability. Their

modularity, low logistical footprint, and ability to operate in both denied and contested environments make them ideal for hybrid warfare, counterinsurgency, and full-spectrum operations. As drone technology converges with AI, 5G communication, and next-generation power systems like fuel cells, five critical domains of military operations are being reshaped:

1. ISR DOMINANCE

Drones have revolutionised Intelligence, Surveillance, and Reconnaissance (ISR) by providing continuous coverage over high-risk or denied areas without risking human lives. UAVs equipped with EO/IR sensors, synthetic aperture radar (SAR), and multispectral imaging can maintain real-time situational awareness of enemy troop movement, logistics, and infrastructure. The integration of AI-based onboard analytics enables drones to autonomously detect, classify, and track targets, significantly reducing the decision-making loop (OODA cycle).

With the emergence of 5G-enabled data relays, high-bandwidth telemetry and ultra-low latency video transmission are now possible, enabling operators to access HD visuals and sensor feeds from multiple drones in real time, even during deep-penetration missions. Fuel cell-powered HALE drones can loiter for over 24–36 hours, ensuring persistent ISR coverage over vast operational theatres.

2. SWARM ATTACKS

Swarm drones, driven by advances in multi-agent AI systems, represent a major leap in autonomous warfare. These systems operate as a decentralised network where each drone shares data with others in the swarm through mesh communication protocols, increasingly using 5G architecture to coordinate attack vectors, dynamically assign roles, or avoid threats. Swarms can execute complex manoeuvres, such as diversion, saturation attacks, or area denial, confusing even the most advanced air defence systems.

The swarm logic is rooted in bio-inspired algorithms, allowing real-time reconfiguration if drones are lost, and autonomous adaptation to changing battlefield scenarios. Swarm attacks can range from soft-kill missions (jamming, disabling radars) to hard-kill engagements using small explosive payloads or loitering munitions, particularly effective in SEAD (Suppression of Enemy Air Defences) operations.

3. LOITERING MUNITIONS

Often referred to as "fire-and-forget" drones, loitering munitions hover over a target area, autonomously seeking enemy assets such as radar installations, missile launchers, or high-value command nodes. These drones are equipped with AI-powered vision systems capable of target recognition and discrimination, sometimes even integrating on-device neural networks to make strike decisions with minimal operator input.

Loitering munitions such as the Switchblade 600, Israel's Harop, and India's ALFA-S have redefined precision strike capabilities in modern warfare. Designed to hover in an area of interest before engaging, these systems offer selective targeting with real-time operator control, helping to reduce collateral damage and support ethical engagement protocols. Emerging research is focused on integrating fuel cell propulsion systems into next-generation loitering drones to significantly extend endurance and reduce acoustic and thermal signatures. While most current systems operate on battery or combustion engines with operational ranges between 50 to 1,000 km depending on platform class, future variants may achieve greater loiter times and extended range using hydrogen or methanol fuel cells, marking the next frontier in persistent unmanned precision strike technologies.

4. URBAN WARFARE

In dense urban environments where conventional ISR systems face challenges, nano and micro drones offer superior agility, stealth, and manoeuvrability. Deployed by Special Forces for room clearing, hostage reconnaissance, and interior mapping, they use SLAM algorithms for autonomous navigation in GPS- and RF-denied zones. Equipped with low-light cameras, thermal sensors, and encrypted FPV links, these drones often rely on tethered optical fibre or localised 5G nodes for secure, jam-resistant control. Their compact size and low noise profile make them ideal for covert operations, minimising risk to troops and civilians. Despite their size, these are highly specialised systems; integrating AI, miniaturised sensors, and secure

Modern drones have ushered in a fundamental transformation of combat tactics and military doctrines, enabling a new generation of warfighting methods that blend precision, autonomy, and adaptability. Their modularity, low logistical footprint, and ability to operate in both denied and contested environments make them ideal for hybrid warfare, counter-insurgency, and full-spectrum operations

Indigenous VTOL based Loiter Munitions *(Pic Courtesy: https://scientechworld.com)*

Government initiatives such as Make in India, Startup India, and the DPEPP 2020 are fostering UAV innovation through funding, testing infrastructure, and fast-track procurement. DRDO, HAL, BEL, and private players are collaborating to deliver a wide spectrum of systems, from quadcopters to loitering munitions

communication technologies, however, they are cost-intensive and far from being low-end tools.

5. ELECTRONIC WARFARE AND SIGINT

Drones are increasingly used for electronic warfare (EW) and signals intelligence (SIGINT). Specialised UAVs can be equipped with directional jammers, RF sniffers, and electromagnetic pulse generators to disrupt enemy communications, navigation systems, and radar installations. AI enables real-time spectral analysis and dynamic threat identification, allowing drones to autonomously prioritise EW targets. With 5G and SDR (Software-Defined Radio) integration, drones can now operate across multiple frequency bands and adapt their jamming or spoofing protocols mid-mission. This capability is crucial in multi-domain operations, where information dominance can be achieved by blinding enemy sensors and disrupting their C4ISR networks.

IV. INDIA'S STRATEGIC DRONE POSTURE AND OPERATION SINDOOR

Over the past decade, India has adopted a structured, multi-dimensional approach to integrating Unmanned Aerial Systems (UAS) into its defence architecture. Driven by regional threats and global shifts in warfare, drones have emerged as strategic force multipliers. Operation Sindoor, a tri-services joint initiative involving the Army, Navy, and Air Force, marked a significant milestone, providing a real-time testing ground for India's rapidly expanding drone ecosystem. Focused on reinforcing border security, especially along the LoC and LAC, it reflects a doctrinal shift where drones are not just ISR tools but frontline assets for surveillance, combat support, and autonomous execution.

India is significantly scaling its UAV spectrum by integrating HALE/MALE platforms, tactical loitering munitions, FPV drones, and AI-enabled swarms. Through indigenous innovation and targeted acquisitions, drones are being embedded into multi-domain operational roles.

Under the iDEX initiative and DRDO's leadership, key indigenous platforms have emerged: Rustom-II (TAPAS BH-201) for long-range ISR, Archer-NG as a next-gen strike drone, and loitering munitions like ALFA-S and ALS-50, showcasing India's AI-integrated, fire-and-forget capabilities. These efforts support the Aatmanirbhar Bharat vision and enable potential for drone exports.

To bridge capability gaps, India is acquiring 31 MQ-9B Sea Guardian drones from the US, enhancing maritime ISR and precision-strike capabilities. Simultaneously, upgrades to Israel's Heron TP fleet support tactical strikes and real-time surveillance along hostile frontiers.

On the tactical front, FPV drones and mini-UAVs are being inducted at the unit level for reconnaissance, artillery spotting, and urban surveillance. Some of which also utilise optical fibre tethers, ensuring secure, jam-resistant control in contested EW environments.

India's AI-driven swarm drone capabilities, first showcased in 2021, are now being deployed in field exercises. These systems enable autonomous decision-making, saturation attacks, and coordinated ISR, with 5G-based battlefield networks being tested to further enhance real-time collaboration.

To counter emerging drone threats, India has invested in anti-UAV systems, laser-based DEWs, RF jammers, mobile interceptors, and drone detection radars, and were deployed at strategic locations under Operation Sindoor. These layered defences ensure readiness in an evolving unmanned battlespace.

Operational Impact: Operation Sindoor has proven to be more than just a border security initiative, it has become India's first full-spectrum drone integration exercise across all three services. In terrains such as the high-altitude Himalayas, dense northeastern forests, and coastal surveillance zones, drones are providing critical advantages: from persistent situational awareness and real-time decision support to autonomous reconnaissance and strike capabilities without risking soldier' lives.

The operation has also accelerated doctrinal evolution within the Indian Armed Forces, pushing

Indigenous Drone Manufacturing lines *(Pic Courtesy: Axl Drone)*

A Panel Discussion on Drone Tech at Ikon Young Entrepreneurs and Business Leaders Summit at Hyderabad

forward the case for a Unified Drone Command, integrated battlefield management systems (IBMS), and AI-enhanced C4ISR integration. Most importantly, it validates India's vision of building a resilient, indigenised, and scalable drone warfare ecosystem, one that can adapt not just to conventional threats, but also to asymmetric and grey-zone conflicts of the future.

V. THE ROAD AHEAD: STRATEGIC AND TACTICAL INTEGRATION

As global military doctrines evolve toward unmanned, network-centric warfare, India is poised to transform its growing drone capability into a full-spectrum strategic advantage. Leveraging operational experience from initiatives like Operation Sindoor, along with accelerated indigenous development, India is crafting a roadmap to emerge as a drone superpower. This transformation spans doctrinal reform, technological innovation, industrial growth, and institutional preparedness.

A key focus area is tri-service integration, enabling a unified command structure for UAV operations across the Army, Navy, and Air Force. Plans include forming dedicated Unmanned Systems Commands within theatre commands. The IAF leads in deploying long-range UAVs like the MQ-9B Sea Guardian, while the Army focuses on tactical ISR and FPV drones, and the Navy enhances maritime surveillance and anti-submarine roles using ship-launched and HALE drones. Secure 5G networks and interoperable data systems are central to this convergence.

Equally critical is the development of an indigenous drone industry ecosystem. Government initiatives such as Make in India, Startup India, and the DPEPP 2020 are fostering UAV innovation through funding, testing infrastructure, and fast-track procurement. DRDO, HAL, BEL, and private players are collaborating to deliver a wide spectrum of systems, from quadcopters to loitering munitions.

India is also advancing AI and cybersecurity integration in UAV operations. AI-driven systems are being developed for autonomous flight, real-time target detection, and swarm logic. Simultaneously, efforts are underway to bolster cyber resilience through quantum-safe encryption, anomaly detection, and jamming-resistant communications.

India's strategic trajectory in drone warfare reflects a vision where drones are no longer auxiliary assets but central to achieving multi-domain dominance. As AI, 5G, and quantum tech mature, India is set to lead in ethical, scalable, and high-impact unmanned warfare across land, sea, air, and space.

Drone warfare is not just a technological leap; it's a doctrinal shift. Countries that master this domain will define the future of warfare. For India, the fusion of indigenous innovation, strategic operations like Operation Sindoor, and a clear policy push is paving the way for drone dominance. As the nation transitions from being a drone importer to a drone power, it also contributes to building a robust defence-tech ecosystem ready for the battles of tomorrow.

Built in India. Flown for the Nation. Defending the Future.

–The writer, an Indian Army veteran, is a subject matter expert in military technology in independent capacity. The veteran officer is alumnus of the NDA Pune, IIT Kanpur, and IIM Indore, he brings a holistic and well-rounded perspective to the defence technology domain. The information presented is sourced from open domains. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

VIEWPOINT

BURGEONING INDIA-EUROPE DEFENCE TIES

India-Europe relations over the years have matured and unlike past, the current relationship matters for both parties. Though for India it becomes a little tricky, as it must maintain parallel relationship with both EU-member and non-member countries. The defence ties between India and Europe have been evolving and at present it has become a two-way street, with Indian defence products being purchased by European countries, and European engineering companies setting-up manufacturing bases in India

ASAD MIRZA

The bilateral and particularly the defence ties between India and Europe are two dimensional. Firstly, India must maintain relations with European Union, representing 28 countries, and secondly bilaterally with bigger EU members and non-EU members, separately.

India pragmatically has developed strategic and defence partnerships with UK, Italy, Germany, Spain, and Sweden. Some analysts believe that the absence of a formal EU institutional framework is hampering development of EU-India military collaboration. They propose including India in the European Defence Fund and establishing a formal bilateral military partnership.

Meanwhile, India has focused on developing relations with both EU and non-EU countries. In this regard, Prime Minister Narendra Modi's visit in mid-June to Cyprus and Croatia, both members of the EU, preceded by External Affairs Minister S Jaishankar's visit to France, EU, and Belgium earlier in June and to the Netherlands, Denmark, and Germany earlier in May 2025, demonstrate this willingness.

Prime Minister Narendra Modi with Cyprus President Nikos Christodoulides

As a result, bilateral relations are rapidly evolving, anchored in the India-EU strategic partnership. In February 2025, during the visit of Ursula von der Leyen, president of the European Commission, and the EU College of Commissioners to India, the two sides had welcomed growing defence cooperation, including joint exercises and collaboration between the Indian Navy and EU maritime security entities.

The two sides have also committed to exploring a security and defence partnership. In this context, one must closely examine the opportunities for deepening the partnership provided by the Joint White Paper (JWP) on European Defence — Readiness 2030, issued by the European Commission in March 2025.

INDIAN AND EUROPEAN SECURITY CHALLENGES

Both Europe and India currently face many challenges to their security. A triad of challenges has pinned Europe in a corner – due to the changing US foreign policy, the continuing conflict in Ukraine, Gaza and Iran and pessimism about a post-war European peace. Similarly, emerging from the latest conflict with Pakistan, New Delhi's strategic imperative to diversify its partnerships and enhance its defence capacity is now more urgent than ever, given the collusive threat posed by the China-Pakistan nexus.

PM Modi and Croatian President Zoran Milanovi

PM Modi with EU Chief Ursula von der Leyen

Naturally, a powerful consensus is emerging: the long-nascent India-EU relationship must urgently acquire a security and defence dimension. The opportunities are significant, but they must be pursued with a clear-eyed understanding of the challenges and based on realistic expectations.

As European nations seek to expand and modernise their defence industry to meet emerging and future threats, India can play a crucial role in the EU's defence industry supply chains. The EU and India are exploring the possibility of a defence and security pact, also called the Permanent Structured Cooperation (PESCO), akin to the EU's agreements and pacts with Japan and South Korea.

The PESCO framework would enable the EU member states to work jointly with India to develop and invest in shared defence capabilities and improve the operational readiness of the armed forces. While this will help India gain access to advanced technologies, European states would benefit from the robust and competitive manufacturing facilities of India, provided these manufacturers set up factories in India.

OPPORTUNITIES FOR INDIAN DEFENCE SECTOR

India can capitalise on the EU's allocation of 500 billion Euros to ramp up its ammunition stocks. Indian ordnance factories manufacturing ammunition shells have the idle capacity to cater for surge requirements during the war and have modernised manufacturing to make hi-tech ammunition, which can be used to equip EU militaries.

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Some EU members have already ordered ammunition from these Indian entities. Joint production with private ammunition manufacturers also remains a possibility, as some of these manufacturers already have collaborations with EU companies.

The Indian government is attempting to kick-start India as a leading shipbuilder with a multi-billion-dollar cash injection, in line with its Viksit Bharat 2047 vision. The government plans, propose to incorporate the state-owned shipyards to provide the much-needed functional and financial autonomy that is presently unavailable to them due to the bloated bureaucracy in the Ministry of Defence.

In its most recent budget announced on 1 February 2025, the government allocated US$ 28 billion for a Maritime Development Fund (MDF) to support the

country's maritime sector. This would help India emerge as a globally competitive shipbuilding hub.

EUROPEAN PRESENCE IN INDIA

Dassault India is in the process of establishing a Maintenance, Repair, Overhaul (MRO) setup near Jewar International Airport in Greater Noida, U.P., which can be scaled to provide maintenance support to combat jets from EU states. It already has a joint facility with Reliance near Nagpur for manufacturing aircraft parts.

Safran has an MRO facility in Hyderabad for aero-engines. The Tata group, in collaboration with Airbus, has already begun manufacturing C295 military transport aircraft at its factory in Vadodara, Gujarat. These facilities can be scaled up to meet Rafale requirements for EU members.

THE INDIAN OFFER

India possesses a robust engineering talent pool, established defence production infrastructure, a large defence budget with a focus on research and development, and indigenisation, allowing it to produce complex military equipment domestically, and potentially export to other countries as well.

Government policies can encourage domestic and foreign private players through Foreign Direct Investments (FDIs) and other incentives. Further, the sector is also capable of absorbing foreign technology for 'Make in India' initiative.

However, the bigger prize would be a Security of Information Agreement (SIA), a key pillar that currently constrains the exchange of classified or sensitive information between the EU and a third country, such as India. An SIA would help unlock more sensitive areas of cooperation, including Indian participation in Permanent Structured Cooperation (PESCO) projects, the EU's framework for joint defence capability development.

In the immediate term, the potential for cooperation is not just abstract; it is about addressing acute supply chain vulnerabilities and seizing a historic economic opportunity. The war in Ukraine has exposed deep frailties, driving up prices of defence materials. 155mm artillery shells, something that India's defence industry is now exporting widely, are just one example of an immediate opportunity.

External Affairs Minister S Jaishankar meeting French President Emmanuel Macron

INDIA-NATO RELATIONSHIP

However, an important yet persistent hurdle, which is likely to remain, is the India-NATO relationship. While NATO does not expect a formal partnership with India, there are expectations of India considering becoming a "contact country," an informal, flexible arrangement that requires no binding treaty. Such status would open the door for Indian officers to attend courses at the prestigious NATO Defence College in Rome and for Indian observers to participate in select exercises, such as those in the Baltics.

In the wake of the high-level visits this year, India should endeavour to explore sales of Advanced Towed Artillery Guns (ATAGs), the Pinaka Multi-Barrel Rocket Launcher, air defence missiles, and radars that meet NATO standards. India should tap this window of opportunity with the assistance of Israel and South Korea. Both these nations have robust defence partnerships with India.

Similarly, Europe needs reliable partners for everything from drone motors and propulsion systems to explosives, such as ammonium nitrate, and the rare earth elements that are the foundation of modern military hardware.

Beyond traditional defence, cooperation in the space domain offers immediate dividends. The EU's Copernicus programme, an Earth observation system

EAM Jaishankar with German Foreign Minister Johann Wadephul

with growing security applications, is a prime example. The legal text governing third-party cooperation with Copernicus makes no distinction between India and a close partner like Norway, presenting a clear pathway.

The focus on space situational awareness is critical for both sides. By leveraging the Copernicus model, where financing for infrastructure in third countries can yield a return in data and services, India can integrate into a cutting-edge civilian-military programme, strengthening its capacities while contributing to a shared vision of space security and sustainability.

EUROPEAN STIMULUS

Notwithstanding these challenges, the enormity of this moment in Europe's history is unmistakable. True to the EU's nature as an economic regulator, its ReArm Europe plan is an economic instrument that promises member states fiscal flexibility to generate an estimated €650 billion in additional defence spending over four years, which would not count towards national deficit limits.

This is complemented by a proposed €150 billion loan instrument, the 'Security Action for Europe' (SAFE), to further support joint investment. This massive injection of capital creates an unprecedented market for India's burgeoning defence sector to meet its export goals. For India, this is an opportunity to integrate into resilient supply chains and co-develop critical technologies.

THE WAY FORWARD

Ultimately, consolidating a bilateral geopolitical outlook and building this partnership is about more than just military hardware; it is about preserving the rules-based international system and jointly shaping the standards for the technologies that will define this century.

The path forward is not without its challenges, which require frank acknowledgement. From a European perspective, there is a persistent lack of understanding of the Indian administrative landscape—a confusion about who holds the authority to make decisions and drive concrete projects.

Conversely, India is often a "victim of its own success," with several powerful EU member states preferring the expediency of bilateral defence ties over a slower, more complex EU-level relationship. These hurdles are compounded by a stark mismatch in diplomatic capacity. The absence of a dedicated Defence Attaché at the Indian embassy in Brussels is a glaring gap that needs to be corrected.

Once such minor irritants are taken care of, the India-Europe defence partnership can blossom into a win-win situation for both.

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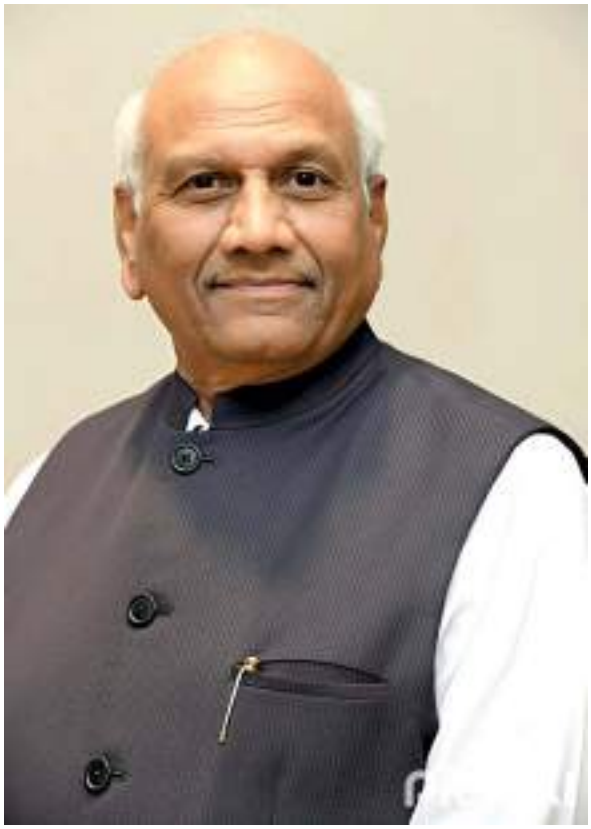
IN CONVERSATION

'WELL-POSITIONED TO SUPPORT SPACE MISSIONS, ANANTH TECHNOLOGIES HAS EMERGED AS A TRUSTED PARTNER IN INDIA'S SPACE GROWTH STORY'

Ananth Technologies Ltd, a key private player in India's space sector, has contributed critical components and subsystems to major Indian missions including Chandrayaan, Mangalyaan, and Gaganyaan. It has played a key role in integrating and testing satellites and launch vehicle systems, supplying avionics for over 104 satellites and 84 launch vehicles. **Dr Subba Rao Pavuluri, Chairman** and **MD of Ananth Technologies,** *spoke to* **Raksha Anirveda's Editor, Ajit Thakur** *on a wide range of issues including India's potential and growth trajectory in the space sector and the role of private companies. Excerpts from the exclusive interview...*



RA: *The Indian space policy reforms have been commended by many. Kindly elaborate on the impact these reforms have made in the space sector including the role play of private companies.*

SRP: India's space policy reforms, particularly the Indian Space Policy 2023, have revolutionised the country's space sector by opening it up to private participation. Institutions like IN-SPACe and NSIL have been established to regulate and facilitate private players while commercialising ISRO's capabilities. This shift has allowed non-governmental entities to design, launch, and operate satellites, as well as offer space-based services. These reforms aim to grow India's share in the global space economy and enhance its strategic presence in space through increased collaboration, innovation, and commercialisation.

As a result, a new wave of private space companies has emerged, driving innovation in launch vehicles, satellite technology, and Earth observation. With support from ISRO in terms of infrastructure and expertise, these startups are significantly contributing to mission frequency, cost efficiency, and technological advancement. The reforms have not only democratised access to space but have also positioned India as a competitive force in the global space arena, promising long-term economic, technological, and strategic benefits.

India's space policy reforms, particularly the Indian Space Policy 2023, have revolutionised the country's space sector by opening it up to private participation. Institutions like IN-SPACe and NSIL have been established to regulate and facilitate private players while commercialising ISRO's capabilities

RA: *Talking of the Indian space sector's overall potential, how do you visualise its growth trajectory and global competitiveness in the next 5 years? Do you think the entry of foreign satellites into India imposes security concerns?*

SRP: India's space sector is set for rapid expansion over the next five years, driven by private sector participation, cost-effective launches, and global collaborations. Reforms like the Indian Space Policy 2023 and IN-SPACe will unlock opportunities in satellite manufacturing, Earth observation, and space tech startups. With SSLV, reusable rockets, and Gaganyaan, India will strengthen its position in the global launch market, potentially capturing 5-7% of the $1.4 trillion space economy by 2029

The entry of foreign satellites presents economic benefits but also security risks, including data


Representative image

sovereignty concerns and dual-use tech risks. However, India can mitigate these through strict licensing, data localisation rules, and defence-space coordination. By balancing open-market growth with strategic safeguards, India can emerge as a leading space power without compromising national security.

RA: ***Ananth Technologies' association with the Indian space sector has been decades old. What are the key activities your company is currently undertaking? Also, highlight the achievements.***

SRP: Ananth Technologies Ltd (ATL) has emerged as a key private player in India's space sector, supporting ISRO for over three decades in areas such as satellite systems, avionics, and launch vehicle electronics. The company has contributed critical components and subsystems to major Indian missions including Chandrayaan, Mangalyaan, and Gaganyaan. It has also played a significant role in integrating and testing satellites and launch vehicle systems, supplying avionics for over 104 satellites and 84 launch vehicles. In a major milestone, ATL established India's first private satellite manufacturing and testing facility in Bengaluru, capable of handling complete satellite assembly. Similarly in Thiruvananthapuram for launch vehicle avionics and Assembly, Integration and Testing (AIT) facility.

With India's space sector opening up to private enterprises, ATL is well-positioned to support both government and commercial missions, including those involving new-age startups and global clients. Its move towards full-fledged satellite manufacturing marks a shift from being a subsystem supplier to becoming a comprehensive aerospace solutions provider. By bridging public and private capabilities, ATL not only strengthens India's space supply chain but also enhances the country's competitiveness in the global space economy, in making satellites for the LEO & GEO orbits and launch vehicles.

RA: ***India's contribution to the global space economy hovers around 2 per cent, according to reports. How can India enhance its share globally while focusing and capitalising on the domestic space economy?***

SRP: To strengthen its position in the global space economy, India should transition from a service-based approach to an innovation-led ecosystem. This shift requires focused investment in high-impact R&D domains such as AI-powered satellite analytics, next-generation propulsion systems, satellite networks, and deep-space exploration.

Domestically, satellite-enabled applications — spanning precision agriculture, infrastructure, disaster response, 5G connectivity, IoT, etc. present immense untapped opportunities. By fostering a robust ecosystem with enhanced funding, simplified regulations, and incentives

ATL has moved from being a subsystem supplier to becoming a comprehensive aerospace solutions provider. By bridging public and private capabilities, ATL strengthens India's space supply chain and enhances competitiveness in the global space economy, in making satellites for the LEO & GEO orbits and launch vehicles

IN CONVERSATION


Chandrayaan 3

India should transition from a service-based approach to an innovation-led ecosystem to strengthen its position in the global space economy. This shift requires focused investment in high-impact R&D domains such as AI-powered satellite analytics, next-generation propulsion systems, satellite networks, and deep-space exploration

for domestic manufacturing, India can emerge as a key production hub and a launch pad for future space innovators worldwide.

RA: ***In the last few years, the Indian space sector has witnessed entry and vibrant participation of startups including the government's involvement in accelerating collaborative partnership in space technology. Will this renewed momentum help the Indian space ecosystem mature faster and position it as a lead innovator, and technology disruptor in the long run?***

SRP: The rise of space startups, backed by ISRO and IN-SPACe, has injected fresh momentum into India's space sector, driving innovation across launch systems, propulsion, satellite tech, and data analytics. By fostering collaborative R&D, expanding access to testing infrastructure, and creating procurement opportunities, India can accelerate its space capabilities far beyond the pace of traditional models.

This growing ecosystem positions India not just as a spacefaring nation, but as a future leader in space technology — developing, owning, and exporting cutting-edge solutions to the world.

KEY IMPROVEMENTS:

- **Stronger Opening:** "Injected fresh momentum" is more vivid than "brought new energy."
- **Sharper Focus:** Streamlined the examples of innovation for better readability.
- **Future-Oriented Conclusion:** "Technology originator and exporter" is rephrased as "developing, owning, and exporting cutting-edge solutions" for greater impact.

RA: ***You have been leading the space industry association SIA-India and organising DEFSAT conference and expo. How has been your experience so far and what major milestones have been achieved while bringing the defence space technology to the centre stage? Also provide insights into the SIA-India's contribution.***

SRP: As an active member and leader in SIA-India, our goal has been to unify the voices of stakeholders across academia, startups, industry, and government. Through initiatives like DEFSAT, we've successfully brought space-based defence technologies to the strategic forefront, encouraging dialogue between policymakers, defence services, and private industry. DEFSAT 2023 and 2024 witnessed significant MoUs, policy announcements, and international collaborations, and served as platforms to showcase India's readiness to lead in space-based ISR, surveillance, and secure communications. SIA-India's continuous engagement with IN-SPACe, NSIL, and MoD is helping to shape a more inclusive and forward-looking policy framework.

RA: ***Ananth Technologies has been a regular exhibitor at Aero India. Kindly share your experience at Aero India 2025 and its contribution to your company's growth journey.***

SRP: Aero India 2025 has been another landmark event for Ananth Technologies, reinforcing our commitment to the aerospace and defence sectors. Our participation this year focused on showcasing our capabilities in mission-critical subsystems, high-reliability electronics, and defence-space integration. The event provided an excellent platform for engaging with domestic and international partners, exploring new markets, and demonstrating how our products are aligned with India's Aatmanirbhar Bharat and 'Make in India' goals. The strong interest from global OEMs and policy stakeholders affirms our position as a trusted partner in India's defence and space growth story.

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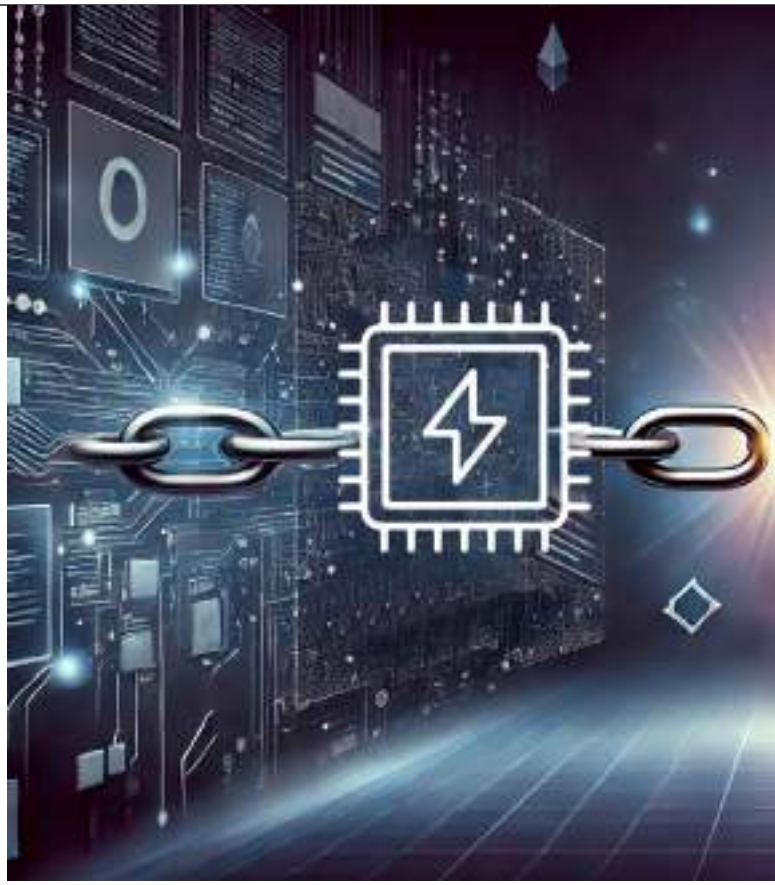
GUEST ARTICLE

TECHNOLOGY INFUSION IN INDIA'S DEFENCE INDUSTRY



Several Indian companies and innovators are using AI, the Internet of Things, cloud computing, big data and analytics, and multi-sensor data fusion to develop new-generation products and systems for the Indian defence forces. The Indian government's efforts to incentivise entrepreneurship and new technology development have placed the country high among the global innovators

ASHISH KANSAL

Technology has been shaping and reshaping every industry at an impressive pace. What's leading this race for technological supremacy is one's ability to ideate, innovate and implement. And this is true even for the Indian defence sector. With the influx of private players, the high-octane field has received a mighty boost from creativity and innovation. Many companies, start-ups and MSMEs are leveraging disruptive technologies to create unique solutions for the Indian defence forces, making India a self-reliant military might.

We witnessed many of these stellar applications during Operation Sindoor. This has given us enough evidence to state that 'Infusion of Technology' in 'Made in India' products can place India on equal ground with major global powers.

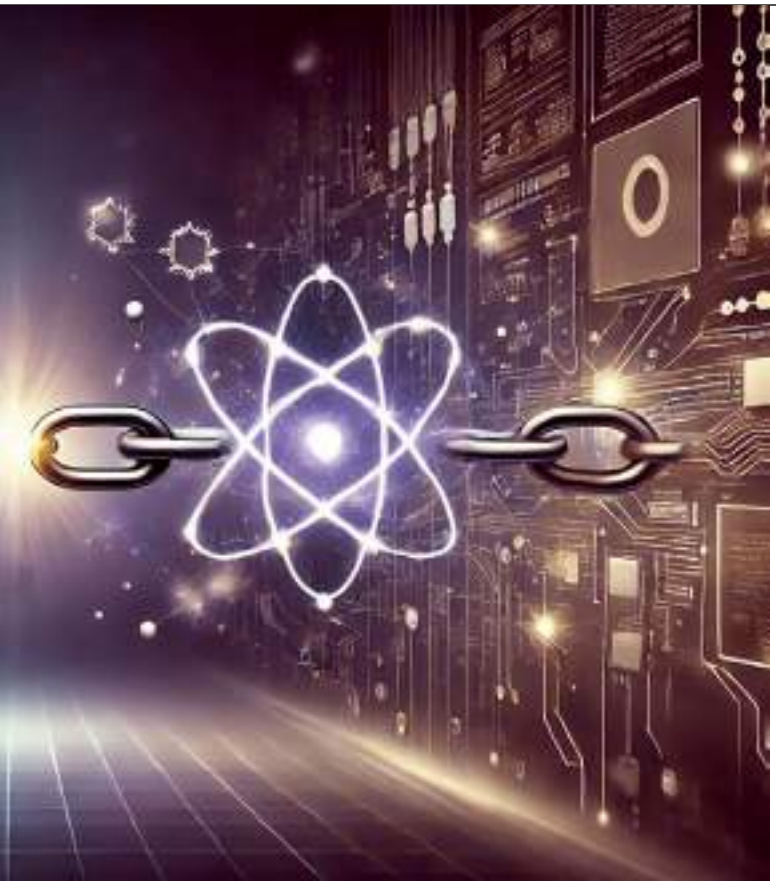
Technologies such as artificial intelligence (AI), networking and the Internet of Things (IoT), cloud computing, big data and analytics, and multi-sensor data fusion (MSDF) are all being used and/or researched to develop new-generation products and systems for modernisation of the Indian defence forces. India is also working towards building its indigenous 5th Gen Fighter aircraft AMCA and, with the thrust and help being extended by the Government of India (GoI), we are not far from achieving this dream.

India is learning from the examples of countries such as China, the USA, Germany, and France whose modernised defence industries are supported financially and politically by their respective federal governments. GoI is also catching up on this front and is pumping in a good amount of GDP every year in defence manufacturing, innovation, and R&D.

Below is a snapshot of how the latest technologies are likely to be used on the battlefield:

AI AND AUTOMATION: DE-RISKING HUMAN LIVES ON THE BATTLEFIELD

AI has influenced every industry, big or small, and when it comes to the defence sector, AI is proving useful in aiding as well as de-risking human lives. Drones, robots, war games, simulators and unmanned vehicles are powered by AI/ML algorithms, which help them perform tasks such as visual perception and decision-making with minimal or no human intervention, thereby reducing the need for humans to risk



their lives on the battlefield. AI also comes to the rescue when a large amount of data is to be quickly processed because manual processing delays decision-making.

Automation in the assessment of events in real-time and predicting future scenarios based on historical patterns and trends, image classification, face recognition and intelligence reporting using AI/LLM algorithms, are all used in tri-service networked systems.

BLOCKCHAIN AND QUANTUM COMPUTING: ELEVATING SECURITY

Blockchain technology and quantum computing are among the most exciting technologies to be linked to the defence industry in recent years. The reason is clear, they make it possible to onboard high levels of security, paramount to a defence sector.

With the application of these technologies, data is not stored in a single location. Thus, there is no centralised version of the information which can be hacked or accessed by external forces. Blockchain, with its distributed node system allowing layers of security inside a sealed network, run by powerful quantum computers will make the defence sector resilient to cyber-attacks and threats.

CLOUD COMPUTING: NO MORE DATA SILOS

Cloud computing, albeit not new, is a very interesting technology to have found a place in the defence sector. It is being merged with Edge Computing (providing data closer to the user) as per the requirement. In the last decade, cloud computing has completely replaced the 'siloed' systems of storing and processing data used by defence sectors. They are now exploring options of moving their data to cloud servers for secure storage and accessing it through Edge Computers for faster access and processing.

Drones, robots, war games, simulators and unmanned vehicles are powered by AI/ML algorithms, which help them perform tasks such as visual perception and decision-making with minimal or no human intervention, thereby reducing the need for humans to risk their lives on the battlefield

GUEST ARTICLE

India revised the FDI policy for defence in 2020 to facilitate access to the latest technologies in the shortest possible timeframe. Under the policy, FDI up to 74% is allowed through the automatic route, and up to 100% under the government approval route. India received FDI worth $6.4 million in defence industries until March 2025

IoT: USED FOR DECADES BY DEFENCE INDUSTRY

While the idea of having inter-connected devices over a common network (IoT) seems novel for the commercial sector, the defence sector has, in fact, leveraged IoT for decades. The defence industry has been using aircraft, ground vehicles, ships and weapon systems that are connected to a common network to share tactical data with one another, long before this technology gained momentum in other industries.

MAKE IN INDIA: FOSTERING INNOVATION, BOOSTING MANUFACTURING

The only way for the defence sector to achieve self-reliance is by continuously implementing and improving technological innovations. Keeping this in mind, GoI has put together several programmes, and one of them is 'Make in India', aimed at boosting manufacturing capabilities and attracting foreign investments.

The Indian industry is looking at procuring advanced technologies from foreign countries through bilateral arrangements, industrial policies and the defence procurement policy. India also has bilateral and multilateral international ties with countries such as Russia, Israel, the USA, South Korea, Singapore, and the UK for the development of strategic, unique, transformative, advanced technology/systems/platforms under the 'Make in India' initiative. Offering not just the end products (5th Gen Fighter aircraft) but inherent technology by two major defence industrial powerhouses, the USA (F-35 supplier) and Russia (Su-57 supplier) to India is a case in point.

The Defence Research and Development Organisation (DRDO) and major defence R&D houses are partnering with global players to help Indian defence forces be ready to face any eventuality, both from within and externally. Apart from this, Indo-US Defence Technology and Trade (DTTI) and a Joint Working Group (JWG) on Defence Equipment and Initiative Technology Cooperation with Japan have been set up to promote cooperation in the field of defence equipment and technology.

FOREIGN DIRECT INVESTMENT (FDI)

The FDI policy for defence was revised in 2020 to facilitate access to the latest technologies in the shortest possible timeframe and help our defence forces to be prepared to fight a multi-faced war. Under the modified policy, FDI up to 74% is allowed through the automatic route, and up to 100% under the government approval route. India received FDI worth $6.4 million in defence industries until March 2025.

The Department of Defence Production (DDP) also brought in policy reforms for attracting investment including setting up Two Defence Corridors in Tamil Nadu and Uttar Pradesh to provide plug-and-play support to the industries. In DPP, under the 'Buy & Make (Indian)' and 'Buy (Global – Manufacture in India)' categories of capital acquisition, foreign companies and Indian companies are encouraged to work together to manufacture defence equipment in India as a part of the 'Make in India' programme. The main objective is to encourage technology partnerships between Indian and foreign companies.

The government is encouraging innovation in premier institutes such as the IITs, IISC, institutes of academic excellence, start-ups and niche technology providers by incentivising entrepreneurship as well as new technology development, helping place us high in the list of global innovators.

Can we say... this is the Time for India!!!

–The writer is a former senior executive, Bharat Electronics Limited. Currently, he is the managing partner of Afreen Elite Services LLP. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

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DEEP DIVE

PRINCIPLES OF WAR, OPERATION SINDOOR AND THE CONVOLUTIONS OF CONTEMPORARY WARFARE

Traditional large-scale wars are being replaced or supplemented by hybrid warfare. This evolution challenges conventional military doctrines and demands a flexible, multi-domain approach to conflict. However, the core principles of war remain relevant; their application must adapt to new realities. Operation Sindoor exemplifies the blend of traditional military doctrines with modern capabilities to achieve strategic objectives

COMMANDER SUMIT GHOSH

The principles of war have evolved significantly over centuries, transitioning from classical doctrines of massed formations and territorial conquest to modern concepts of precision, agility, and multi-domain integration. Today's warfare and tactics are no longer confined to traditional physical spaces but rather span cyberspace, information networks, and the psychological realm, requiring a dynamic reinterpretation of older military precepts. Operation Sindoor, a recent, decisive military action by India against Pakistan after the Pahalgam terror attacks, serves as a powerful illustration of this evolution. Through a limited but potent application of force, India demonstrated how contemporary warfare prioritises strategic messaging, speed, and precision over sheer scale. Operation Sindoor effectively

combined ancient strategic wisdom propagated by Kautilya and Sun Tzu, with modern doctrines drawn from NATO and Indian Joint Warfare principles.

The shifting tides of technology, politics, ideology, and society at large have always shaped warfare. In the 21st century, too, warfare is increasingly characterised by complexity, unpredictability, and multi-domain operations at hyper speeds. While the fundamental principles of war have historically provided a framework for military successes, their application in modern contexts demands re-interpretation. Against this backdrop, Operation Sindoor-type contemporary operations exemplify the blend of traditional military doctrines with modern capabilities to achieve strategic objectives.

CLASSICAL PRINCIPLES OF WAR

Despite the dynamic nature of modern conflict, the age-old classical principles of war continue to provide a strategic compass. These principles, formulated by theorists like Carl von Clausewitz, Antoine Henri Jomini, and later adapted by modern militaries, include:

- **Objective:** Directing every military operation towards a clearly defined goal.
- **Offensive:** Seizing and maintaining initiative to impose will on the enemy.
- **Mass:** Concentrating combat power at the decisive point.
- **Economy of Force:** Allocating the minimum necessary resources to secondary efforts.
- **Manoeuvre:** Positioning forces to gain an advantage.
- **Unity of Command:** Ensuring all efforts are coordinated under a single commander.
- **Security:** Preventing the enemy from gaining an unexpected advantage.
- **Surprise:** Striking the enemy at an unanticipated time or place.
- **Simplicity:** Clear, uncomplicated plans to ensure effective execution.

Each of these principles serves as an enduring guideline, but their operationalisation must adapt to contemporary threats and tools.

OPERATION SINDOOR: CONTEXT AND OVERVIEW

Operation Sindoor involved both military and civilian considerations with a possible international politico-military fallout. While specific operational details are a secret, Operation Sindoor can be broadly understood as a strategic military strike against Pakistan in response to terror attack involving our

armed forces assets, hi-tech weapons and IT systems, deploying unmanned systems employing real-time hard intel from our satellites and all other sources ensuring stunning military success with minimal civilian casualties. Through sheer intensity, it created shock and awe during expeditious neutralisation of threats, permitting little response opportunity to the Pakistani forces. Operation Sindoor showcased the traditional military strategy intersecting with modern tactical requirements.

APPLICATION OF PRINCIPLES OF WAR IN OPERATION SINDOOR

Op Sindoor, though short-lived, exemplified the practical application and adaptation of principles of war, which are enumerated as follows:

- **Objective:** The operation was guided by a clear mission of neutralising terror infrastructure at specific locations within Pakistan. Every action was calibrated to serve this overarching goal with speed and accuracy.
- **Unity of Command:** A unified command and control was in place, ensuring synchrony between air assets, missile batteries, C4ISR systems, and civil authorities.
- **Manoeuvre:** Tactical positioning through various terrains (jungle, urban, sandy, or

Warfare is not restricted to physical battlegrounds or uniformed armies today. It encompasses cyberspace, information domains, space, and psychological dimensions. Conflicts occurring at extended ranges are asymmetric, and non-state actors challenge established military powers with irregular tactics

DEEP DIVE

mountainous) demonstrated manoeuvre not just in positioning but also in psychological advantage. The use of high-speed tactical and ballistic missiles, UAVs supported by satellite imagery enhanced operational flexibility. Indian naval force manoeuvres in the Arabian Sea precluded offensive Pak navy deployments.

- **Surprise:** Intel-based targeting allowed for strategic ambushes and pre-emptive strikes. Digital surveillance and stealth movement ensured Pakistan had minimal or no warning of the impending attack. BRAHMOS attack on deep inland airfields, including Kirana Hills, came as a huge surprise to Pakistan and the world.
- **Economy of Force:** Resources were efficiently distributed in the attack on nine terror camps to achieve the quickest destruction, ensuring optimal use of manpower and equipment. Correct payloads for chosen targets ensured optimum economy of firepower.
- **Security:** The government and armed forces maintained the highest operational secrecy and information control to avoid information leaks, sabotage, or ambushes. Cyber hygiene and secure communication channels fully protected the mission integrity.
- **Simplicity:** The act of terror was responded to with the decimation of Pakistan's terror support system, keeping the mission simple and clear.
- **Mass:** Concentrated force was used decisively at critical targets, allowing unchallenged domination of operational zones. BRAHMOS and other tactical missiles were rained in at chosen points to inflict maximum devastation.
- **Offensive:** Rather than waiting for threats to materialise, the operation likely focused on proactive engagement, a hallmark of offensive tactics being adopted in modern conflicts.

RELEVANCE AND ADAPTATION OF PRINCIPLES IN MODERN WARFARE

Modern warfare challenges the rigid application of traditional principles. However, rather than rendering them obsolete, it necessitates their reinterpretation.

- The objective now includes strategic goals beyond battlefield victory such as political stability, regime overthrow, counter-terrorism, or gaining territory.

- Surprise has evolved to include cyber-attacks, disinformation campaigns, and multi-domain intrusions by unmanned systems/ drone swarms that disrupt, degrade, or confuse enemy systems.
- Unity of Command must cover joint operations involving cyber units, C4ISR systems, space-based assets, and key civilian agencies.
- Manoeuvre extends beyond physical terrain to cyber and informational spaces, AI-supported mission planning and decision support systems requiring commanders to assimilate the plan and act expeditiously.

CHANGING FACE OF CONTEMPORARY WARFARE

Contemporary warfare differs radically from its classical predecessors in both form and function. No longer restricted to physical battlegrounds or uniformed armies, warfare today encompasses cyberspace, information domains, space, and psychological dimensions. Conflicts occur at much extended ranges, are increasingly asymmetric, and non-state actors such as terrorist groups, cyber criminals, and ideological extremists challenge established military powers through irregular tactics. Uniformed men participating in war following the Geneva Conventions and IHL are things of passé. Deceit, unpredictability and unexpected international alliances can alter the game.

Technological advances have also introduced unmanned systems, artificial intelligence (AI), precision-guided hypersonic weapons, and real-time surveillance, enabling faster and more surgical operations. Moreover, hybrid warfare, blending conventional and unconventional tactics, has increasingly become a hallmark of modern conflicts. Propaganda, misinformation, and psychological operations (PSYOPS) are now weaponised to shape public opinion and disrupt enemy morale.

Some emerging principles are:

- **Information Dominance:** The ability to control and manipulate information flow to gain a strategic advantage.
- **Internal Consensus/Favourable Public Opinion:** Winning the support of own population and influencing public opinion globally is vital for sustaining operations and achieving objectives.
- **Successful Exterior Manoeuvre/International Support:** Securing international support and managing international perceptions is essential for legitimacy and resource allocation.
- **Correct Identification of Centre of Gravity (COG):** Identifying and targeting the enemy's critical vulnerabilities, both physical and psychological, is essential for a decisive victory.
- **Strategic Anchoring:** Every action, from tactical to operational, must be consciously linked to a clear strategic objective in the information age.
- **Adaptability and Agility:** The ability to rapidly adapt to changing circumstances and exploit fleeting opportunities is paramount.
- **Information Operations (IO):** The deliberate use of information to influence, disrupt, corrupt, or usurp the decision-making of adversaries while protecting one's own.
- **The Strategic Corporal:** Recognising that even the actions of a single soldier can have strategic implications in the information age.

Overall, traditional large-scale conflicts are increasingly being replaced or supplemented by hybrid warfare, proxy conflicts, asymmetric attacks by non-state actors. This evolution challenges conventional military doctrines and demands a flexible, multi-domain approach to conflict. Despite these changes, the core principles of war remain relevant. However, their application must adapt to new realities. Modern warfare necessitates a re-evaluation of strategy that integrates information dominance, rapid technological adaptation, and ethical considerations in the use of force. Nations must build capabilities not just in firepower but in intelligence, cyber defence, and public narrative. Ultimately, the enduring principles of war provide a foundational framework, but their interpretation must evolve in tandem with the complex, dynamic nature of contemporary and future conflicts. Preparing for this future requires foresight, adaptability, and a holistic understanding of both tradition and transformation in warfare.

–The writer is a former Indian Navy Submarine Officer He is a specialist in missiles, underwater weapons, sensors, anti-submarine warfare and also 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 like USI, the Chakra Foundation and STRIVE. The views expressed in the paper are personal. He can be reached at sumit12in@gmail.com.

The enduring principles of war provide a foundational framework, but their interpretation must evolve in tandem with the complex, dynamic nature of contemporary and future conflicts. Preparing for this requires foresight, adaptability, and a holistic understanding of tradition and transformation in warfare

GUEST COLUMN

DEFENCE REFORMS: A MID-YEAR REALITY CHECK

Despite grand promises, progress on key reforms like Integrated Theatre Commands and simplification of acquisition procedures remains elusive. The urgency for tangible outcomes grows as Pakistan bolsters its defence capabilities, among other threats facing India

AMIT COWSHISH

The Ministry of Defence (MoD) ushered in the New Year by declaring 2025 as the 'Year of Reforms' with a view to giving 'impetus to the ongoing and future reforms' and 'laying the foundation for unprecedented advancements in defence preparedness'. The ultimate aim was to transform the armed forces into 'a technologically advanced and combat-ready force capable of multi-domain integrated operations'.

With half the year gone, the razzmatazz accompanying the new year declaration has ebbed, though the resolve to fast-track the reforms was reiterated two months later when the MoD announced that Defence Minister Rajnath Singh would conduct quarterly reviews of the critical defence reforms being driven by the government to boost the armed forces' combat readiness.

Reforms or no reforms, the armed forces acquitted themselves superbly in Operation Sindoor, launched in the wake of the dastardly Pahalgam incident of April 22, with precision strikes on terrorist hideouts inside Pakistan-occupied Kashmir and across the length of Pakistan, thwarting massive drone attacks, and launching decisive counterattacks on airbases. It resulted in Pakistan reaching out to India for cessation of hostilities within less than four days.

This does not diminish the importance of reforms, though. If anything, the fact that Pakistan ramped up its defence budget by 20 per cent in June 2025 in a bid to boost its combat capabilities underlines the urgency of multifarious defence reforms in India. Indeed, the MoD started off on the right foot by identifying the following objectives of the push for reforms in 2025:

(a) Promotion of jointness and integration initiatives, and establishment of the Integrated Theatre Commands,
(b) Focusing on new domains such as cyber and space, and emerging technologies like artificial intelligence, machine learning, hypersonics, and robotics, and associated tactics, techniques, and procedures required to win future wars,
(c) Development of a shared understanding of operational requirements and joint operational capabilities through inter-service cooperation and training,
(d) Simplification of acquisition procedures to make them more straightforward and time-sensitive to facilitate swifter and more robust capability development,
(e) Facilitating technology transfer and knowledge sharing between the defence sector and civil industries, and promoting public-private partnerships by improving ease of doing business,
(f) Collaboration across various stakeholders in the defence ecosystem for effective civil-military coordination to eliminate inefficiencies and optimise resources,
(g) Positioning India as a credible exporter of defence products, fostering research and development (R&D) and partnerships between Indian industries and foreign Original Equipment Manufacturers (OEMs) for knowledge sharing and resource integration,
(h) Ensuring the welfare of veterans while leveraging their expertise by making efforts 'towards optimisation of welfare measures for veterans', and
(i) Instilling a sense of pride in Indian culture and ideas, fostering confidence in achieving global standards through indigenous capabilities, while adopting best practices from modern militaries that suit the nation's conditions.

There should have been perceptible and irrefutable progress by now in some, if not all, of these focus areas, but no official assessment of where the MoD stands at the midpoint of the year is available.

The issue with the MoD's declaration of the Year of Reforms is that it is more about ideas that, in its view, should propel the reforms, than about the concrete steps to be taken to implement those ideas. As Mark Twain once said, 'Action speaks louder than words but not nearly as often'.

'Ensuring the welfare of veterans while leveraging their expertise by making efforts 'towards optimisation of welfare measures for veterans', for example, is a noble idea, but its implementation requires devising workable schemes and careful execution. This is not as simple as it may appear, and it will be quite a feat to introduce any major reform to achieve this objective in the remaining six months of the year.

Defence Secretary Rajesh Kumar Singh and Defence Minister Rajnath Singh

Reforms are an ongoing process, and in most cases, these are long-drawn-out. It took almost two decades for India to appoint a Chief of Defence Staff after the idea was first mooted by the Kargil Review Committee. The committee had also recommended the creation of integrated theatre commands, which India has been actively working on for several years now.

The last concrete development in this regard was the enactment of the Inter-Services Organisations (Command, Control and Discipline) Act 2023. Interestingly, the rules notified under this Act came into effect only on May 27, 2025. Earlier, three Joint Logistics Nodes (JLNs) were set up in 2021 at Mumbai, Guwahati, and Port Blair to integrate logistics and enhance coordination between the three services.

These were important steps towards ensuring jointness among the armed forces, but the formation of integrated theatre commands does not seem imminent. The Standing Committee on Defence (SCoD) examined this issue as recently as February/March 2025, but its report gives no indication of how close the MoD is to setting up the integrated commands.

The statement given by the MoD to the SCoD that in 'pursuance of the Government's directive, the Indian Armed Forces are moving towards creating and operationalising Theatre Commands' is too bland to inspire confidence that the Year of Reforms will culminate in the reorganisation of the existing 17 commands of the armed forces into three or five theatre commands, which is the number of integrated commands being mentioned in media reports.

The situation may appear glum, but the glass is still half-full. Drawing inspiration from Oscar Wilde's famous line in the play Lady Windermere's Fan, 'We are all in the gutter, but some of us are looking at the stars', the MoD can make use of the remaining six months of the year to at least formulate half-a-dozen or so concrete plans for reforms. Ideas are worthless without action, or at least a plan of action.

It will, of course, require out-of-the-box thinking, which cannot come from within the imposing confines of South Block. Ideation requires a free-wheeling exchange of views, challenging established precepts, and considering seemingly impossible options.

This is possible only in an atmosphere that is not straitjacketed by bureaucratic hierarchy. Unlike the United States of America and other countries like the United Kingdom in Europe, where think tanks work in tandem with the government and provide invaluable inputs for the formulation of policy and the strategies for their implementation, defence think tanks in India mostly operate on a parallel track with the MoD.

The Manohar Parrikar Institute for Defence Studies and Analyses, which is fully funded by the MoD, has vast resources and can play a pivotal role in facilitating the crystallisation of ideas on various issues that form the core of defence reforms, but its resources have not been optimally utilised by the MoD all these years. This is also true of many other service-specific think tanks which have been functioning for a long time.

Amidst all this, there is at least one area where some

GUEST COLUMN

tangible outcome is expected by the end of the year. A committee was set up by the MoD in April 2025 to revise the Defence Acquisition Procedure 2020 (DAP 2020), which generally governs capital acquisitions for the armed forces' modernisation. It will be prudent to focus on this project, which can potentially produce a tangible result before the culmination of the Year of Reforms.

The procurement procedure was first promulgated as a public document in 2002 when it was known as the Defence Procurement Procedure, or DPP. The DPP was revised in 2003, 2005, 2006, 2008, 2011, 2013, 2016, and lastly in 2020, when it was also rechristened.

Meanwhile, a separate procedure for revenue procurements was laid down by way of the Defence Procurement Manual (DPM) 2005, which was revised in 2006 and 2009. A supplement to the DPM 2009 was issued in 2010, and a draft DPM (in two volumes) was circulated by the MoD in 2021 for comments, but evidently, it was never finalised. It is not known if any move is currently afoot to revise the DPM.

The following broad objectives of the DAP 2020 were laid down by the MoD in a recent notification:

(a) To meet the operational requirements and modernisation of the armed forces in a timely manner to ensure the security of the nation.

(b) To align the DAP with the Government of India's policies and initiatives to:

(i) Achieve 'Aatmanirbharta' or self-reliance, by promoting technology infusion through indigenously designed and developed systems,

(ii) Enable 'Make in India' by promoting defence manufacturing in India by facilitating the formation of joint ventures, creating avenues for the transfer of technology to the private sector, encouraging foreign OEMs by suitable alignment of the foreign direct investment policy, and making India an international defence manufacturing and MRO (maintenance, repair, and overhaul) hub,

(iii) Promote 'design and development', both in the public and private sectors, for the infusion of indigenous technology and design by startups, innovators, and the private defence industry.

The Review Committee has sought the comments of all stakeholders by July 5 to make suitable changes in DAP 2020 relating to procurement policy and procedure. This provides an opportunity for all stakeholders, particularly the industry, to express their views and seek changes that are reasonable and practical and not driven by ambition.

However, the industry and indeed the armed forces have had such opportunities in the past. DAP 2020, and practically all previous DPPs, were revised by the MoD after extensive consultation with all stakeholders, but the revised procedure has seldom satisfied everyone.

Within a year of the promulgation of DAP 2020, the then Chief of Army Staff General MM Naravane lashed out at the overbearing nature of the rules and regulations leading to a 'zero-error syndrome' and called for a 'revolution in bureaucratic affairs' to ensure that soldiers received the required equipment on time. It was surprising that the armed forces had been involved in the year-long deliberations that preceded the promulgation of DAP 2020.

The biggest achievement of the Year of Reforms will be if the review of the capital acquisition procedure results in the promulgation of a system that satisfies not only the objective of capital acquisitions but also all stakeholders, without whose cooperation India cannot become a manufacturing hub, achieve self-reliance in defence production, and, most importantly, equip the armed forces with the capabilities they require to discharge the responsibilities entrusted to them. It is a tall order, but nothing is impossible unless one concedes it is.

–The writer is a former Financial Advisor (Acquisition), Ministry of Defence. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

COVER FEATURE

Today we are witnessing a significant void in global leadership. This has opened a rare opportunity for India to emerge as a global change maker. India is well positioned with its wisdom, balanced approach, and strategic resolve. Can India deliver and rightfully fill this global leadership void while facing multi-directional pressures?

Raksha Anirveda's cover feature themed - **India: The Global Change Maker** through a collection of articles, brings in a balanced perspective...

COVER FEATURE

FROM A RELUCTANT GIANT TO GLOBAL GAME-CHANGER: INDIA'S PATH TO STRATEGIC LEADERSHIP

In an era of shifting power dynamics, India is positioned to play a strategic role by leveraging its economic growth and geopolitical goodwill. It can provide a new vision for global leadership, one that transcends the traditional superpower frameworks

RAKESH KRISHNAN SIMHA

In the rapidly evolving 21st-century global order, the question of leadership is more complex and contested than ever before. The post-World War II international system, shaped by US-led liberal hegemony, is in a state of flux. Amid this turbulence, India stands at a crossroads. It is neither a superpower nor a minor player, but it possesses unique attributes that position it as a potential strategic player on the global stage. India must seize this historic opportunity to shape the emerging world order — not necessarily as a hegemon, but as a pivotal actor capable of catalysing cooperation, managing rivalries and anchoring a more just, pluralistic and multipolar global system.

A VOLATILE WORLD AND THE LEADERSHIP VACUUM

The international order that emerged after 1945 was established on the twin pillars of the United States' military and economic dominance, and a liberal and rules-based framework that sought to promote peace, trade, and multilateralism. However, this order is now under severe strain. The rise of revisionist powers, especially China, challenges the foundational assumptions of this system. China's assertive territorial claims, techno-authoritarian governance model, and efforts to reshape global institutions have unsettled many states. Simultaneously, liberal democracies in the West face internal political polarisation, economic challenges, and a growing scepticism towards globalisation and multilateralism.

Multilateral institutions such as the United Nations, the World Trade Organisation, and the International Monetary Fund are increasingly hampered by gridlock and a lack of reform. New regional and multipolar alignments — such as AUKUS — are emerging, but without clear leadership or coherence. A leadership vacuum is never a good thing because it can result in anarchy and conflicts that can spiral out of control.

India's vision for Viksit Bharat 2047 — creating a developed India by its 100th year of Independence — centres on Aatmanirbharta or self-reliance. This is often misunderstood as isolationism, but in reality, it is a developmentalist doctrine emphasising the

Prime Minister Narendra Modi with French President Emmanuel

strengthening of domestic capacities to engage the world from a position of strength. The country's emphasis on building digital public infrastructure, fostering inclusive economic growth and nurturing democratic resilience is not inward-looking but outward-facing. It offers a compelling alternative to the binary of Western neoliberalism and Chinese techno-authoritarianism.

India's ancient civilisational pluralism and democratic ethos provide a model of governance that is both rooted in tradition and adaptable to modern challenges. In a world grappling with ideological polarisation, India's vibrant democracy, which embraces diversity and dissent, offers a template for coexistence. The global community, fatigued by binary choices and hegemonic dominance, is increasingly receptive to such alternative models.

The current global volatility and leadership vacuum, therefore, presents an unprecedented opening for India to step forward — not as a hegemon seeking dominance, but as a strategic playmaker offering a new paradigm of leadership grounded in cooperation with all countries.

INDIA AS A GLOBAL SWING STATE

The concept of a "global swing state" is essential to grasping India's distinctive and increasingly influential role in international affairs. Unlike traditional superpowers that dominate global politics through overwhelming military or economic might, a swing state wields influence precisely because of its ability to pivot between competing powers and shape outcomes through strategic choices. American policy experts Richard Fontaine and Daniel M Kliman have aptly described India as the quintessential global swing state — an actor whose decisions and alignments could decisively alter the trajectory of world affairs in the coming decades.

This characterisation is far from mere diplomatic flattery or theoretical abstraction. It is rooted in tangible geopolitical, economic and demographic realities that confer upon India a unique leverage. The country's vast population, rapidly expanding economy and strategic geographic location at the crossroads of South Asia, Central Asia and the Indo-Pacific region grant it a centrality that few other nations possess. Moreover, India's longstanding commitment to strategic autonomy — eschewing rigid alliances in favour of flexible, interest-based partnerships — allows it to navigate complex global rivalries with agility.

As a swing state, India holds the power to influence critical issues ranging from regional security and trade to climate action and technological governance. Its choices can tip the balance in global institutions, shape emerging norms and foster cooperation or competition among great powers. In an era marked by uncertainty and shifting alliances, India's role

Macron (L), US President Donald Trump (C) and Italian Prime Minister Giorgia Meloni

The international order established after WW II was based on two pillars: first, the military and economic might of the United States, and second, a liberal and rules-based framework for peace, trade, and multilateralism. However, this order is now under strain. China and other nations have challenged the foundation of this system

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The current global volatility and leadership vacuum presents an unprecedented opening for India to step forward, not as a hegemon, but as a strategic player offering a new paradigm of leadership grounded in cooperation with all countries

as a global swing state is not only plausible but increasingly indispensable for maintaining a stable and inclusive international order.

DEMOGRAPHICS AND ECONOMIC POTENTIAL

With over 1.4 billion people, India has surpassed China as the world's most populous country. Its demographic dividend — characterised by a young, increasingly skilled workforce — provides a powerful engine for economic growth and innovation. Its economy is currently the fourth largest globally in nominal terms and is expected to become the third largest by the early 2030s, surpassing Germany. This growth trajectory is supported by reforms in infrastructure, digitalisation, manufacturing and services.

India's expanding middle class and consumer market make it an attractive destination for investment and trade. Moreover, the country's commitment to sustainability and renewable energy, as evidenced by its leadership in the International Solar Alliance, aligns with global priorities on climate change. India walks the talk.

EMERGING STRATEGIC PLAYBOOK

India's strategic posture is evolving from a traditionally cautious, status quo approach to a more assertive and proactive one. This transition is evident in both policy and practice.

Operational Readiness and Force Projection: Operation Sindoor signals India's growing willingness to project power and manage regional contingencies. This builds on precedents like Operation Raahat in Yemen, where India successfully evacuated hundreds of foreign nationals amidst conflict.

India's expanding military capabilities, including the modernisation of its navy and air force, reflect an intent to secure its maritime interests and assert influence in the Indo-Pacific. The development of indigenous platforms such as the Tejas fighter jet, the Arihant-class nuclear submarine and the induction of advanced missile systems demonstrates a commitment to self-reliance in defence.

Doctrinal Clarity and Challenges: Despite these advances, India's strategic doctrine remains somewhat opaque. While strategic ambiguity offers flexibility, it can undermine deterrence and credibility. Clear articulation of red lines, response mechanisms,

External Affairs Minister S. Jaishankar interacts with Members of the European Parliament

and strategic objectives is vital for both domestic confidence and international signalling.

Information Warfare and Narrative Shaping: In the contemporary era, conflict extends beyond kinetic warfare to include cyber operations, disinformation campaigns and narrative battles. India must enhance its capabilities in information warfare to defend against cyber threats and proactively shape international opinion. For instance, during Operation Sindoor, India won the battles, leaving Pakistan's defences in tatters, but Pakistan's info warfare fooled most of the global media.

India's cultural diplomacy, digital outreach and fact-based narrative projection — exemplified by platforms like the CoWIN vaccine portal — have demonstrated potential. Expanding these efforts through coordinated digital influence operations and strategic communication can amplify India's soft power.

Defence Modernisation: The 'Make in India' initiative aims to reduce dependence on foreign arms imports and boost indigenous defence manufacturing. While progress has been made, critical gaps remain in technology, supply chains and innovation ecosystems.

Bridging these gaps is essential for sustained strategic autonomy. Partnerships with countries such as the US, France, Israel and Japan for technology transfer and joint development can accelerate modernisation while nurturing domestic capabilities.

FOREIGN POLICY RESET

India's foreign policy is undergoing a quiet but determined reset, moving from Cold War-era non-alignment to a more pragmatic multi-alignment strategy, often described as Strategic Autonomy 2.0.

Indo-Pacific Engagement: India's maritime turn is evident in its active participation in the QUAD alongside the United States, Japan and Australia, aimed at promoting a free, open and inclusive Indo-Pacific. Trilateral dialogues such as India-France-UAE and initiatives like the Indo-Pacific Oceans Initiative reflect India's commitment to regional security, maritime domain awareness, and sustainable development.

G20 Presidency and Global South Leadership: India's presidency of the G20 in 2023 marked a milestone in its global leadership. It emphasised integrating the voices of the Global South, advocating for equitable vaccine distribution, climate finance and debt relief. This normative balancing act reinforced India's image as a champion of developing countries' interests.

West Asia Outreach: Diplomatic agility is also visible in the West Asia policy. Balancing relations with Israel, Iran and the Gulf Cooperation Council (GCC) states amidst overlapping crises in the Middle East demonstrates India's nuanced and pragmatic approach. This outreach secures energy supplies, supports the Indian diaspora, and enhances strategic partnerships.

Russia-Ukraine Dilemma: New Delhi's response to the Russia-Ukraine conflict illustrates its calibrated diplomacy. While condemning civilian casualties and advocating for peace, India has maintained strategic energy and defence ties with Russia, reflecting its commitment to strategic autonomy and realpolitik.

Diverse diplomatic portfolio: India is a member of BRICS, the Shanghai Cooperation Organisation (SCO), the G20 and the QUAD, among others. This allows India to engage with a broad spectrum of countries and coalitions, bridging the Global North and South.

Strategic autonomy: The refusal to be locked into rigid alliance structures gives India the latitude to shape global norms and outcomes rather than merely reacting to them. This flexibility enhances India's credibility as a swing state capable of balancing competing interests and fostering dialogue.

India's leadership must internalise a shift from a reluctant participant to a proactive shaper of global norms and institutions. It must invest in doctrinal clarity, defence modernisation, information warfare capabilities and diplomatic agility

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While progress has been made, critical gaps remain in technology, supply chains and innovation ecosystems. Bridging these gaps is essential. Partnerships with the US, France, Israel and Japan for technology transfer and joint development can accelerate modernisation while nurturing domestic capabilities

(L-R) Belarus' Defence Minister Viktor Khrenin, India's Defence Minister Rajnath Singh, Iran's Defence Minister Amir Nasirzadeh during the Defence Ministers' Meeting of the Shanghai Cooperation Organisation (SCO)

WILL THE WORLD ACCEPT INDIA'S LEADERSHIP?

The global middle powers and the Global South are engaged in a complex hedging game amid great-power rivalries and regional conflicts. With the United States and China locked in strategic competition, Russia embroiled in Ukraine, and the Middle East volatile, there is no clear hegemonic successor or stable concert of powers.

Appeal to the Global South: India's leadership is attractive to the Global South because it lacks colonial baggage and the conditionality-heavy assistance associated with Western powers. It's South-South cooperation, climate action initiatives and technology sharing, such as the CoWIN portal's global outreach, resonate deeply with developing countries seeking equitable partnerships.

Value to Western Allies: While not a formal ally, India is an indispensable partner for Western democracies. Its democratic credentials, large market, and role as a strategic counterbalance to China make it a critical node in the emerging global architecture.

Regional Powers' Alignment: Countries like the UAE, Indonesia, Japan and Brazil increasingly align with India's worldview of decentralised global governance, a rules-based order without Western imposition and inclusive development. This growing convergence enhances India's legitimacy as a strategic player.

Tightrope of Leadership: Acceptance of New Delhi's leadership will depend on its ability to walk a tightrope: maintaining democratic values while ensuring strategic coherence; resisting coercion without alienating partners; and leading without slipping into hegemonism. India's pluralistic ethos and diplomatic finesse will be tested in this endeavour.

FROM HESITANT POWER TO STRATEGIC PLAYER

India's rise is neither inevitable nor uncontested. It faces significant internal and external challenges, including economic disparities, infrastructural deficits and complex geopolitical rivalries. Yet, the global order today does not require another hegemon imposing dominance but a strategic playmaker capable of catalysing cooperation, managing rivalries and anchoring order without coercion.

India's civilisational ethos, economic momentum, strategic centrality and democratic vibrancy uniquely position it to fulfil this role. To do so, the country's leadership must internalise a shift from a reluctant participant to a proactive shaper of global norms and institutions. It must invest in doctrinal clarity, defence modernisation, information warfare capabilities and diplomatic agility.

The future world order may not belong to traditional superpowers but to those who can bridge divides, balance interests and build enduring coalitions. India's moment has arrived — not merely for its own ascent but for a world in search of stable, just and non-hegemonic leadership.

– 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 of the writer and do not necessarily reflect that of ***Raksha Anirveda***

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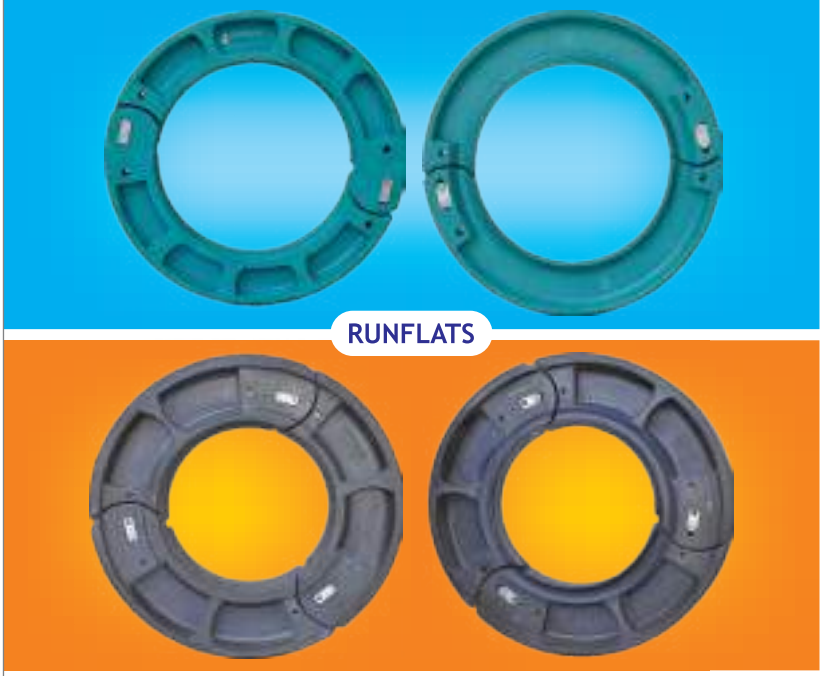

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COVER FEATURE

PLAYING IT BY OUR RULES

The changing conditions around the world mandate that India change the rules of its engagement

PRANAY K SHOME

Change is the order of life. German philosopher Hegel, who created the theory of dialectics, highlighted that change is of paramount importance for the creation of both the thesis and the antithesis, with the friction generated by the resultant clash resulting in the creation of a new idea - the thesis, this clash continues till a perfectly new idea is developed.

Something of that sort occurs in the realm of international politics, especially for an aspiring great power like India. In the past one year, a lot of changes have taken place around the world, particularly in India's neighbourhood. Given the uncertain nature of changes, New Delhi had to adapt itself, albeit based not on the old playbook, but on a new playbook with completely new rules of engagement.

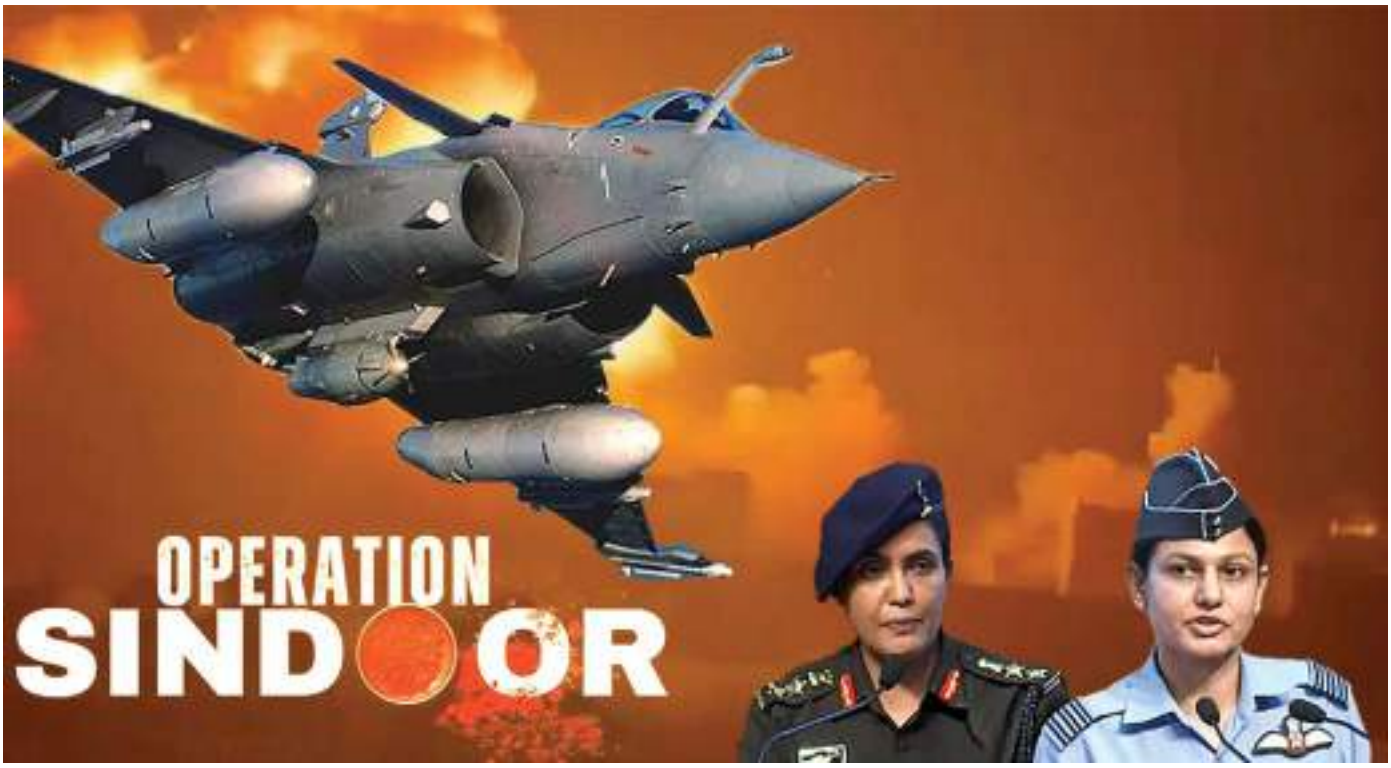
A BOLDER INDIA

The India of the 21st century is a bold and strong state actor. Boasting the world's fourth-largest economy and one of the strongest armed forces in the world, New Delhi means business. While India advocates the cause of peace and stability both regionally and internationally, any attempt to undermine the sovereignty of India would be met with a brutal and swift response.

This was on full display in the aftermath of the April 22 terror attack in Pahalgam, Kashmir. With New Delhi tightening the noose around Islamabad diplomatically and economically, it ultimately culminated in an audacious military operation called Operation Sindoor. Nine targets deep inside Pakistan Occupied Kashmir and Pakistan were struck in airstrikes, carried out by the state of the art missiles by Indian fighter aircraft. All targets were neutralised with clinical efficiency.

While India responded militarily to the affront to its sovereignty, New Delhi intellectually dismantled Pakistan's lies of the two-nation theory peddled by the now 'Field Marshal' of the Pakistani armed forces Asim Munir by making two career woman officers, one belonging to the army and the other to the air force, the face of daily press briefings. What was highly noticeable was the religious harmony this representation carried.

India, in Prime Minister Narendra Modi's address to the nation, made it very clear to our



nemesis Pakistan that its use of nuclear blackmail to 'bleed India by a thousand cuts' would no longer work. New Delhi also elaborated that any further terror attack on its soil would be taken as an act of war with India responding proportionately.

HYPOCRISY OF THE WEST

While the countries in the Euro-Atlantic region have emerged as one of the most important sources of economic, political and security engagement with New Delhi, what acts as a thorny issue in ties is the doublespeak of the Western powers.

Upon the outbreak of the Russia-Ukraine conflict, the West invested immense diplomatic capital in India in the process of convincing New Delhi to join the Western bandwagon in condemning Russia despite knowing that Russia is an important strategic partner for India; gaining little support from India in the process, the West started subtly condemning India. The threat of sanctions against Indian purchases of Russian crude oil and Russian weapons platforms, both on existing deals and new ones are cases in point.

In the aftermath of Operation Sindoor followed by drone attacks carried out by Pakistan and retaliatory Indian strikes, the West urged caution. What makes this doublespeak all the more glaring is the fact that the West has been complicit in arming and providing ample opportunities to the Pakistani pseudo-republic to carry out its nefarious designs against India. The IMF loan provided to Pakistan is an excellent example.

The double game tactics of the West were exposed by the learned external affairs minister of India, Dr S Jaishankar, when he highlighted that while India expects the world to be united in the fight against terrorism, he expected countries to be partners, not preachers, taking in the process, an indirect jibe at Europe.

A NEW PLAYBOOK

In international relations, every major power has a distinct style of pursuing its national interests based on the social, cultural and political specificities of its internal and external conditions. The situation is no different for India.

Given the multiplicity of security issues that New Delhi is facing, India has formulated new rules of engagement. These involve treating territorial disputes strictly on a bilateral basis. For instance, when US President Donald Trump claimed that it was the US who successfully stopped the skirmish between India and Pakistan through mediation, New Delhi rejected the insinuation.

India highlighted that the issue of Kashmir is a strictly bilateral matter that would be dealt with between the two neighbours; there is no scope for international mediation.

The 21st century India is a bold and strong state actor with the world's fourth-largest economy and one of the strongest armed forces. While India advocates peace and stability both regionally and internationally, any attempt to undermine its sovereignty would be met with a brutal and swift response

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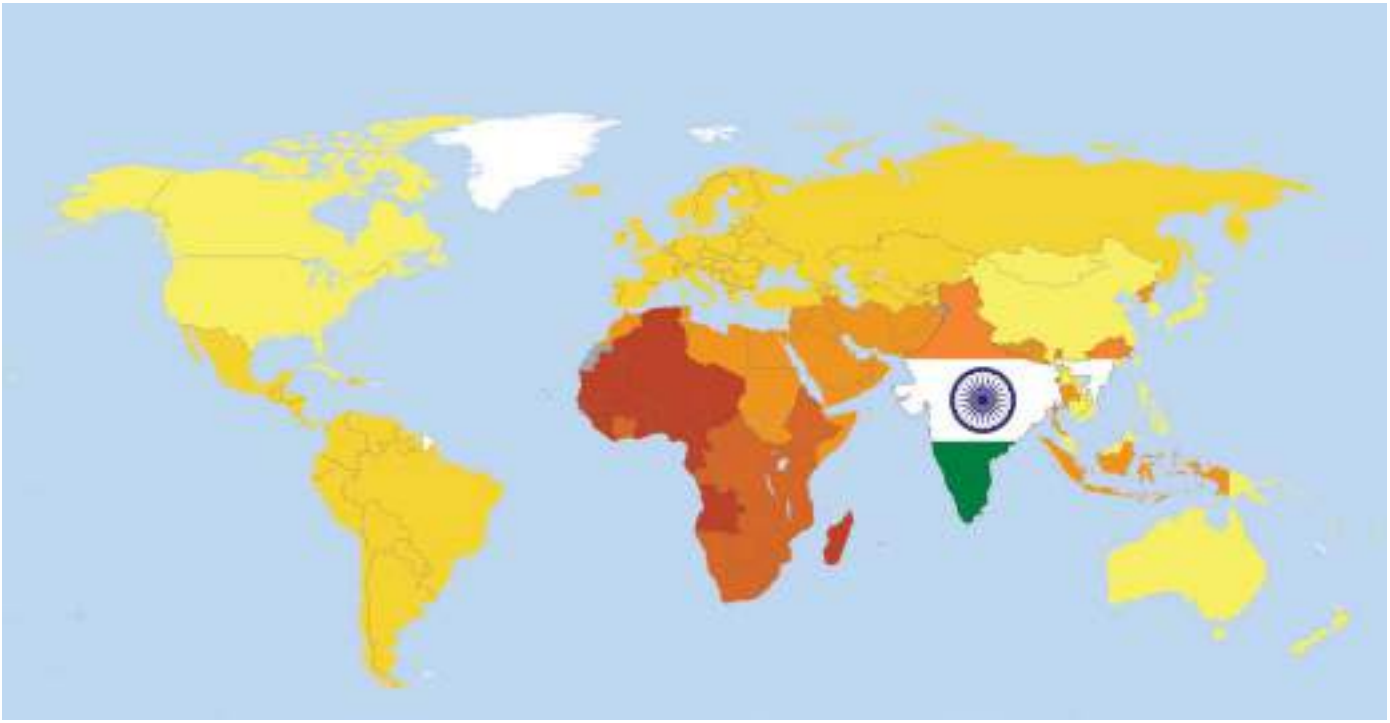

Prime Minister Modi's address to the nation made it clear to Pakistan that its use of nuclear blackmail to 'bleed India by a thousand cuts' will no longer work

Another key part of this new playbook is the idea that in order to protect its national security and territorial sovereignty, India will not hesitate to take steps that may possess the potential to upset the international community, the kinetic response to Pakistani terrorism is a case in point. Further, the gradual improvement of ties between India and the Taliban regime in Afghanistan, which was until a few years ago, designated individuals with a distinct anti-India approach in their first stint in power are now gradually warming up to India to balance Pakistan.

Therefore, following the Kautilyan dictums of statecraft and diplomacy is of paramount importance for India.

Economics plays a key role in shaping the relationship between state actors. It is a key part of New Delhi's new playbook. As India is aggressively negotiating FTAs with different countries and trading blocs around the world, it is doing so keeping in mind the need to guard its national interests. This is clearly evident from the recent Free Trade Agreement India signed with the UK which saw the dairy sector, the source of livelihood of millions of farmers and the backbone of the MSME sector in India being excluded from the deal.

India is likely to follow a similar approach with the other negotiating parties when it comes to sensitive sectors of its economy.

A key question arises in this context - how will India convince the world about the rules of engagement of its new playbook?

Firstly, the statistics speak for themselves; India is the world's fastest-growing major economy and one of the biggest markets and consumers of important commodities and goods. International politics is a two-way street, just like India needs the world for its prosperity; the world needs India to act as an important stakeholder in global matters - from economic development to climate change.

Secondly, India's soft power, which is the product of its 5000-year-old civilisational heritage, exerts a positive influence in perception building vis-à-vis other countries, allowing India to build on it.

However, being complicit is not an option. New Delhi is rightly aware of that and has dispatched several inter-party delegations to over 30 countries to disseminate India's message that India stands for zero tolerance to terrorism.

Hence, it is necessary for India to continue building strategic capital across the world through its deft diplomacy while ensuring the protection of its sovereignty against all threats.

– The writer is currently working as a Research Associate at Defence Research and Studies (dras.in) and is a columnist. The views expressed are personal and do not necessarily reflect the views of ***Raksha Anirveda***

AGNIT HARNESSES GaN TO POWER INDIA'S DEFENCE AND TELECOM SECTORS

While global powers dominate GaN technology, Agnit's audacious mission is to build an entirely Indian supply chain, reducing reliance on foreign imports amid growing geopolitical tensions

RA EDITORIAL DESK

Gallium Nitride (GaN), a revolutionary material transforming aerospace and telecommunications with its high-power, high-frequency capabilities, is now at the heart of India's rapid stride in advanced semiconductor technology. Agnit Semiconductors, a trailblazing start-up born at the Indian Institute of Science (IISc), is leveraging GaN to innovate in critical sectors like defence, next-generation telecom, satellite communications, and electric vehicles.

Emerging from a 15-year collaboration that began in 2006, Agnit was founded by five IISc professors and two PhD scholars determined to unlock GaN's potential. Unlike silicon, GaN's wide bandgap enables superior performance in radar systems, secure communications, and high-efficiency electronics, making it indispensable for mission-critical applications. While global powers dominate GaN technology, Agnit's audacious mission is to build an entirely Indian supply chain, reducing reliance on foreign imports amid growing geopolitical tensions.

Under the leadership of Hareesh Chandrasekar and Muralidharan Rangarajan, Agnit has taken a bold approach, tackling both chip design and manufacturing. This end-to-end strategy encompassing material research, chip architecture, and foundry partnerships,

Hareesh Chandrasekar, CEO and Co-founder of AGNIT Semiconductors

distinguishes it from most start-ups in India and abroad, which typically focus solely on design to cut costs. The company is ably supporting India's decarbonisation goals through energy-efficient technologies.

Agnit's efforts align with the Indian government's push for indigenisation, backed by the Ministry of Defence's Innovations for Defence Excellence (iDEX) initiative. The start-up is currently testing its GaN-based solutions in five pilot projects—three with Defence Public Sector Undertakings and two with private defence firms. These trials, spanning radar and communication systems, signal Agnit's potential to reshape India's strategic capabilities.

However, the company looks to robust support to bridge the gap between product development and commercial success. While iDEX offers a start, viability gap funding and long-term procurement commitments from the government are critical to sustain R&D and attract private investment.

As the start-up navigates funding challenges and bureaucratic complexities, its work could redefine India's technological sovereignty, powering everything from secure military networks to the nation's electric vehicle revolution.

COVER FEATURE

THE INDIA MODEL OF WORLD ORDER: A MULTIPOLAR PATH TO INCLUSIVE GLOBAL LEADERSHIP

India's multipolar, collective-order approach stands out as an alternative to both the West-led order, which is self-centric, and the East-led model under China, which lacks transparency. Often misunderstood as fence-sitting, External Affairs Minister S Jaishankar calls it 'the third option'. India proposes equitable growth across the Global South and presents itself as a partner that can be trusted. India's voice carries the quiet credibility of action over rhetoric

External Affairs Minister S Jaishankar

DR MANJARI SINGH

A profound vacuum in international leadership has emerged as the world grapples with pervasive conflicts, climate stress, and the breakdown of trust in global institutions. As the old Western-led order loses moral authority and the China-centric model lacks transparency and rule-based governance, many countries, particularly the Global South, seek a more inclusive, development-focused approach to cooperation. India, in that context, with its democratic ethos, civilisational depth, and pragmatic diplomacy, is perceived as a promising choice. It is not merely rising as a power but is also evolving into a stabilising force, a bridge-builder, and a credible voice for shared futures.

India's growing stature on the world stage is backed by tangible economic strength. As of May 2025, India's nominal GDP crossed $4.3 trillion, making it the fourth-largest economy globally, surpassing Japan. The International Monetary Fund projects a real growth rate of 6.5 per cent in 2025, maintaining India's position as the fastest-growing major economy. Foreign direct investment remains robust, exceeding $70 billion in 2023-24, while foreign exchange reserves now stand at over $570 billion. This macroeconomic stability reflects a carefully managed mix of domestic demand, fiscal discipline, and innovation-driven growth across sectors.

Part of this economic success is anchored in India's digital revolution. The Digital Public Infrastructure (DPI) export to countries such as Mauritius, Sri Lanka, the Philippines, and Kenya reflects how technology developed at scale in India can serve as a public good globally. Platforms like Aadhaar and UPI enable efficient welfare delivery, financial inclusion, and governance transparency at a low cost. Hence, these efforts are not just technological exports, but instruments of soft power and capacity-building diplomacy. They signal India's willingness to share what works.

This is also where India's Aatmanirbhar Bharat (self-reliant India) initiative has shown early results. Introduced in 2020 to enhance economic self-reliance, the initiative has already mobilised more than $23 billion in production-linked incentives across various sectors such as semiconductors, pharmaceuticals, renewable energy, and electronics. Today, over 70 per cent of smartphones sold in India are manufactured domestically. More importantly, it has increased the country's resilience to global supply shocks, while boosting its profile as a reliable manufacturing and innovation hub for the world.

Beyond technology, India's diaspora of over 32 million acts as India's 'national influencers' or Vishwabandhu (global friends), extending India's reach, as reiterated by External Affairs Minister Dr S Jaishankar during an interview with Dr Sreeram Chaulia's show 'Indian Diplomacy' hosted at national broadcaster, Doordarshan. In parliaments from Washington to Canberra to London, India caucuses champion closer ties, trade, and policy collaboration, while in local communities they strengthen cultural bonds and enable swift humanitarian responses. In addition, remittances from the diaspora, totalling over $100 billion a year, fuel development domestically.

Furthermore, India's development diplomacy, especially in the Global South, adds depth to this economic outreach. The Ministry of External Affairs' Development Partnership Administration (DPA), launched in 2012, coordinates over $30 billion in grants and lines of credit across more than 65 countries. These include solar micro-grids in Bhutan, convention centres in Niger, hospitals in Rwanda, and water purification projects in Latin America amongst other initiatives. New Delhi's initiatives are unique and widely welcoming because of its non-prescriptive and consultative approach. Unlike traditional donors or strategic lenders, India's development model is cooperative rather than transactional, and inclusive rather than extractive.

As the world reels from a string of 'grey rhino' crises ranging from climate extremes to food insecurity and infrastructure collapse in war-affected regions, India's emphasis on sustainable development becomes even more relevant. When the Russia-Ukraine conflict triggered food shortages, India safeguarded its domestic food security first but swiftly resumed wheat and rice supplies to the World Food Programme and partner nations. It remains one of the largest suppliers of rice and pulses to Africa and South Asia. During the COVID-19 pandemic, under Vaccine Maitri, India supplied over 200 million doses of vaccines and essential medicines to more than 100 countries, becoming a first responder when global supply chains were paralysed.

Additionally, policy analyses up until 2018-19 pointed to gaps in India's evacuation policy, particularly visible during Middle East crises. Those insights often flagged by this author in her writings at academic and government forums have since shaped a comprehensive overhaul. Today, the government has instituted a dedicated evacuation fund, a streamlined grievance-redress mechanism, rapid-response teams, and multiple evacuation channels, ensuring that Indian citizens abroad can count on swift, reliable assistance in emergencies.

India's leadership in climate diplomacy also reflects a long-term vision. It chairs the International Solar Alliance, now joined by over 100 countries. At COP28, India played a key role in securing a $100 billion 'loss and damage' commitment to help vulnerable nations adapt to climate shocks. It also promotes green hydrogen corridors and offshore wind alliances with countries in Europe and Asia.

With its democratic ethos, civilisational depth, and pragmatic diplomacy, India is evolving into a stabilising force and a bridge builder. India's growing stature on the world stage is backed by tangible economic strength. India's nominal GDP hit the $4.3 trillion mark, making it the fourth-largest economy, surpassing Japan. IMF projects a real growth rate of 6.5% in India in 2025

These actions are not driven by tokenism; they are rooted in India's conviction that climate justice must guide climate action.

India's regional outreach is anchored in its Indian Ocean policy through initiatives like SAGAR (Security and Growth for All in the Region) and the MAHASAGAR platform. These are shaping maritime cooperation on everything from anti-piracy to disaster relief. The Indian Ocean Rim Association (IORA) and Indian-led efforts in coordinating humanitarian assistance and disaster response have made India a dependable anchor for regional stability. The India-Middle East-Europe Economic Corridor (IMEC), announced in September 2023, illustrates India's connectivity diplomacy. It links ports in the Gulf to Europe via Israel and Jordan, offering a transparent and trade-friendly alternative to opaque debt-driven infrastructure models.

Yet, India's strategic positioning is often misunderstood as fence-sitting. This perception misses the nuance of what External Affairs Minister

COVER FEATURE

Prime Minister Narendra Modi attending the Outreach Session on Energy Security at the G7 Summit in Kananaskis, Canada

S Jaishankar calls the 'third option', a posture that upholds strategic autonomy rather than aligning with power blocs and forming exclusive partnerships. India does not follow binaries. It builds bridges. By refusing to be drawn into Cold War-style camps, India presents itself as a partner that others can trust, especially smaller and medium-sized nations caught in the crosswinds of great-power rivalry. This posture is particularly valuable in a world where multilateral institutions often fail to represent the voice of the majority.

India's presidency of the G20 in 2023 proved this. It delivered long-awaited African Union membership in the group and shifted the conversation towards food security, inclusive finance, pandemic preparedness, and digital inclusion. India also launched the Global Biofuel Alliance and continues to steer the International Solar Alliance. In every such forum, the message has been consistent: India stands not just for itself, but for equitable growth across the Global South.

Domestically, the Viksit Bharat 2047 roadmap lays out a bold development blueprint to make India a fully developed nation by its centenary of Independence. It prioritises universal health care, education, green energy leadership, and a trillion-dollar digital economy. Complementing this is the Panch Pran of Amrit Kaal, that is, the five

fundamentals that guide India's ascent, namely, the unwavering goal of national development, the elimination of any colonial mindset, honour and pride in our roots, the cultivation of unity, and a reinforced sense of duty among every citizen. Together with Aatmanirbhar Bharat, this roadmap underpins India's aspiration to project itself not as a hegemon, but as a responsible development partner, globally active, but never interventionist.

India's influence extends far beyond economics. Its foreign policy today embodies a transition from the earlier idea of Vishwaguru – not positioned along a power-driven Western leadership discourse but more towards a guiding teacher of values – to Vishwamitra and Vishwabandhu – a global friend and equal partner. This conceptual shift reflects a grounded understanding of 21st century geopolitics. India does not claim moral high ground or civilisational superiority, but rather prefers collaboration over coercion. Its goal is not to dictate terms, but to jointly frame agendas. That is a far more acceptable form of leadership for countries across Africa, Southeast Asia, Latin America, and even parts of Europe.

This cooperative leadership is also visible in India's tech diplomacy. Its DPI solutions are being piloted in Kiribati and Fiji, and are being considered by Brazil and Indonesia. Over 10 billion dollars in semiconductor investment commitments have come from the US, Taiwanese, and South Korean firms, reflecting India's role in global tech supply chain diversification. Meanwhile, India remains vocal at the UN and G20 on ethical AI, data sovereignty, and digital rights — issues that resonate deeply with developing nations.

The West-led order appears increasingly self-centric, while the East-led model under China often lacks transparency or inclusiveness. India provides a third perspective, one that is rules-based, democratic, and development-oriented. It does not seek to dominate, but to convene. Whether through green partnerships, food security initiatives, or post-conflict reconstruction support, India's voice carries the quiet credibility of action over rhetoric.

Challenges remain, undoubtedly. India must address gaps in infrastructure, sharpen institutional delivery, and expand its presence in under-represented regions such as Latin America and Francophone Africa. However, it enters this phase with a unique advantage, such as credibility, trust, and a cooperative spirit. A multipolar world looks for ideas that unite rather than divide. In a world accustomed to zero-sum calculations, India's multipolar, collective-order approach stands out as an alternative. It understands that the real tests of this century – over resources, climate resilience, food security and digital governance – demand alliances built on mutual interest and shared responsibility. India may still be emerging as a global leader, but its emphasis on sustainable development, respect for sovereignty, and democratic values offers a vision of international cooperation well suited to the challenges ahead.

–The writer focuses on contemporary Middle Eastern affairs and is the author of 'India and the Gulf: A Security Perspective'. She is also a subject matter expert at the Centre for Joint Warfare Studies.

India's leadership in climate diplomacy reflects a long-term vision. It chairs the International Solar Alliance, now joined by over 100 countries. At COP28, India played a key role in securing a $100 billion 'loss and damage' commitment to help vulnerable nations adapt to climate shocks. It also promotes green hydrogen corridors and offshore wind alliances with Europe and Asia

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CONFRONTING CHINA: INDIA'S DOCTRINAL CLARITY AND FOREIGN POLICY RESET

The era of strategic restraint and reactive diplomacy is over—India needs to address its strategic matrix of discomfort amidst the rising geopolitical challenges and shifting power dynamics with doctrinal clarity, multi-domain warfare readiness, and assertive foreign policy realignment

MAJ GEN SANJEEV DOGRA

India today stands at a pivotal strategic crossroads—encircled by converging threats and evolving battlefronts. The prospect of future wars being fought on multiple fronts is no longer hypothetical; it is a looming reality, sharpened by China's assertive expansionism, collusive threats from Pakistan, and instability across its maritime and continental peripheries. As Beijing deepens its hybrid, grey-zone, and psychological warfare, India's traditional postures of strategic restraint and reactive diplomacy appear increasingly inadequate.

To navigate this matrix of discomfort, India must undertake a dual recalibration: first, by forging a coherent, forward-leaning military doctrine tailored to 21st-century warfare; and second, by transforming its foreign policy discourse—from accommodation and ambiguity to assertiveness and alignment. The cost of inertia is rising; clarity is now a strategic necessity.

The world is drifting into an era of fractured alignments and fluid escalations. In Europe, the Ukraine-Russia war has rewritten the rules of deterrence, showing how attrition, economic isolation, and drone warfare can all redefine conventional superiority. In the Middle East, the simmering conflict between Israel and Iran—often spilling into Syria, Lebanon, and the Red Sea—threatens a regional conflagration. The United States, torn between global commitments and domestic fatigue, is recalibrating its leadership posture, often amplifying strategic vacuums.

Meanwhile, the Indo-Pacific is turning into a fulcrum of power struggle, with Taiwan and the South China Sea as the focal points. China's muscle-flexing in the region and its ambition to reorder global governance mechanisms are no longer veiled. Amidst this, India's neighbourhood has grown more fragile and volatile. Along the Line of Actual Control (LAC), China's tactical incursions are part of a long strategic game. Pakistan, emboldened by Beijing's backing, continues to act as a willing disruptor. The growing Chinese footprints in Nepal, the Maldives, and Sri Lanka have transformed India's periphery into a contested strategic buffer. The matrix of discomfort facing India is not only multidimensional—it is intensifying at a pace that outstrips India's institutional agility.

INDIA'S STRATEGIC POSTURE AND ITS LIMITATIONS

India's current strategic posture has been shaped by a legacy of strategic restraint—an approach that once enabled the country to prioritise growth, avoid entanglements, and preserve autonomy. But today, this very posture is beginning to show fatigue. India's security architecture remains largely land-centric, with a primary focus on holding territory rather than imposing costs. Our adversaries, meanwhile, have shifted the battlefield into the grey zones of cyber, information, space, and economic coercion.

Despite structural changes like the appointment of the Chief of Defence Staff (CDS), true tri-service integration remains elusive. Military planning still occurs in silos, procurement is fragmented, and inter-theatre coordination is embryonic. India's strategic ambiguity—once considered prudence—is increasingly being perceived as indecision. Diplomatically, India walks a careful line between the West and Russia, between the Indo-Pacific and Eurasia. But in a world of sharp power projection, caution without coherence risks irrelevance.

The problem is not of will or capability, but of strategic articulation. Without a codified national doctrine and integrated civil-military interface, India

risks being tactically reactive and strategically disjointed. The time for hedging has passed; the time for hard choices has arrived.

UNDERSTANDING CHINA'S LONG-TERM STRATEGIC AIMS

To understand the Chinese threat, one must look at the mindset that drives it—calculated, historical, and unapologetically expansionist. China's long-term objective is strategic primacy in Asia, and that vision cannot tolerate a resurgent, autonomous India.

Unlike Pakistan, China does not seek to provoke India into open war. Instead, it prefers incremental encroachment—salami-slicing land, building influence in India's neighbourhood, and boxing India in through ports, highways, debt diplomacy, and digital dominance. From the LAC to the Indian Ocean, from Sri Lanka to the Himalayas, Beijing's tactics are calibrated to apply pressure without breaching the threshold of war.

China also pursues narrative control—undermining India's global standing by blocking Nuclear Suppliers Group (NSG) membership, resisting United Nations Security Council (UNSC) reforms, and marginalising India in forums like BRICS (Brazil, Russia, India, China, and South Africa). Its deployment of surveillance infrastructure and its strategic partnerships in South Asia are aimed not just at military advantage but at influencing political choices in India's extended neighbourhood.

India, for China, is not just a military rival—it is a civilisational competitor. And in this grand contest, it's not just territory that is at stake—it is the very definition of Asian leadership.

DOCTRINAL CLARITY—WHY INDIA NEEDS IT NOW

Doctrine is not a luxury in modern warfare—it is a lifeline. India cannot afford to improvise its response every time the adversary shifts the playing field. A coherent doctrine is the bedrock of national preparedness—it defines the nature of threats, the thresholds of response, and the principles of deterrence.

Operation Sindoor was a telling reminder: when political will, inter-service coordination, and precise execution come together, India can act with purpose and impact. But that operation was exceptional—successful despite the absence of doctrinal codification. To replicate such outcomes

Adversaries have moved beyond traditional warfare, exploiting cyber, economic, and psychological domains. India's security architecture, still focused on territorial defence, must evolve to impose costs across these new battlefronts—or risk strategic irrelevance

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consistently, India must stop relying on individual brilliance and start depending on institutional clarity.

Our doctrine must evolve to reflect the realities of today's battlefield, which is no longer restricted to terrain and troops. We need a multi-domain doctrine that integrates space, cyber, artificial intelligence (AI), electronic warfare, and perception management. We must be prepared not just for limited wars and surgical strikes, but also for cognitive and economic warfare, as demonstrated in Ukraine, Syria, Israel-Gaza, and Iran's regional playbook.

Most importantly, India's military doctrine must shift from "hold and deny" to a more dynamic triad of:

1. Deterrence by denial (make aggression costly),
2. Deterrence by punishment (hold adversaries accountable across domains), and
3. Strategic manoeuvring (pre-emptive deployments, rapid force projection, and narrative dominance).

India must declare what it will not accept, what it will respond to, and how it will calibrate its retaliation. A doctrine is not just military—it's the strategic conscience of the nation.

THE CASE FOR FOREIGN POLICY REALIGNMENT

Foreign policy cannot remain rooted in yesterday's map. In a world of real-time threats and fluid alliances, India must adopt what statisticians describe as a Bayesian approach—where strategies are constantly updated

based on new information and evolving realities.

India's traditional model of hedging—being everywhere but committing nowhere—is no longer sustainable. The world respects clarity. India must move from an era of strategic non-alignment to an age of principled alignment. This means embracing partnerships not just for trade, but for tech, logistics, and security. The Quadrilateral Security Dialogue (Quad) must move from dialogue to deterrence. The India-Middle East-Europe Economic Corridor (IMEC) must evolve from blueprint to backbone. Engagement with Europe must be rooted in shared values, not just market access.

Regionally, the Neighbourhood First policy must become Neighbourhood Forward—where India offers not just aid, but security, resilience, and infrastructure alternatives to China's Belt and Road Initiative (BRI). In the Indian Ocean, India must become the net security provider it aspires to be—through bases, training missions, and logistics diplomacy.

The future foreign policy doctrine of India must rest on three pillars:

- Assertive Alignment with like-minded powers,
- Regional Leadership through capability and credibility, and
- Narrative Sovereignty, projecting India as a civilisational force aligned with global stability.

In this world of blurred battlelines and weaponised dependencies, foreign policy is no longer an extension of war—it is its deterrent twin.

WAY FORWARD: STRATEGIC, MILITARY, AND DIPLOMATIC RECOMMENDATIONS

Vision must now yield to action. The first step is the urgent release of a National Security Strategy that unifies doctrine, foreign policy, internal stability, and technological preparedness into a single framework.

Next, India must embed a culture of war-gaming and red-teaming across the services and ministries. Simulation-led decision-making, informed by scenario-based data, must replace intuition-based planning. The proposed theatre commands must not just coordinate—they must operate as agile combat hubs, empowered by real-time intelligence, surveillance, and reconnaissance (ISR) and digital battlefield systems.

On the military front, India must fast-track its Aatmanirbhar defence agenda in semiconductors, space surveillance, quantum communication, and drone swarms. Doctrinal clarity must be matched by technological readiness.

Diplomatically, India must lead with confidence—scaling up defence diplomacy, hosting multilateral wargames, providing humanitarian assistance, and shaping maritime governance norms. Every Indian action—be it in Sri Lanka, Africa, or Southeast Asia—must reaffirm its role as a responsible and resolute power.

In essence, if the doctrine defines the "what," and foreign policy sets the "where," then this stage is about the "how." The world is moving fast. India can no longer afford to be cautious in strategy and bold only in hindsight.

*–The writer is an Indian Army veteran with expertise in Operations Research and Systems Analysis. He commanded a Division along the Line of Control in High Altitude Area and retired as the Deputy Commandant of National Defence Academy. The views expressed are of the writer and do not necessarily reflect that of **Raksha Anirveda***

Modern deterrence requires more than military might. A dynamic triad of denial, punishment, and strategic manoeuvring—spanning AI, space, and electronic warfare—must replace outdated Cold War-era postures

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INDIA'S LEADERSHIP POTENTIAL IN A MULTIPOLAR WORLD: NAVIGATING PROMISE AND CONSTRAINTS

The world today finds itself in an uncertain place. The United States and China are facing challenges, and international institutions are struggling to respond to global problems effectively. In this changing environment, India is emerging as a potential global leader. India's democratic system, economic growth, independent foreign policy, and helpful role during global crises make it a strong candidate. However, India also faces significant challenges. These include resistance from big powers, hesitation from developing nations, and global narratives shaped by the West

ANURAG ASTHANA

The global leadership landscape is in transition. While the United States is dealing with internal divisions and a reduced appetite for global responsibility, China's growing power has led to distrust in many regions, especially among democratic and smaller nations. At the same time, international institutions like the United Nations and World Bank are seen as outdated and dominated by older powers.

In this context, India stands out. It is the world's largest democracy, has a fast-growing economy, and has been an active participant in solving global problems. India's actions during the COVID-19 pandemic, such as sending vaccines to developing countries, showed its willingness to lead. But global leadership is not only about good intentions; it also requires being accepted by others. India's rise is being watched with both hope and caution.

While the United States is dealing with internal divisions and a reduced appetite for global responsibility, China's growing power has led to distrust in many regions, especially among democratic and smaller nations. At the same time, international institutions like the United Nations and World Bank are seen as outdated and dominated by older powers

In today's world, rising geopolitical conflicts and trade wars are reshaping global alignments. National interests are increasingly overriding traditional multilateral diplomacy, leading to a decline in consensus-driven global governance. As a result, nations are moving toward transactional cooperation — focused more on immediate gains than shared values or long-term partnerships. This fragmented landscape complicates India's leadership ambitions, but also opens up opportunities for flexible and pragmatic engagement with diverse partners.

INDIA'S STRATEGIC STRENGTHS

India brings several key strengths that can help it play a leadership role globally:

a) Democratic Values: India is the world's most populous democracy. Despite its challenges, India continues to hold elections, maintain a free press, and operate under the rule of law.

This gives India moral credibility, especially among other developing countries.

b) Helping Others Develop: India has a strong record of supporting other countries through aid, training programmes, and sharing technology. For example, the 'Vaccine Maitri' initiative sent COVID-19 vaccines to more than 90 countries, as per Ministry of External Affairs' records.

c) Independent Foreign Policy: India does not blindly follow any one country or group. It engages with the US, Russia, Europe, and the Global South. This balanced approach allows India to be a trusted partner in a divided world.

CHALLENGES INDIA FACE

Despite these advantages, there are several reasons why India's leadership might not be accepted easily:

a) Resistance from Big Powers: The US still wants to lead the global system but finds it hard to share space. China, on the other hand, prefers dominance through projects like the Belt and Road Initiative. Shivshankar Menon., in his book 'India and the World: Through the Eyes of an Indian Diplomat' writes that India's approach, which focuses on cooperation and fairness, does not fit into the current global power model.

In today's world, rising geopolitical conflicts and trade wars are reshaping global alignments. National interests are increasingly overriding traditional multilateral diplomacy, leading to a decline in consensus-driven global governance. As a result, nations are moving toward transactional cooperation — focused more on immediate gains than shared values or long-term partnerships

b) Global South's Hesitation: Countries in Africa, Southeast Asia, and Latin America often prefer to stay neutral. They take support from China, the US, and India but hesitate to commit to any one leader. India needs to show long-term commitment to gain their full trust.

c) Western Narratives: Pankaj Mishra in his book, 'The Western Narrative Trap' rightly points out that much of the global media, academic research, and policy thinking is shaped by the West. These sources sometimes view India through a critical or

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The world is looking for a responsible and inclusive leader. India, with its history, diversity, and developmental approach, has what it takes. But leadership must be earned, not granted. India must invest in its story, its economy, and its relationships. With the right steps, India can play a key role in shaping a fairer, more balanced global future

narrow lens. As a result, India's voice and its own narrative get overshadowed.

WHAT INDIA CAN DO

India can still rise as a respected global leader by taking a few important steps:

a) Tell its Story Better: India needs to communicate its own development model and values. Investing in think tanks, research, and public diplomacy can help create a stronger international voice.

b) Deepen Ties with Developing Nations: India must build long-term partnerships with countries in Africa, Latin America, and Southeast Asia. These should go beyond aid and include technology, digital infrastructure, and climate cooperation.

c) Focus on Economic Growth and Social Harmony: A strong economy and a stable society are the foundations of any global power. India must continue to improve infrastructure, education, and innovation.

d) Form Practical Partnerships: India doesn't need to join military alliances. It can work with like-minded countries on shared interests like clean energy, digital technology, and disaster management.

e) Promote Fair Leadership: Rather than dominating others, India can show how leadership means helping others grow. This idea of global stewardship is needed in today's world.

The world is looking for a responsible and inclusive leader. India, with its history, diversity, and developmental approach, has what it takes. But leadership must be earned, not granted. India must invest in its story, its economy, and its relationships. With the right steps, India can play a key role in shaping a fairer, more balanced global future.

–The writer is an internationally experienced leader in R&D and product innovator with a proven track record of building and transforming global organisations to accelerate innovation, reduce costs, and drive growth across the healthcare sector. As a thought leader in global affairs, he offers unique perspectives at the intersection of technology, healthcare, and international strategy. The views expressed are personal and do not necessarily reflect the views of ***Raksha Anirveda***

MISSION INNOVATION: RISING ABOVE TURF BATTLES IN THE INDIAN DEFENCE SECTOR

The Indian defence sector should come together as a group and focus on building and innovating, rather than playing zero-sum games and indulging in petty disputes

DR R SHIVARAMAN

I was a defence enthusiast from an early age, and I grew up wondering how I could contribute to the Indian Defence Forces. I wanted to get my hands dirty with innovation that mattered and this very fact gravitated me towards the defence sector – a domain where cutting-edge technology directly serves national security and human lives. Eventually, post my first entrepreneurial stint, I started Big Bang Boom Solutions in 2018 with the vision of developing the best products for the Indian Defence Sector.

Over the past 7 years, the Big Bang Boom Team has toiled day and night, securing 8 iDEX wins and successfully completing development of three products.

The latest Product line developed by the Big Bang Boom Team is AgniQuell, a high expansion fire-fighting foam developed with the Indian Navy under the Innovation for Defence Excellence (iDEX).

AgniQuell rapidly expands to extinguish Class A & Class B fires in large, enclosed spaces like engine rooms and boiler rooms on Naval vessels—smothering fires in seconds where conventional extinguishers fail. Unlike regular extinguishers, Agni Quell expands rapidly over 800x its original volume to rapidly blanket and cool and hard-to-reach spaces with minimal water use.

AgniQuell has been rigorously tested across multiple Naval bases in India and has successfully met all Qualitative Requirements. This is product, which is IMO (International Maritime Organisation (IMO) Certified, free from ship-damaging and non-corrosive compounds, free from 'Forever Chemicals' and has a high degree of biodegradability.

This is a speciality chemical which has been imported into India for the past 75 years. A speciality chemical that is now available at 50% of the original import cost.

This is just an example of how innovation can help strengthen the Indian defence ecosystem.

AgniQuell rapidly expands to extinguish Class A & Class B fires in large, enclosed spaces like engine rooms and boiler rooms on Naval vessels—smothering fires in seconds where conventional extinguishers fail

Unfortunately, it is being seen that instead of a singular focus on developing the best products, multiple Turf wars have risen in various quarters of the Indian Defence sector. Turf wars aren't limited to public-private rivalries in India's defence sector — in recent years, private Indian defence companies have also been drawn into multiple disputes. These conflicts, while less publicised than PSU-related issues, are equally detrimental, especially in a still-maturing ecosystem.

While competition can fuel innovation, these confrontations often stem from a zero-sum mindset, leading to inefficiencies, delays, and missed opportunities.

It's time for the Indian Defence Sector to come together as a group and focus on building and innovating, rather than playing zero-sum games and indulging in petty disputes.

–The writer is Co-Founder and Director of Big Bang Boom Solutions

THOUGHT POT

NEAR-SPACE: IAF'S BOLD LEAP

The IAF is integrating near-space technologies into India's strategic posture, including hypersonic missiles, spaceplanes, and high-altitude platforms like solar-powered drones and balloons for military and space applications

AIR VICE MARSHAL SANJAY BHATNAGAR

In February 2023, a Chinese high-altitude balloon shot down by the United States Air Force (USAF) B-21 (Raider) aircraft near North Carolina brought the spotlight onto the hitherto little-known near-space region. The region between 20 and 100 kilometres above the Earth's surface is termed near-space. Aircraft manoeuvre in the Earth's atmosphere using lift generated by their wings. As altitude increases, air becomes rarer, requiring aircraft to fly at significantly higher speeds to sustain aviation, which reduces efficiency and limits manoeuvrability. Consequently, aircraft typically fly at altitudes not higher than 12 to 15 kilometres above ground level, with notable exceptions like the USAF's U-2 spy plane, which operates at altitudes of 21 to 22 kilometres.

In space, an imaginary line 100 kilometres above the Earth's surface, known as the Kármán Line, marks the boundary beyond which aerodynamic drag significantly impacts satellites, causing orbital decay. Satellites seeking to maintain stable orbital heights must frequently fire thrusters to return to their original orbits, consuming limited onboard fuel and reducing their lifespan. Most satellites operate at 400 to 500 kilometres in Low Earth Orbit (LEO). One of the closest satellites in LEO, a

B-21 Raider

Japanese satellite, orbits at 130 kilometres above the Earth's surface.

Near-space remains largely unexplored by most nations due to the aforementioned challenges. This region is primarily used for transit and manoeuvres during travel between space and Earth's atmosphere and vice versa.

ADVANTAGES OF NEAR-SPACE

Located closer to Earth than LEO, near-space offers unique advantages. Its proximity enables high-resolution Earth observation, and launching platforms into near-space is significantly cheaper than deploying satellites. These platforms can remain stationary over an area of interest, providing persistent surveillance and real-time high-resolution data collection. Near-space also serves as an elevated communication node.

EVOLVING WARFARE AND NEAR-SPACE

Modern warfare is rapidly evolving into multi-domain operations involving the Army, Navy, and Air Force, with space and cyber forces playing an increasingly significant role. India's Operation Sindoor and the Israel-Iran conflict (Operation Rising Lion) in 2025 demonstrated nations employing a mix of kinetic and non-kinetic warfare, enabling simultaneous and non-linear targeting at various depths, greatly enhancing the tempo of operations across domains.

Near-space is utilised by hypersonic missiles, which travel at speeds exceeding Mach 5 and conduct the majority of their flight at altitudes lower than ballistic missiles. Radars struggle to track them due to the intense heat generated by friction and air resistance, creating a plasma effect around the missiles. Their ability to alter flight paths in near-space enhances manoeuvrability, further complicating missile defence systems. Nations are also leveraging near-space for High-Altitude Pseudo-Satellites (HAPS). Understanding the engineering and aerodynamic challenges of near-space is critical for nations aiming to exploit this region for defensive and offensive purposes. Detailed studies are needed to analyse weather phenomena in this region. Communication effects in near-space require particular attention, as they have the potential to bridge the gap between terrestrial 5G and LEO-based communication systems.

U-2 in flight

The Chinese Near-Space Flight Vehicles (NSFV) programme is progressing significantly. China has developed the Dongfeng-17 (DF-17) Hypersonic Glide Vehicle (HGV), with a range of 1,600 kilometres and a speed of Mach 10. It is also developing the Dongfeng-41 (DF-41) Hypersonic Cruise Missile (HCM) with a range of 12,000 kilometres and the Dongfeng-27 (DF-27) Hypersonic Intermediate-Range Ballistic Missile (IRBM) with speeds of Mach 8 to 10.

In 2022, Russia claimed to have deployed the Zircon hypersonic cruise missile (HCM) against Ukraine, reaching a maximum speed of Mach 8. Russia also operationalised the Kinzhal HCM, capable of Mach 12 speeds.

The United States (US) is developing a range of such weapons under an ambitious programme, including a USD 756 million contract with Lockheed Martin. Countries such as France, Germany, Australia, Japan, Iran, and Israel are also pursuing hypersonic missile systems.

HAPS are solar-powered unmanned aerial vehicles (UAVs) operating in the stratosphere at altitudes between 18 and 25 kilometres. They offer services similar to satellites and can hover for extended periods, potentially months or years, by generating solar energy.

The US's Airbus Zephyr-S is being developed as a solar-powered HAPS, having successfully completed trials of 17 days in flight. China is developing the Qimingxing-50 with similar capabilities.

CHINA AND NEAR-SPACE COMMAND

China has prioritised allocating resources and conducting developmental trials in the near-space region. Intelligence sources indicate that in 2023, China established the Near-Space Command, expected to function jointly with the People's Liberation Army (PLA), People's Liberation Army Navy (PLAN), People's Liberation Army Air Force

The Defence Research and Development Organisation (DRDO), under the Hypersonic Technology Demonstrator Vehicle (HSTDV) programme, is developing both hypersonic cruise missiles and glide vehicles. The glide vehicle project is at a more advanced stage. On November 17, 2024, the DRDO successfully flight-tested a long-range hypersonic missile off the coast of Odisha, marking a significant milestone for national security.

THOUGHT POT

Reusable Launch Vehicle–Technology Demonstrator

(PLAAF), and Strategic Rocket Force. This command will oversee offensive and defensive operations in the near-space region.

NEAR-SPACE CAPABILITIES AND INDIAN ARMED FORCES

India must closely monitor developments in hypersonic technologies, HAPS, and related domains. Near-space capabilities are critical for India's strategic defence to counter potential threats.

India is actively developing near-space capabilities and hypersonic technologies for military and space applications. The IAF is expected to play a pivotal role in integrating these technologies into India's strategic posture, including hypersonic missiles, spaceplanes, and high-altitude platforms like solar-powered drones and balloons.

The IAF recognises the potential and opportunities offered by the near-space domain as a strategic region. Its strategy involves leveraging near-space for surveillance, early warning, and deploying weapons on elevated platforms. The IAF is expanding the use of near-space platforms to enhance Intelligence, Surveillance, and Reconnaissance (ISR), communication, and Signals Intelligence (SIGINT)/Communications Intelligence (COMINT) collection. Near-space communication nodes are considered vital for developing a robust Ballistic Missile Defence (BMD) system.

HYPERSONIC MISSILES

The Defence Research and Development Organisation (DRDO), under the Hypersonic Technology Demonstrator Vehicle (HSTDV) programme, is developing both hypersonic cruise missiles and glide vehicles. The glide vehicle project is at a more advanced stage. On November 17,2024, the DRDO successfully flight-tested a long-range hypersonic missile off the coast of Odisha, marking a significant milestone for national security.

India is establishing a hypersonic test facility under the aegis of the Indian Institute of Technology, Kanpur (IIT-K), expected to be operational by 2027. Existing facilities at the Indian Institute of Science (IISc), Bengaluru, and Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram, can test up to 4 kilometres per second, whereas the new 24-metre hypervelocity expansion tunnel at IIT-K will enable testing of cruise missiles and capsules, like Gaganyaan, up to 10 kilometres per second.

HIGH-ALTITUDE PSEUDO-SATELLITE (HAPS)

In the field of HAPS, the Council of Scientific and Industrial Research-National Aerospace Laboratories (CSIR-NAL) in India has tested a prototype capable of hovering for hours and aims to develop a larger version with extended flight capabilities by 2027. Noteworthy are the efforts of Bengaluru-based NewSpace Research and Technologies Pvt Ltd. In February 2025, their 8-metre wingspan HAPS, named 'ARKA', demonstrated an endurance of 17 hours. This project, under the Innovations for Defence Excellence (iDEX) initiative, aims to achieve an endurance of seven days.

India plans to develop HAPS, solar-powered drones, and balloons for various missions. These platforms will be equipped with advanced sensors and Artificial Intelligence (AI)-based systems for navigation and data analysis. Once their endurance and manoeuvrability are proven, they will be ideal for border surveillance, real-time ISR monitoring, and extending communication range, especially in remote areas.

Zephyr: An artist's impression

REUSABLE LAUNCH VEHICLE & SPACEPLANE

The Indian Space Research Organisation (ISRO) is developing the Reusable Launch Vehicle–Technology Demonstrator (RLV-TD), where the booster of a satellite launch vehicle is ejected at altitudes of 50 to 80 kilometres, landing at a predetermined location over land or sea for reuse in subsequent launches. The IAF is transforming to develop space-based capabilities, including a potential spaceplane, to enhance ISR and prepare for future conflicts involving space assets.

COLLABORATION AND TESTING

The IAF, alongside the Defence Space Agency (DSA) under Headquarters Integrated Defence Staff (HQ IDS), collaborates with the DRDO, ISRO, academic institutions, and the vibrant private sector to develop technologies for effective defensive and offensive operations in near-space.

Among the various Defence Space (DefSpace) challenges launched under the iDEX initiative, priority has been given to developing near-space technologies.

In the communication and command-and-control domain, the IAF is actively collaborating with Bharat Electronics Limited (BEL) to expand the Integrated Air Command and Control System (IACCS) to include Space Situational Awareness (SSA) of satellites and other space objects, obtained through ISRO's Network for Space Object Tracking and Analysis (NETRA) project and private space companies.

In the field of HAPS, the Council of Scientific and Industrial Research-National Aerospace Laboratories (CSIR-NAL) in India has tested a prototype capable of hovering for hours and aims to develop a larger version with extended flight capabilities by 2027. Noteworthy are the efforts of Bengaluru-based NewSpace Research and Technologies Pvt Ltd. In February 2025, their 8-metre wingspan HAPS, named 'ARKA', demonstrated an endurance of 17 hours

TAKEAWAYS

Near-space technologies have the potential to bridge the gap between terrestrial and space-based technologies for defensive and offensive purposes, particularly in hypersonic technologies, HAPS, communication, persistent ISR capability, and enhanced situational awareness for commanders. They are significantly cheaper than space-based systems and offer the advantage of being easily replaceable. Indian private space start-ups must be encouraged to deliver early benefits for the Indian Armed Forces.

–The writer is an IAF veteran and has been involved in air operations, intelligence and strategic matters. He has served as Assistant Chief of Air Staff (Off Ops) at Air HQ and Assistant Chief of Integrated Defence Staff (Tech Int) at HQ – IDS, appointments related to offensive operations, UAV, space and ISR matters. The views expressed are of the writer and do not necessarily reflect the views of ***Raksha Anirveda***

KREMLIN LOG

FROZEN CONNECTIONS

The dispute surrounding Kuril Islands remains a Gordian knot of geopolitics, as the late Japanese PM Shinzo Abe's legacy clashes with the fallout of Ukraine sanctions, a hardening US-Japan alliance, and China's shadow over the Indo-Pacific

MAJ GEN DEEPAK MEHRA

In May 2025, Russian President Vladimir Putin, extended a rare personal gesture to Akie Abe, wife of late Japanese Prime Minister Shinzo Abe, by facilitating her visit to Moscow's Bolshoi Theatre in his own luxury limousine, 'Aurus Senat'. During a meeting with teary-eyed Akie Abe at the Kremlin, visibly moved President Putin acknowledged the late Prime Minister's persistent efforts to secure a post-World War II peace treaty between Russia and Japan. Despite 27 meetings between the two leaders, no treaty was signed (John 2022). By facilitating her visit, this exceptional act of diplomacy demonstrated the respect Putin held for the late Japanese leader and emphasised the ongoing complexities surrounding the territorial dispute over the Kuril Islands, referred to as the Northern Territories in Japan (Reuters, 2025). The dispute over the Kuril Islands has remained a significant impediment in Russo-Japanese relations, preventing the formal conclusion of World War II hostilities and obstructing the development of a comprehensive bilateral peace agreement.

Following the start of Russia's Special Military Operation against Ukraine in Feb of 2022, there has been a radical shift in the relationship between Russia and Japan. In a swift move in consonance with the US and other G-7 Nations, Japan imposed strict sanctions against Russia. It not only emerged as one of the largest aid donors to Ukraine in its fight against the Russians but a few months earlier, had eased its rules to export to United States missiles manufactured in Japan for American Patriot anti-aircraft systems. This has drawn sharp reaction from the Russians and closed any further prospects of reconciliation between the two nations in the foreseeable future.

SHINZO ABE'S LEGACY

During Shinzo Abe's tenure as Japan's longest-serving Prime Minister, relations between Japan and Russia showed signs of improvement, and rapprochement appeared feasible. Abe had committed himself to resolve this longstanding dispute by negotiating a peace treaty with Russia, his foreign policy priority (Brown 2019). He aimed to shift Japan's security focus towards challenges originating from the South, particularly those posed by an increasingly assertive China. Stable relations between Japan and Russia were also important for Russia, as it sought to develop its Far East regions while shifting its focus from Greater Europe to Greater Eurasia. However, the firm stance of Russia during negotiations, Abe's assassination in 2022, and Russia's special operations against Ukraine ultimately ended hopes of resolution.

STRATEGIC SIGNIFICANCE OF KURIL ISLANDS

The Kuril Islands, which separates the Sea of Okhotsk from the North Pacific ocean, consists of 56 islands stretching from South of Kamchatka Peninsula in the far east of Russia to the Island of Hokkaido, the northernmost island of Japan (The Week 2019a). Four Southernmost Islands of the Kuril Archipelago namely; Kunshier, IIturup, Habomai, and Shikotan, are under dispute between Russia and Japan. Entire Island chain is sparsely populated with total population of only about 20,000 residents.

The four southernmost Islands however, have significant strategic importance for Russia. Control of these islands by Russia ensures all the year round access to the Pacific Ocean by the Russian Navy's Pacific Fleet based in Vladivostok, as the straits between the Kunashir and Iturup Islands does not freeze in winter (The Week 2019b). The vast area of the Sea of Okhotsk for the Russian Navy protect the Russia's Eastern Coast & its nuclear submarines from a sudden first strike by the adversary. Islands also act as valuable forward base for the deployment of weapons and intelligence collection systems for the Russians. During the Cold War, the containment strategy of the US Navy envisaged denial of access to the Soviet Navy of the Pacific Ocean by launching operations in the Kamchatka Peninsula, blocking the Southern Kuril Islands, and taking over of oil rich Sakhalin Island. Control over Kuril islands by Japan would allow it to extend the encirclement of Russia along the eastern periphery of the Eurasian continent stretching all the way from the South China Sea to the Sea of Okhotsk in the North (Diesen Glenn 2017). Apart from the abundant marine life, these islands are also rich in minerals, and special metals like Rhenium, used in aircraft production.

THE KURIL KNOT: RUSSO-JAPANESE IMBROGLIO

At the end of the Second World War Kuril islands were transferred to Russia and confirmed in 1945 by the Yalta Agreement(Yalta Protocol 1945) and Potsdam Declaration (Potsdam Declaration 1945). Japan did not agree to the Yalta conference as it was not represented however, in 1951, vide Article 2 of the San Francisco treaty (San Francisco Treaty 1951), Tokyo renounced its sovereignty over these islands. Out of four islands under dispute between Russia and Japan, two major islands Kunshier and Iturup have strategic significance and the other two islands Habomai and Shikotan are minor islands. During the subsequent negotiations, Japan and Russia had agreed to settle the dispute, with Japan gaining control over the two minor islands on conditions that a peace agreement must be signed between Japan and USSR and Japan's military alliance with the United States would not be directed against the Soviet Union (Elleman, Nichols, and Ouimet 1998). In the year 1956 during the visit of Japanese Prime Minister Ichiro Hatoyama to the Soviet Union, a Joint Declaration ending the state of war and restoring diplomatic relations between the two countries was signed. In Paragraph nine of the Declaration, both the countries had agreed to "continue negotiations for the conclusion of a peace treaty". Soviet Union at that time agreed to hand over the Habomai and Shikotan Islands to Japan and the actual handover was to take place after the conclusion of the peace treaty (MOFA Japan 2014).

KREMLIN LOG

Japan's $7.3 billion aid to Ukraine and Patriot missile exports to the US sparked Moscow's fury, burying Abe's dream of using Russia as a buffer against China

Meanwhile, Conservatives in Tokyo, emboldened by the United States, rejected the same raising the issues of sovereignty. It is believed that United States, to preserve its leadership in the region, maintain the territorial dispute and fuel animosity between the Soviet Union and Japan, had threatened to keep Okinawa if Japan signed the agreement (Clark 2018). Over a period of time, Japanese position hardened and got entrenched as a nationalistic sentiment. At the dawn of the new millennium in 2001, Prime Minister of Japan, Yoshiro Mori met the newly crowned President of Russia, Vladimir Putin at Irkutsk in Russia. In a joint statement the two premiers reaffirmed the Japan-Soviet Joint Declaration of 1956 as the basis of the commencement of negotiation process between the two countries. The two sides assented that the said document established the legal basis for the conclusion of a peace treaty and agreed to continue future negotiations to realise the normalisation of Japan-Russia relations.

In the second decade of the new Millennium the relations, despite the 2014 annexation of Crimea by Russia, continued to improve between Russia and Japan under the carefully crafted strategy of Prime Minister Shinzo Abe and President Vladimir Putin. Abe and Putin, between 2012 and 2020 met in person over 27 times and held about ten phone calls (Corbin Michael 2024). Apart from Japanese participation in the Sochi Olympics in 2014 and Russia supporting Tokyo's bid for the Olympic Games, Japanese firms Mitsui and JOGMEC with the support of the Government of Japan, acquired a 10 percent stake in the Arctic LNG 2 project in northern Siberia (Brown D.J. James 2023). During these years' main drivers for Japan to forge a closer relationship with Russia were: utilise Russia as a buffer against increasingly assertive China; Japan's energy security concerns and; mutual interest in increased trade.

RUSSIA'S SPECIAL OPERATION IN UKRAINE & JAPAN-US ALLIANCE

With the onset of the Russian Special operation in Ukraine, Russo-Japanese relations deteriorated. As part of the Western sanctions, Japan froze assets of Russian Nationals and removed the most favoured nation status of Russia leading to substantial drop in trade between the two countries. Till late 2023, as per the Kiel Institute, Germany, Japan had made almost 7.269 Billion Euro contribution to Ukraine war effort (Biadun 2024) which mostly consisted of financial and humanitarian aid and provision of mostly non-lethal weapons. Along with the December 2023 declaration by Japan of supplying United States missiles for Patriot anti-aircraft systems, Japanese agencies and companies have pledged another 15.8 billion yen ($105 million) for Ukraine for demining and urgent reconstruction projects in the field of energy and transportation sectors. This has led to renewed chill in the relations between Russia and Japan. On the other hand, as the Western sanctions are gaining momentum and the Ukrainian conflict continues, the cooperation between Russia and China has reached historical heights, leading to isolation of Japan between two unfriendly giants.

Tokyo now faces disputes across the Indo-Pacific with most of its neighbours, be it Russia, China, North Korea or South Korea. With the onset of Russia's special operations in Ukraine and Tokyo joining the West imposed sanctions against Russia, late Prime Minister Abe's hope of utilising Russia as a buffer against China seems to be a distant dream. In its National Security Strategy of 2013, Japan had a conciliatory stance

towards Russia with the focus on advancing cooperation and enhancing bilateral relations in order to ensure its security (PM Japan & Cabinet 2013). Russia's Special Military Operation in Ukraine has shaken the Security Establishment mandarins in Tokyo and in its NSS of 2022 Kshida administration has adopted a tougher stance stating that Russia's actions, in strategic coordination with China, are of strong security concern to Japan (PM Japan & Cabinet 2022). To overcome the twin security concerns posed by Russia and China, Japan apart from focussing on proactive diplomatic efforts and acquisition of counterstrike capabilities, continues to strengthen the Japan-US alliance for the realisation of peace and stability in the region.

TRUMPONOMICS AND JAPAN-US ALLIANCE

International relations are inherently unpredictable and can shift rapidly due to changes in leadership, security concerns or global events. This was visible in case of Japan-US relations too. Close on the heels of Prime Minister Shigeru Ishiba and President Trump declaring a 'A New Golden Age' between Japan-US ties in February 2025, US announced 25 percent tariffs on the imports of Japanese steel. Not only tariffs, President Trump while addressing the reporters at the White House on 07 Mar 2025 stated "I love Japan. We have a great relationship with Japan, but we have an interesting deal with Japan that we have to protect them, but they don't have to protect us", raising a question mark over Japan's role as a trusted ally (Abe and Yomiuri 2025). Some damage control was evident with the visit of US Secretary of Defence, Pete Hegseth to Japan where he described Japan as an 'indispensable partner' against China and sought to dispel the transactional approach of US Administration towards its allies. However, the damage had been done!

While Trump's comments have not directly altered Japan-Russia relations, they underscore the complexities of Japan's foreign policy decisions. It has forced Japan to reflect on the resoluteness of the US to uphold the current liberal World Order and, question the legitimacy of its security commitments. Off late Japan seem to be adopting a more pragmatic approach to protect its national interests. It has started mending its ties with China and after a long hiatus, high level delegations from both the countries have visited each other. Japanese Prime Minister even hinted at visiting China in near future which has been welcomed by China.

On the Russian front, the visit of Akie Abe to Russia in May 2025 may not be a direct response to Trump's remarks however, the shifting geopolitical landscape has enhanced its significance. Though the visit was termed as private, the timing amidst evolving security dynamics in the region, could prompt both sides to reaffirm and strengthen diplomatic ties and build on the goodwill created during Shinzo Abe's time. Japan while navigating its security commitments and tariff war with the United States appears to be managing its diplomatic relations with Russia, particularly concerning the territorial dispute and regional security dynamics.

PROGNOSIS

Today, Russia-Japan relations may be at the lowest trajectory but they seem to be retrievable. Russia does offer favourable market conditions for Japanese firms. Despite the downward trajectory of trade between the two nations, the survey by the Japan External Trade Organization (JETRO) in February 2024 confirms that many of the Japanese firms have continued their trade with Russia (Golubkova 2024). Energy dependent Japanese Government has also encouraged companies to 'Positively Consider' continuing their investments in Sakhalin-1 and Sakhalin-2 oil and gas extraction projects in the Russia's Far East (Eguchi Satoru et al. 2023). With time, as the Western sanctions on Russia continue to bite, the economic incentives offered by Tokyo, which Moscow considered insufficient during Late Prime Minister Shinzo Abe's time, may also become more appealing. Japan and Russia have far too much to gain from each other. Going forward, keeping each other sensitivities in view, a joint management and development model for the islands under dispute could be a middle path, should both the sides agree.

India enjoys close ties with Russia and Japan. Russia has been India's time-tested partner and the relationship between the two countries has been elevated to the level of a "Special and Privileged Strategic Partnership". On the other hand with Japan, India shares "Special Strategic and Global Partnership" and has an unwavering commitment to working together towards a "Free and Open Indo-Pacific". From the Indian point of view, it may be more beneficial for the World and especially for the Indo-Pacific, if Japan stays focused on the long shadow that China is casting in its neighbourhood, rather than looking over its shoulder towards Russia. Prime Minister Fumio Kishida statement in Washington on April 11, 2024 "As I often say, Ukraine of today may be East Asia of tomorrow,"(Kishida 2024) might as well for the sake of Japan and Russia, be modified to read as "Ukraine of today may be Taiwan, Senkaku or even Vladivostok of tomorrow".

–The writer, Kirti Chakra, AVSM, VSM, 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 in the field, further enriching his depth of knowledge and global perspective.. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

President Trump's 2025 steel tariffs and quip— 'they don't have to protect us'— have rattled Japan's bonhomie with the US

TECH TRENDS

ADAPTIVE WARFARE: CONVERGENCE OF AI, AUTONOMY, AND CYBER RESILIENCE

With advances in technology, modern warfare is now not is not a contest of numbers but of intelligence, adaptability, and algorithmic superiority. AI enables faster decisions. Robotics extends physical reach. Quantum safeguards communication and sensing. And RL allows cyber systems to evolve continuously. At its core lies the convergence of Artificial Intelligence (AI), Robotics, Quantum Technologies, and most critically, Reinforcement Learning (RL)-driven cyber resilience frameworks

DR RAGHAV VADHERA and AMIT VADHERA

In today's rapidly shifting geopolitical landscape, traditional defence paradigms are crumbling under the weight of hybrid threats and relentless digital offensives. From autonomous drone swarms to precision-guided cyber intrusions, the theater of war is now dictated as much by code as by combat.

Nations worldwide—from the US and Israel to China, Iran, Ukraine, Pakistan, and India—are embracing this transformation, not merely to defend but to dominate. At its core lies the convergence of Artificial Intelligence (AI), Robotics, Quantum Technologies, and most critically, Reinforcement Learning (RL)-driven cyber resilience frameworks.

As part of my recent research at George Washington University, I developed a Cyber Resilience system integrating Reinforcement Learning, adaptive neural architecture search, and real-time threat modelling. The accompanying diagram and technical narrative reflect key innovations from that work, serving as a case study for how modern defence can leverage self-learning systems for proactive cybersecurity.

THE AI-DRIVEN SHIFT IN MODERN WARFARE

AI is no longer a backend tool—it's now vital to battlefield supremacy. For example, Israel's Harop loitering munitions autonomously identify and destroy radar systems in urban combat. The US Department of Defence's Project Maven classifies massive drone footage in real time, turning data into actionable insight. Ukraine, constrained by budget and terrain, has pioneered the use of FPV drones enhanced with machine learning for low-cost reconnaissance and kamikaze missions.

The writer reviews the product demonstration at Milipol India 2025

In South Asia, India's Indrajaal system deploys real-time 360° sensor fusion and deep learning to neutralise UAV swarms autonomously. Bhargavastra, another

Indian counter-UAS platform, incorporates Bayesian threat modelling and trajectory prediction to optimise kinetic interception. Meanwhile, China is developing swarms of micro-UAVs—referred to as "mosquito drones"—and long-range autonomous carrier drones like Jiu Tian, with AI-based mission flexibility.

Pakistan's Shahpar II, though less sophisticated than its Indian counterparts, showcases AI-led ISR capabilities. India's Rudrastra, a hybrid VTOL UAV, supports ISR, EW payloads, and kinetic engagement—highlighting a trend toward modular, intelligent, multi-role assets.

All these platforms compress the OODA (Observe–Orient–Decide–Act) loop from minutes to seconds, a critical edge in high-speed, multi-domain warfare.

ROBOTICS AND DISTRIBUTED AUTONOMY

Autonomous robotics—both ground-based and aerial—are transforming how militaries operate in high-risk and high-altitude conditions. India deploys robotic mules and quadruped units near the Himalayas, enabled by SLAM and edge AI. These units can evacuate wounded soldiers or deliver ammunition in GPS-denied zones.

China's legged robots are capable of similar logistics functions across complex terrain, integrated with video relays and autonomous path planning. Iran's AI-enabled drones, such as the Shahed-136, combine swarm coordination and self-navigation for long-range attacks, and have reportedly been used by Russian forces in Ukraine. The newer Hadid-110 drone expands this capacity further.

India's Nagastra-1, a tactical loitering munition, demonstrates EO/IR-guided autonomous targeting with a return-to-base feature. It mirrors concepts seen in Israel's Hero-series drones, which offer operator override alongside autonomous engagement for precision targeting.

QUANTUM TECHNOLOGIES: SECURING THE DIGITAL BATTLEFIELD

As cyber and electronic warfare intensify, quantum systems are reshaping military communications, navigation, and surveillance. In India, the DRDO–IIT Delhi demonstration of Quantum Key Distribution (QKD) over 1 km of free space represents a breakthrough in tamper-proof, quantum-resilient communications.

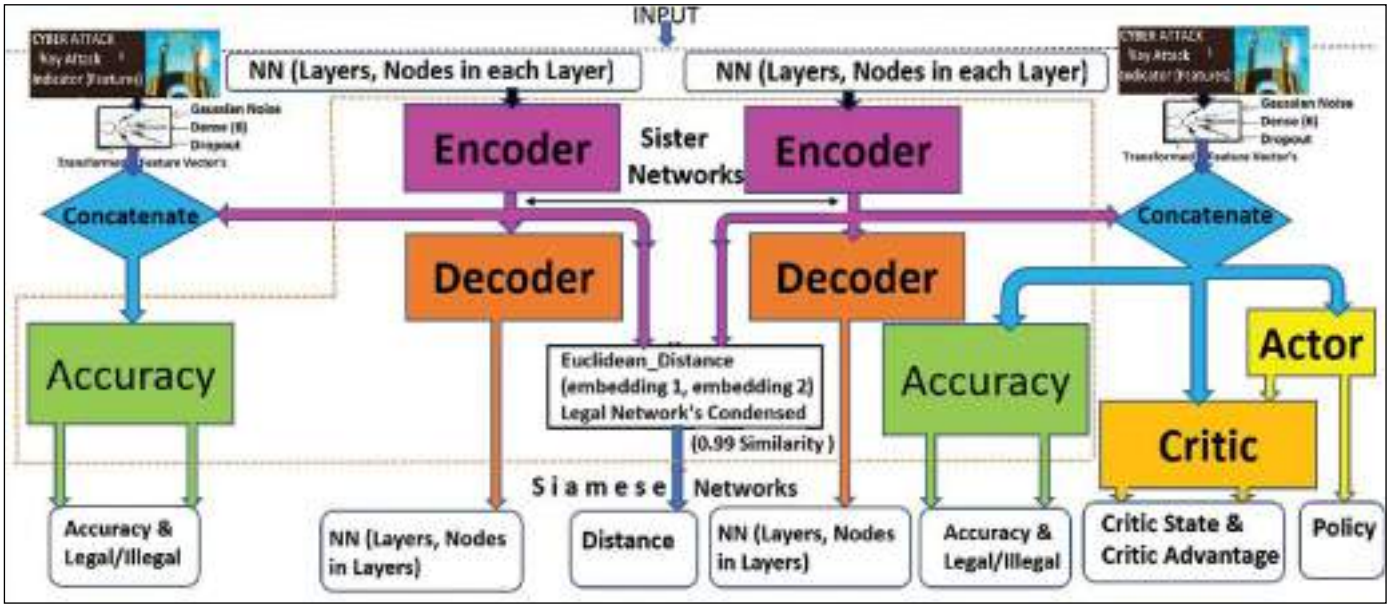
These technologies mirror efforts by China, which has already launched quantum satellites and deployed

QKD links in strategic cities. The US and NATO allies are investing in quantum radars, optically pumped magnetometers, and Quantum Inertial Navigation Systems (Q-INS) to counter stealth and GPS-denied threats. Russia is developing similar capabilities as part of its new-generation EW arsenal.

India's Quantum Technology Research Centre (QTRC) is working on battlefield synchronisation via

In South Asia, India's Indrajaal system deploys real-time 360° sensor fusion and deep learning to neutralise UAV swarms autonomously. Bhargavastra, another Indian counter-UAS platform, incorporates Bayesian threat modelling and trajectory prediction to optimise kinetic interception

TECH TRENDS



A self-optimising AI framework using Encoder-Decoder networks, Accuracy modules, Siamese embedding comparison, and Actor-Critic policy optimisation. The Critic refines policy for real-time threat response, enabling dynamic adaptation to novel cyber-attacks

While kinetic threats grab headlines, cyberspace remains the most contested and fastest-evolving domain. Static detection systems quickly become obsolete. In contrast, RL-based frameworks adapt dynamically to changing threat landscapes, evolving without the need for manual retraining

atomic clocks, which can maintain coordinated multi-domain operations even under heavy EW conditions.

REINFORCEMENT LEARNING: THE NEW CYBER SENTINEL

While kinetic threats grab headlines, cyberspace remains the most contested and fastest-evolving domain. Static detection systems quickly become obsolete. In contrast, RL-based frameworks adapt dynamically to changing threat landscapes, evolving without the need for manual retraining.

Drawing from my doctoral research at George Washington University, I developed an RL-guided architecture optimisation system for cyber resilience. It automatically generates and refines neural network configurations optimised for real-time threat detection and classification.

A self-optimising AI framework using Encoder-Decoder networks, Accuracy modules, Siamese embedding comparison, and Actor-Critic policy optimisation. The Critic refines policy for real-time threat response, enabling dynamic adaptation to novel cyber-attacks.

The system includes:

- Encoder to translate network and attack descriptions into an embedding space.
- Accuracy Model to predict classification efficacy.
- Actor-Critic Networks, guided by the Bellman Equation, to explore better architectures.
- A Siamese Network for structural consistency across attack classes.
- Noise-augmented vector training for better generalisation under diverse attack profiles.

Trained on public datasets (Kaggle's DDoS, malware, and APT logs), this system generalises across novel attacks without overfitting. In simulation environments, it achieves high detection accuracy with significantly reduced retraining.

REAL-WORLD DEPLOYMENTS AND CYBER RESILIENCE

Ukraine's cybersecurity units use RL-enhanced filters to suppress botnets and identify ransomware signatures in real time. Iran has employed adversarial

AI in psychological warfare—including deepfake generation—but faces growing resistance from RL-empowered defence systems.

The US, through programs like DARPA's GARD (Guaranteeing AI Robustness Against Deception), is exploring RL-based tools to safeguard military networks. Israel, meanwhile, incorporates RL into its cyber units for proactive threat hunting and zero-day exploit detection.

Pakistan and India, often targeted by cross-border cyber operations, are working to build multi-modal RL-based cyber defence capabilities—sharing threat intelligence and training on mirrored attack datasets.

THE KILL WEB DOCTRINE: REAL-TIME AUTONOMOUS ORCHESTRATION

The future of warfare lies in Kill Webs—a concept where AI-guided drones, RL-optimised cyber shields, quantum-secure communications, and robotics operate as a synchronised, multi-domain grid.

In one example, UAVs detect incoming hostiles; AI systems classify and prioritise them; QKD-encrypted data is relayed to a central node; Nagastra or Rudrastra loitering munitions are deployed; and RL cyber systems respond to concurrent malware attacks—all within 90 seconds.

Such a lattice—combining autonomy, convergence, and speed—compresses the OODA loop and vastly improves survivability.

DOCTRINAL, ETHICAL, AND SOVEREIGNTY CHALLENGES

With these breakthroughs come hard questions. India's Digital Battlefield Doctrine (2026) is under review to regulate autonomous engagement and AI usage. The US DoD continues to balance innovation with ethical oversight through its Responsible AI Guidelines. NATO and Israel both advocate for bounded autonomy in kinetic applications.

Tech sovereignty remains a challenge. From quantum-grade chips to AI model training pipelines, indigenous capacity is essential to avoid strategic dependencies. China's chip autonomy push and India's Make in India Quantum initiative signal a global race for trusted infrastructure.

Tech sovereignty remains a challenge. From quantum-grade chips to AI model training pipelines, indigenous capacity is essential to avoid strategic dependencies. China's chip autonomy push and India's Make in India Quantum initiative signal a global race for trusted infrastructure

SPEED, ADAPTABILITY, AND INTELLIGENCE

Overall, modern warfare is not a contest of numbers but of intelligence, adaptability, and algorithmic superiority. AI enables faster decisions. Robotics extends physical reach. Quantum safeguards communication and sensing. And RL allows cyber systems to evolve continuously.

The cyber resilience architecture I developed at George Washington University—an integration of Reinforcement Learning, neural architecture search, and threat-aware training—offers a blueprint for nations to protect and project power in the digital battlespace.

As militaries embrace this shift, the victors of future conflicts will not be those with the largest arsenals, but those who can learn, adapt, and strike with the most precision and speed.

–The writer is an AI/ML, PhD/Doctoral candidate in Cyber Analytics at GWU and also an award winning researcher. The co-writer is a seasoned executive and respected industry leader with extensive global experience. Both are US-based. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

ANALYSIS

INEVITABILITY OF THEATRE COMMANDS

India's higher defence organisation requires refinement in light of Operation Sindoor's success and the lessons from the US's Operation Midnight Hammer. A joint warfare approach and effective tri-service synergy are urgently needed to address modern warfare challenges, particularly in the context of potential two-front conflicts

CMDE RANJIT B RAI

On April 22, 2025, a few Lashkar-e-Taiba (LeT) terrorists armed with automatic machine guns descended on holidaymakers in Baisaran Valley near Pahalgam, killing twenty-six civilians, including mostly Hindu tourists, a Christian tourist, and a local Muslim, in full view of their families. An enraged Prime Minister Narendra Modi vowed to act, and he did. He chaired military meetings, consulting each Service Chief and the Chief of Defence Staff (CDS) to assess the circular error probable (CEP) and the likelihood of success of the weapons to be deployed to teach Pakistan a lesson. He granted the Army, Navy, and Air Force Chiefs a free hand to act.

Just after midnight on May 7, India unleashed the might of its tri-service lethality to destroy nine Pakistani terror infrastructure bases with waves of air- and land-launched Hammer, Scalp, Spice-2000/MPR, and BrahMos missiles, alongside loitering Kamikaze Harop and Harpy drones. The

operation, named 'SINDOOR'—the vermilion powder symbolising the sanctity of marriage—relied on deceptive tactics and decoys to maintain secrecy. The Prime Minister acted as India's de facto Commander-in-Chief (C-in-C) with Cabinet Control.

The Constitution of India vests the supreme command of the armed forces in the President under Article 53(2). However, the Prime Minister, as head of government, exercises significant control over defence policy and military operations through the Cabinet Committee on Security. This authority is termed 'Cabinet Control'. Fifty-five years ago, during the 1971 war for Bangladesh, Prime Minister Indira Gandhi assumed a role akin to C-in-C. She did not face a nuclear foe and had the Soviet Union's support and the Mukti Bahini forces to bolster India's Armed Forces. In contrast, PM Modi faces now a nuclear-armed Pakistan, which harbours terrorism with tacit support from China.

Nine Pakistani terror camps, including the headquarters of LeT and Jaish-e-Mohammed (JeM) at Muridke and Bahawalpur, respectively, were struck. Credit goes to India's intelligence agencies and ISRO, which utilised RISAT, EMISAT, GSAT-7 SIGINT relay, and Cartosat satellites to map radar blind spots and pinpoint terror camps using GPS and terrain mapping, enabling precision strikes and capturing battle damage imagery. No Indian forces crossed the border. Pakistan was informed that Operation Sindoor targeted only terrorist camps, not Pakistan itself.

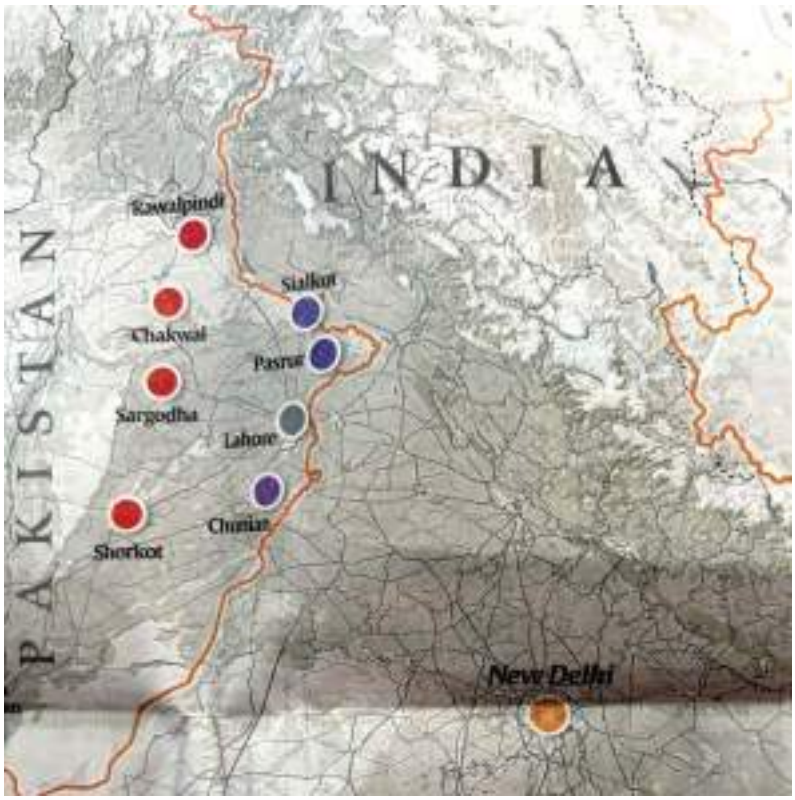
The scale and intensity of Operation Sindoor took Pakistan and the world by surprise. From May 7-9, Pakistan retaliated with 155mm guns across the International Border in the Jammu sector and the Line of Control (LoC). It attempted attacks from Kashmir to Rajasthan and Bhuj in Gujarat, using Bayraktar TB2 (Songar) Turkish drones and missiles. No planes crossed the border. India's armed forces responded swiftly, neutralising most Fateh missiles and Chinese JL-9 missiles from J-10C planes, and launched retaliatory strikes on 11 Pakistani military installations and air bases, including Sukkur, Sargodha, Sialkot, Bholari, Kamra, and Pasrur. India's counterstrikes proved effective, destroying the Chinese HQ-9 (Hong Qi-9) air defence system and rendering 11 Pakistani air bases non-operational. Sensing significant damage, Pakistan's DGMO, Maj Gen Kashif Abdullah, contacted India's DGMO, Lt Gen Rajiv Ghai, and both sides agreed to cease all firing and military action from 1700 hours IST on May 10, 2025.

The details of exact damages, losses, and weapons employed will be confirmed when made public. Pakistan's arsenal included JL-9 missiles fired from J-10C planes, HQ-9B SAMs, YLC-8B radars, ZDK-03 AWACS from China, and AIM-120C AMRAAMs on F-16s supplied by the USA. On the Indian side, the performance of BrahMos missiles launched from land, SU-30 MKI aircraft with SPICE-2000/MPR bombs, KH-35 missiles, Kamikaze Harop and Harpy drones, and the efficacy of air defence systems like Akash, Spyder, and associated Akashteer radars was remarkable.

PM Modi addressed the nation on May 12, establishing red lines for dealing with Pakistan: a terror attack would constitute an act of war; talks and terrorism cannot coexist until Pakistan dismantles its terror network; and blood and water cannot flow together. This signalled that India will hold the Indus Water Treaty in abeyance until Pakistan ceases supporting terrorism and may renegotiate it.

India unleashed the might of its tri-service lethality to destroy nine Pakistani terror infrastructure bases with waves of air- and land-launched Hammer, Scalp, Spice-2000/ MPR, and BrahMos missiles, alongside loitering Kamikaze Harop and Harpy drones

ANALYSIS



USA Ohio Class Submarine Fired Two WKS on Isafhan Nuclear Facility

The current structure, with Service Chiefs enjoying autonomy and the CDS lacking operational authority, needs re-examination. The rules of the MoD, which state that the Defence of India rests with the Defence Secretary, require revision

The Army's Cold Start doctrine was tailored to accelerate Army readiness, as the Air Force's response is swift, and the Navy's readiness, with ships armed as in Op Sindoor, could wreak havoc on Pakistani ports and blockade shipping.

Op Sindoor effectively disrupted Pakistan's terror infrastructure. US media reported that President Trump and his staff studied Op Sindoor for Operation Midnight Hammer, launched against Iran on June 21, 2025, with strikes occurring between 6:40 PM and 7:05 PM Eastern Time (2:10 AM to 3:05 AM Tehran time on June 22, 2025).

Although Op Sindoor was a success, India's higher defence organisation requires fine-tuning, particularly through theatre commands for tri-service synergy. The current structure, with Service Chiefs enjoying autonomy and the CDS lacking operational authority, needs re-examination. The rules of the MoD, which state that the Defence of India rests with the Defence Secretary, require revision. The appointment of the CDS in 2020, with the Department of Military Affairs (DMA), was a welcome change in India's civil-military relations. However, a joint warfare approach and effective inter-service synergy must be addressed at the theatre level, as India may face a two-front war.

In the United States, the Goldwater-Nichols Act of 1986 transformed the structure and command of the US military, enhancing the efficiency and effectiveness of joint operations by restructuring command relationships. Modern warfare's transformation is not merely tactical but fundamental, requiring rethinking. India's current structure includes 17 Military Commands with multiple three-star posts. In a potential conflict with its two nuclear-armed neighbours, India would engage four army commands, three air force commands, and two naval commands, none of which are collinear in their Areas of Responsibility (AoR), with no two headquarters collocated.

Israel has long viewed Iran's nuclear ambitions as an existential threat, and from mid-June, it struck Iranian sites with planes and drones, killing several military leaders. Following this, US Operation Midnight Hammer, ordered by President Trump on June 21-22, 2025, targeted Iran's five nuclear sites from air and sea, mirroring Operation Sindoor in principle. Midnight Hammer was a tri-service operation controlled from a single war room. B-2 Spirit stealth bombers, departing from the US heartland, delivered 420,000 pounds of explosives (GBU-57s), supported by refuelling tankers and fighter jets, targeting key underground uranium enrichment plants in Iran. An Ohio-class submarine

USA B2 bomber dropping GBU-57B massive ordnance penetrator (MOP)

fired dozens of Tomahawk cruise missiles from underwater towards two sites. Operation Midnight Hammer was a 'precision strike' that "devastated the Iranian nuclear program," sharing similarities with Op Sindoor.

In a 'Decoy Plan', even before US planes took off, elements of misdirection were employed. Trump publicly announced that "he'd decide within two weeks on whether to strike Iran", ostensibly to allow time for negotiations, but in reality, masking the impending attack. One group of B-2 stealth bombers travelled from Missouri on June 21-22, 2025, with some heading west towards a US air base in the Pacific (like Guam) to act as decoys, while the main strike package flew east over the Atlantic and Mediterranean to strike targets in Iran. Official reports stated that 75 precision-guided weapons, including 14 GBU-57 "bunker buster" bombs deployed by seven B-2 Spirit stealth bombers and two-dozen Tomahawk cruise missiles launched from a US submarine, were used.

TAKEAWAYS

Op Sindoor was a message not only to Pakistan but also to China, which tacitly supports Pakistan with arms and funds, fuelling terrorism at home and abroad. PM Modi deserves credit for fulfilling his promise to teach Pakistan a lesson in deterrence

USA GBU-57 bomb called the 30,000 LB bunker buster

against terrorism. However, deterrence requires a credible and powerful military. Op Sindoor highlights the urgent need to advance the proposed Theatre Commands for tri-service synergy. The current structure, which excludes the CDS and Service Chiefs from apex decision-making, must be revisited by the government.

*–The author attended discussions on Op Sindoor and Op Midnight Hammer at All Souls College, Oxford. With Neil Harvey, his book **'India's Elephant Navy and China's Dragon Navy @2025: Contesting to Have a Say in the Info Pacific's 'Pas de Deux-Churn'** will be released on August 15. The views expressed are personal and not of **Raksha Anirveda***

IDEA EXCHANGE

BOOSTING INDIAN NAVAL MIGHT THROUGH INNOVATIVE IDEAS, FRUGAL DESIGN

The Aatmanirbhar Bharat initiative, apart from the call for self-reliance in defence is also an invitation to the wider Indian technocrats to contribute with innovative ideas to strengthen the might of the Indian armed forces. ***Raksha Anirveda***, following the same holistic mission, will carry a series of articles by Rahul Vatsyayan, a professional architect with naval lineage, focusing on how to increase the ship building capacity of the Indian Navy at a reduced cost but amalgamating the latest technical advances. He brings forth an innovative approach to shipbuilding which will be unveiled in the forthcoming issues. The first article in the series focuses on building indigenously designed MCMVs, missile vessels and modular construction of naval ships

RAHUL VATSYAYAN

According to MoD sources, the procurement will move ahead once the "acceptance of necessity (AoN)" is granted. An open tender or request for proposal (RFP) will then be issued, inviting Indian shipyards to submit their technical and commercial bids.

India plans to build 12 specialised warships that can detect and destroy underwater mines. These ships are critical to protect ports and maritime trade from enemy forces. The defence ministry is likely to present the proposal, worth around ₹44,000 crore, to the Defence Acquisition Council led by Defence Minister Rajnath Singh for approval.

"It will take at least 7-8 years, if not more, for the first Mine Countermeasure Vessel (MCMV) to roll out after the contract is signed," a source stated. At present, the Indian Navy lacks a dedicated MCMV, since the last minesweeper was decommissioned in 2019.

CASE FOR INDIGENOUSLY DESIGNED MCMVs FOR THE INDIAN NAVY

The case for Indian MCMVs involve firstly the strategic imperatives, as Naval mines are cost-effective, low-tech yet highly effective tools of sea denial. With growing tensions in the Indian Ocean Region (IOR), hostile state and non-state actors may deploy mines to disrupt India's maritime trade and naval mobility.

Further, India's long 7,516 km coastline, including 13 major ports and over 200 minor ones make it vulnerable to mine threats, especially in chokepoints like the Strait of Hormuz, Malacca, and other Indian coastal approaches. As India seeks to expand its footprint as a net security provider in the Indian Ocean region (IOR), it must maintain freedom of navigation in contested waters and assure allies of its ability to conduct mine-clearing operations.

Second factor is the operational necessity, the Indian Navy decommissioned its last MCMVs (Pondicherry-class) without replacements, creating a critical operational void. In view of this, major Indian ports such as Mumbai, Visakhapatnam, and Kochi etc. becomes vulnerable to mining. MCMVs are vital for ensuring maritime infrastructure security, in addition to ensuring safe beach landings and amphibious assaults by clearing sea mines beforehand.

Thirdly, an indigenous MCMV development programme aligns well with India's push for defence self-sufficiency and reduced reliance on foreign suppliers. Indian MCMV building programme incorporate high-end technologies like non-magnetic hulls, advanced sonar systems, and unmanned underwater vehicles (UUVs), will further give a push to the indigenous R&D efforts, besides being offered to friendly navies in Southeast Asia,

Africa, and the Middle East, enhancing India's defence export and diplomacy.

Fourthly, the MCMV development will invigorate local shipyards (e.g., Goa Shipyard Ltd), generate employment, and build long-term capabilities, in the fields of indigenous development of sonar, sensors, propulsion, and automation systems benefitting both civilian, marine, and offshore sectors. Further, indigenously built vessels can be maintained and upgraded at a lower cost over their operational life compared to imported platforms.

Fifthly, the new MCMV programme aligns well with earlier issued strategic documents, like: The Indian Maritime Security Strategy (2015) emphasising capability development for mine countermeasure operations; the Make in India and Aatmanirbhar Bharat Abhiyan highlight domestic defence production as a national priority; further with rising competition from China and its increasing deployment of maritime assets in the IOR, India needs a balanced and capable navy with full-spectrum mine warfare capabilities.

WHICH ROUTE TO TAKE?

Now as the MoD has finally decided to allot ₹44,000 crore to procure these MCMVs through the indigenisation route, further strengthening the Aatmanirbhar Bharat initiative, the moot question is which design should be adopted for these news MCMVs.

In today's rapidly evolving threat scenarios, a flexible solution that is cost-effective, modular design and a rapidly customisable ship is the need of the hour. Long-gone are the multi-decade procurement strategies that plagued the system and compromised operational readiness. A build solution that can be handled by smaller shipyards and developed in customisable modules is urgently required. This will result in capability building amongst the smaller shipyards and will reduce workload of the main Naval Shipyards.

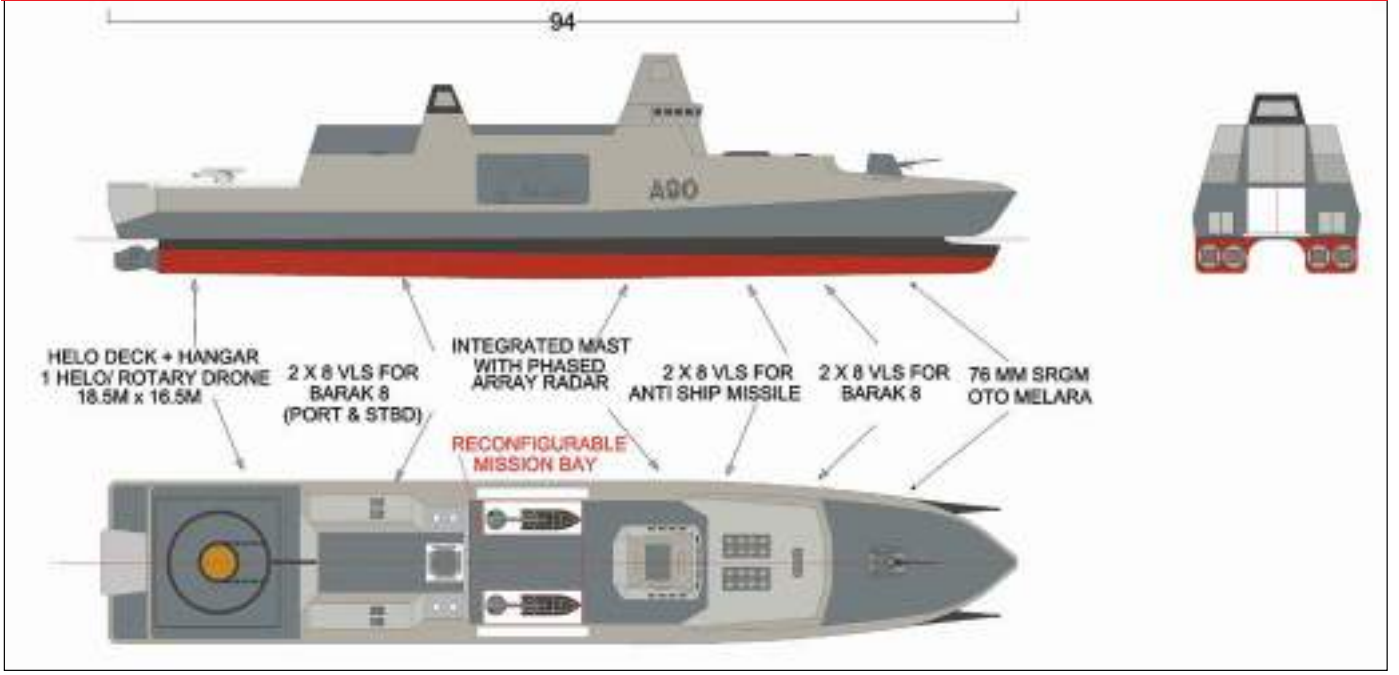
After intensive research, I have arrived at a novel design, which would besides shortening the gestation period of building new ships, will also help in considerable financial savings. This fresh approach favours building a sub-2000-ton ship, which could then be reconfigured for MCMV or patrol duties.

MODULAR CONSTRUCTION FOR NAVAL SHIPS

This proposal recommends modular construction with readily reconfigured mission bays to carter to: MCMV duties with deployed RPVs for Mine Hunting; Long Range Patrol Vessel, and; Missile Corvette with mission bays configured to carry upto 16 extra ASCMs or Land Attack Cruise missiles

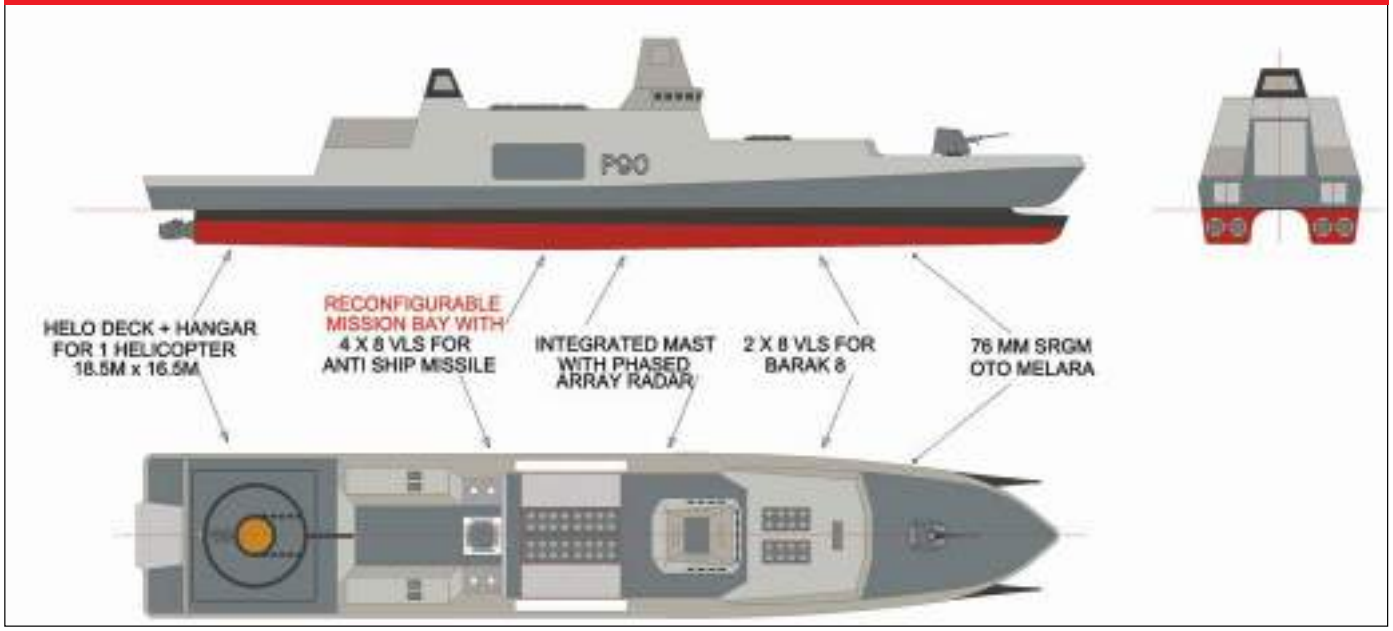
India plans to build 12 specialised warships that can detect and destroy underwater mines. These ships are critical to protect ports and maritime trade from enemy forces. The defence ministry is likely to present the proposal, worth around ₹44,000 crore, to the Defence Acquisition Council

NEXT GENERATION MCMV CORVETTE A90 MAY 25



IDEA EXCHANGE

NEXT GENERATION MISSILE CATAMARAN P-90 DEC 2024



Furthermore, aligning with new international trends in MCMVs production, the focus is on manufacturing unmanned systems. This would require the MCMVs to be built as "motherships" for unmanned mine-clearance assets

Considering the size of the vessels involved, smaller shipyard could be utilised to build modules, which are then mated to one another at the nodal shipyard for launching, fitting out and commissioning.

It is envisaged that if utilised properly, these shipyards could become game changers in shortening build times to under 3 years. This would lead to a rapid expansion of the navy in critical capability areas like MCMVs, Missile vessels and long and medium range patrol vessels

The propulsion under consideration for these vessels are Marine Diesel engines powering Water Jet propulsors for quick response and shallow water operations that make for highly manoeuvrable vessels.

In this proposal, the Indian Navy would gain rapidly convertible flexible warships which can be constructed rapidly by smaller shipyards. It is a winning proposal for a cost conscious Navy.

NEXT GENERATION MCMV 94 M

This concept envisages a 94 m long customisable hull with interchangeable mission modules. It can be configured for either MCMV duties with a hangar for deployable RPVs or a missile silo for upto 16 VLS cells for Land Attack ASCMs

Water jets are the preferred mode of propulsion powered by Diesel Electric engines. This mode of propulsion allows for very shallow water operations and the use of un- or semi-prepared docking facilities.

NEXT GENERATION MISSILE VESSEL

The use of RPV's is strongly recommended and provisions in the design cater to this proposal. The ship itself could be optionally manned and carry Unmanned MCMV modules and RHIB's, aerial minesweeping rotary assets, rotary UAVs for surveillance, self Defence systems like VLS tubes for SAM's and SSM's, a 57mm or 76mm main gun, provision for Technology inserts (For-but-not-with), provision to be rapidly reconfigurable, propulsion by water-jets to retain ability for shallow draft operations.

Furthermore, aligning with new international trends in MCMVs production, the focus is on manufacturing unmanned systems. This would require the MCMVs to be built as "motherships" for unmanned mine-clearance assets. This would require ship designs to include facilities for ASVs, UUVs, towed mine-hunting sonar, and ROV launch/recovery. This aligns with modern concepts and is already part of India's MCM planning.

Concurrently, invest in domestic development of AUV/ROV platforms (DRDO/industry) so that local assets equip the ships. In addition, fast-track Procurement and funding by allocating dedicated funds in the next Defence Acquisition Plan for MCMVs. Given the urgency (navy has no MCMVs now), the project should have a compressed timeline. For example, set a goal for first steel-cut by 2026 and initial commissioning by early 2030s.

Consider interim measures (e.g. leasing second-

EXPLAINED: P90 DESIGN

The P90 adopts a twin-hull (catamaran) design with a wave-piercing bow and faceted superstructure for stealth. Like other modern catamaran corvettes, this layout offers high speed and stability (smoothing motion in waves) while reducing radar signature. The ship's surfaces would be sharply sloped and planar to scatter radar (analogous to the Zumwalt destroyer's design), and the hull would use radar-absorbent paints and fairings to lower its profile. The render shows the gray-painted hull and upper works under neutral lighting so details (panel lines, exhausts, deck fittings) stand out clearly.

HULL AND SUPERSTRUCTURE

- The catamaran hull provides a broad, stable platform with reduced draft. Each hull is narrow and wave-piercing, connected by transverse structures. This twin-hull form increases deck area for weapons and fuel at the expense of internal volume.
- The stealth superstructure is sharply angular (e.g. trapezoidal mast and faceted deckhouses) to deflect radar. Deck edges and exhausts are enclosed or cooled to minimise IR signature. Textures on the model are matte gray, with subtle panel variations and hull markings.

ARMAMENT AND SENSORS

- 76mm OTO Melara gun (bow): A single rapid-fire 76mm gun is mounted in a low, stealth cupola on the foredeck. This gun can engage air and surface targets at up to ~20 km. (On similar designs like Taiwan's Tuo Chiang corvette, the 76mm gun is the primary forward weapon.)
- Vertical Launch Systems (VLS): The mid-ship and aft decks each have flush VLS cells. For example, two 2×4-module VLS banks accommodate 16 Barak-8 SAMs (in each bank) for area air defence. Additional VLS cells (or box launchers) amidships carry anti-ship cruise missiles. These cells are flush with the deck to preserve stealth lines.
- Phased-Array Radar & Mast: A single integrated mast houses multi-function AESA radars and sensors. In concept, this would be like an enclosed S-band mast carrying a 4-sided AESA (similar to the EL/M-2248 MF-STAR). The MF-STAR (or equivalent) can track hundreds of air/surface targets simultaneously and guide the Barak-8 and other missiles. Placing radar and communications antennas in one composite mast (as in modern ship designs) minimises separate protrusions and enhances signature control.

AVIATION FACILITIES

The aft deck features a helicopter landing pad with an integral hangar underneath. The hangar, built into the ship's stern, can accommodate a medium naval helicopter (e.g. 5–7 ton class) for ASW/utility missions. This is akin to designs where a catamaran corvette has a full flight deck and hangar (e.g. Germany's Braunschweig class). The helipad is marked on deck and supported by the twin hull structure below.

hand MCMVs) only if truly needed to cover the gap, while the main focus remains on indigenisation. Use the MCMV construction as an anchor project for Indian shipyards and electronics firms. Encourage joint ventures between PSUs and private firms for equipment (e.g. sonar, engines, robotics). Leverage incentives from the Maritime Vision 2030 and RoFR (right-of-first-refusal) policies to prioritise domestic bids. In parallel, upgrade training institutes (dockyards, NMRL) to produce skilled MCM personnel.

Further, align the MCMV program with India's maritime security strategy. Revive doctrines from the Navy's 2020 "Indian Maritime Security Strategy" that stressed coastal defence and supply chain security. Enhance inter-service and inter-agency coordination (Navy, Coast Guard, DRDO, port authorities) for mine warfare.

Regularly review and update mine warfare requirements in the light of emerging threats (e.g. opportunistic mines, sea drones). While pursuing indigenisation, engage friendly navies for training and exchange. Joint exercises (MILAN, Varuna, Malabar) can include MCM drills. MoUs with NATO navies (or allies like France/US) on MCM technology sharing could be sought. However, ensure that all core design and production remain under Indian control to uphold self-reliance goals.

By implementing these measures, the Indian Navy will fill a critical capability gap, protect its maritime interests, and advance national objectives of defence self-reliance. Indigenously built MCMVs will not only defend India's seas from the silent menace of naval mines but also spur domestic industry and technology — a true force multiplier for India's security and economy.

Overall, the development and induction of indigenously designed MCMVs is not merely a defence requirement but a strategic necessity for India. They will plug a critical operational gap, enhance maritime security, support self-reliance, and contribute to industrial growth. A time-bound, technology-focused, and well-funded indigenous MCMV program should be a key priority for the Ministry of Defence and the Indian Navy. ■

–The writer is an Architect by profession with 36 years of experience with leading corporates in the Indian real estate industry. However, his passion is matters Naval! Probably 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 for designing new MCMVs adopting the modular design technology, which is both cost and time effective. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

INSIGHT

BITING THE SILVER BULLET: DIFFERENT TYPES OF BULLETS AND THEIR USES

A better understanding of the wide range of bullets available for small caliber ammunition and their functionality is a must. Continuing the series - Biting the Silver Bullet, **SANJAY SONI** in this article guides gun users to make the right choice of bullets for their usage while buying

What is the best type of bullet to buy?: Understandably, it gets confusing, especially if you are new to guns and shooting. There are so many different types of bullets available, and since some are not always legal to own, it is important to understand the different types of bullets available. Below is a partial list of popular bullet choices and a little bit about what the bullet does, uses, and guns it matches.

If you are considering different types of bullets for your guns, shooting, or competing, consider the ultimate goals you have for needing a gun. Those goals will help point you in the right direction for choosing the best bullet for your situation.

PLATED BULLETS

For use in indoor ranges

Plated bullets are a nice middle ground between lead and jacketed bullets. While they can't reach the same high velocities of a jacketed bullet, plated bullets are cheaper than FMJs and cleaner than lead bullets. Plated bullets are ideal for shooting at indoor ranges.

FULL METAL JACKET BULLETS

For use in handguns and rifles

Full Metal Jacket bullets consist of a hard outer shell and a soft metal inner. These are bullets that are ideal when you need to create the most damage possible and when you need increased accuracy.

Initially, Full Metal Jacket bullets were created as military slugs. That makes sense because you'd want a bullet that caused the most damage. You see these a lot at ranges because they are cost-efficient for training and practising.

The hard outer metal cover protects the soft inner lead from melting too quickly. That little fact is part of what improves the bullet's trajectory. Full Metal Jacket bullets are ideal for handguns and rifles. If you plan on training more, FMJ is generally less expensive than hollow point bullets.

LEAD BULLETS

For inexpensive target shooting or practicing

Lead bullets are available for most shooting applications. There are some bans depending on the country on the use of lead bullets for hunting due to the toxic nature of lead. Lead bullets are common at gun ranges, for target shooting or practicing. Lead bullets are often cheaper, giving you more cartridges for your buck.

ROUND NOSE BULLETS

For target practice, pest control, and self-defence

A round nose bullet has a tip that is 1/2 the diameter of the bullet. The tip is rounded, not hollow, and differs from those bullets with pointed tips, such as some options for rifle shells.

Round nose bullets inflict more damage and deeper penetration than other types of bullets, such as flat-nose bullets. Round-nosed bullets are good for target practice, pest control, and self-defense. They are a good middle-of-the-road round, but you can do better in certain situations.

HOLLOW-POINT BULLETS

For tactical situations and target practice

Hollow-point bullets are useful when control of damage and penetration of the bullet is important. They are used in tactical situations where the bullet's trajectory cannot leave the target - hostage situations, in-home defence, self-defence, etc. Hollow points are a handgun slug primarily because rifles fire at a higher velocity, so a hollow point would be overkill.

Outside tactical situations, hollow-point bullets are welcomed as ammo for target practice as they have tremendous accuracy.

SOFT POINT BULLETS

For hunting

The soft point bullets are replacement bullets for hunting in situations where you need an expanding bullet – when hunting bear, deer, elk, moose, and other big game targets. Many hunters use soft point bullets in situations where a hollow point bullet is not permitted.

Soft point bullets are also common in metal-plate target shooting since there is less ricochet. They are available in metal jacket variations too - JSP or Jacket Soft Point.

As a self-defence bullet, soft points are acceptable

Full Metal Jacket bullets consist of a hard outer shell and a soft metal inner and were created as military slugs. They are cost-efficient for training and practicing

INSIGHT

FMJ Boat Tail bullets are useful anytime and precision is a must. The tapered tip adds stability to the trajectory once the bullet leaves the barrel. With an increase in its coefficient, the tip of the bullet stays elevated longer, making it ideal for target practice, sniping, and long-distance shooting

though many people prefer hollow points. They're available for both handguns and rifles.

BOAT TAIL BULLETS

For sniping rifles, long distance shooting, and target practice

FMJ Boat Tail bullets are useful anytime and precision is a must. The tapered tip adds stability to the trajectory once the bullet leaves the barrel. With an increase in its coefficient, the tip of the bullet stays elevated longer, making it ideal for target practice, sniping, and long-distance shooting.

Boat tail bullets are ideal for rifles and in situations where long-range shots are common. Use them in your sniping rifles, for competitions, and when you cannot get close to the game.

RIFLE BULLETS

For military use, hunting and sniping to distance, target practice, and competition

Rifle bullets are longer than those for handguns. They have more powder, and their larger diameter means they fly at a greater velocity. Rifle bullets come in an array of formats including:

- Semi-Jacketed
- Full Metal Jacket
- Jacketed Hollow Points
- Lead or Lead Round Nose
- Special - Bullets designed for limited application or guns.

Rifle bullets also have an array of applications from hunting and sniping to distance target practice and competition. Specialised rifle bullets could be armour piercing (AP), Tracer, armour piercing incendiary (API), armour piercing incendiary tracer (API-T), reduced range bullets etc.

ARMOUR PIERCING BULLETS

Mostly military use

As the name implies, an armor-piercing bullet is used against targets wearing ballistic armor. They are also useful against ballistic shields which would cause an average bullet to deflect or stop before hitting the target.

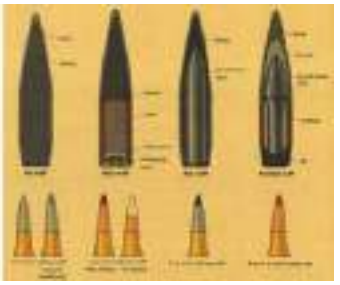
Armour-piercing bullets are available for handguns and rifles, although they are not legal for civilian usage.

TRACER BULLETS

Mostly military use

Tracer bullets are intended for loading cartridges used to defeat unprotected or lightly protected targets with the additional possibility of visual observation of the trajectory of the bullet. The most widely used tracer bullets represent full metal jacket bullets with a lead core containing a pyrotechnic element (tracer) in the rear portion of the bullet.

The possibility of visual observation of the trajectory of the tracer bullet is provided by a bright flame formed during the combustion of pyrotechnic composition, which ignites at the shot under the effect of powder gases through the hole in the base of the bullet. Observation of the trajectory of the bullet allows correcting the direction of firing and significantly improving the efficiency of firing at long range, especially when firing at moving targets.



ARMOUR PIERCING INCENDIARY BULLETS

Use against unarmoured or lightly armoured enemy targets

Armour piercing incendiary bullets (API) are intended for loading cartridges used to defeat unarmoured or lightly armoured enemy targets with an additional incendiary effect. The most widely used API bullets represent full metal jacket bullets with a high hardness core, containing an incendiary composition in the forward portion of the bullet.

API bullets are characterised by reduced internal volume for the placement of the incendiary composition, reduced length and weight of the core, and reduced armour-piercing and incendiary effect. In this connection, the use of API bullets for loading of cartridges of small caliber should be considered inexpedient.

ARMOUR PIERCING INCENDIARY TRACER BULLETS (API-T)

Use against unarmoured or lightly armoured enemy targets

Armour Piercing Incendiary Tracer Bullets (API-T) are intended for loading cartridges used to defeat unarmoured or lightly armoured enemy targets with the additional possibility of visual observation of the trajectory of the bullet. The most widely used API-T bullets represent full metal jacketed bullets with a high hardness core, containing a pyrotechnic element (tracer) in the rear portion of the bullet.

FRANGIBLE BULLETS

Training shooting, firing in populated areas

"Frangible bullets" are intended for loading cartridges used for training shooting, as well as firing in populated areas and other kinds of firing, at which the ricochet of bullets is not allowed.

The most widely used frangible bullets represent semi-jacketed bullets with a frangible core partially protruding from the jacket through the hole in the jacket from the side of the forward portion of the bullet.

Frangible and jacketed frangible bullets possess the ability to penetrate inside upon impact with a soft target and crumble into powder upon impact with a hard target. In addition, frangible bullets leave a mark on hard surfaces, which allows determining the point of impact.

REDUCED RANGE BULLETS (RR)

Practice shooting and training

Reduced range or practice bullets are intended for loading cartridges used for practice training shooting. The most widely used RR bullets represent jacketed bullets with a lead core, containing a compacted inert substance in the forward portion of the bullet.

The impact of the practice bullet with a hard surface is accompanied by the emission of an inert substance and the formation of a powder cloudlet. In addition, the inert substance leaves a mark on the hard surfaces, which allows determining the point of impact. As an inert substance, sodium carbonate (soda) is usually used.

The RR bullets provide the same ballistic characteristics of full range bullets. Therefore, they are used extensively for training purposes especially for ammunition such as .50 BMG which has an extremely long effective range.

I trust this article has provided you with a better understanding of the wide range of bullets which are available for small caliber ammunition. Whether you use guns in your professional capacity or in a personal capacity, knowing the types of bullets available and their functionality is very important for choosing the right kind of ammunition for your usage.

In my next article we will delve deeper into the world of special purpose cartridges.

–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 – Bangalore, he has been involved with the ammunition industry in India and abroad for the last eight years

Armour piercing incendiary bullets are characterised by reduced internal volume for the placement of the incendiary composition, reduced length and weight of the core, and reduced armour-piercing and incendiary effect

ISRAEL DIARY

STANDOFF WEAPONS: PRECISION POWERHOUSES

Israel's standoff weapons empower the Israeli Air Force to strike high-value targets in Iran, Syria, and Yemen with minimal risk. These advanced munitions are attracting European interest for local production

ARIE EGOZI

Lessons from the Russia-Ukraine war are actively shaping European procurement strategies, with several countries engaging in advanced negotiations with Israeli firms for standoff weapons. These discussions, driven by the need for long-range, precision-guided munitions to counter evolving threats, include proposals for local production by European defence companies, enhancing strategic partnerships.

Standoff weapons are precision-guided munitions launched from a safe distance, typically by aircraft, to strike high-value or heavily defended targets. They enable attacks beyond the range of enemy air defences, minimising risk to the launch platform. Since 13 June 2025, the Israeli Air Force (IAF) has been deploying cutting-edge standoff weapons against Iranian targets, demonstrating their effectiveness in high-stakes operations. Two leading Israeli defence firms, Israel Aerospace Industries (IAI) and Rafael Advanced Defence Systems (Rafael), are advancing long-range air-launched systems, attracting significant European interest due to their proven combat performance and adaptability.

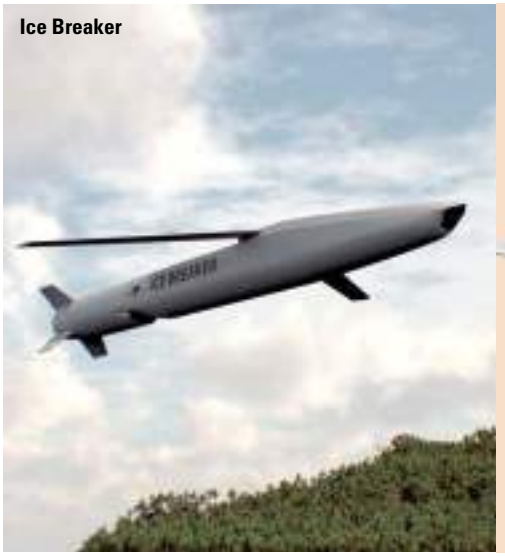
Spice 2000

IAI's Wind Demon, a next-generation air-to-surface cruise missile, embodies a pragmatic response to modern warfare's demands, combining affordability, adaptability, and advanced capabilities. Launched from airborne platforms, it follows a pre-programmed mission plan to strike moving or stationary targets at ranges exceeding 200 km, offering both fire-and-forget and man-in-the-loop capabilities. Equipped with sophisticated day-and-night electro-optic and laser homing seekers, it ensures pinpoint accuracy across diverse conditions. Its 20 kg-plus warhead supports blast, fragmentation, or penetration effects, while a low flight profile and navigation-resistant suite enhance survivability against enemy defences.

An IAI spokesperson emphasised, "Wind Demon meets the growing demand for cost-effective systems enabling mass attacks, offering substantial capabilities at an affordable price, allowing procurement in large quantities." This missile's modular design supports integration with various platforms, ensuring flexibility for future upgrades and multi-domain operations.

Rafael's Ice Breaker, a highly advanced standoff missile, is under active evaluation for co-production in Germany, building on the success of Euro Trophy GmbH, Rafael's European hub for the Trophy Active Protection System (APS). This initiative reflects Israel's commitment to fostering international collaboration, with Ice Breaker poised to enhance Europe's defence capabilities through localised manufacturing.

Israeli standoff weapons are precision-engineered munitions designed to strike high-value or heavily defended targets from significant distances, allowing launch platforms, typically aircraft, to remain beyond the reach of enemy air defences. These systems are central to Israel's strategy for neutralising threats, such as Iranian-backed forces in Syria and Houthi targets in Yemen, while minimising risks to pilots and aircraft.


Ice Breaker


Spice 1000

The Rampage, developed by Israel Military Industries (IMI), now acquired by Elbit Systems (Elbit) and IAI, is a supersonic air-to-surface missile (Mach 1.5 in terminal phase) derived from the EXTRA artillery rocket. Optimised for high-value targets, it destroys radar sites, communications centres, and weapons depots with a hardened steel nose and delayed-action fuse for maximum internal damage. Its operational success in IAF strikes in Syria and Yemen, and its use by the Indian Air Force (IAF) in the 2025 India-Pakistan conflict, underscores its export potential. The missile's high speed and penetration capabilities make it ideal for rapid, decisive strikes against fortified infrastructure.

The Popeye, a pilot-guided standoff missile, provides real-time control and video feedback to the cockpit, enabling precise strikes on fortified targets like power stations and port facilities. Its advanced guidance system allows in-flight adjustments, offering unmatched flexibility compared to traditional fire-and-forget systems. This capability ensures high accuracy in complex environments, enhancing the IAF's operational effectiveness.

The Smart, Precise Impact, Cost-Effective (SPICE) series transforms conventional bombs into precision-guided standoff munitions. Key variants include:

SPICE 1000: For 1,000 lb warheads (e.g., MK-83), with a 100 km range.

SPICE 2000: For 2,000 lb warheads (e.g., MK-84, BLU-109), with a 60 km range.

SPICE 250: A stand-alone glide bomb with a 100 km range.

These systems employ electro-optical guidance and advanced scene-matching algorithms, ensuring accuracy in GPS-denied environments, making them versatile for diverse operational scenarios.

The Bullseye, a precision-guided missile based on an Israeli cruise missile design, is offered to the United States (US) military as a cost-effective, scalable standoff weapon. Though details are limited, its development highlights Israel's ability to adapt technologies for global markets, reinforcing its position as a leader in defence innovation.

Launched from airborne platforms, IAI's Wind Demon follows a pre-programmed mission plan to strike moving or stationary targets at ranges exceeding 200 km, offering both fire-and-forget and man-in-the-loop capabilities

Israel is in advanced negotiations to procure the US-made Joint Air-to-Surface Standoff Missile (JASSM), a stealthy cruise missile with a 1,000 lb warhead and a 930 km range (JASSM-ER variant). Designed to evade radar, it targets command centres, air defences, and infrastructure deep in enemy territory, significantly enhancing Israel's deep-strike capabilities, particularly against Iranian targets.

IAF operations in Syria and Yemen, using Rampage, Popeye, and SPICE munitions, have effectively neutralised air defences, logistics hubs, and Iranian weapons smuggling networks. Supported by F-15I and F-16 aircraft equipped with advanced targeting pods and bunker-busting munitions, these operations demonstrate Israel's ability to conduct rapid, precise strikes with minimal risk, reinforcing its strategic dominance in the region. The integration of these weapons into Israel's arsenal, combined with ongoing developments like Wind Demon and Ice Breaker, positions the country as a global leader in standoff weaponry, with growing appeal for European and other international partners.

–The writer is an Israel-based freelance journalist. The views expressed are of the writer and do not necessarily reflect that of ***Raksha Anirveda***

APPOINTMENTS

AIR MARSHAL JASVIR S MANN TAKES CHARGE AS SENIOR AIR STAFF OFFICER, WESTERN COMMAND

Air Marshal Jasvir Singh Mann took over as Senior Air Staff Officer of Western Air Command, Indian Air Force on June 01.

The Air Marshal is an alumni of the National Defence Academy and was commissioned as a fighter pilot in the IAF on December 16, 1989. He has flown over 3000 ours primarily on various types of fighter aircraft.

He is a pilot Attack Instructor and in his operational career, he has commanded a fighter squadron,

been Chief Operations Officer of a forward base and Air Officer Commanding of a premium fighter base. He has also held various important appointments at Air Headquarters and Command Headquarters.

The Air Officer has directed Joint Military Training exercises with Republic of Singapore Air Force in 2017 and USAF in 2018. The Air Officer tenanted the appointments of Senior Officer-in-Charge Administration and Air Defence Commander of Central Air Command. The Air Marshal is also an alumni of the prestigious Defence Services Staff College and Royal College of Defence Studies, London (UK).

Prior to taking over as Senior Air Staff Officer, Western Air Command, Indian Air Force, he was Director General (Weapon Systems) at Air Headquarters. The Air Officer is a recipient of Presidential awards 'Ati Vishist Seva Medal' and 'Vayu Sena Medal'.

Rear Admiral V Ganapathy Assumes Charge as Commandant of Military Institute of Technology, Pune

Rear Admiral V Ganapathy, an accomplished Flag Officer of the Indian Navy, has assumed the command of the Military Institute of Technology (MILIT), Pune, under the Headquarters Integrated Defence Staff.

During his illustrious naval career, Rear Admiral Ganapathy has held several key operational, staff and instructional appointments, demonstrating a rare blend of operational insight, institutional leadership and future-oriented thinking. He is an alumnus of College of Defence Management, National Defence College, and Defence Services Staff College.

Rear Admiral V Ganapathy's appointment as Commandant comes at a transformative time when the Armed Forces are undergoing rapid technological evolution and institutional integration under the ethos of jointness.

As the head of India's premier Tri-services technical training institution, he now helms the mission of preparing mid-career officers from the Army, Navy, Air Force and friendly nations in cutting-edge military technologies.

His leadership is poised to further strengthen MILIT's role as a hub of excellence in joint technical education, with a renewed emphasis on niche and emerging domains that are reshaping modern warfare.

Air Marshal S Sivakumar Takes Charge as Air Officer-in-Charge Administration

Air Marshal S Sivakumar assumed the appointment of Air Officer-in-Charge Administration (AOA) at Air Headquarters, here on July 1. Air Marshal Sivakumar was commissioned in Administration branch of the Indian Air Force in June 1990. He holds an MBA in HRM from Pondicherry University and an M Phil degree in Defence and Strategic Studies from Osmania University. In a career spanning over 35 years, the Air Marshal has held a number of important Command and Staff appointments which include Senior Air Traffic Control Officer of a forward base, represented IAF in the UN Mission at Congo, Air Force Examiner, Chief Administrative Officer of a premier Flying Station, Command Works Officer and Command Personnel Staff Officer at two Operational Commands, Air Officer Commanding of an Equipment Depot, Assistant Chief of Air Staff (Air Force Works) at Air Headquarters and Senior Officer-in-Charge Administration of an Operational Command. Before assuming the present appointment, the Air Marshal was Director General (Administration) at Air HQ. The Air Officer is a recipient of Vishisht Seva Medal.

Chris Pogue Joins Calian as President, Defence and Space division

Calian Group Ltd., a mission-solutions company focused on defence, space, healthcare and critical infrastructure, announced that Chris Pogue will become President of its newly created Defence and Space division, effective July 7, 2025. In this role, Pogue will lead a high-performance team uniting Calian's Advanced Technologies and Learning units combining communications, manufacturing and immersive training expertise to accelerate mission success for defence and space clients.

Pogue has more than 20 years of senior executive experience. Most recently, he was President and CEO of Thales Canada, where he expanded naval support operations, revitalized land-forces capabilities, and led major AI and digital transformation efforts. Over the course of his career, Pogue has been a strong advocate for innovation, working to connect Canadian small and medium-sized enterprises with national defence and space initiatives. He is also a retired Royal Canadian Air Force officer with more than 3,500 flight hours on the C-130 Hercules.

Boeing Elevates Steve Parker as CEO-Defence Business

Boeing announced Stephen (Steve) Parker as president and chief executive officer of its Defense, Space & Security (BDS) business, effective immediately. Parker has served as interim leader of the Boeing business unit since September 2024. Parker will report to Ortberg and serve on the company's Executive Council. Parker will oversee all aspects of the company's business unit that provides technology, products and solutions for defense, government, space and intelligence customers worldwide. Parker was previously BDS chief operating officer, responsible for day-to-day business operations overseeing teams that include quality, manufacturing and safety, supply chain and program management. Before that, Parker led BDS divisions including Bombers & Fighters and Vertical Lift, and oversaw teams that developed many of the most innovative products and solutions across Boeing's defense portfolio. He also managed Boeing Defence Australia, the company's largest subsidiary outside the U.S. Parker joined Boeing in 1988.

Boeing Names Shashank Jha as Head of Digital Technology and Chief Information Officer for India

Boeing has named Shashank Jha as India site leader for Information Digital Technology & Security (IDT&S) and Chief Information Officer (CIO), Boeing India. Based in Bengaluru, Jha will lead strategy and operations for Boeing's IDT&S team in India, which includes nearly 1,500 team members. In this role, he will focus on strengthening collaboration, talent development, and IDT&S India site engagement. Further, as part of the global engineering and product support teams, he will work with the business partners team across the global IDT&S function. In addition to leading the India site for IDT&S, Jha will be executive director of commercial Product Lifecycle Management (PLM) products that are critical to Boeing's engineering operations.

Jha comes with over two decades of experience in engineering and IT leadership, specialising in enterprise systems, cybersecurity, product engineering platforms, and digital transformation. Most recently, Jha served as India Global Capability Centre leader at Dover India, overseeing corporate IT functions for India and China. Previously, he has led IT, engineering methods and tools, and PLM centres of excellence at GE, Honeywell, and Bosch.

Hari Kumar R Takes Charge as Director (R&D), BEL

Hari Kumar R took charge as Director (R&D) of Defence PSU Bharat Electronics Limited (BEL) today. He was serving as General Manager (Technology Planning) prior to being elevated to the Board. Hari Kumar joined BEL on May 1, 1989, as a Probationary Engineer after completing his B. Tech. (Electronics & Communication) from the College of Engineering, Thiruvananthapuram, Kerala. In a career spanning over three and a half decades, he has primarily been in Development and Engineering (D&E), supporting manufacturing activities at BEL with high-quality designs and engineering documentation. He was a part of the teams that developed India's first 65-Kelvin C-band and Extended-C-band Low Noise Amplifiers for Satcom earth stations of VSNL & Doordarshan. His teams also were the first to develop transmitters based on Gallium Nitride (GaN) technology for both communications & radar applications along with C-Band Quad Transmit-Receive (T/R) Modules for phased array radars and solid-state replacements for microwave tube amplifiers. During the first wave of COVID-19 in 2020, he led teams which got BEL certified to the ISO 13485:2016 Medical Standard in 45 days, and BEL's ICU Ventilator System third-party evaluated, before successfully completing the Pre Dispatch Inspection of 30,000 Ventilator Systems (comprising 1.5 Lakh sub-systems) in 3½ months. During 2020-22, he also played a key role in the turnaround of Components SBU, including speeding up procurement and ramping up production across multiple product groups. As GM (Technology Planning), he focused on overseeing and speeding up R&D processes and projects.

Subir K Saha Assumes Charge as Executive Director of Gun & Shell Factory, Cossipore

Subir Kumar Saha has assumed the charge of Executive Director of Gun & Shell Factory (GSF), Cossipore, a unit of Advanced Weapons and Equipment India Limited (AWEIL) from June 01, 2025. Subir Kumar Saha brings with him a wealth of experience, spanning over 33 years, in defence manufacturing, engineering management and strategic operations. His career reflects a consistent trajectory of growth, leadership and a deep commitment to public service and national defence.

He joined Indian Ordnance Factories Service (IOFS) as Assistant Works Manager (Electrical) in April 1992. In 1997 he was promoted to Works Manager. Further career progression saw him take charge as Deputy General Manager, Joint General Manager, Additional General Manager and General Manager. Throughout his career, Subir Kumar Saha has spearheaded several critical modernisation initiatives and has played a pivotal role in enhancing productivity, quality assurance and indigenous production capabilities at GSF and other Ordnance Factories.

ACHIEVEMENT

ET NOW MACHINIST AWARD 2025: ASHISH RAJVANSHI, NAMED AS CEO OF THE YEAR

Ashish Rajvanshi, CEO Adani Defence & Aerospace was recently conferred the title of the CEO of the Year (2025), at the Times Group's 11th ET NOW MACHINIST Super Shopfloor Awards 2025. This recognition is a testament to his leadership in propelling India's defence and aerospace sector towards Aatmanirbharta.

Under his leadership, Adani Defence & Aerospace is not only delivering cutting-edge solutions but also nurturing a skilled workforce and fostering innovation. His focus on building a robust ecosystem of local suppliers and MSMEs is aligned to the company's vision of nation-building.

In a congratulatory message to Ashish, Adani Defence and Aerospace said, "We congratulate Ashish on this achievement, celebrating his tireless efforts to advance India's defence and aerospace capabilities. His commitment to Aatmanirbharta and ecosystem-building sets a benchmark for the entire industry. A truly well-deserved recognition for his visionary leadership in strengthening India's defence and aerospace capabilities.

Adani Defence & Aerospace is one of India's leading defence and aerospace companies with capabilities across a wide domain such as unmanned systems, drones, counter drones, missiles, small arms, ammunition, aircraft services, and defence electronics.

Based on Adani Group's ethos of nation-building, Adani Defence & Aerospace plays an instrumental role in helping transform the country into a destination for hi-tech defence and aerospace manufacturing hub, aligned with the Aatmanirbhar Bharat initiative.

It also specialises in designing, researching, developing, manufacturing, integrating, and maintaining high-tech systems, products, and services to ensure national security and keep vital information and infrastructure secure.

Adani Defence & Aerospace is one of India's leading defence and aerospace companies with capabilities across a wide domain such as unmanned systems, drones, counter drones, missiles, small arms, ammunition, aircraft services, and defence electronics

The company has partnered with Indian startups and MSMEs committed to the Aatmanirbhar Bharat initiative, aiming to develop a domestic defence ecosystem with an export-orientation mindset, with best-in-class processes and quality management systems.

The company's overarching objective is to ensure its clients stay ahead of the curve and is well-prepared to address any unforeseen contingencies. Driven by a relentless pursuit of excellence, Adani Defence & Aerospace remains dedicated to delivering superior solutions and services in all its endeavours.

NEWS MAKER

SHARANG SHAKTI UNVEILS vajR: INDIA'S FIRST AUTONOMOUS HARD-KILL DRONE INTERCEPTOR

RA EDITORIAL DESK

VajR, a fully autonomous hard-kill drone interceptor system designed to take down hostile UAVs in real-time has been unveiled by Gurugram-based deep-tech startup Sharang Shakti. This is also one of the first attempts by an Indian private firm to deliver a reusable, AI-enabled kinetic drone defence platform, particularly tailored for modern aerial threats.

Unlike traditional counter-drone systems that rely on soft-kill methods like jamming or spoofing, vajR is built for kinetic elimination. It launches automatically from a dedicated autonomous hangar, receives targeting data from radar or optical sensors, and then flies toward the hostile drone. Using onboard sensors and neural networks, vajR identifies and locks on to its target in mid-air, before physically colliding with it to neutralise the threat.

This hard-kill approach is especially valuable in high-threat zones where soft-kill techniques may fail due to signal interference or latency.

What makes vajR unique is not just its capability—but the indigenous technology used in its manufacturing. The system has been designed entirely in-house by Sharang Shakti, from the control software and avionics to the sensor fusion and onboard AI. At the core of vajR lies Sharang Shakti's own guidance and control system. It enables precise manoeuvring at high speeds, even during complex engagements with agile enemy drones.

Once within 50–100 meters of the target, vajR switches from remote guidance to its internal targeting system. Using a forward-looking electro-optical/infrared (EO/IR) sensor and a deep learning model trained on thousands of drone profiles, it performs autonomous target recognition, tracking, and engagement.

Upon target lock, the drone executes a full-speed collision. Critical components are housed in a Kevlar-reinforced dome, allowing vajR to survive and return safely—making it reusable, unlike many interceptors that are destroyed in action. Further, vajR is designed to operate in coordinated swarms, enabling multiple interceptors to work together against large drone formations.

The ground module houses and maintains vajR units. These hangars can autonomously charge, launch, and recover the drones without human intervention—allowing for round-the-clock readiness.

vajR comes into operation with the detection of a suspicious aerial object by a radar or an optical system. This data is sent to the vajR ground station, which then deploys the interceptor. During flight, it is guided by an AI-enhanced control system until it switches to its own onboard sensors for terminal guidance. The system includes a "human-in-the-loop" safeguard, allowing an operator to abort the mission at any point before impact.

Sharang Shakti's broader vision is "from India, for global" and vajR reflects that ambition. The system is modular, scalable, and has applications across defence, critical infrastructure, and even civilian drone monitoring.

The unveiling of vajR is more than just a product launch—it reflects India's evolving defence-industrial ecosystem. As a private player, Sharang Shakti represents a new wave of defence tech startups that blend deep engineering with real-world military utility. vajR with its smart design, indigenous development, and battlefield relevance, could soon become a core part of India's counter-UAS doctrine. Overall, vajR offers a decisive, homegrown answer—fast, intelligent, and deadly.

TEN ISRO TECHNOLOGIES TRANSFERRED TO INDIAN FIRMS: IN-SPACe

The latest initiative by the ISRO to transfer technologies to the private sector aims to promote public-private sector partnerships. This will also give access to the vast repository of ISRO-developed new technologies to the private sector for increasing their commercialisation

RA EDITORIAL DESK

The Indian National Space Promotion and Authorisation Centre (IN-SPACe) has said it facilitated the transfer of 10 state-of-the-art technologies developed by the Indian Space Research Organisation (ISRO) to six Indian companies.

The tripartite Technology Transfer Agreements (TTAs) were signed between NewSpace India Limited (NSIL), the six companies, and IN-SPACe at the IN-SPACe headquarters in Ahmedabad.

The technology transfers will give private players the opportunity to access the developed technologies available with ISRO, enabling them to use space-related technology for commercial applications in space as well as other sectors.

The technologies that foster satellite launch, ground station infrastructure, and geospatial applications are expected to deepen industry participation, enable indigenisation, and reduce dependency on foreign technologies.

"The transfer of these technologies marks yet another significant step towards empowering the private sector to harness and commercialise space technologies. ISRO has a flourishing repository of R&D in space technologies, and it is time we leverage that to the optimum to strengthen India's space industrial ecosystem, and in that, industry-led innovation will play a key role," said Dr Pawan Goenka, Chairman, IN-SPACe.

TECHNOLOGIES TRANSFERRED

Two advanced inertial sensors — the Laser Gyroscope and the Ceramic Servo Accelerometer — developed by ISRO's Inertial Systems Unit, for potential use in satellite launch vehicles have been transferred to Hyderabad-based Zetatek Technologies. The company has over 25 years of expertise in Inertial Navigation System (INS) testing, calibration, and QA/QT equipment.

Three technologies related to ground station operations — S/X/Ka tri-band dual circular polarised monopulse feed, tri-axis antenna control servo system, and Ku/C/L and S Band Cassegrain feed — have been transferred to Avantel and Jisnu Communications, Hyderabad-based companies specialising in end-to-end communications solutions for space and defence platforms. These technologies, currently sourced from foreign vendors, will enable self-reliance in critical ground station infrastructure.

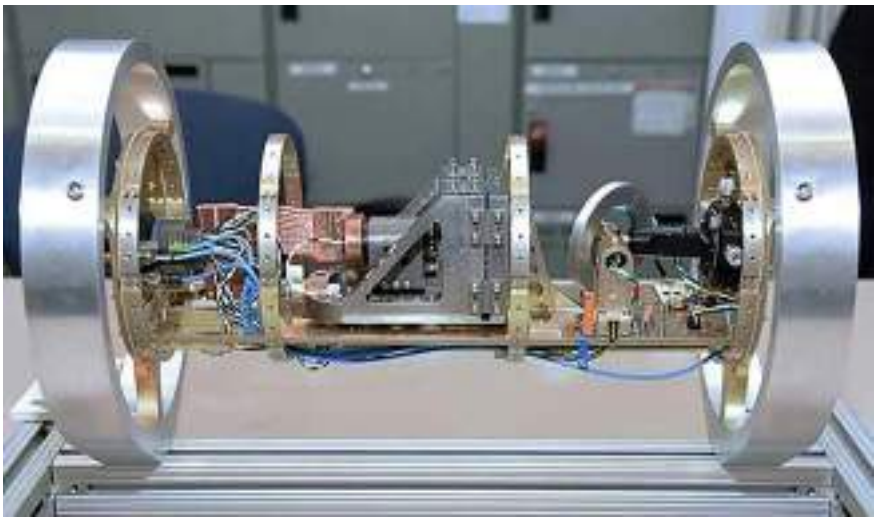
Further, two geospatial models developed by SAC/ISRO for pest forewarning and semi-physical crop yield estimation were transferred to Ahmedabad-based Amnex Info Technologies, to be deployed in agricultural decision-making and crop protection.

A compact, multi-parameter, portable bathymetry system developed by NRSC/ISRO has been transferred to Jalkruti Water Solutions, Ahmedabad, to enable UAV-based integration for water resource monitoring. Further, VSSC/ISRO's ceramic-based flame-proof coating technology — originally developed for launch vehicle applications — has been acquired by Ramdev Chemicals, Ahmedabad, for wider industrial applications.

"With this transfer, we are taking a pivotal step toward building indigenous capabilities within India. ISRO, IN-SPACe, and NSIL will collaboratively provide comprehensive handholding support to all the industry players to ensure successful absorption of the technology," said Rajeev Jyoti, Director, Technical Directorate, IN-SPACe.

TECHNOLOGY

ADITI 2.0 DEFENCE CHALLENGE WINNER QUBEATS TO DEVELOP INDIGENOUS QUANTUM POSITIONING SYSTEM FOR THE INDIAN NAVY



Winning the ADITI (Aatmanirbhar Defence Technology Initiative) 2.0 Defence Challenge has come as the latest feather in QuBeats' cap, which has pioneered the latest Quantum technology-based solutions, for both military and civilian sectors.

GPS denial is a real and growing threat, especially in contested zones, but the Earth itself offers a solution, says Mallikarjun Karra, one of the founders of Hyderabad-based QuBeats.

QuBeats says, the award will fund the development of high-precision quantum sensors that enable accurate navigation in environments where GPS is jammed, denied, or spoofed—a critical capability for modern military operations.

The traditional satellite-based navigation like GPS, runs the risk of signal denial in the form of jamming and spoofing, particularly in contested military zones, this vulnerability has spurred global investment in alternative technologies. On the other hand, quantum navigation uses principles of quantum mechanics to develop systems that are entirely self-reliant, needing no external satellite inputs.

Founded by a team of Indian researchers from global institutions in 2023, QuBeats is led by Mallikarjun Karra, a PhD candidate at the Max Planck Society; Madhu Talluri, a postdoctoral researcher at the Lawrence Berkeley Lab; Shouvik Mukherjee, a postdoc at the Joint Quantum Institute (University of Maryland); and Rajat Sethi, a graduate of MIT, Harvard and IIT Kharagpur who has also served as a political adviser to three chief ministers.

At the centre of the start-up's work is the development of a 'quantum magnetometer', an advanced sensor that detects subtle changes in the Earth's magnetic field. Since these magnetic patterns differ from place to place, accurately sensing them can help navigate by using the Earth itself as a natural map.

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The company says that the quantum navigation suite under development includes not just magnetometers, but also quantum gyroscopes, miniature atomic clocks, Rydberg radars and ultra-sensitive detection sensors. These technologies are intended for a range of strategic military applications such as undersea warfare, long-range missile guidance and communication in contested environments.

Further these technologies have potential civilian applications as well, including deep-sea exploration, autonomous vehicles, and space navigation.

India also, has also been gradually stepping up efforts in the quantum domain. Last month, the Defence Research and Development Organisation (DRDO) opened its first Quantum Technology Research Centre (QTRC) in Delhi, a facility set to boost research and development in quantum computing, sensing and communication for defence applications.

The QuBeats grant is part of the MoD's broader ADITI 2.0 programme, launched in October 2024. This initiative includes 19 challenges from the Armed Forces covering areas such as AI, quantum tech, military communication, anti-drone systems and adaptive camouflage. The winners receive funding up to Rs 25 crore through the iDEX (Innovations for Defence Excellence) platform.

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QuBeats Technologies is poised to lead the charge in the quantum revolution, delivering transformative solutions that will redefine the boundaries of what is possible. Its commitment to sustainability and ethical innovation guides its approach as it strive to create technologies that not only advance human capabilities but also contribute positively to society and the environment.

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CIVIL AVIATION NEWS

ALICE AIRCRAFT COMPLETES HISTORIC ALL-ELECTRIC FLIGHT

The aviation industry witnessed a watershed moment as Eviation's all-electric Alice aircraft successfully completed its first passenger-configuration flight in Washington state, potentially heralding a new era of sustainable regional air travel. This groundbreaking achievement saw the nine-seater aircraft cover 130 kilometres in just 30 minutes, with energy costs as low as ₹700 per seat - a fraction of conventional aircraft operating costs.

Developed over seven years with $400 million in funding, the Alice represents the most advanced electric passenger aircraft to reach flight testing. Its revolutionary design incorporates three magniX 650 electric motors (640 kW each) powered by an 820 kWh lithium-ion battery system. The aircraft's carbon-composite airframe reduces weight by 30per cent compared to aluminium structures, while its distributed propulsion system enhances efficiency and redundancy.

Cape Air, a prominent US regional carrier, has already placed a firm order for 75 Alice aircraft, with deliveries scheduled to begin in 2025. The current model offers a 260-knot (481 km/h) cruise speed and 440 km range, though Eviation engineers are working to extend this to 800 km by 2026 through battery density improvements, informed Gregory Davis, Eviation's CEO.

The implications for markets like India are profound. Routes such as Mumbai-Pune (150 km), Bengaluru-Chennai (280 km), or Delhi-Chandigarh (240 km) could be served at 40-50 per cent lower fares with zero direct emissions. Industry analysts suggest electric aircraft could capture 15-20 per cent of India's regional market by 2030, especially for routes under 300 km where they outperform conventional aircraft on both cost and environmental metrics.

However, significant infrastructure challenges remain. The Alice requires specialised 1.5 MW fast-charging stations that can replenish its batteries in under 30 minutes. Airports will need to invest in charging infrastructure and potentially renewable energy sources to maximise environmental benefits. Regulatory frameworks for electric aircraft certification are still evolving globally, though the FAA and EASA are working closely with Eviation to establish safety standards.

ATR BETS BIG ON REGIONAL AVIATION GROWTH

India figures prominently in the global expansion strategy of European turboprop manufacturer ATR (Avions de Transport Régional). In a media interaction, Stefano Bortoli, ATR's Managing Director for Asia-Pacific, outlined ambitious plans that could see India account for nearly 40 per cent of the company's regional deliveries within this decade.

ATR's confidence stems from several converging factors. Currently, about 75 per cent of the company's Asia-Pacific deliveries are destined for Indian operators, with 52 aircraft already forming the backbone of regional carriers like Alliance Air, IndiGo, and SpiceJet. This fleet is projected to double by 2028 as India's aviation sector rebounds post-pandemic, with regional traffic growing at 12 per cent annually - nearly twice the global average.

The government's UDAN (Ude Desh Ka Aam Nagrik) scheme remains the critical catalyst. Since its 2016 launch, this regional connectivity program has added 76 new routes and 25 operational airports to India's aviation map. What generates ATR's interest is is that barely 10 per cent of India's 148 commercial airports currently see turboprop operations and 70 per cent of these airports have runways too short for jets but perfect for ATR aircraft.

ATR is preparing to introduce its new ATR 72-600 'EVO' variant in 2025, featuring advanced Pratt & Whitney engines that promise 20 per cent lower fuel consumption and 15 per cent reduced maintenance costs. The company is also exploring hybrid-electric versions for potential introduction by 2030, aligning perfectly with India's net-zero commitments.

However, significant challenges remain. Aviation turbine fuel (ATF) taxes in India hover around 25-30 per cent, compared to single-digit rates in most global markets. Many regional airports still lack proper refuelling infrastructure and night landing capabilities. Bortoli revealed that the company is working closely with Indian authorities to address these issues including tax rationalisation for regional operators.

The company is negotiating over 30 new orders with Indian carriers and exploring partnerships to establish local maintenance, repair, and overhaul (MRO) facilities. "India isn't just a market for us - it's becoming a strategic hub for the entire Asia-Pacific region.

MALAYSIA AVIATION GROUP ORDERS 20 MORE AIRBUS A330NEO WIDEBODIES

Malaysia Aviation Group (MAG), the parent company of national carrier Malaysia Airlines, has placed a firm order with Airbus for 20 more A330-900 aircraft. This new order will double Malaysia Airlines' future A330neo fleet to 40 aircraft. The announcement was made during the official visit to France of the Prime Minister of Malaysia, H.E. Anwar Ibrahim.

MAG first selected the A330neo in 2022 under its widebody fleet renewal programme, with a commitment for 20 aircraft, of which four have now been delivered. Featuring an all-new premium cabin layout, the aircraft are already operating on services from Kuala Lumpur to Melbourne, Auckland and Bali.

"The A330neo continues to deliver the right balance of operational efficiency, range, and cabin comfort to support our network and growth strategy," said Datuk Captain Izham Ismail, Group Managing Director of MAG. "With its enhanced fuel efficiency and flexibility across both regional and long-haul routes, the aircraft is a strong fit for our evolving market needs. It also allows us to offer a product that aligns with our premium positioning – streamlined, modern, and designed around passenger comfort and expectations. This additional order reinforces our long-term vision of building a future-ready fleet that supports sustainable growth, delivers consistent value to our passengers, and strengthens our competitiveness in key markets."

Powered by the latest generation Rolls-Royce Trent 7000 engines, the A330-900 is capable of flying 7,200 nm / 13,300 km non-stop. The A330neo features the award-winning Airspace cabin, which offers passengers a unique experience, high level of comfort, ambience, and design. This includes more individual space, enlarged overhead bins, a new lighting system and access to the latest in-flight entertainment and connectivity systems.

At the end of May 2025, the A330 Family had won over 1,800 firm orders from more than 130 customers worldwide. As with all in-production Airbus aircraft, the A330neo is able to operate with up to 50% Sustainable Aviation Fuel (SAF), with a target to increase to up to 100% SAF capability by 2030.

THALES' FLYTOPTIM SELECTED BY CORSAIR TO CUT CO_2 EMISSIONS AND ADVANCE SUSTAINABLE AVIATION

FlytOptim is an intuitive AI-powered solution that enables pilots to optimise their vertical flight trajectory using real-time weather and aircraft data, thus enabling them to reduce their fuel consumption by 2%.

Harnessing AI to reduce emissions and advance sustainable aviation

This innovation uses Thales' trusted AI and advanced prediction algorithms of its Flight Management System (FMS), PureFlyt, to identify the optimal vertical flight path, based on real-time weather and aircraft data (such as mass and position). When an optimisation is possible, the alternative vertical flight path is sent directly to the pilot in the cockpit using existing communication channels. Once approved by air traffic control (ATC), the pilot can update the flight plan accordingly.

User-centric experience with no operational disruption

Designed together with pilots, FlytOptim's intuitive design and efficient user-experience has seen an unparalleled adoption rate: after only a few weeks trial at Corsair, 80% of the flights were using FlytOptim. FlytOptim can be deployed quickly and easily, with no need to modify the aircraft or the airline's existing IT systems.

A comprehensive range of more environmentally-friendly solutions

This solution marks another step in Thales' roadmap towards climate-efficient aviation, offering both CO2 and non-CO2 reduction tools for pilots, dispatchers, air traffic controllers and flow managers. FlytOptim will progressively integrate Thales' other green operations innovations including its contrail avoidance solution and the dynamic management of Air Traffic Control constraints, thus supporting aviation industry customers in their journey towards more efficient operations.

"We are proud to announce our new customer for our FlytOptim solution. This milestone is fully aligned with Thales' strategy to help transform the aerospace industry future through innovative technologies that support more sustainable and responsible aviation." Yannick Assouad, Executive Vice-President, Avionics, Thales.

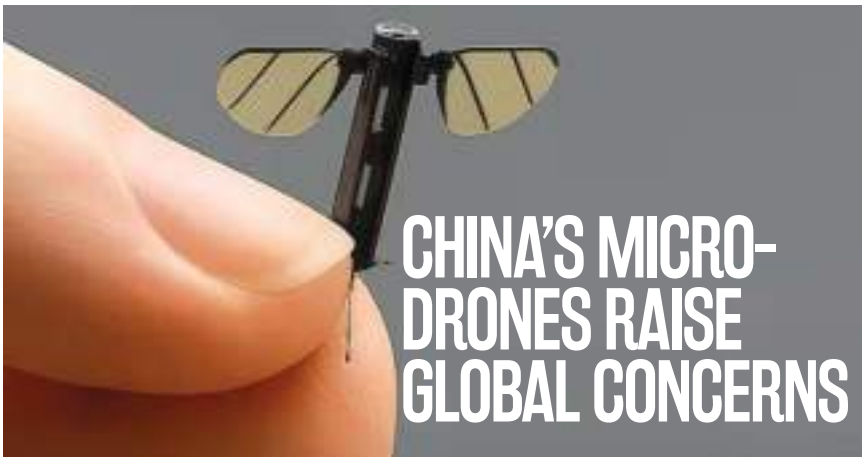
NEWS ROUND UP

HAL AND SAFRAN JOIN HANDS FOR A STRATEGIC PARTNERSHIP

Hindustan Aeronautics Limited (HAL) and French engine manufacturer Safran have announced an expanded partnership to produce critical components for the LEAP engine family. This collaboration, revealed at the Paris Air Show, will see HAL's Bengaluru facility manufacturing high-precision forged parts including turbine discs, compressor blades, and combustion chamber components. Representing a major milestone in India's 'Aatmanirbhar Bharat' initiative for defence and aerospace, the agreement comprises the annual supply of components worth over $200 million by HAL to Safran's global production network for LEAP engines, which power 70 per cent of the world's new-generation single-aisle aircraft including the Airbus A320neo and Boeing 737 MAX.

According to HAL Chairman CB Ananthakrishnan, this partnership elevates India into the elite group of nations capable of manufacturing critical aero-engine components. The Bengaluru production line will incorporate advanced robotic machining and AI-assisted quality control systems, with technology transfer from Safran's French facilities. HAL engineers undergoing specialised training at Safran's R&D centre near Paris.

The collaboration extends beyond manufacturing. Safran CEO Olivier Andriès revealed that his company will collaborate with HAL to develop next-generation engine technologies such as a 110 kN thrust engine particularly for India's fifth-generation futuristic Advanced Medium Combat Aircraft (AMCA) program. The partnership also covers maintenance solutions for India's growing fleet of LEAP-powered commercial aircraft. The deal could position India as a global hub for aero-engine components with Safran planning to double its Indian sourcing to €1 billion by 2030. The partnership is expected to create over 500 high-skilled jobs in India and stimulate ancillary industries in precision metallurgy and advanced manufacturing.



CHINA'S MICRO-DRONES RAISE GLOBAL CONCERNS

China's rapid advancements in micro-drone technology have sparked international security concerns, with military analysts warning about the potential battlefield applications of palm-sized unmanned systems. Recent demonstrations by Chinese defence research institutes showcased swarms of 1,000+ micro-drones operating autonomously with frightening precision - identifying targets, evading defences, and even delivering payloads with scary accuracy.

These developments build on China's 2017 breakthrough when the China Electronics Technology Group Corporation (CETC) demonstrated a swarm of 119 fixed-wing micro-drones. Today's systems are far more sophisticated: The "Zhen" (Mosquito) drone weighs just 40 grams with a 10cm wingspan, yet carries high-resolution cameras, facial recognition software, and GPS spoofing capabilities. Its carbon-fibre construction makes it virtually invisible to radar, while advanced AI allows autonomous operation without radio signals that could be jammed.

Military experts identify several concerning applications:

1. Covert surveillance: The drones can infiltrate secure facilities by mimicking insects or birds
2. Electronic warfare: Swarms could disable enemy communications and radar systems
3. Precision strikes: Potential to deliver toxins or explosives to specific individuals
4. Psychological operations: Mass formations could overwhelm urban areas

According to NATO's Assistant Secretary General for Emerging Security Challenges David van Weel, these aren't science fiction threats. The Pentagon has confirmed testing of microwave-based counter-drone systems that can disable multiple micro-drones simultaneously, while Defense Advanced Research Projects Agency (DARPA), the US military's innovation arm for breakthrough technologies, is developing laser defences that can track and eliminate tiny fast-moving targets. The ethical implications are equally troubling, notes International humanitarian law expert Dr Helen Durham. China maintains its drone research is purely defensive, but satellite imagery shows extensive testing at military facilities like the Zhurihe training base in Inner Mongolia. As the technology proliferates, arms control experts are calling for urgent international regulations.

BEL, METAMIND & PERSISTENT SYSTEMS SIGN TRIPARTITE MoU TO OFFER INNOVATIVE AI-DRIVEN SOFTWARE SOLUTIONS

Defence PSU Bharat Electronics Limited (BEL), Metamind Systems Private Limited and Persistent Systems Limited have signed a tripartite MoU to jointly develop and deliver innovative software products, solutions and service offerings in the domains of Data Analytics, Artificial Intelligence (AI), Machine Learning (ML) and Cyber Security across sectors such as Aerospace & Defence, Healthcare, Telecommunications, Energy, Smart Cities and other technology-driven industries.

The partnership will focus on collaborating and exploring business opportunities in India, the United States (US) and Latin America (LATAM). The tripartite MoU was signed by Durga G K, Executive Director (Software), BEL; Hrishikesh Kinikar, Director, Metamind Systems Private Limited; and Rajesh Gharpure, Chief Delivery Officer, Persistent Systems Limited in the presence of Rajnish Sharma, Director (Bengaluru Complex), and Manoj Jain, Chairman & Managing Director, BEL.

EUROPE AND JAPAN FORGE SIXTH-GEN FIGHTER ALLIANCE

The Global Combat Air Programme (GCAP) achieved a major milestone with the formal establishment of 'EdgeWing', a multinational joint venture that will develop and produce next-generation fighter aircraft for the UK, Japan, and Italy. This unprecedented trilateral partnership brings together defence giants BAE Systems (UK), Mitsubishi Heavy Industries (Japan), and Leonardo (Italy) under a unified corporate structure with shared leadership and funding.

EdgeWing's ambitious roadmap envisages a sixth-generation fighter prototype to fly by 2030, with operational deployment targeted for 2035. The program, valued at over $25 billion in its initial phase, will create what developers term a "system of systems" - a fighter aircraft working in concert with AI-driven loyal wingman drones, space-based sensors, and networked weapons platforms. Technical specifications reveal groundbreaking capabilities: The manned fighter will feature adaptive cycle engines for hypersonic speeds (Mach 2.5+), directed energy weapons, and quantum radar systems. Its unmanned companions, called "Remote Carriers," will operate in swarms of 10-15 drones with varying payloads for reconnaissance, electronic warfare, or kinetic strikes.

According to GCAP program director Air Marshal Richard Knighton the collaboration will pave the way for future air combat superiority for the nations. The partners have agreed to an innovative workshare arrangement: BAE leads the fuselage and systems integration, Mitsubishi develops the engines and avionics, while Leonardo handles sensors and electronic warfare systems. The geopolitical implications are significant. Japan's participation marks its first major defence export initiative since relaxing

arms trade restrictions in 2022. Industry observers note potential collaboration with India's AMCA program, particularly in engine technology and stealth materials. "EdgeWing could become the foundation for a broader Indo-Pacific defence partnership," suggested Tokyo-based security analyst Kenji Kawase.

EdgeWing will utilise digital twin technology throughout development, allowing virtual testing of systems before physical prototypes are built. The JV has already established research centres in Bristol, Tokyo, and Turin, with plans to recruit over 2,000 engineers across the three nations.

ISRO TRANSFERS SSLV TECHNOLOGY TO HAL

The Indian Space Research Organisation (ISRO) has taken a revolutionary step toward commercialising space technology by transferring its Small Satellite Launch Vehicle (SSLV) know-how to HAL. This strategic decision, approved by the Space Commission, aims to create an indigenous launch vehicle production ecosystem while freeing ISRO to focus on advanced research and interplanetary missions. The SSLV, India's newest launch vehicle, represents a paradigm shift in small satellite deployment. Standing 34 meters tall with a lift-off mass of 120 tonnes, the three-stage rocket can place 500 kg payloads into 500 km low Earth orbits at just 30-35 crore per launch - half the cost of ISRO's workhorse Polar Satellite Launch Vehicle (PSLV). What makes the SSLV particularly attractive is its rapid turnaround capability; the vehicle can be assembled and launched within 72 hours compared to weeks for conventional rockets.

According to ISRO Chairman S. Somanath, HAL will establish a dedicated production line capable of delivering six SSLVs annually. The technology

transfer includes complete design documentation, manufacturing processes, and mission management protocols. HAL plans to involve private sector partners for components like avionics and propulsion systems, creating a vibrant space industry supply chain. The commercialisation of SSLV comes at an opportune moment. The global small satellite market is projected to grow from $3.2 billion in 2022 to $13.7 billion by 2030, with India well-positioned to capture a significant share. Indian startups like Skyroot and Agnikul, which have developed their own micro-launchers, may now collaborate with HAL for payload integration services.

This transfer bridges the gap between India's space research and commercial sectors, with potential launch costs dropping to as low as $25,000 per kilogram, making India highly competitive in the global small launch market. The first HAL-built SSLV is scheduled for a demonstration flight in mid-2025 from Sriharikota. ISRO will continue providing technical support and range services while shifting its focus to next-generation technologies like reusable rockets and advanced propulsion systems. ISRO aims to create an environment where any Indian company can access space affordably, signalling a new era of public-private partnership in India's space program.

NEWS ROUND UP

PIXXEL SIGNS IDEX SPARK GRANT AGREEMENT TO DEVELOP HYPERSPECTRAL & MWIR PAYLOADS FOR THE IAF

Pixxel, a Bengaluru-based space technology company building the world's highest-resolution hyperspectral satellite constellation, has signed a second Agreement with the Innovations for Defence Excellence (iDEX), Ministry of Defence, Government of India. This new SPARK (Support for Prototype and Research Kickstart) Grant, awarded to SpacePixxel Pvt Ltd under iDEX DISC 8 Challenge 6.2, supports the development of advanced Hyperspectral and MWIR (Mid-Wave Infrared) payloads, tailored for the Indian Air Force.

The grant further strengthens Pixxel's collaboration with the Indian ecosystem, following its selection under the Mission DefSpace Challenge of iDEX Prime (Space) in 2023 to manufacture miniaturised multi-payload satellites.

With this new milestone, Pixxel will leverage its cutting-edge optical engineering and in-house satellite manufacturing capabilities to design and build next-generation Earth observation payloads with security-grade performance. The high-resolution Hyperspectral and MWIR payloads will enhance India's airborne and space-based imaging capabilities across various operational and strategic applications.

The grant through the iDEX scheme is designed to accelerate the development of next-generation prototypes and technologies by Indian startups and MSMEs, fostering a self-reliant and innovation-driven landscape in the country. Pixxel's continued participation underscores its commitment to supporting strategic goals and reflects the government's growing confidence in its technology stack.

With three Firefly satellites already in orbit and more to launch soon, Pixxel has demonstrated its ability to build scalable, affordable, and versatile space solutions from the ground up. This is further enabled by Pixxel Aurora, the company's Earth Observation Studio, which makes hyperspectral imagery accessible and usable through intuitive visualisation, analysis, and insight generation tools. As the company expands its capabilities, it remains focused on building a real-time, high-fidelity health monitor for the planet.

EDGE AND FAB SIGN STRATEGIC AGREEMENT TO BUILD A RESILIENT FINANCIAL ECOSYSTEM

EDGE Group, one of the world's leading advanced technology and defence groups, has entered a strategic partnership with First Abu Dhabi Bank (FAB), the UAE's global bank. The agreement covers two major financial initiatives: the implementation of FAB's advanced Supply Chain Finance (SCF) solution and the deployment of its AI-powered Treasury Management System (TMS). Through FAB's digital SCF solution, EDGE provides local and international suppliers access to early, low-cost financing, which enhances supplier trust, improves commercial terms, and ensures continuity across critical operations. EDGE's deployment of FAB's AI-powered TMS represents the largest to date. The solution delivers real-time cash visibility, advanced forecasting capabilities, and integrated risk management tools, enabling EDGE to automate treasury operations and optimise liquidity across the Group. The platform provides protection for interest rate risk and FX risk, while improving financial agility, investment planning, and funding.

FLYING HIGH: MAX AEROSPACE TO ESTABLISH HELICOPTER MANUFACTURING FACILITY IN NAGPUR

The upcoming project of Max Aerospace & Aviation Pvt Ltd is expected to generate nearly 2,000 direct and indirect employment opportunities. The actual manufacturing operations are scheduled to begin in 2026. The facility will be located near Nagpur Airport, enabling it to benefit from existing infrastructure and logistics connectivity. This will be Maharashtra's first dedicated plant for the customisation and complete production of helicopters, and will function as a Centre of Excellence for rotary-wing platforms, including integration and flight testing. The use of international-grade aerospace technology will help strengthen India's growing presence in the global aerospace supply chain.Max Aerospace & Aviation Pvt Ltd has signed a Memorandum of Understanding (MoU) with the Maharashtra government to establish the manufacturing facility in Nagpur. The MoU was signed by Industries Department Secretary P. Anbalagan and Max Aerospace Chairman Bharat Malkani. Other dignitaries present included MIDC CEO P Velrasu, Max Aerospace CFO Kirit Mehta, Business Development Head Meghna Malkani, President Jayesh Mehta, and other senior advisors. The upcoming project with an investment of Rs 8,000 crore is expected to generate nearly 2,000 direct and indirect employment opportunities. The actual manufacturing operations are scheduled to begin in 2026.

RELIANCE DEFENCE SECURES EXPORT ORDER WORTH RS 600 CRORE FROM RHEINMETALL

Reliance Infrastructure Limited promoted, Reliance Defence Limited (Reliance Defence), June 25 announced securing of a significant export order worth Rs 600 crore from Rheinmetall Waffe Munition GmbH, a leading German defence and ammunitions manufacturer. Reliance Defence's export order is one of the largest in the high-tech ammunition domain to date. This underscores the strength of its recently announced strategic partnership with Rheinmetall. The order represents a key milestone in Reliance Defence's strategy to strengthen its position as a reliable partner in the global defence and munition supply chain, with a particular focus on Europe. The collaboration highlights the mutual commitment of both parties to long-term cooperation, and to advancing the 'Aatmanirbhar Bharat' and 'Make in India' initiatives by strengthening indigenous defence manufacturing capabilities. Reliance Defence aims to be amongst top three Defence exporters in the country. The export order showcases the strength of the partnership and demonstrates the growing capabilities of India's private sector in delivering high-quality defence products that meet stringent global standards. The agreement aligns with Reliance Defence's strategic focus on expanding its international presence, with Europe identified as a key market for future growth.

SAFRAN TO SET UP NEW MAINTENANCE AND OVERHAUL FACILITY FOR M88 JET ENGINES IN HYDERABAD

French aerospace major Safran has announced a significant expansion of its operations in Hyderabad, Telangana, with the establishment of a new entity, Safran Aircraft Engine Services India. This new facility will be dedicated to the maintenance and overhaul of the M88 military jet engines that power the Dassault Rafale fighter jets, marking a strategic move to strengthen India's aerospace and defence ecosystem. The initiative was formally announced following a meeting between Safran's General Manager, Pierre Fernandez, and Telangana Industries Minister D Sridhar Babu. According to the Telangana government's press release, the new maintenance, repair, and overhaul (MRO) center is expected to generate approximately 150 new jobs by the end of next year, with the potential to create an additional 750 positions in subsequent phases, reflecting the project's scale and long-term vision.

Safran already operates two advanced facilities in Hyderabad: Safran Electrical & Power India, which manufactures electrical harnesses for CFM LEAP engines and the Rafale fighter, and Safran Aircraft Engines Hyderabad, specialising in rotating parts for the LEAP engine's low-pressure turbine. The addition of the M88 engine MRO facility will further consolidate Hyderabad's status as a central hub for the production, export, and maintenance of critical aerospace components, particularly those linked to the Rafale programme. The announcement comes amid deepening Indo-French industrial collaboration, with Safran expressing gratitude for the Telangana government's consistent support. The company highlighted its participation in a roundtable discussion with a delegation of French companies led by the Indo-French Chamber of Commerce and Industry, underscoring the importance of such partnerships in advancing Telangana's ambitions to become a major aerospace hub in India.

Safran's investment aligns with broader efforts to localise high-value defence manufacturing and support capabilities in India, as evidenced by recent agreements between Dassault Aviation and TATA Advanced Systems to manufacture Rafale fuselage components in Hyderabad. The new MRO centre is expected to play a pivotal role in supporting the operational readiness of the Indian Air Force's Rafale fleet and in boosting local employment and technical expertise. Overall, Safran's latest initiative not only reinforces its commitment to India's aerospace sector but also positions Hyderabad as a critical node in the global supply chain for advanced military aviation technology.

AIRBUS A400M FIREFIGHTING KIT COMPLETES A SUCCESSFUL TEST CAMPAIGN IN FRANCE

Airbus Defence and Space announced today the successful completion of a series of test drops and demonstrations of its A400M firefighting demonstrator kit in Nîmes-Garons, France. The objective of this test campaign was to conduct an independent assessment of the effectiveness of the A400M firefighting kit. The tests were conducted by the Entente-Valabre's Test and Research Centre (CEREN), a French public institution authorised and approved by the Ministry of the Interior to assess forest firefighting equipment, training personnel in France and abroad, and which is an international authority in this field.

The test campaign, which ran at the end of April 2025, involved the A400M performing multiple drops over a designated section of the airfield. These rigorous so-called cup grid tests allowed the CEREN to precisely assess the system's capabilities, including the accurate distribution and concentration of retardant upon reaching the ground. During the drops, the aircraft reached altitudes under 30 meters (98 feet) and speeds around 230 km/h (125 knots).

The A400M Roll-on/Roll-off (Ro-Ro) firefighting kit offers unique operational advantages previously unavailable on the market. Its innovative roll-on/roll-off design requires no permanent modification to the aircraft, allowing any A400M in a fleet to be rapidly converted for firefighting missions on very short notice. The system, housed in the cargo hold, can discharge up to 20,000 liters of water or retardant by gravity through the rear ramp, with tanks capable of being refilled in less than 10 minutes using standard ground pumps. Furthermore, the A400M's inherent ability to take off and land on short and unpaved runways significantly enhances its flexibility, enabling operations from a wide range of air bases and airfields closer to fire zones.

AXIOM SPACE PARTNERS WITH INDIA-BASED SKYROOT AEROSPACE TO ADVANCE SPACE EXPLORATION

Axiom Space has signed a Memorandum of Understanding (MoU) with India-based Skyroot Aerospace to explore collaboration opportunities to advance space exploration and access to low-Earth orbit (LEO).

This collaboration further reinforces the growing cooperation between Axiom Space and the Indian space sector. Axiom Mission 4 (Ax-4), which launched June 25 at 2:31 a.m. ET, marks India's return to human spaceflight and the nation's first mission on board the International Space Station. This historic mission underscores how Axiom Space is redefining the pathway to LEO and fueling a vibrant space economy for the benefit of every human, everywhere. With Ax-4, Axiom Space is laying the foundation for the construction and operation of Axiom Station, marking the US Company as a leader in LEO. As Axiom Space develops a diverse and global supply chain, the company is strategically partnering with pioneering organizations like Skyroot Aerospace.

Skyroot Aerospace is India's leading private space launch service provider and the first private company to launch a rocket to space in South Asia. As the first private space-tech company to partner with the Indian Space Research Organisation (ISRO), Skyroot is on a mission to make access to space affordable, reliable, and on demand. In 2022, Skyroot successfully launched Vikram-S, and the team is now preparing to launch the Vikram-1 rocket, its maiden orbital-class launch vehicle. Axiom Space and Skyroot Aerospace are exploring opportunities to collaborate on era-defining space infrastructure.

NEWS ROUND UP

BUILT BY GOA SHIPYARD, FIRST FPV-ADAMYA INDUCTED BY ICG

'Adamya' the first Fast Patrol Vessel (FPV) under the eight FPV Project at Goa Shipyard Limited (GSL) was inducted in the Indian Coast Guard (ICG) on June 26, 2025, in Goa. The FPV is the first ship in its class within the ICG fleet to feature Controllable Pitch Propellers (CPPs) and indigenously developed gearboxes, offering superior manoeuvrability, operational flexibility, and enhanced performance at sea. The vessel is equipped with state-of-the-art technology, including a 30mm CRN-91 gun, two 12.7mm stabilised remote-control guns with fire control systems, an Integrated Bridge System (IBS), an Integrated Platform Management System (IPMS), and an Automated Power Management System (APMS). These advanced systems will empower the ICG to perform its charter of duties with increased precision, efficiency, and responsiveness across India's extensive maritime domain. Designed and built entirely by GSL, 'Adamya' exemplifies India's growing shipbuilding capability and represents a major stride towards the nation's vision of Aatmanirbhar Bharat. These FPVs will act as force multipliers in the ICG's operational fleet, enabling swift response for maritime law enforcement, coastal surveillance, search and rescue operations, and the protection of India's Exclusive Economic Zone (EEZ).

DRDO-BHARAT FORGE JOINTLY DEVELOP NEW LIGHTWEIGHT, EFFICIENT CQB CARBINE

In a boost to tackle urban warfare and carry out counter-insurgency operations, the Defence Research and Development Organisation (DRDO) and Bharat Forge have jointly developed a new Close Quarter Battle (CQB) Carbine for the Indian Armed Forces. The weapon is intended to serve operational needs where existing assault rifles may be less effective due to their size. The carbine is the result of collaboration between DRDO's Armament Research and Development Establishment (ARDE), Pune, and private-sector manufacturer Bharat Forge. The Ministry of Defence (MoD) had earlier issued an Acceptance of Necessity (AoN) for 4,25,213 units of 5.56 x 45mm CQB Carbines in 2022.

The CQB Carbine is designed for rapid response in close-range combat scenarios such as counter-terrorism operations, building clearances, and engagements in dense or urban areas. The compact design improves mobility and response time during missions where standard assault rifles may not be suitable. After rigorous tests including performance at international standards, the carbine is considered ready for infantry deployment. According to DRDO, the weapon weighs approximately 3.3 kilograms and has an effective range of 200 meters. It can fire both NATO-standard and INSAS ammunition.

The weapon is equipped with a short barrel and modern ergonomic features, making it easier to use in confined areas. It also includes a 30-round curved magazine for consistent ammunition feeding during rapid fire. The carbine represents India's ongoing efforts to strengthen indigenous defence production through collaboration between research institutions and private manufacturers. This development marks a step forward in meeting the Indian Armed Forces' long-standing requirement for a lightweight, efficient weapon system suited for modern combat environments.

RAPHE mPHIBR RAISES $100 MILLION TO BOOST R&D AND PRODUCTION CAPACITY

With demand for drones increasing rapidly and in the wake of the recent Indo-Pakistan, the conflict spurred New Delhi to triple its drone spending to $470 million over the next 12 to 14 months, according to the Drone Federation of India, an association representing over 550 companies.

The drone startup Raphe mPhibr has raised $100 million in an all-equity Series B round led by General Catalyst, as the startup aims to boost its and local production capabilities amid growing demand for drones in battlefields and for border surveillance.

Drones are becoming increasingly ubiquitous in global military operations with countries turning to drones for rapid infiltration and high-impact strikes. The recent India-Pakistan war is a prime example, with both militaries deploying drones at scale despite having advanced fighter jets and missile systems.

While China remains the dominant force in global drone manufacturing, Raphe mPhibr aims to strengthen India's indigenous drone capabilities.

The startup currently offers nine different drones with payloads ranging from 4.4 pounds to 441 pounds, covering an average distance of between 12 and 124 miles. These drones include the mR10 operational drone swarm, the mR20 for high-altitude logistics resupply, the X8 compact platform for maritime patrol and situational awareness at sea, and the Bharat lightweight man-carried drone for quick surveillance in complex terrain.

The startup has more than 10 customers, all of which are Indian government agencies, including the Indian Army, Navy, and Air Force, as well as armed police forces such as the Border Security Force, Central Reserve Police Force, and the Indo-Tibetan Border Police.

Raphe mPhibr domestically produces its flight controllers, batteries, and all components and materials required to build drone structures, including subtractive metals, thermoplastics, carbon fiber composites, and even wire harnesses. It also develops proprietary autopilots and inertial navigation systems at its facility. However, the startup imports radars and high-end cameras, which it also plans to manufacture in-house within 18 months.

The startup also utilises AI on its drones for object detection in surveillance scenarios, automatically switching between frequency bands to adapt to electronic warfare and employing operational UAV swarm intelligence to make decentralised decisions using AI.

In recent months, Raphe mPhibr has partnered with Germany's Hensoldt and France's Safran to collaborate on developing new sensors, as well as with France's Dassault Systèmes for software simulation requirements.

ACCELERATING MILITARY BUILDUP: JAPAN CONDUCTS FIRST DOMESTIC MISSILE TEST

Japan's army announced that it conducted a missile test for the first time on Japanese territory, as the country accelerates its military buildup to deter increasingly assertive China. The test-firing of the Type 88 surface-to-ship, short-range missile was conducted at the Shizunai Anti-Air Firing Range on Japan's northernmost main island of Hokkaido. About 300 soldiers participated in exercise by the Ground Self-Defence Force's 1st Artillery Brigade, using a training missile targeting an unmanned boat about 40 kilometres (24 miles) off the southern coast of Hokkaido, officials said.

Due to space limitations and safety concerns, Japan has previously conducted missile tests in the territories of the United States, a treaty ally, and Australia, a top Japanese defence partner where vast training grounds are available. The first domestic missile test underscores Japan's push toward a more self-sufficient military and its acquisition of strike-back capabilities as a deterrence to China's increasingly assertive naval activity in regional seas. Japan is also concerned about growing joint military exercises around Japanese coasts between China and Russia. Japan is currently working to deploy long-range cruise missiles, including Tomahawks purchased from the US, beginning later this year. Japan is also developing Type 12 surface-to-ship missiles with a range of about 1,000 kilometres, 10 times that of a Type 88. The truck-mounted Type 88 guided missile, developed by Japan's Mitsubishi Heavy Industries, have a range of about 100 kilometres.

DRDO'S LIGHT TANK ZORAWAR COMPLETES HIGH-ALTITUDE TRIALS, EXTENDED RANGE PINAKA MBRL AND FICV NEARING DEVELOPMENTAL TRIALS PHASE

The Defence Research and Development Organisation (DRDO) has achieved significant milestones in the development of three major indigenous defence platforms: the Zorawar light tank, the Future Infantry Combat Vehicle (FICV), and the extended-range Pinaka multi-barrel rocket launcher (MBRL). Each of these systems is poised to substantially enhance the Indian Army's operational capabilities, particularly in challenging terrains and against evolving regional threats.

The Zorawar light tank, a 25-ton platform named after the Dogra general Zorawar Singh, has recently completed high-altitude trials in Nyoma, Ladakh, at elevations exceeding 4,200 metres. Developed jointly by DRDO and Larsen & Toubro, Zorawar demonstrated exceptional firepower, mobility, and protection during these trials, including successful firing of multiple rounds with high accuracy. The tank also showcased its amphibious capabilities and was airlifted by the Indian Air Force, underscoring its rapid deployability in remote, high-altitude regions. Earlier, Zorawar underwent rigorous automotive and firing trials in desert terrain, meeting all performance objectives.

Collectively, these projects highlight India's commitment to defence self-reliance and indigenous capability development. The successful trials and ongoing progress of Zorawar, the extended-range Pinaka, and the FICV mark significant steps toward equipping the Indian Army with advanced, versatile, and strategically relevant systems for future conflicts.

SMPP BAGS TWIN CONTRACTS FROM THE INDIAN ARMY WORTH ₹300 CRORE

SMPP, an indigenous designer, developer and manufacturer of defence equipment, has added another feather to its cap. It has been awarded dual contracts under Emergency Procurement 5 on June 22, 2025, by the Indian Army for supply of Bulletproof Jackets and Advanced Ballistic Helmets. The total value of the order is more than ₹300 crore. According to this contract, SMPP will supply 27,700 bulletproof jackets and 11,700 Advanced Ballistic Helmets to the Indian army.

SMPP's differentiated value proposition is built on supplying products with a focus on critical safety standards to be perceived as a trusted brand name in the defence sector.

The Bulletproof Jackets come with advanced features like dynamic load distribution and quick release system which increase the operational efficiency by enhancing soldier comfort while offering protection against the most lethal armour piercing bullets. The Advanced Ballistic helmet is world's first helmet which provides protection from AK-47 fired lethal Hard Steel Core ammunition.

SMPP has a manufacturing facility for personal protection products at Palwal (Haryana) and made its first ballistic grade boron carbide plate in 2008 with its in-house developed technology. The testament to the technology is the continuous order from a global aircraft manufacturer since 2014. From one of the largest orders of 186,138 bullet-resistant jackets of Level III and III+ protection for the Indian Army in 2018 which was delivered not just on time but well before the scheduled delivery date, SMPP has come a long way in supplying protective gear to our soldiers including specialist products like Ballistic Helmets for Sikh Soldiers and Ballistic Shields which stop Armour Piercing bullets. The Indian defence manufacturing sector is witnessing an unprecedented transformation, fueled by government's dynamic initiatives. As the demand for Indigenous defence solutions grows, local manufacturers are stepping up to meet the needs of the Indian Armed Forces and beyond. Among these, SMPP Limited has carved a unique niche for itself by emerging as a major contributor in enabling India to achieve 'Aatmanirbharta' in Defence production through its outstanding quality and yet competitive pricing capabilities.

NEWS ROUND UP

ISRAELI COMPANY MORE DEVELOPS ADVANCED SIMULATOR TO TEST OPERATIONAL READINESS OF ELECTRONIC SYSTEMS

The growing number of electronic systems in the battlefield creates a problem – how to ensure that all of them function under different conditions? Israeli company MORE has developed an advanced simulator that is capable of testing the real operational readiness of many electronic systems. The system weighs 10 kg and can be carried by different types of UAV's.

According to Efrat Holzer, Senior System Architect at MORE, the Electromagnetic Operational Environment Emulator (EMOE Emulator) has been designed to prepare platforms and crews for the realities of electromagnetic conflict. This drone-mounted system emulates real-world threats in real time across land, sea, and air. The aerial platform developed by MORE enhances the ability to simulate complex threat environments, providing valuable insights into electromagnetic spectrum warfare.

The company says that this innovation strengthens the military's operational readiness by offering realistic and adaptable testing and training environments across multiple domains. The first EMOE systems are planned to be delivered by year end to a defence client whose identity remains confidential. To explain the unique capabilities of the system, let's consider a naval vessel equipped with multiple sensors to ensure comprehensive situational awareness and threat detection. These include:

Radar systems are used for long-range target detection, surface surveillance, and missile guidance. Electronic Support Measures (ESM) detect and analyse radar signals from enemy threats, providing early warning. * Electronic Attack (EA) systems are used to jam or deceive incoming missiles and radar systems by generating false targets or disrupting guidance systems. The complexity of the multi-layered sensor suite poses challenges in testing the systems through realistic simulation.

SENTRYCS' ADVANCED CYBER OVER RF SOLUTION INTEGRATED INTO RAFAEL'S DRONE DOME SYSTEM

Israeli company Sentrycs, has announced the integration of its advanced solution into Rafael's Drone Dome system. Rafael's Drone Dome is an end-to-end, modular, combat-proven Counter-Unmanned Aerial System (C-UAS) that is already operationally deployed by multiple customers worldwide. Delivering 360-degree, all-weather protection against hostile drones, Rafael's Drone Dome combines radar, SIGINT/RF sensors, EO sensors, jamming systems, and a centralised C2 centre to detect, track, and intercept aerial threats.

The integration of Sentrycs' Cyber over RF solution adds a critical layer of intelligence to Drone Dome's defence architecture, enabling the system to distinguish between authorised and unauthorised drones, reduce false alarms, pinpoint both the drone's location and that of its operator, and identify in real time the communication frequencies being used—particularly valuable against frequency-hopping threats. By incorporating this technology, Drone Dome now delivers faster, more accurate threat detection and mitigation, while maintaining operational safety for friendly UAVs and avoiding unnecessary interference with nearby systems.

Unlike conventional C-UAS solutions that rely on layered and sequential detection processes, Sentrycs' approach interacts directly with a drone's communication protocols, enabling immediate identification and tracking as soon as a signal is detected. This transforms detection from a separate stage into an integrated component of the response process. By analysing the protocol-level communication between drone and operator, the system offers advanced situational awareness, including operator location estimation—capabilities essential in complex, dynamic threat environments. With no dependency on preloaded signal libraries, the system can dynamically analyse and respond to new or modified drone platforms, while ensuring that only unauthorised threats are engaged.

Once a hostile drone is identified, the system seamlessly assumes control, guiding it to a pre-defined landing zone without the need for jamming or kinetic engagement. This protocol-based intervention ensures precise, lawful, and interference-free mitigation, allowing Drone Dome operators to neutralise threats without disrupting nearby communications, critical systems, or authorised aerial activity.

Already operational in more than 20 countries across critical infrastructure, military bases, borders, and law enforcement sites, Sentrycs' solutions offer a proven, lawful, and intelligent approach to countering the growing threat of unauthorised drones.

PARAS ANTI-DRONE TECH SECURES Rs 22 CRORE DEAL FROM FRANCE-BASED CERBAIR

Paras Anti-Drone Technologies, a subsidiary of Paras Defence and Space Technologies, has secured a significant deal to supply advanced counter-unmanned aerial vehicle (UAV) technology to France-based CERBAIR, valued at Rs 22 crore.

Under this agreement, CERBAIR will acquire up to 30 units of the CHIMERA 200 system, a state-of-the-art, man-portable radio frequency detection and neutralisation device. The CHIMERA 200 is specifically engineered as a primary defence against both individual drones and drone swarms, reflecting the growing need for robust counter-UAV solutions in the face of evolving aerial threats.

The CHIMERA 200 system offers exclusive wideband detection and neutralisation capabilities, supporting both omnidirectional and directional operations. Its adaptive and upgradeable configuration enables precise detection of drones, remote controls, and their take-off and control locations across a broad frequency range of 400 MHz to 6 GHz, with the ability to monitor up to five simultaneous bands.

The system's evolutionary radio frequency architecture, secure API for command and control (C2) and weapons integration, low false alarm rate, and scalable design ensure it is capable of countering current and emerging threats, including IEDs and signal spoofing.

The CHIMERA 200 has already been field-proven across critical infrastructure sites in India, demonstrating robust and upgradeable detection and neutralisation capabilities, rapid deployment features, and adaptability to evolving UAV threats. These attributes make it highly appealing to both domestic and international security agencies.

Paras Defence and its subsidiaries maintain manufacturing facilities across India, enabling cost-effective production for military, homeland security, and critical infrastructure clients worldwide. By partnering with CERBAIR, Paras Defence aims to unlock new export opportunities and expand cooperation for future deliveries through 2026 and beyond.

RELIANCE DEFENCE FORMS STRATEGIC PARTNERSHIP WITH COASTAL MECHANICS, USA

Reliance Infrastructure Limited promoted, Reliance Defence Limited (Reliance Defence), has announced strategic agreement with Coastal Mechanics Inc. (CMI), a leading US Department of Defense authorised contractor to jointly address India's Rs 20,000 crore defence maintenance, repair, overhaul (MRO) and upgrade market opportunity.

Reliance Defence and Coastal Mechanics will focus on providing end-to-end Maintenance, Repair, Overhaul (MRO), upgrade, and lifecycle support solutions for the Indian Armed Forces, targeting a wide range of critical platforms such as 100+ Jaguar fighter aircrafts, 100+ MiG-29 fighter aircrafts, the fleet of Apache attack helicopters, L-70 air defence guns, and other legacy systems that require long-term sustainment and modernisation. The segment represents a high-value, long-duration opportunity driven by the Indian military's strategic shift from asset replacement to lifecycle extension and performance-based logistics.

Reliance Defence and Coastal Mechanics will also set up Joint Venture (JV) at MIHAN in Maharashtra, to serve both the Indian market and export markets. This JV will provide complete Maintenance, Repair and Overhaul (MRO) and upgrade services for various air and land defence platforms used by the armed forces. Coastal Mechanics supplies critical components to the US Air Force and US Army. Its partnership with Reliance Defence brings world-class manufacturing capabilities and global certifications into India's aerospace ecosystem.

INDIA PREPARES TO TEST K-6 HYPERSONIC SUBMARINE-LAUNCHED MISSILE

India is poised to achieve a monumental breakthrough in strategic defence with the development of the K-6 hypersonic submarine-launched ballistic missile (SLBM), representing the most advanced weapon system in the nation's arsenal. This cutting-edge missile, currently under development by the Defence Research and Development Organisation (DRDO) at the Advanced Naval Systems Laboratory in Hyderabad, embodies India's ambitious vision of achieving elite-level nuclear deterrence capabilities.

The K-6 distinguishes itself as a hypersonic intercontinental ballistic missile capable of reaching extraordinary speeds of Mach 7.5, approximately 9,200 kilometres per hour during its terminal phase. This hypersonic velocity dramatically reduces enemy reaction time and renders conventional

missile defence systems virtually ineffective against interception attempts. The missile's exceptional speed, combined with its manoeuvrability during flight, creates an almost impenetrable offensive capability that can penetrate even the most sophisticated air defence networks.

With an operational range of approximately 8,000 kilometres, the K-6 missile significantly extends India's strategic strike capabilities beyond any previous submarine-launched system. This extraordinary range allows Indian submarines operating from the Indian Ocean to target adversaries across vast geographical distances, covering nearly all of Asia and parts of Europe and Africa. The missile's intercontinental reach ensures that India can maintain credible deterrence while keeping its nuclear submarines in relatively safe waters, far from potential threats. The K-6's range represents a quantum leap compared to its predecessors in the K-series family.

NEWS ROUND UP

ARMY STRENGTHENS DEEP STRIKE ARTILLERY, OPERATIONALISES TWO ADDITIONAL PINAKA REGIMENTS

India's ongoing expansion of its Pinaka multi-barrel rocket launcher (MBRL) system marks a pivotal phase in the country's artillery modernisation and deep strike capabilities. On June 24, 2025, the Indian Army operationalised two additional Pinaka regiments, reinforcing its shift from Soviet-era platforms to advanced indigenous solutions.

Developed by the Defence Research and Development Organisation (DRDO) and produced by Bharat Earth Movers Limited (BEML), TATA Power Company Limited (TPCL), and Larsen & Toubro (L&T), the Pinaka system is designed for rapid, high-volume saturation attacks and is now a core component of India's long-range fire support doctrine.

Each Pinaka battery contains six launchers, capable of firing 72 rockets in just 44 seconds, saturating an area of nearly 800 by 1000 metres. The rockets have a base range of up to 38 kilometres at sea level, with significantly extended reach in mountainous regions like Ladakh, thereby enhancing deep strike options along sensitive borders. The system's integration of Automated Gun Aiming & Positioning Systems (AGAPS) and digital command posts allows for rapid deployment and precise targeting, making it especially effective in complex and high-altitude terrains.

The induction of these regiments is part of a broader modernisation plan that aims to replace the aging Russian BM-21 Grad systems with a total of 22 Pinaka regiments by 2042, ensuring that the Pinaka becomes the backbone of India's rocket artillery. The ongoing development of the Extended Range (ER) Pinaka, capable of striking targets up to 75 kilometres away, and future plans to reach ranges of 90 to 120 kilometres, further underline India's commitment to indigenous capability enhancement and self-reliance. Strategically, the deployment of additional Pinaka regiments enhances India's deterrence posture against both Pakistan and China.

The Pinaka's superior range, digitised fire control, and mobility offer clear advantages over legacy systems like the Grad-21, and its domestic production ensures supply chain sovereignty and aligns with the "Aatmanirbhar Bharat" (self-reliant India) policy.

INDIA's TRANSFORMATIVE LEAP WITH ANGSTROM-SCALE CHIP INITIATIVE

India is poised to make a transformative leap in semiconductor technology with its angstrom-scale chip initiative, led by a 30-member team from the Indian Institute of Science (IISc). This project aims to develop chips at the atomic scale—ten times smaller than today's 3-nanometer (nm) technology—by harnessing the unique properties of 2D materials like graphene and transition metal dichalcogenides (TMDs).

Angstrom-scale chips refer to semiconductor devices with features measured in angstroms (1 angstrom = 0.1 nm), representing the next frontier in electronics miniaturisation. While current state-of-the-art chips operate at the 3nm node, angstrom-scale chips push into the sub-nanometre regime, enabling dramatic increases in transistor density, performance, and energy efficiency.

Traditional silicon-based technology faces fundamental physical and material limitations at these scales. To overcome this, IISc's proposal focuses on 2D materials, which are only an atom thick but offer exceptional electrical, thermal, and mechanical properties. This shift could enable devices that are faster, cooler, and up to 10x smaller than current silicon-based chips. The IISc's angstrom initiative has followed a structured timeline. This initiative is part of a broader government push for self-reliance in critical technologies and aligns with India's ambitions to become a global player in the post-silicon era, joining the US, South Korea, and Taiwan at the forefront of semiconductor innovation.

SWEDEN TO BOLSTER AIR DEFENCE CAPABILITIES, INKS $900 MILLION IRIS-T AIR DEFENCE DEAL

Sweden has launched a major procurement to bolster air defence capabilities in the Baltic Sea region. The initiative includes medium- and short-range missile systems, radars, command infrastructure and vehicle platforms. Kicking off the effort, a German authority signed an agreement with the German company Diehl for the procurement of seven medium-range air defence systems (fire units) in the form of IRIS-T SLM (Surface-Launched Medium-range) on behalf of Sweden. The deal is secured through the European Sky Shield Initiative, and was announced at a press brief by the Swedish government.

The contract is worth around SEK 9 billion ($900 million) and was presented on the island of Gotland in the Baltic Sea, which is of great strategic importance to Sweden and NATO. Gotland plays a vital role in countering Russia's A2/AD (Anti-Access/Area Denial) strategy in the Baltic Sea. The first deliveries to the Swedish Armed Forces are slated for mid-2028, with full completion expected by 2030. The German-led European Sky Shield Initiative seeks to create a multi-layered air defence network across Europe, to enhance NATO's Integrated Air and Missile Defence.

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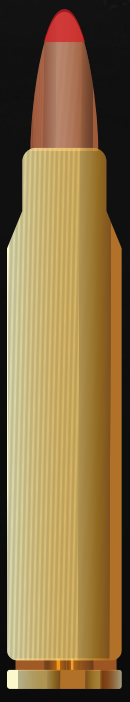

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