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समाचार पत्रों से चयनित अंश
Newspapers Clippings

डीआरडीओ समुदाय को डीआरडीओ प्रौद्योगिकियों, रक्षा प्रौद्योगिकियों, रक्षा नीतियों, अंतर्राष्ट्रीय संबंधों और विज्ञान एवं प्रौद्योगिकी की नूतन जानकारी से अवगत कराने हेतु दैनिक सेवा

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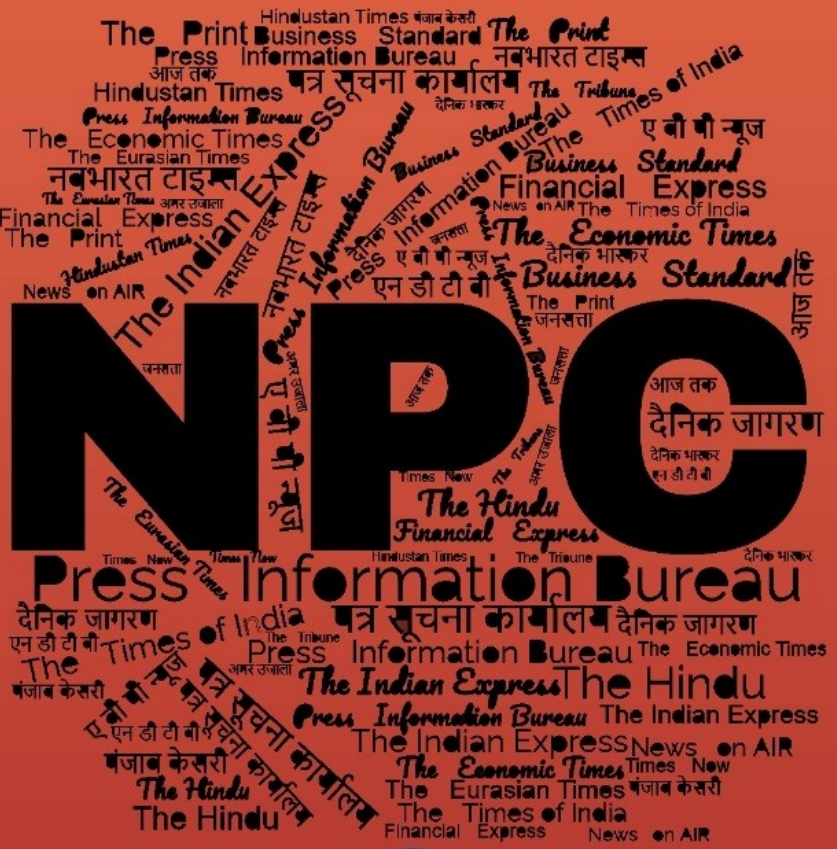

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DRDO News

'आकाशतीर' वायु रक्षा प्रणाली का अच्छा प्रदर्शन, चार्ल्स साल्वे ने थपथपाई देश की पीठ

Source: NavBharat Times, Dt. 23 May 2025,
URL: https://navbharatlive.com/maharashtra/nagpur/akashteer-air-defense-system-performed-very-well-in-operation-sindoor-drdo-chief-charles-salve-1230914.html

भारत के शीर्ष रक्षा वैज्ञानिक ने भरोसा जताया है कि 'ऑपरेशन सिंदूर' के दौरान भारत की स्वदेश निर्मित 'आकाशतीर' वायु रक्षा प्रणाली की सफलता दूसरे देशों को आकर्षित करेगी। भारत की स्वदेशी रूप से विकसित और पूरी तरह से स्वचालित 'आकाशतीर' वायु रक्षा नियंत्रण और रिपोर्टिंग प्रणाली को तैनात किया था, जो पाकिस्तान और उसके कब्जे वाले कश्मीर में 9 आतंकी ठिकानों के खिलाफ 'ऑपरेशन सिंदूर' के दौरान नई युद्ध क्षमताओं की अदृश्य शक्ति के रूप में उभरी।

रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) के प्रमुख समीर वी. कामत ने बृहस्पतिवार शाम को 'पीटीआई-भाषा' से कहा, ''निश्चित रूप से, हमारी वायु रक्षा प्रणाली ने बहुत अच्छा प्रदर्शन किया है, और मुझे यकीन है कि अन्य देशों की भी इसमें रुचि होगी।" कामत ने नागपुर की यात्रा के दौरान भारत की रक्षा प्रौद्योगिकी के भविष्य के बारे में आशा व्यक्त की। उन्होंने यहां ड्रोन, मिसाइल और रॉकेट विनिर्माण केंद्रों का दौरा किया।

रक्षा क्षेत्र में भारत को 'आत्मनिर्भर' बनने की दिशा

डीआरडीओ के प्रमुख ने रक्षा क्षेत्र में भारत को 'आत्मनिर्भर' बनने की दिशा में आगे बढ़ने के बारे में बात की और कहा कि पर्याप्त प्रगति हुई है, लेकिन पूरी तरह से आत्मनिर्भर बनने के लिए और अधिक काम करने की आवश्यकता है। कामत ने कहा, ''मुझे लगता है कि हमने एक बहुत ही महत्वपूर्ण स्तर हासिल कर लिया है, लेकिन हमें अब भी बहुत काम करना है। और मुझे यकीन है कि आने वाले सालों में हम पूरी तरह से आत्मनिर्भर बन जाएंगे।

रोबोट द्वारा युद्ध के मैदान में सैनिकों की भूमिका

क्या पारंपरिक हथियार भविष्य के संघर्षों में पीछे रह जाएंगे, इस पर कामत ने कहा कि भविष्य के युद्ध पारंपरिक उपकरणों को ड्रोन और इलेक्ट्रॉनिक युद्ध जैसी उभरती प्रौद्योगिकियों के साथ जोड़ेंगे।

उन्होंने कहा, ''भविष्य के युद्ध में पारंपरिक उपकरणों के साथ-साथ इन नई चीजों का भी संयोजन होगा... हमें दोनों के लिए तैयार रहना होगा।" कामत ने निकट भविष्य में रोबोट द्वारा युद्ध के मैदान में सैनिकों की भूमिका निभाने की संभावना को खारिज कर दिया और कहा, ''एक दिन ऐसा आएगा जब ऐसा हो सकता है, लेकिन निकट भविष्य में नहीं।"

एएमसीए विकसित करने की हमारी परियोजना

बता दें कि'आकाशतीर' प्रणाली विभिन्न रडार प्रणालियों, सेंसर और संचार प्रौद्योगिकियों को एक एकल, मोबाइल, वाहन-आधारित ढांचे में एकीकृत करके दुश्मन के विमानों, ड्रोन और मिसाइलों का पता लगाने, उन्हें ट्रैक करने और उनसे निपटने में सक्षम बनाती है, जिससे शत्रुतापूर्ण वातावरण में इसे संभालना आसान हो जाता है।

स्वदेशी 5.5 पीढ़ी के 'स्टेल्थ' लड़ाकू विमान – आधुनिक मध्यम लड़ाकू विमान (एएमसीए) के विकास की प्रगति के बारे में पूछे गए सवाल पर कामत ने कहा, ''एएमसीए विकसित करने की हमारी परियोजना पिछले साल शुरू हुई

थी, और हमें उम्मीद है कि यह 2034 तक पूरी हो जाएगी तथा फिर 2035 तक इसे शामिल कर लिया जाएगा।" फरवरी में बेंगलुरु में आयोजित एयरो इंडिया 2025 में एएमसीए के पूर्ण पैमाने के मॉडल का अनावरण किया गया था।

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DRDO expects international demand for 'Akashteer' air defence system after Op Sindoor success

Source: Hindustan Times, Dt. 23 May 2025,
URL: https://www.hindustantimes.com/india-news/drdo-expects-international-demand-for-akashteer-air-defence-system-after-op-sindoor-success-101747992940455.html

India's top defence scientist is confident that the success of the indigenously-developed 'Akashteer' air defence system during Operation Sindoor will draw interest from other countries.

The Ministry of Defence hailed Akashteer as a breakthrough, saying it "sees, decides, and strikes faster than anything the world has fielded

'Akashteer', the fully automated air defence control and reporting system, emerged as the invisible force of new war capabilities during Operation Sindoor, launched against nine terror sites in Pakistan and Pakistan-occupied Kashmir.

"Definitely, our air defence system has performed exceedingly well, and I am sure there will be interest from other countries," Defence Research and Development Organisation (DRDO) chief Samir V Kamat told PTI on Thursday evening.

The DRDO chairman spoke about India's march for 'Atmanirbhar' (self-reliance) in the defence sector, saying that while substantial advancements have been made, more work is necessary to become completely self-reliant.

"I think we have achieved a very significant level, but we still have some work to do. And I am sure in the coming years, we will become totally Atmanirbhar," he said.

Kamat expressed optimism regarding the future of India's defence technology during a visit to Nagpur, where he toured facilities focused on manufacturing drones, missiles, and rockets.

The 'Akashteer' system enables detection, tracking, and engagement of enemy aircraft, drones, and missiles by integrating various radar systems, sensors, and communication technologies into a single, mobile, vehicle-based framework, making it easier to handle in hostile environments.

Replying to a question whether conventional weapons will take a back seat in future conflicts as warfare shifts to domains where drones and signal jamming take centre stage, Kamat said future warfare will blend traditional equipment with emerging technologies, such as drones and electronic warfare.

"Future warfare will be a combination of the traditional equipment as well as these new things...We have to be prepared for both," he said.

Kamat ruled out the potential for robots to play the role of soldiers on the battlefield in future conflicts and said, "There will be a day when that may happen, but not in the near future."

To a question about the progress in the development of indigenous 5.5 generation stealth fighter aircraft – Advanced Medium Combat Aircraft (AMCA), Kamat said, "Our project for developing AMCA started last year, and we are hopeful that it will be completed by 2034 and then it should go into induction by 2035."

A full-scale model of the AMCA was unveiled at Aero India 2025 held in Bengaluru in February.

The Aeronautical Development Agency (ADA), a division of DRDO, is actively working on cutting-edge technologies, including AI-powered pilots, net-centric warfare systems, integrated vehicle health management, and internal weapon bays.

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Need to go full throttle on indigenous defence systems: DRDO ex-chief Satheesh Reddy

Source: The Hindu, Dt. 26 May 2025,
URL: https://www.thehindu.com/news/national/operation-sindoor-showed-indias-full-dominance-need-to-go-full-throttle-on-indigenous-systems-dr-satheesh-reddy/article69618578.ece

India has shown complete dominance during Operation Sindoor, showcasing its air power and air defence capability, said G. Satheesh Reddy, former Secretary, Research and Development, and

Chairman, Defence Research and Development Organisation (DRDO), while expressing happiness that the majority of them are indigenous systems.

He cautioned that technology is changing very fast, and the process of induction should not be so long that the technology gets outdated by the time it is inducted.

“I want to say that this war brought many positive things to India. First, many indigenous systems have been used very effectively, so the confidence of the armed forces in the indigenous equipment has reached all-time highs. I believe this will lead to more vigorous and efficient induction of indigenous systems. The morale of the scientists community today is very high, and this paves the way for the development of many more advanced systems. Industry is now more confident of getting production orders for indigenous systems, and they should hence gear up and be ready to absorb bulk orders,” Dr. Reddy, currently President of the Aeronautical Society of India, said in a conversation with The Hindu.

“The international community has seen what India’s capability is, so I feel the exports also will see another period of marked growth. These are significant takeaways for India from this conflict — and they have given an opportunity of growth and challenges to all stakeholders who are also gearing up to meet the same.”

The country’s multi-layered air defence system worked seamlessly during the conflict from May 7 to May 10, integrating a range of systems from the long-range S-400, medium-range surface-to-air missile (SAM) systems, Akash and Spyder, and various air defence guns. Dr. Reddy said he is particularly proud of the Akash SAM, one of the missiles developed under the Integrated Guided Missile Development programme. “It was a project which was conceived by none other than Dr. A. P. J. Abdul Kalam. I heard that our armed forces are extremely happy with the performance of that system.”

Noting that almost all attempts of attack by the enemy were neutralised by the country’s air defence systems mid-air itself, Dr. Reddy said that Operation Sindoor proved the effectiveness of India’s air defence systems, largely home-grown, while also showcasing the depth in its attack arsenal to be able to target and neutralise any base locations of the enemy.

On what the country should focus on in the near future, he stressed that investing in niche technologies is key as also intuitively investing in countering of these niche technologies, especially those to target at longer ranges with cost effective means and counter technologies that can counter enemy attacks by detecting and engaging them at farther ranges using both hard-kill and soft-kill mechanisms.

Excerpts from the interview:

What is your overall assessment of Operation Sindoor?

Firstly, it is important to understand that what has happened in this conflict is different compared to the earlier conflicts, unlike any other typical war that India has fought till date. Firstly, this was largely an airborne or aerial warfare which completely tested the air power and air defence of our country, across both manned and unmanned platforms. Secondly, for India, it has been a moment of reckoning, which has validated our domestic defence manufacturing ecosystem.

We have been discussing (and executing) over the last 10 years or so the procurement and induction of more indigenous weapons. Today, this has happened to a large extent, and as the reports and press briefs and MoD releases have stated, Operation Sindoor has been fought with the majority of indigenous weapons and equipment. Our resolve over the last decade or so has been to strengthen our indigenous ecosystem, and the events in the last few years, especially the Russia-Ukraine crisis and the COVID pandemic, have again highlighted the risks in sourcing from the global supply chain. According to me, Operation Sindoor not only vindicated our Atmanirbharata resolve but also laid down a path for future procurement strategies as well.

Overall, Operation Sindoor highlighted India's complete dominance, where in the first attack, complete terrorist camps were eliminated and in the second, the enemy air defence radars and other systems were neutralised, which was then followed by attacking their air bases and leveraging our air defence systems to prevent counter attacks on our bases. It is heartening to see that almost all attempts by the enemy to attack were neutralised by our air defence systems in mid-air itself – few that sneaked through were not as effective as they did not do any significant damage per se.

Operation Sindoor proved the effectiveness of India's air defence systems (largely home-grown) while also showcasing the depth of the attack arsenal to be able to target and neutralise any base locations of the enemy. I am extremely happy that the majority of the systems used were indigenous systems. It is time for the Government and industry to go full throttle on further strengthening the indigenous defence manufacturing and R&D ecosystem.

We are talking a lot of Indian systems integrated with imported systems, all of which functioned seamlessly. So what stands out to you in terms of the success story? And are there any limitations or aspects that need to be focussed on?

Firstly, Operation Sindoor witnessed multiple indigenous systems being used including air defence radars which have performed very well. The integrated operation of the complete radar network with the other elements of the air defence have worked very well, and the layered air defence with multiple weapons has also proved very effective – be it Akash, Mediurm Range Surface Air Missiles (MRSAM) or others.

I think the command and control centre was fully aware of the situation, and to be able to track and target every incoming object with the appropriate weapon, required strong and comprehensive connectivity with the entire ecosystem. We hear the anti-drone systems have also been fully functional and were able to handle almost all the incoming drones and drone swarms.

This reiterates the fact that there needs to be investment in much more advanced systems, with strong connectivity and integration, such that one system can speak to another. We need to have/create that vision and invest in niche and futuristic areas so that we can be ahead of the technology curve. The enemy understands our capability now, and this makes it all the more imperative that we continue to evolve and be more advanced in our attack and defence for the future.

What should be our priority in the next 5-10 years?

Investing in niche technologies is key, and intuitively investing in countering these niche technologies as well. If there is a technology, more likely that the enemy also knows about it, and hence it is important to have a counter to that as well as a deterrent or defence mechanism.

For instance, technology developments in the unmanned systems domain (across land, sea and air) are growing at an exponential rate. We as a country need to focus on both manned, unmanned and anti-unmanned technologies in a big way - from micro drones to mini-Unmanned Aerial Vehicles (UAV) to drone swarms, to the stealthy High Altitude Long Endurance (HALE) and fighter aircraft versions and to the Unmanned Ground Vehicles (UGV) and Unmanned Underwater vehicles (UUV). We need to work vigorously towards high technology areas, including hypersonics, quantum technologies, laser weapons, electromagnetics, higher precision and long-range sensors, as well as highly miniaturised electronics.

We need to look at technologies which can target longer ranges with cost-effective means, and we also need to look at cost-effective technologies that can counter enemy attacks by detecting and engaging them at farther ranges using both hard kill and soft kill mechanisms. We also need to consider the possibility that the future warfare may revolve around space and/or cyber only, and hence we need to continue our R&D and innovation in these areas parallelly as well, at a faster pace and with a stronger resolve.

If you have to pick one major system as a success story, what would that be?

I feel more proud of the Akash missile systems, as it is one of the missiles that has been developed under the Integrated Guided Missile Development Programme (IGMDP). It was a project which was conceived by none other than Dr A. P. J. Abdul Kalam. I heard that our armed forces are extremely happy with the performance of that system. That, for sure, is a proud moment for me and for every Indian, I must say. There are other weapons also, like the other SAMs and also the BrahMos, which have reportedly performed very well. Our radars and multiple sensors (both airborne and on ground) have effectively negated enemy attacks.

I would like to add that for the plethora of weapons which are currently being developed, if they come up quickly, our armed forces will be significantly strengthened. With current indigenous content in the armed forces at 60-65%, which soon will go to 75-80%, it will be another major leap towards indigenisation. We need to work out mechanisms and processes to ensure that the procurement cycle from development to induction happens in the most efficient and effective manner.

So how do you ensure the development and procurements happens fast?

Processes have to be simplified and sequential induction processes should also be removed. An integrated system should be brought in such that it is an integrated process from development to induction, and roadmap for usage of every project deliverable should be very clearly defined. This will enable the industry to plan their capacities and capabilities and come up with the production facilities right in the beginning itself.

There are couple of systems where development, production and induction have happened quickly, and that should be replicated for other procurement as well. Technology is changing fast and the

internal process from development to induction should not allow the technology to get outdated by the time it is inducted.

I want to say that this war brought many positive things to India. First, many indigenous systems have been used very effectively, so the confidence of the armed forces in the indigenous equipment has reached all-time highs. I believe this will lead to more vigorous and efficient induction of indigenous systems. The morale of the scientific community today is very high, and this paves the way for the development of many more advanced systems.

Industry is now more confident of getting production orders for indigenous systems, and they should hence gear up and be ready to absorb bulk orders. The international community has seen what India's capability is, so I feel the exports will also see another period of marked growth. These are significant takeaways for India from this conflict, and they have given an opportunity for growth and challenges to all stakeholders who are also gearing up to meet the same.

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आकाशीय बिजली से विमानों की क्षति के कारण तलाशेंगे वैज्ञानिक

Source: Hindustan, Dt. 25 May 2025,
URL: https://www.livehindustan.com/uttar-pradesh/prayagraj/story-research-on-lightning-damage-to-aircraft-mnit-and-drdo-collaboration-201748150890754.html

दिल्ली से श्रीनगर जा रहे विमान के तूफान में फंसने के कारण अगला हिस्सा क्षतिग्रस्त होने की घटना चर्चा में है। 21 मई को हुई इस घटना से विमान में सवार 227 यात्रियों की जान सांसत में पड़ गई थी। भविष्य में इस प्रकार की घटना की पुनरावृत्ति रोकने के लिए मोतीलाल नेहरू नेशनल इंस्टीट्यूट ऑफ टेक्नोलॉजी (एमएनएनआईटी) के वैज्ञानिकों ने रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) के प्रोजेक्ट पर काम शुरू कर दिया है।

डीआरडीओ ने एमएनएनआईटी के अप्लाइड मेकैनिक्स विभाग को 59.70 लाख रुपये की ग्रांट प्रदान की है। एमएनएनआईटी के अप्लाइड मेकैनिक्स विभाग के एसोसिएट प्रोफेसर डॉ. आशुतोष कुमार उपाध्याय ने बताया कि आकाशीय बिजली से विमानों की क्षति एक गंभीर समस्या है।

आकाशीय बिजली से विमानों की क्षति के कारण को तलाशा जाएगा। यह पता लगाने के लिए (शोध) अनुसंधान कर रहे हैं कि कौन से मिश्रित पदार्थ आकाशीय बिजली के प्रभाव को कम कर सकते हैं। डॉ. उपाध्याय ने कहा कि विमानो को बिजली और आवेश दोनों का खतरा रहता है। क्योंकि दोनों बादलों के बीच करंट के लिए विमान एक माध्यम बन जाता है। यह अध्ययन आधुनिक विमानों में उपयोग होने वाले मिश्रित पैनलों (कंपोजिट पैनल) पर केंद्रित है। जो हल्के मजबूत और उन्नत सामाग्री से बने होते हैं। यह विश्लेषण किया जाएगा कि जब किसी विमान पर आकाशीय बिजली गिरती है तो वह बिजली पैनल की संरचना, तापमान, विद्युत प्रवाह और यांत्रिक मजबूती को किस तरह प्रभावित करता है।

उन्होंने बताया कि इसमें मल्टी फिजिक्स मांडलिंग तकनीक के जरिए विद्युत ऊष्मा और यांत्रिक प्रभावों को एक साथ जोड़ा जाएगा ताकि वह समझा जा सके कि किस प्रकार की क्षति होती है और उसके बाद विमान की कार्यक्षमता पर क्या असर पड़ता है। इस आधार पर एक नया कोड तैयार होगा और इस कोड से सिमुलेशन सॉफ्टवेयर को अपडेट कर दिया जाएगा। जिससे नए मैटेरियल यानी पदार्थ की विद्युत रोधी क्षमता को आसानी से परखा जा सकेगा। इससे विमान पर पड़ने वाले आकाशीय बिजली के प्रभाव को कम किया जा सकेगा।

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How homegrown sats can take India's defence to next level

Source: The Time of India, Dt. 26 May 2025,

How homegrown sats can take India's defence to next level

Operation Sindoor showed what satellite intelligence can do. Now, India is racing to build a network big enough to protect every inch of its land, sea and sky

Hyderabad-based Skyroot launched India's first private rocket into suborbital space in Nov 2022. It's preparing to send its first orbital launch vehicle, Vikram-1, into space later this year

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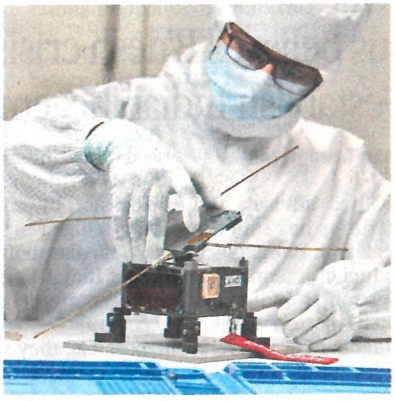
They were the unseen heroes, invisible but vigilant eyes in the sky during Operation Sindoor. Cartography satellites (Cartosats), radar imaging satellites (Risats), and Earth-observation satellites (EOSs) played a key role in the precision hammering of Pakistan's air defence systems and air bases. That has driven home the importance of having more such silent sentinels in space in the era of high-tech warfare.

Need To Scale Up

India currently has around 10 surveillance satellites in various orbits. Both Indian Space Research Organisation (Isro) chairman V Narayanan and space regulator Indian National Space Promotion and Authorisation Centre (INSPACe) chairman Pawan Goenka have recently stressed on the need to beef up the country's surveillance capabilities.

At the Global Space Exploration Conference 2025 held during May 7-9 in New Delhi, Goenka said India plans to put a constellation of 52 spy satellites in orbit over the next five years. Of these, 21 will be developed by Isro with the remaining 31 coming from private players.



Hyderabad's Dhruva Space is set to launch its first commercial satellite, P-30, later this year

The national space agency was set to launch its 101st satellite, the EOS-09 (Risat-1B), on May 18. The Earth-observation satellite, equipped with an advanced C-band Synthetic Aperture Radar (SAR) system capable of capturing high-resolution images in all-weather conditions, was intended to be a key addition to India's surveillance fleet. However, an anomaly in the third-stage propulsion system of the PSLV (Polar Satellite Launch Vehicle) rocket resulted in the mission suffering a setback.

India's Big Surveillance Push

Narayanan recently noted that India now operates around 55 satellites and plans are afoot to add another 100-150 to comprehensively cover its borders and 7,500-km coastline. "For national security, we must rely on our satellites," he said at the Central Agricultural University convocation on May 11 in Agartala amid reports of Pakistani drones intruding into Indian airspace despite the ceasefire announced the day before. "Monitoring our seashores and sensitive zones isn't possible without satellite and drone tech," he stressed.

So far, Isro has put around 127 Indian satellites in orbit, including those of private players and academic institutions. Of these, 22 govt-owned satellites are currently operating in low Earth orbit (LEO), while 29 are in geo-synchronous Earth orbit (GEO).

But space experts point out that India needs thousands of satellites to match rivals like China, which has drawn up plans to deploy nearly 20,000 of them.

Dr Subba Rao Pavuluri, former Isro scientist and founder-chairman and MD of Ananth Technologies, believes that

India requires at least 10,000 satellites over the next five to 10 years. These, he says, would not only serve surveillance needs but also support communication, Earth observation, navigation, weather forecasting, scientific research, etc.

Private Players Step Up

Ananth Technologies, the first private Indian player to get IN-SPACe's nod to offer GSO communication satellite services in Ka-band (a radio frequency range that allows faster data transfer and higher bandwidth) is already developing India's first private GEO satellite, weighing up to 3,000kg. It also plans to roll out another two to three satellites over the next few years.

Pavuluri said India has a huge requirement for communication satellites, a view echoed by Pawan Kumar Chandana, co-founder & CEO of Skyroot Aerospace.

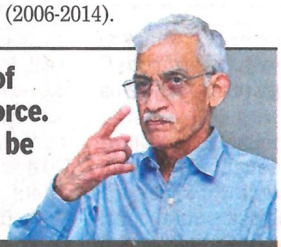
"That presents a great opportunity for Indian startups to build capabilities, not only to cater to the domestic market but also to tap into the rapidly growing global space market," Chandana said. Skyroot successfully launched India's first private rocket into suborbital space in Nov 2022 and is now preparing to send its first orbital launch vehicle, Vikram-1, into space later this year.

Tanveer Ahmed, co-founder & CTO of Bengaluru-based space tech startup Digantara, says India's mantra over the next few years should be "launch, baby, launch" to close the capability gap with rivals like China.

Digantara, which launched SCOT (Space Camera for Object Tracking) — the world's first commercial space situational awareness (SSA) satellite — in Jan this year, now plans to launch around 40 more of those in the next few years. "We must not only match the technical capabilities of the world's best space-faring nations but also emulate the scale of countries like China. If we play our cards right, we should be able to do so within a few years," Ahmed said, pointing to the key role of technology indigenisation in meeting such an objective.

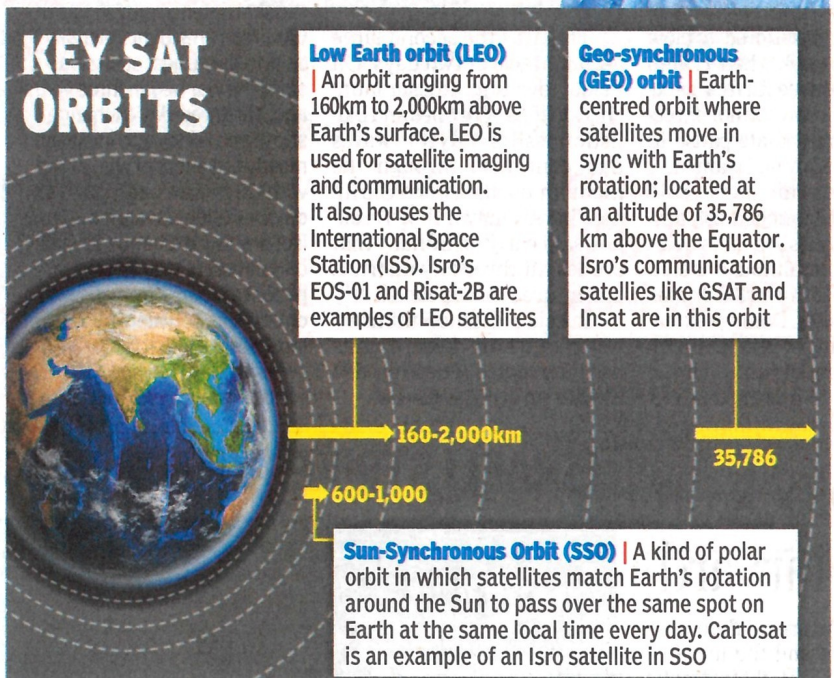
According to Dr V K Saraswat, Niti Aayog member and former director-general of Defence Research and Development Organisation (DRDO), what India urgently needs is "an umbrella of satellites" in low Earth orbit (LEO) to provide real-time information within about a 1,500-3,000km radius of its geographical borders.

"We need satellites with early warning capabilities that will be able to detect even the plume of a rocket or missile the moment it takes off," says Saraswat, who also served as chief scientific advisor to then defence minister A K Antony (2006-2014).



"Space will become the fourth segment of defence after the Navy, Army, and Air Force. These four, along with cyberspace, are going to be most crucial in the near future

—AVINASH CHANDER | FORMER DG, DRDO



Another former DRDO DG, Avinash Chander, believes that space will become the fourth segment of defence after the navy, army and air force. "These four, along with cyberspace, are going to be most crucial," he said.

"We currently have 9 to 11 satellites that have improved our intelligence, surveillance and reconnaissance (ISR) capabilities. But, for distant ISR — which means 24x7 surveillance — we require many more," said Indian Space Association (ISpA) director general Lt Gen A K Bhat.

Beyond Defence

Not just military applications, a growing number of Indian space tech startups are already pursuing satellite projects to aid sectors like mining, navigation, geospatial mapping and agriculture.

Data from the Department for Promotion of Industry and Internal Trade (DPIIT) shows that, as of 2023, India had 189 space tech startups. To boost private participation, the govt has already relaxed FDI limits to 100% in areas like satellite manufacturing and operation, etc. It has also announced a Rs 1,000-crore venture capital (VC) fund, managed by IN-SPACe, to boost investments in the sector.

Among the startups making waves is Bengaluru-based GalaxEye Space, which is gearing up to launch the world's first multi-sensor imaging satellite in Oct this year. "Multi-sensor imaging satellites equipped with synthetic aperture radar and multi-spectral imager will be able to provide weather information for any location on Earth, even through cloud, smoke or rain. It offers a range of benefits to sectors such as defence, mining and agriculture," said GalaxEye co-founder Pranit Mehta.

"We're looking at launching a constellation of around six satellites over the next few years and, if demand scales, we can expand to a little over 10," Mehta added.

Hyderabad-based Dhruva Space, too, is set to launch its first commercial satellite, P-30, later this year. This 20-50kg class Earth-observation satellite, to be put in LEO, will carry a hyper-spectral imager for an Australian client along with other payloads.

Race With Reason

But India still has a long way to go, and challenges remain, says ISpA founding-director Wg Cdr Satyam Kushwaha. "It's like comparing a Ferrari with a Maruti 800. China launching 'X' number of satellites doesn't mean we should follow suit. We need to see what our security challenges are and what the solutions for them could be. We need to be rational."

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Defence News

Defence Strategic: National/International

CDS visits Northern & Western Commands HQs; Conducts strategic review & operational assessment post-Operation Sindoor

Source: Press Information Bureau, Dt. 25 May 2025,
URL: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2131197

Chief of Defence Staff (CDS) General Anil Chauhan visited Indian Army's Northern Command at Udhampur, Jammu & Kashmir and Western Command at Chandimandir Military Station, Haryana on May 25, 2025. He interacted with the Army Commanders, Lieutenant General Pratik Sharma and Lieutenant General Manoj Kumar Katiyar, and senior Staff Officers who were actively involved in the planning and execution of Operation Sindoor. He conducted a strategic review and operational assessment in the Northern and Western theatres during the visit.

At Udhampur, the CDS was briefed on the success of the Northern Army in neutralising the terror network, adversary's assets that supported terror and counter measures taken to protect own military assets & civil population during Operation Sindoor. He was apprised about the efforts by the Northern Army in the rehabilitation of the civilians of the border areas who were targeted by the adversary.

The Northern Army Commander gave an update on the continued operational & logistics preparedness of the Northern Army and assured the CDS of its commitment in protecting the borders, while also launching an all-out effort to eradicate terrorism in Jammu & Kashmir.

At Chandimandir, a comprehensive brief on the kinetic & non-kinetic punitive response during Operation Sindoor was given by the Western Army Commander. A detailed overview of the operational environment, defence preparedness and key outcomes of the operation were provided, while underscoring the prevailing security situation along the Western borders.

Inputs on technological infusion and enhanced logistics capability, contributing to high operational efficiency, real-time situational awareness, strengthening the military capability of Western Army were also highlighted. The CDS was also given an insight into Veterans' Care & Medicare facilities extended to serving & retired personnel reflecting the Indian Army's firm commitment to welfare of those who serve the national cause.

General Anil Chauhan remembered the bravehearts who made the supreme sacrifice in the line of duty during Operation Sindoor, lauding the valour, resolve, precision & discipline of all ranks. He acknowledged the operational excellence achieved by the field formations responsible for the Northern and Western borders in Jammu & Kashmir and Punjab.

The CDS commended the overall synergy & timely accomplishment of operational tasks under challenging conditions. He emphasised the importance of continued vigilance, jointness & synergy across the Services to address evolving threats. He exhorted them to render a helping hand in rehabilitation of the civilians who were targeted by the adversary.

The visit concluded with the CDS expressing his deep appreciation for the exemplary conduct and successful execution of military operations which reaffirmed the faith reposed by the nation in its Armed Forces. He attributed the overall success achieved in attaining national security objectives to high morale, discipline and unwavering commitment of the Indian Army.

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Operation Sindoor marks combat debut for two women colonels

Source: Hindustan Times, Dt. 24 May 2025,
URL: https://www.hindustantimes.com/india-news/operation-sindoor-marks-combat-debut-for-two-women-colonels-101748055852688.html

Operation Sindoor — India's retaliation against Pakistan for the Pahalgam terror strike — served as a rite of passage for two women commanding officers who were at the centre of the army's muscular air defence (AD) that countered Pakistan's missile and drone attacks on multiple Indian military installations, airbases and cities during the May 7-10 clash between the two nuclear-armed neighbours, people aware of the matter said on Friday.

The women colonels commanded two of the 25-odd Indian Army AD units that beat off the enemy's unceasing aerial attacks on military and civilian areas, including religious places, the people added, asking not to be named.

The women colonels commanded two of the 25-odd Indian Army AD units that beat off the enemy's unceasing aerial attacks on military and civilian areas, including religious places, the people added, asking not to be named.

The operation marked the maiden live combat exposure for the army's women commanding officers (COs).

One of the women COs led her AD unit at Pathankot in Punjab; the other at Suratgarh in Rajasthan, HT learns. Both cities were among the locations that the Pakistani forces attempted to target along India's western front, but India's resilient AD shield fended off the attacks.

The two COs are the only women in their units, said a second person. An AD unit has around 800 soldiers.

The army currently inducts women Agniveers in its personnel below officer rank (PBOR) cadre only in the Corps of Military Police.

India launched Operation Sindoor in the early hours of May 7 when the army and the Indian Air Force (IAF) hit nine terror camps inside Pakistan and Pakistan-occupied Kashmir, killing more than 100 terrorists. It triggered four days of strikes and counterstrikes with fighter jets, missiles, drones, long-range weapons and heavy artillery before the two sides reached an understanding on stopping all military action on May 10.

And between the strikes on the terror sites and the calling of the ceasefire, the IAF struck multiple military targets in Pakistan, which attempted to target several locations in India's north and west including Awantipora, Srinagar, Jammu, Chandigarh, Pathankot, Amritsar, Kapurthala, Jalandhar, Ludhiana, Adampur, Bathinda, Suratgarh, Nal, Phalodi, Uttarlai, and Bhuj.

The army began appointing women as COs in 2023 — a watershed in the country 's military history — when it conducted a special selection board to promote 108 women officers to the rank of colonel.

The move was aimed at bringing about gender parity, offering women command assignments in select branches, and giving them new hard-earned identities.

Around 120 women are currently serving as COs, with 60% of them heading units in operational areas, including forward locations in the Northern and Eastern Commands that are responsible for guarding India's borders.

Operation Sindoor marked trial by fire for Agniveers too, as first reported by HT on Thursday.

At least 3,000 Agniveers — barely 20 years old and recruited during the last two years — manned critical weapons and systems integral to the army's hardy AD shield, which Pakistan couldn't punch through despite launching wave after wave of missile and drone attacks.

The soldiers, recruited under the Agnipath model, made their training count at a pivotal moment and acquitted themselves honourably in different roles during the four-day military confrontation that sparked fears of a full-blown shooting war with Pakistan.

The Agnipath scheme for recruiting PBOR in the three services, for long a political hot button, was introduced around three years ago with the stated objective of keeping the armed forces young and battle-ready. Agnipath was a major departure from the military's decades-old recruitment system that was scrapped when the National Democratic Alliance (NDA) government announced the new scheme in June 2022.

It recruits soldiers for only four years, with a provision to retain 25% of them in regular service for another 15 years.

The Agniveers helped operationalise the locally developed air defence control and reporting system, called Akashteer, which emerged as the centrepiece of India's AD grid during the clash.

Serving alongside the regular soldiers, they took down targets with shoulder-fired missiles; manned and fired guns including the upgraded L-70s and Zu-23-2Bs; operated the Pechora, Schilka, OSA-AK, Strela and Tunguska weapons, and the medium-range surface-to-air missile system; manned a variety of radars and Akashteer nodes; were an integral part of the communication network; and drove vehicles used for transporting and launching missiles.

The agile Akashteer system, an integral part of the Indian military's multi-layered AD grid, played a pivotal role in detecting, identifying, tracking and engaging Pakistani missiles and drones. It is mated with IAF's Integrated Air Command and Control System (IACCS), the beating heart of the military's four-tiered AD shield that Pakistan couldn't penetrate.

India's AD grid operated with multiple weapons across four levels, depending on the distance of the incoming target. The weapons that formed part of the grid included the S-400 system.

The locally produced military hardware that packed a formidable punch during the military confrontation with Pakistan included Akash surface-to-air missiles, the Samar (surface-to-air missile for assured retaliation) system and several counter-drone weapons.

The threats countered by the Indian forces included Chinese-origin PL-15 air-to-air missiles, long-range rockets, loitering munitions, and Turkish-origin drones.

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Written off by many after accident, INS Brahmaputra set to sail again

Source: Hindustan Times, Dt. 25 May 2025,
URL: https://www.hindustantimes.com/india-news/written-off-by-many-after-accident-ins-brahmaputra-set-to-sail-again-101748111983445.html

Indian warship INS Brahmaputra, crippled after an accident at the Naval Dockyard in Mumbai last July, could be seaworthy by the year-end and fully combat ready around mid-2026, as the Indian Navy rushes to repair and return the locally produced frigate to service even as many feared the vessel may not sail again because of the extensive damage it suffered, senior officials aware of the matter said on Saturday.

"Repairs are in full swing at the Naval Dockyard. The activities leading to the restoration of 'float and move' capabilities are expected to be completed by the year-end/early 2026. The 'fight' component is likely to be reactivated by June-July 2026. Getting the warship back in action is a priority," said one of the officials, asking not to be named.

This is the first update on the operationalisation of the guided missile frigate built at Kolkata-based Garden Reach Shipbuilders and Engineers Limited (GRSE) and commissioned into the navy in 2000.

In naval parlance, the "float, move and fight" components refer to a warship's ability to stay afloat (structural integrity), manoeuvre (propulsion systems) and engage in combat (weaponry and sensors).

The 3,850-tonne warship tipped over at the Naval Dockyard on July 21 after a fire broke out on board, and firefighting units pumped huge quantities of water to douse the flames. A sailor, leading seaman Sitendra Singh, was killed in that accident.

Singh was among the frigate's crew involved in repairs when the incident occurred. While most of the men exited the warship using the gangway, some others jumped into the water and swam back to safety, except Singh, who drowned.

The warship was moved to the dry dock in November 2024 after being brought to its upright position, followed by a thorough assessment of the damage and the repairs needed to make it operational, said a second official, who also asked not to be named.

"The repairs are now being carried out in a phased manner, beginning with the warship's hull, propulsion and power generation systems to get the 'float and move' component going. Equipment and systems that require repair or replacement are being removed and taken to the shop floors of the Naval Dockyard for necessary action," he said.

Work on fixing the 'fight component' is also happening alongside, the official added. The warship's crew is coordinating the repair work with the Naval Dockyard, like the crew of any warship undergoing a refit.

Navy chief Admiral Dinesh K Tripathi visited Mumbai immediately after the accident to assess the damage to the warship and directed the Western Naval Command to initiate necessary actions to make it seaworthy and combat ready again.

After the INS Brahmaputra mishap, Tripathi also formed a special task force (STF), under a rear admiral, to look into the wider safety and security issues involving vessels and suggest measures to minimise or eliminate accidents.

The STF has submitted its report, and its recommendations on safety, security and standard operating procedures have been promulgated to all naval commands, establishments and units. The navy has issued directions for the recommendations to be implemented at the earliest.

Earlier in April, the navy's top brass held a four-day conference to discuss a raft of issues pertaining to the service including its modernisation, measures to boost indigenisation, its readiness to address maritime challenges, and safety norms.

The Naval Commanders' Conference, chaired by Tripathi, also featured a special session dedicated to safety, with focus on the actions taken by various naval commands, establishments and units based on the findings of the STF.

Two more accidents took place after the STF was formed.ats were neutralized over the last week, and Indian defences remain on high alert.

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The air power use discourse and Operation Sindoor

Source: The Hindu, Dt. 26 May 2025,
URL: https://www.thehindu.com/opinion/lead/the-air-power-use-discourse-and-operation-sindoor/article69618270.ece

Whenever nations embark on reconfiguring their security strategies, they must invariably review the use of the various instruments of force that are available for exploitation. India's journey down that road has been evolutionary rather than transformational. From a rather diffident power soon after Independence, that perceived the instrument of force as an 'avoidable necessity', to more assertive expressions of national power over the last five decades, that commenced with the 1971 war with Pakistan, Indian statecraft stands at the crossroads of a new era.

The 'new normal'

Operation Sindoor (May 7-10) may well have redrawn the contours of India's unwritten national security strategy. Here, at its centre, is a more assertive and proactive strategy that is now willing to explore 'prevention, pre-emption and punishment' as the new normal against Pakistan, should it continue to support terrorism against India as an instrument of the Pakistani state. However, what will hopefully remain as the inviolable edifice of this strategy will be the continuation of 'responsibility and restraint' (the hallmark of any response that the Indian state has offered whenever faced with a national security crisis).

In the past, an excessively continental mindset, a preoccupation with attrition warfare along long and contested borders, and the linkages between conventional operations and territory as a currency of military effectiveness, ensured that land forces, both military and paramilitary, occupied pole position in India's national security calculus. The widespread prevalence of internal armed conflict added to the inescapable necessity for this orientation.

The reemergence of the maritime domain and its attractiveness to double-bank as an instrument of force and diplomacy lifted the blinkers off centuries of sea-blindness and offered options other than a continental mindset to India's national security planners. However, all was not well when it came to understanding the competitive advantage that air power offered apex policymakers when confronting the dilemmas of climbing the escalation ladder vis-à-vis unpredictable adversaries such as Pakistan and matching the capabilities of China (which now appears to have significantly widened the conventional gap with India in all realms of military power, especially air power).

Air power use and what has changed

It is in this context that the recent offensive-defensive employment of air power in Operation Sindoor paves the way for a more nuanced understanding of the importance of military air power in the national security calculus. For over a decade now, the non-kinetic capability of the Indian Air Force (IAF) has matched the best in the world in areas such as tactical and strategic airlift, and

Humanitarian Assistance and Disaster Relief (HADR) operations. It is in the offensive realm that the IAF, over the last decade or so, has been attempting to impress upon the strategic establishment that it has the capabilities and the will to act as the first responder and cause significant attrition to an adversary in several new configurations of warfare that are proliferating across the globe.

Until Operation Sindoor, offensive air power was considered by a conservative and diffident strategic establishment in India as an escalatory instrument that fitted only into the calculus of conventional military operations. Even though the IAF doctrine of 2012 articulated the mission requirements of sub-conventional conflict that include counter-terrorist operations, it mainly remained in the realm of discussion in war colleges till the Narendra Modi government decided to use offensive air power at Balakot (in 2019). The IAF, however, remained doctrinally persistent when it continued to push for greater involvement in limited conflict and no-war-no-peace situations in its latest doctrine.

In an era of a serious budgetary squeeze, the past few years have seen fierce competition between the three services (the Indian Army, Indian Navy and IAF) for a share of the defence budget, a situation that has also resulted in dissonance in crafting the optimal military strategy against collusive adversaries with the available instruments. In this milieu, the IAF has been a laggard in educating and convincing policymakers that offensive air power offers immense potential in waging non-contact warfare and can impose serious costs on adversaries in several contingencies without needlessly committing boots on ground.

What the discourse should be

Notwithstanding the success of offensive air power and integrated air defence operations during Operation Sindoor, the four-day conflict cannot serve as a standard template for imposing costs on Pakistan, or on inflicting unacceptable attrition on other adversaries in limited conflict scenarios.

However, what it certainly does is to grant the IAF an equal role in multi-domain operations. The discourse must not be about air power displacing land or maritime power as the pre-eminent instrument in the prevailing complex security environment that India finds itself in. It must be more about what air power can bring to the integrated battle to force decisive strategic outcomes.

Based on the Prime Minister’s recent articulation on India’s reduced threshold to accept pain, and if its response mechanisms gravitate more towards prevention, pre-emption and punishment strategies, it is a no-brainer that offensive air operations delivered at the tactical and operational levels that produce strategic outcomes will become the Indian military’s first responder. Concurrently, a robust and integrated air defence ecosystem that can absorb a peer adversary’s natural retaliatory response, will be a significant force multiplier.

With its current capital budgetary allocation to build robust air power capability at very modest levels, the biggest challenge for the IAF is to build the capability to focus on collusive threats that are morphing in the neighbourhood such as the imminent delivery of fifth generation fighter aircraft (the J-35 by China) to the Pakistan Air Force. The IAF has much catching up to do with government support if it is to fulfil the potential it demonstrated during Operation Sindoor.

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Creation of theatre commands will kick-start next generation of reforms: CDS Gen. Anil Chauhan

Source: The Hindu, Dt. 24 May 2025,
URL: https://www.thehindu.com/news/national/indian-armed-forces-restructuring-theatre-commanders-to-look-after-force-application-service-chiefs-force-generation/article69609933.ece

In an indication of the structure of the proposed restructuring of the Indian armed forces into Integrated Theatre Commands (ITC), Chief of Defence Staff (CDS) Gen. Anil Chauhan stated that the theatre commanders will be responsible for force application or the operational aspects while the Service Chiefs will look after the functions of 'Raise, Train and Sustain.'

"The concept of establishing theatre commands is to create two parallel and complementary streams for 'Force Application' and 'Force Generation'. The Force Application component will become the responsibility of a theatre commander, whereas Service Chiefs, in their transformed role will be responsible for what is colloquially called the 'Raise, Train and Sustain (RTS) function'. In other words, the service chiefs will preside over the Force Generation, an equally important aspect," Gen. Chauhan wrote in the book he authored 'Ready, Relevant and Resurgent: A Blueprint for the Transformation of India's Military' that was released on Thursday.

Recalling that it has been 22 months since he was appointed as the country's second CDS, Gen. Chauhan noted that one of the tasks entrusted to the CDS has been to facilitate the restructuring of military commands for the optimal utilisation of resources and bring about jointness and integration in operations.

This, he wrote, will be visibly manifested in the establishment of joint operational structures at various levels and echelons and this switch will be one of the "most revolutionary" changes attempted by the Indian armed forces in the post-independence era. "The creation of the Theatre Commands is the beginning of this change and will kick-start start next generation of reforms in the armed forces."

In this regard, Gen. Chauhan stated that an essential prerequisite for the establishment of theatre commands is a high degree of jointness amongst the three Services and physical integration of several processes, activities and essential infrastructure. "The structural transformation at the apex level will usher in conceptual and cultural changes," he wrote stating it will also trigger cascading organisational changes at Headquarters and establishments at lower levels which will come with its own set of challenges. The acceptability of the change will only happen once officers at all levels are aware of the impending changes, he added.

Mandate of CDS

The mandate of the CDS is to ensure "jointness" of the three services in operations, logistics, transport, training, support services, communications, repairs and maintenance and the top priority is the reorganisation of the armed forces geography-centric ITC. The effort got delayed due to lack of consensus between the Services and was stalled by the death of the first CDS Gen Bipin Rawat,

and then the delay in the appointment of his successor. The process got back on track after Gen Chauhan took over as the CDS. The formation of ITC has also been included by the BJP in its election manifesto before the 2024 eelctions.

The broad consensus among services is for the creation of three theatre commands, two land commands focusing on the western and northern borders and a maritime command to oversee the country's vast coastline. The other and a more pertinent recommendation, confirmed by multiple sources, is that all the three commanders as well the Vice CDS should be four star officers akin to the three service Chiefs and the CDS.

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Artillery's firepower reverberates during Operation Sindoor

Source: The Hindu, Dt. 25 May 2025,
URL: https://www.thehindu.com/news/national/artillerys-firepower-reverberates-during-operation-sindoor/article69615205.ece

While the precision strikes by the Indian Air Force and the joint aerial defence with the Army were widely displayed during Operation Sindoor, the Army's Regiment of Artillery, along with Army Air Defence, played a major role in both hitting terror targets in the initial phase and in the subsequent shelling and exchanges along the Line of Control (LoC) in Jammu and Kashmir, multiple officials said.

In response to the terror attack in Pahalgam on April 22 that killed 26 civilians, the Indian military hit nine terror targets in Pakistan and Pakistan-occupied Kashmir (PoK) overnight on May 6-7 under Operation Sindoor. Nine targets, chosen from among 21, were hit with 24 precision strikes in a span of 25 minutes, between 1:05 a.m. and 1:30 a.m., in which officials said over 100 terrorists were killed. Of the nine camps, five were in PoK and four in Pakistan, at distances ranging from six kilometres to 100 km from the border, Colonel Sofiya Qureshi had said in a media briefing.

Seven of these terror targets were assigned to the Army, and of those, a majority were hit by the Artillery regiment using precision long-range Excalibur rounds and loitering munitions, officials stated. "As far as the Army's role in Op Sindoor is concerned, protection was (provided) by Air Defence and firepower was (used) by the Artillery regiment," one official observed.

Most of the targets, especially in PoK, were within 6-16 kilometers from the border, another official noted, adding that the type of weapon depends on the range and nature of the target, and the 155mm artillery is very accurate in a flat trajectory.

Along the LoC, between May 7 and May 10, Pakistan resorted to heavy shelling using small arms, mortars, and heavy artillery, including 105 mm and 155 mm artillery guns, to which the Indian Army responded effectively, Army sources said. Wing Commander Singh, in a media briefing on May 8, stated that Pakistan's heavy shelling using heavy-calibre artillery guns and armed drones in Tangdhar, Uri, Poonch, Mendhar, Rajouri, Akhnoor, and Udhampur in Jammu and Kashmir had resulted in some losses and injuries to Indian Army personnel. "Pakistan Army also suffered major losses in Indian retaliatory fire," she added.

Destruction of enemy emplacements, bunkers, counter-fire, and similar actions along the LoC were undertaken by the artillery, the official cited above said. The heavy shelling continued during the night of May 10, even after the understanding to stop all firing and all military activity came into effect at 5 p.m. that day. The Army has several artillery guns – Bofors, M777, and Soltam – deployed in the region, all of which were employed, officials said. In response to heavy shelling by Pakistan, concentrated artillery hits were undertaken by the Indian Army, causing extensive damage to several bunkers along the LoC, one of the officials stated.

In 2019, the Indian Army procured Excalibur precision rounds for all its 155mm artillery guns, which also extend their range. The procurement was fast-tracked in the aftermath of the Balakot episode in February 2019. The Excalibur precision-guided projectile, co-developed by Raytheon and BAE Systems Bofors, provides accurate 'first-round effects' at all ranges in all weather conditions and "extends the reach of .39-calibre artillery to 40 km and .52-calibre artillery to more than 50 km," according to Raytheon's website.

As reported by The Hindu earlier, the Army has revised the profile of its Artillery regiments as a result of lessons drawn from the Ukraine war, with a focus on a mix of mobility and augmented long-range firepower, based on a detailed study by the Regiment of Artillery along with the Operations Branch. An effort is already underway to convert all artillery guns to medium 155mm gun systems, expected to be achieved by 2042.

A few years back, the Regiment of Artillery had initiated a process for procuring tactical Unmanned Aerial Vehicles (UAVs) – unlike the Medium Altitude Long Endurance (MALE) UAVs operated by Army Aviation — to enable Observation Post (OP) officers to better direct firepower, and also to carry out post-strike damage assessment at long ranges. These were quite effective as UAVs overcome the limitations of ground-based surveillance. A new automation software, 'Shakti', was also incorporated a few years back to automate and speed up the firing process

As reported earlier, the Regiment of Artillery is looking at UAVs with a range of 15-20 kilometers and endurance of up to two hours, and those with a slightly longer range of 80 kilometers with an endurance of four hours. The latter are for long-range rocket systems; for instance, the Smerch multi-rocket launch system has a range of 90 kilometers, thus requiring the surveillance to extend beyond 90 kilometers.

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In Operation Sindoor, air power, sky high

Source: The Indian Express, Dt. 24 May 2025,
URL: https://indianexpress.com/article/opinion/columns/in-operation-sindoor-air-power-sky-high-10025063/

While it is too early to draw operational and tactical lessons from Operation Sindoor, it may be possible to look at the big picture and draw positive lessons for future national security contingencies. This article seeks to throw light on four critical aspects of the operation: Planning and preparation, execution, escalation control and narrative building.

There was a tight centralised model during the planning and preparation phase of the operation, stewarded by the troika of the Prime Minister, the National Security Advisor and the Raksha Mantri. This was backed by the second tier comprising the Chief of Defence Staff and the three service chiefs. Clear and cogent strategic outcomes were conveyed to the service chiefs and intelligence agencies, leaving them to chart out the modalities of the operation.

The 15-day interlude between the Pahalgam massacre and Op Sindoor gave enough time to tweak operational plans, even while Indian diplomacy and other non-kinetic measures, such as the abrogation of the Indus Waters Treaty, increased Pakistan's worries. The secrecy of the plans was maintained at the strategic level, despite the attention they received from several quarters.

The choice of the IAF as the first and principal responder, and the reliance on stand-off weapons such as the indigenously-produced BrahMos missile and several loitering munitions, signalled a newfound confidence in taking forward the philosophy of non-contact warfare that began with the Balakot strike. Critical targets such as Bahawalpur, Muridke, terrorist camps close to the Line of Control and airfields deep inside Pakistan, such as Sargodha, felt the impact of this strategy. Equally telling was India's attempt to avoid needless attrition to its ground and maritime forces, which would have been inevitable had they been pressed into offensive action immediately.

The IAF and Indian Army's integrated air defence system surprised one and all with its splendid performance over three nights of sustained operations against hundreds of low and high-cost drones, quadcopters, unmanned combat aerial vehicles (UCAVs), cruise missiles and ballistic missiles. The Integrated Air Command and Control System (IACCS) drew on imported, indigenous, modern and legacy systems. Pakistan erred in assuming that India's weak link was its air defence system.

The reputation acquired by the Turkish and Chinese drones and UCAVs during the Armenia-Azerbaijan and Russia-Ukraine wars was punctured as the IAF demonstrated multi-domain operations, using an offensive-defensive strategy — this evolved with great speed and managed the escalation with much greater finesse than Pakistan's strategic establishment.

Calibrated escalation control seemed to have dictated India's fighting strategy, even if that meant having to play the role of "responder" after the initial strikes, which were aimed at causing significant damage to terrorist infrastructure and leadership — and not target Pakistan's military or its civilian population/infrastructure. The resilience and depth of the Indian forces allowed them to play the waiting game and caused Pakistan to exhaust most of its surprisingly large inventory of drones, UCAVs and quadcopters on the nights of May 7, 8, and 9. The Indian forces then raised the stakes on May 10 after a night of relentless attacks on civilian and military targets across the length of the LoC and the International Boundary.

The ferocity of the IAF's airstrikes on the morning of May 10 has left the world stunned — it targeted a vast swathe, from the Nur Khan air base in the north to the Malir Cantonment on the outskirts of Karachi to the south. Some commentators are suggesting that the damage inflicted on 10 PAF airfields surpasses the cumulative damage inflicted by the IAF on PAF airfields during the 1971 war on the western front.

The de-escalation was swift — its modalities principally involved an outreach from the Pakistani DGMO to his Indian counterpart. This was accepted soon after the Indian strikes were successful, and they had not elicited a Pakistani response. The application of offensive air power by India accelerated the de-escalation just as it did during the Kargil conflict.

Building and spreading narratives in contemporary conflict are as important as the execution of politico-diplomatic-military operations. Even as the conflict raged, there was a visible attempt to be transparent and assertive by conducting regular briefings marshalled by an articulate Foreign Secretary, Vikram Misri, and two women officers from the Army and the Air Force. Occupying the moral high ground was as important as offering glimpses of the conflict. After the ceasefire was declared, many were surprised by the detailed and "as transparent-as-can-be" briefings by senior military officers from the three services, with evidence provided of key targets that were attacked in Pakistan. On the other hand, briefings by Pakistan's Inter-Services Public Relations made extravagant claims about the losses inflicted on India without providing a shred of evidence.

The Indian Army stood firm across the LoC and the IB, engaging in artillery duels, destroying terrorist launch pads, thwarting infiltration, and plugging in effectively its air defence weapons. The Indian Navy flexed its muscles in the northern Arabian Sea and showed that it was ready to join the fray as the next escalatory instrument. However, it was for the first time in independent India's military history that the IAF emerged as the sword arm of the forces. With its first-mover advantage, precision capability, offensive firepower and remarkably effective ground-based integrated air defence network, it surprised several observers.

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Pause in India-Pak military action, Army works on plan to 'rebalance' troops at border

Source: The Indian Express, Dt. 25 May 2025,
URL: https://indianexpress.com/article/india/to-dial-down-army-works-on-plan-to-rebalance-troops-equipment-at-border-10026907/

A fortnight into the pause of military action in the wake of the April 22 Pahalgam terror attack, a proposed plan for "rebalancing of troops" is being discussed within the military to avoid any fresh escalation at the borders, The Indian Express has learned.

This even as Operation Sindoor is on pause and all alerts remain at their heightened levels.

While Indian and Pak armies are focusing on multiple confidence-building measures, plans for de-escalating troops and equipment from the borders within the next fortnight are being considered.

Sources said Pakistan, which carried out major reinforcements of troops and equipment over the last few weeks, will also pull them back to pre-April locations.

Incidentally, India had not ordered large-scale mobilisation or deployment of offensive formations over the last month. Limited equipment and corresponding troops, which had been moved from their permanent locations to operational ones, are now planning to go back to their regular locations.

During Operation Sindoor, the density of troops along the borders had increased but that was more because of curtailing leave and less essential movement. However, sources said, these restrictions have now been lifted. Even short-term courses, which were to be cancelled temporarily, will now continue as per slated schedules.

According to sources, after the first two days following the ceasefire agreement, no aerial violations by Pakistani drones were reported though the occasional stray drones were sighted in Jammu and Kashmir. They added that there are orders in place to avoid firing on them without appropriate clearances, even as any ceasefire violations at the LoC will be responded to by the troops.

As Prime Minister Narendra Modi had flagged, in his address to the nation, Operation Sindoor is only on pause. This would imply that the military would continue to remain at a heightened state of alertness and operational readiness, while maintaining a strong defensive posture throughout. There has been no official statement from the government on whether there have been DGMO-level talks on the de-escalation after May 12.

On May 12, DGMO Lieutenant General Rajiv Ghai spoke to his Pakistani counterpart Major General Kashif Abdullah – their second conversation since they agreed to stop all military action—during which it was agreed that both sides would consider immediate measures to ensure troop reduction from the borders and forward areas. Sources said that stopping aerial violations was also discussed in the meeting.

An Army statement had also mentioned that issues related to continuing the commitment that both sides must not fire a single shot or initiate any aggressive and inimical action against each other were discussed in the talks. The Indian Express had earlier reported that within days following May 12, both sides were scheduled to exchange plans on the modalities of de-escalation of troops and equipment deployed along the borders.

Two days after the May 12 talks, Pakistan's Foreign Minister Ishaq Dar had claimed that Pakistan had agreed to extend the ceasefire with India until May 18 following DGMO-level talks between the two sides. Without commenting on whether the two sides spoke, the Indian Army said both sides will continue the confidence-building measures to reduce the alertness level. It clarified that there is no expiry date to the understanding reached between the two militaries on May 10 to "stop all firing and military action from land, air and sea."

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Operation Sindoor has ticked the right boxes

-by Air Chief Marshal S Krishnaswamy, former Chief of Air Staff

Source: The Tibune, Dt. 26 May 2025,
URL: https://www.tribuneindia.com/news/comment/operation-sindoor-has-ticked-the-right-boxes/

A defining feature of Operation Sindoor, which has been paused for the time being, is that India launched it without being perturbed by international opinion. This approach is a far cry from how things panned out during Operation Parakram, which began shortly after terrorists attacked

Parliament on December 13, 2001. At that time, several Cabinet meetings were held to monitor the situation and work out an action plan. The military mobilisation underlined India's resolve to punish Pakistan. A strike by the Indian Air Force (IAF) on a terror camp was proposed with the aim of deterring Pakistan from sponsoring terror attacks. However, some Cabinet members were apprehensive that an airstrike could make the situation spin out of control. For that reason, proposals to strike the terrorists' headquarters in Bahawalpur and deploy the Navy in the Arabian Sea to carry out a blockade of Karachi, as and when required, were declined.

International pressure started mounting on India to call off the offensive because some countries feared that Pakistan may use nuclear weapons. Presidents of the US and Russia voiced their concerns. The India-Pak skirmish upset the Americans, who were deeply involved in Afghanistan following the 9/11 attacks. They did not want any distraction caused by a war in Afghanistan's neighbourhood. Besides, the US needed Pakistan's support for their Afghan engagement.

A series of events happened in the first two weeks of January 2002. LK Advani, then Home Minister, travelled to the US. The Americans told him that they would persuade Pakistan President Gen Pervez Musharraf to avoid going to war. Prodded by the US, then UK PM Tony Blair visited India to dissuade the Vajpayee government from taking military action. In a public speech on January 12, Gen Musharraf promised to reduce tensions; he condemned the Parliament attack but emphasised his stand to use nuclear weapons in accordance with Pakistan's right of 'first use'. His speech was reason enough for the Indian government to call off the planned airstrike. By then, around 500,000 Indian and 300,000 Pakistani troops had been deployed at the border.

On May 14, 2002, Pakistani terrorists attacked an Indian Army camp at Kaluchak (J&K), killing 30 people, mostly wives and children of defence personnel. However, Pakistan refused to extradite the terrorists' handlers, even as Lashkar-e-Taiba continued to operate under a new name. The Indian Cabinet felt that a limited airstrike would serve no purpose under these circumstances. By May-end, both India and Pakistan were fully mobilised. Pakistan's terror network was extremely well organised. It was practically used as an extension of the Pakistan army and was given huge technical and financial support.

On June 5, 2002, then US Deputy Secretary of State Richard Armitage extracted a commitment from Gen Musharraf that he would stop cross-border terrorism and dismantle infrastructure supporting terrorism. On June 10, India called off Op Parakram and the entire strike plan against Pakistan with the hope that the promise secured by the Americans would be fulfilled.

However, the 'love story' between the Pakistan army and terror outfits continued unabated. India witnessed one major terror attack after another — Mumbai (2008), Pathankot and Uri (2016) and Pulwama (2019).

The April 22 massacre in Pahalgam was promptly followed by the deployment of the Navy's Carrier Battle Group in the Arabian Sea and the suspension of the Indus Waters Treaty. On the intervening night of

May 6-7, Operation Sindoor was launched. The IAF struck nine terror sites inside Pakistan and PoK. In retaliation, Pakistan sent some 300 drones across the border, the majority of which were lightweight quadcopters; in between them were embedded unmanned combat aerial vehicles

(UCAVs) that carried munitions. These UCAVs were identified and shot down by the Indian air defence system; they caused practically no damage to Indian assets.

India's response this time has been kinetic as well as non-kinetic. What has stood out is the Prime Minister's resolve to teach Pakistan a lesson; he has declared that any future terror attack will be viewed as an act of war against India. This resolve was reflected in the directions to the armed forces. Decisions were taken spontaneously and fearlessly.

Long-range precision-guided munitions proved lethal and accurate, especially the BrahMos and Akash missiles. Radars and sensors also performed exceptionally well. It is estimated that Pakistan suffered heavy losses that may take it years to recoup.

Military planning was fully integrated, including all intelligence agencies and national space assets. The entire operation lasted just three nights, with no loss of aircrew – a remarkable achievement indeed.

The IAF's pilots flew in the dead of night and unleashed weapons with pinpoint accuracy. High-end technicians worked long and hard with confidence. The Integrated Air Command and Control System proved exceedingly good. The IAF, despite facing a serious shortage of combat equipment, has been consistently working to modernise its inventory, training and management, ably supported by the government.

The Defence Research and Development Organisation (DRDO) has done the nation proud. The policy of Atmanirbharta (self-reliance) is now well established in the defence sector. Apathukatha Sivathanu Pillai (BrahMos designer) and Prahlada Ramarao, the brain behind the Akash missile system, deserve a special mention.

We have every reason to be proud of our armed forces and the national leadership for achieving what seemed to be nearly improbable.

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Pakistan regards India as an existential threat: US defence intelligence annual report

Source: The Economic Times, Dt. 25 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/pakistan-regards-india-as-an-existential-threat-us-defence-intelligence-annual-report/articleshow/121394664.cms

The US defence department in its World Wide Threat Assessment report for 2025 has said that Pakistan sees India as an "existential threat," while India regards Pakistan as one of an "ancillary security problem." The US defence intelligence agency says that the Pakistani army will continue to pursue its military modernisation effort, "including the development of battlefield nuclear weapons".

"Pakistan regards India as an existential threat and will continue to pursue its military modernisation effort, including the development of battlefield nuclear weapons, to offset India's

conventional military advantage," the report metions. "Pakistan is modernising its nuclear arsenal and maintaining the security of its nuclear materials and nuclear command and control. Pakistan almost certainly procures WMD applicable goods from foreign suppliers and intermediaries," it added.

Further, the report says Pakistan's top priorities will likely remain cross-border skirmishes with regional neighbors. "During the next year, the Pakistani military's top priorities are likely to remain cross-border skirmishes with regional neighbors, rising attacks by Tehrik-e Taliban Pakistan and Baloch nationalist militants, counterterrorism efforts, and nuclear modernization," the report said.

"Despite Pakistan's daily operations during the past year, militants killed more than 2,500 people in Pakistan in 2024," it added US also said that Pakistan is the "primary recipient" of China's economic and military generosity and foreign materials and technology supporting Pakistan's armed forces are very likely acquired primarily from suppliers in China

"Pakistan primarily is a recipient of China's economic and military largesse, and Pakistani forces conduct multiple combined military exercises every year with China's PLA, including a new air exercise completed in November 2024," the report said.

"Foreign materials and technology supporting Pakistan's WMD programs are very likely acquired primarily from suppliers in China, and sometimes are transshipped through Hong Kong, Singapore, Turkey, and the United Arab Emirates. However, terrorist attacks targeting Chinese workers who support China Pakistan Economic Corridor projects has emerged as a point of friction between the countries; seven Chinese nationals were killed in Pakistan in 2024," it added. The defence intelligence agency (DIA), which operates under the US Department of Defense, focuses on military intelligence.

The report comes after 26 tourists were killed in Jammu and Kashmir's Pahalgam in a terrorist attack last month. In retaliation, Indian Indian armed forces launched missile strikes targeting terrorism-linked infrastructure inside Pakistan and Pakistan-occupied Kashmir (PoK). Both countries were engaged in multiple rounds of missile launches, drone operations, loitering munition attacks, and intense artillery shelling from May 7 to May 10.

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India views China as its primary adversary, Pakistan more an ancillary security problem: US defence intelligence report

Source: The Economic Times, Dt. 25 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-views-china-as-its-primary-adversary-pakistan-more-an-ancillary-security-problem-says-us-defence-intelligence-report/articleshow/121394863.cms

the US Defence Intelligence Agency in its threat assessment report 2025 has said that Prime Minister Narendra Modi's defence priorities will likely focus on demonstrating global leadership, countering China, and enhancing the country's military power.

"India views China as its primary adversary and Pakistan more an ancillary security problem to be managed, despite cross-border attacks in mid-May by both India's and Pakistan's militaries," the report says. This comes after recent tensions between India and Pakistan after Indian airstrikes targeted terrorist infrastructure in Pakistan and Pakistan-Occupied Kashmir following the terror attack in Jammu and Kashmir's Pahalgam last month.

"Following a late April terrorist attack in Jammu and Kashmir, New Delhi conducted missile strikes on terrorism-related infrastructure facilities in Pakistan. The missile strike provoked multiple rounds of missile, drone, and loitering munition attacks, and heavy artillery fire, by both militaries from 7 to 10 May. As of 10 May, both militaries had agreed to a full ceasefire," the report says. The report adds that India is prioritising bilateral defence partnerships in the Indian Ocean region to counter Chinese influence and boost its global leadership role.

Further, the report says that India and China's disengagement along the Line of Actual Control last year "did not resolve the longstanding dispute about border demarcation but reduced some tension still lingering" from the 2020 clash. "India also has increased trilateral engagement in the Indo-Pacific region and actively participates in multilateral fora such as the Quadrilateral, BRICS, Shanghai Cooperation Organization and ASEAN," the report said.

"India almost certainly will continue promoting its "Made in India" initiative this year to build its domestic defense industry, mitigate supply chain concerns, and modernize its military India continued to modernize its military in 2024, conducting a test of the nuclear-capable developmental Agni-I Prime MRBM and the Agni-V multiple independently targetable reentry vehicle while also commissioning its second nuclear-powered submarine to strengthen its nuclear triad and bolster its ability to deter adversaries," it added.

On India-Russia ties, the US report said India will maintain its relationship with Russia through 2025. India views its ties with Russia "as important for achieving its economic and defense objectives and sees value in the relationship as a means to offset deepening Russia-China relations".

"Under Modi, India has reduced its procurement of Russian-origin military equipment but still relies on Russian spare parts to maintain and sustain its large inventory of Russian-origin tanks and fighter aircraft that form the backbone of its military's ability to counter perceived threats from China and Pakistan," the report says. The Defense Intelligence Agency comes under the US Department of Defense and specialises in military intelligence.

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China-Pakistan axis: The dragon-scorpion squeeze

Source: The Economic Times, Dt. 25 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/china-pakistan-axis-the-dragon-scorpion-squeeze/articleshow/121396091.cms

In the years that have elapsed since South Asia emerged from the long twilight of British colonialism, the region has been gripped by a persistent instability – neither the disordered anarchy of stateless zones nor the cold equilibrium of an established balance of power, but something more

ambiguous: a fluctuating, brittle order, always one crisis away from unraveling. Nowhere is this more evident than in the enduring antagonism between India and Pakistan that has matured into a more protean and perilous confrontation. Yet to view this rivalry in its traditional binary form is to miss the evolution of its real strategic character. As developments since the Pahalgam terror attack have demonstrated, the Indo-Pakistan conflict has not merely persisted; it has been transformed, gradually but inexorably, into a trilateral configuration in which China, once a peripheral observer, now looms as a latent but decisive actor.

This metamorphosis warrants a more nuanced interrogation. Historically, Pakistan's reliance on foreign backers has been a fixture of its strategic posture. During the Cold War, the United States saw Pakistan as a geopolitical lever against Soviet influence, providing arms, funds, and legitimacy. But where America once sought alignment through ideology, China now pursues influence through infrastructure, arms sales, and algorithmic entanglement. The transition is less a case of old dependencies continuing in new dress than it is of an evolving strategic fusion.

As the latest episode of India-Pakistan conflict shows, the Sino-Pakistani nexus is not just diplomatic; it is operational. The integration of Chinese military platforms into Pakistan's arsenal is a cautionary tale of deeper entanglement. This increasingly seamless military and doctrinal convergence has birthed what one might term the 'dragon-scorpion axis': a symbiotic arrangement wherein the scorpion – Pakistan – delivers the sting through asymmetric terror, while the dragon – China – provides both the venom and the armour. The interoperability of systems, the shared training regimes, and the strategic alignment of objectives are the sinews of this new axis, one that is fast reshaping South Asia's security calculus.

It is a development reminiscent, in structural terms, of Soviet influence over the Warsaw Pact states – though with subtler means and in an age where digital infrastructure and surveillance capabilities amplify the reach of hegemonic ambition. Where the Soviet Union once asserted its dominance through the visible apparatus of military occupation and ideological enforcement, Beijing now extends its reach through dual-use infrastructure projects, arms sales, and economic inducements that come with strings attached.

Fighter jets, development loans, and digital platforms serve as the modern equivalents of commissars and armored divisions – tools for shaping behaviour, limiting autonomy, and binding Pakistan into a sphere of influence without the formal trappings of empire. The latest agreement to expand the China-Pakistan Economic Corridor (CPEC) into Afghanistan underscores this strategy, embedding infrastructure and investment as instruments of geopolitical alignment. By drawing Afghanistan into its orbit, Beijing seeks to create a buffer zone and secure a secondary axis of influence that fortifies Pakistan's strategic posture. This quiet coordination with Pakistan – 'clandestine compact' – functions as a deliberate mechanism of pressure – one aimed at constraining India's strategic bandwidth, shifting the balance of power through the cumulative effect of economic leverage, military entanglement, and narrative control.

This reconfiguration renders India's strategic predicament more acute and multidimensional. It is no longer merely a matter of deterring a hostile but inferior neighbour. Rather, India confronts a composite adversary – Pakistan as the immediate provocateur, and China as the hidden architect of escalation. The much-invoked "two-front" threat seems to have matured into what might more

aptly be termed a “Proxy Pincer”: a calibrated architecture of coercion in which Pakistan functions as the overt executor of disruption, while China maneuvers with calculated ambiguity from the flanks – eschewing attribution, yet resolute in shaping outcomes. The geometry of pressure is deliberate, the silence between actions as strategic as the actions themselves.

And herein lies the most insidious development: in a future crisis, the locus of decision-making in Islamabad may be so enmeshed with Chinese strategic imperatives that distinctions between national will and foreign influence become indistinguishable. Pakistan, in effect, has become Beijing’s Trigger Finger – an appendage through which China can apply pressure without bearing responsibility, exert force without crossing thresholds, and deny involvement while shaping outcomes.

What we confront now is an asymmetrical entanglement, in which China’s ability to influence the tempo and tenor of a South Asian crisis enables it to shape outcomes without entering the battlefield. This is not mere ideological alignment; it is the operationalization of a plausible provocation pact – a tacit understanding that escalations can be engineered below the threshold of formal war, while plausible deniability is preserved.

Such choreography is most evident in the post-Pahalgam milieu. The ghastly terror attack unfolded not merely as an act of violence, but as a moment of strategic theatre. India’s restrained but firm military response was followed by a flurry of international statements – none more telling than those emanating from Washington and Beijing. The United States, ever eager to claim the mantle of crisis manager, framed the ceasefire as a diplomatic victory. Yet this performative diplomacy belied a deeper shift: China’s silent choreography behind the scenes. The sudden halt in cross-border drone intrusions, a spate of ambiguous official statements, and the conspicuous tempering of Pakistani belligerence bore the unmistakable imprint of Beijing’s strategic choreography. At its core was a calculated reminder: that strategic equilibrium in South Asia no longer hinges solely on Western mediation, but now rests, increasingly, on the tacit acquiescence – and latent leverage – of Beijing.

This maneuver – subtle in its blend of opportunism and statecraft – aims to recast the Indo-Pakistan rivalry as a local disturbance to be managed by a disinterested overseer. What emerges is an axis of ambiguity, where power is projected through proxies, where escalation is modulated through influence, and where accountability vanishes into the fog of denial.

What makes this architecture particularly pernicious is that it seeks to erode India’s agency while simultaneously casting China as a stabilizer. The rhetorical inversion is complete: India’s self-defense becomes provocation; its deterrence, escalation. The tragic triangle that now defines South Asia – India under constant psychological pressure, Pakistan as a pliable executor, and China as a puppeteer cloaked in neutrality – must be acknowledged for what it is: a strategic trap. This is an agonizing clash of values – India’s insistence on sovereign equality and transparency pitted against China’s preference for hierarchical ambiguity and covert coercion. It is not a contest of force alone, but of narrative and perception, of who gets to define legitimacy in a crowded geopolitical theatre.

And yet, within this fog lies opportunity. India must not merely react to these constraints. It must shape the terrain of engagement. The first imperative is doctrinal: deterrence must be reframed not

in terms of punishment alone, but of unpredictability, denial, and disruption. India must build the capacity not only to retaliate, but to pre-empt, confuse, and outmaneuver.

The second imperative lies in diplomacy. India must craft a narrative that extracts it from artificial entanglement that binds its image to Pakistan's provocations. This requires deepening ties with like-minded partners, particularly within the Indo-Pacific, but with a realistic understanding that the West's appetite for justice is often eclipsed by its addiction to stability.

History does not reward victimhood; it rewards agency. The task before India is not simply to withstand the Dragon-Scorpion axis, but to render it obsolete – through the steady construction of resilience, through alliances that privilege transparency over ambiguity, and through strategic patience informed by long memory.

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In a first, 17 women cadets to graduate from NDA alongside 300 male soldiers on May 30

Source: The Economic Times, Dt. 25 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/in-a-first-17-women-cadets-to-graduate-from-nda-alongside-300-male-soldiers-on-may-30/articleshow/121389695.cms

NDA's first batch of female cadets at National Defence Academy in Pune. 17 female cadets are set to graduate alongside more than 300 male counterparts from the academy. On May 30, Cadet Ishita Sharma will step onto the National Defence Academy (NDA) parade ground in Pune, not just as a graduate but as part of a moment that will go down in history.

She is among the first 17 women cadets who will pass out of the prestigious military institution — a landmark event in the journey of gender integration in India's armed forces. These 17 women, alongside nearly 300 male cadets, are set to become NDA's first co-ed graduating batch since the academy opened its doors to female aspirants in 2022. For decades, the NDA had remained an all-male bastion. That changed following a Supreme Court directive, and now, three years later, the results of that shift are ready to be commissioned into military life.

"A complete transformation"

"I come from a non-military background. My parents work in the corporate sector, and my brother is an IT professional. I was pursuing a bachelor's degree in economics when NDA announced its entry for women. I didn't think twice before applying," Ishita, who now holds the honorary title of Division Cadet Captain (DCC), told ToI.

Reflecting on her time at the academy, she said, "After spending three years here, I can confidently say that my personality underwent a complete transformation." For Ishita, leadership was not just taught, it was lived — with responsibilities like being DCC offering a chance to develop character and command from within the ranks. Her experience is echoed across the batch, with cadets describing the three years as intense, transformative, and deeply personal. "Before joining the

academy, I was an introvert. Here, I made several friends for life. In fact, my course mates feel like family now," she said.

Breaking barriers, shaping futures

Another cadet, Shriti Daksh, daughter of a retired wing commander, shared how the NDA experience not only matched but exceeded her expectations. "At the academy, I actually understood what the real experience of military training feels like," she said.

The first day at NDA was more than a moment of pride — it was a generational milestone. "It was a special day for my father and me when he dropped me off at the academy, a mix of nostalgia and pride for him. Now, I am just a few days away from the moment my father experienced in his life, and I am excited to share that moment with him on May 30," she added.

Cadet Ritul Duhan, who became the first woman to be appointed Battalion Cadet Captain (BCC), knows the weight her position carries. "We're not just completing training; we are paving the way for future leadership and inspiring younger cadets," she said. Despite the physically and mentally demanding training, the women cadets said the environment was one of equal opportunity. "Equal opportunity naturally empowers each individual. That is what makes the academy unique in all aspects," Ishita noted.

Their time at NDA was defined not just by military drills and academic learning, but by breaking mental barriers. "Once you break that mental barrier, you push your limits to the next level each time," Ishita said. The historic passing-out parade on May 30 will not only celebrate the graduation of these cadets, but also reflect a new chapter for the armed forces — one that signals inclusivity, resilience, and a future where leadership wears no gender.

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India, Russia begin talks on advanced BrahMos missile production

Source: The Economic Times, Dt. 25 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/india-russia-begin-talks-on-advanced-brahmos-missile-production/articleshow/121384094.cms

India and Russia following the success of jointly produced BrahMos missiles in Operation Sindoor and subsequent conflict with Pakistan have launched negotiations for manufacturing an advanced version of the missile.

Russia, it is understood, has extended full technical support for jointly producing an advanced version of the missile in India, ET has learnt. Initial negotiations have already been held between New Delhi and Moscow on the issue, ET has further learnt.

The newly inaugurated BrahMos facility in Uttar Pradesh has been identified for producing the advanced version of missiles, according to informed sources. The facility will produce missiles in substantial numbers, sources informed.

A BrahMos Aerospace Unit has been established in Lucknow at a cost of ₹300 crore, with 80 hectares of land provided free by the government.

The unit includes anchor unit PTC and 7 other supporting facilities.

The unit was inaugurated on May 11 by Defence Minister Rajnath Singh and Uttar Pradesh Chief Minister Yogi Adityanath. The UP CM heaped praises on the success of BrahMos missile during the Operation Sindoor. “You must have seen a glimpse of the BrahMos missile during Operation Sindoor. If you didn’t, then just ask the people of Pakistan about the power of the BrahMos missile,” he had said on the occasion.

On May 10 SU-30 MKI-launched Brahmos missiles damaging northern air command-control network at Nur Khan airbase. BrahMos missiles like S-400 proved extremely effective in hitting terror bases and thwarting Pakistani designs.

It was India's strike on Pakistan's Nur Khan airbase, situated at Rawalpindi, that finally rattled the Pakistan military forcing them to approach the USA.

Nur Khan is not only the home to the air refueling capability that kept Pakistani fighter jets in the air, but it is also near the headquarters of Pakistan’s Strategic Plans Division, which oversees and protects the country’s nuclear arsenal. BrahMos missiles have also reportedly been used to target JeM headquarters at Bahawalpur. BrahMos, a supersonic missile, cannot be intercepted by any known air defence systems including by Chinese and Pakistan, sources said.

Once launched BrahMos can reach 300 km within minutes. It can cause huge damage to the runways. India has several versions including land-to-land version, land-to-ship and ship-to-land. In 2018, Prime Minister Narendra Modi announced two Defense Industrial Corridors — one in Uttar Pradesh and the other in Tamil Nadu.

These are part of the ‘Make in India’ and ‘Atmanirbhar Bharat (Self-Reliant India)’ initiatives, aiming to reduce dependence on defense imports and promote indigenous manufacturing.

Six designated nodes in UP: Lucknow, Kanpur, Aligarh, Agra, Jhansi, and Chitrakoot. There are Excellent logistics support through major expressways and highways. Precision Casting Plant – For critical components of jet engines and aircraft systems. Forge Shop & Mill Products Plant – For titanium and super alloy bars, rods, and sheets.

Precision Machining Shop, Strategic Powder Metallurgy Facility – India’s first indigenous plant for titanium and super alloy metal powder production. STRIDE Academy – For practical training in defense and aerospace technology.

R&D Center – For indigenous technology development, material innovation, and manufacturing process improvement. So far, 57 MoUs have been signed, with a proposed investment of nearly ₹30,000 crore. The target is ₹50,000 crore investment and 100,000 jobs across the six nodes.

So far, five units have commenced production, and two new units have recently joined. The swift development of defense manufacturing units within just three to four years marks a major step toward achieving the goals of 'Atmanirbhar Bharat'.

India spends around ₹6.5 lakh crore annually on defense, of which ₹2.5 lakh crore accounts for imports.

As part of the UP Defense Industrial Corridor, land has been allocated to 57 investors, with production facilities currently in various stages of development. These units represent a grounded investment of ₹9462.8 crore and are expected to generate direct employment for 13,736 people. It is noteworthy that the first land lease agreement was executed in June 2021, and within less than four years, 57 industries are actively developing facilities within the corridor.

In the Jhansi node, 16 companies have been allotted 531.09 hectares of land. These projects amount to a proposed investment of ₹4372.81 crore and will provide direct employment to 2,928 people. This node will house enterprises specializing in explosives, ammunition, propulsion systems, and mobile platforms for mid-caliber infantry weapons.

In the Kanpur node, 5 companies have received 210.60 hectares of land, with an expected investment of ₹1758 crore and employment for 2,200 people. The node will host units manufacturing small, medium, and large caliber ammunition, bulletproof jackets, specialized fabrics, and small arms.

The Aligarh node leads in the number of companies, with 24 companies allotted 64.001 hectares of land. With an investment proposal of ₹1921 crore, the node is projected to create 5,618 direct jobs. It is emerging as a hub for drones, loitering munitions, counter-drone systems, precision equipment, mechatronics, small arms, and radar systems.

The Lucknow node, home to the BrahMos Aerospace facility, has allocated 117.35 hectares of land to 12 companies. This node anticipates an investment of ₹1411 crore and 2,930 direct jobs. Apart from the world's most powerful supersonic cruise missile BrahMos, this node will produce missile systems, ammunition, defense packaging, drones, and small arms.

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India & Russia eye collaboration on nuclear energy, cybersecurity

Source: The Economic Times, Dt. 24 May 2025,
URL: https://economictimes.indiatimes.com/news/india/india-russia-eye-collaboration-on-nuclear-energy-cybersecurity/articleshow/121369011.cms?from=mdr

As India readies to amend its contentious nuclear liability laws and boost its cyber defence mechanisms in the aftermath of Operation Sindoor, discussions are learnt to have been started with Russia to forge joint collaborations in nuclear energy and cyber space, besides cutting-edge technology across several sectors, ET has learnt.

Deliberations are, in fact, picking pace ahead of Russian President Vladimir Putin's India visit this year for the annual bilateral summit, to draw up clear roadmaps.

Case in point: A high-level NITI Aayog team is expected to attend the St. Petersburg International Economic Forum next month where a special roundtable on Indo-Russia Science and Technology cooperation is lined up, ET has learnt. Movement is also being quietly made on the nuclear front

with a clutch of small modular reactors (SMRs) being considered as part of the collaboration between the two countries. Russian nuclear firm Rosatom, which built the Kudankulam Nuclear Power Plant (NPP), signed a memorandum of understanding this April with Maharashtra for thorium-based SMRs. It is gathered that Rosatom plans to build a number of SMRs and has been in talks with the stakeholders, according to people familiar with the matter. The company is also awaiting a green signal from India for another NPP, they said. There is keen interest to work with India on cybersecurity as well, especially co-development of cyber defence mechanisms, sector specific firewalls as well as cybersecurity "products" for global markets, it is gathered. Semiconductors, Artificial Intelligence, space technology and critical minerals are among other areas identified for cross-sectoral collaboration on "knowledge creation" and "Brahmos-like co-development models" in order to develop an enduring technology base for future "products", according to people in the know. In fact, several steps have been taken over the last few months in this direction.

Moscow-based non-governmental development organisation -Innopraktika -is readying to set up an Indo-Russian technology association and engineering centre with bases in both countries to spur innovation, it is learnt. Earlier this year, an Innopraktika delegation held discussions with the Indian business community to assess readiness for high-tech product development.

In January, Russia's leading National Research University - Higher School of Economics (HSE) and the University of Delhi, in partnership with Geoscan (a portfolio company of the Innopraktika non-state development institute), inked an agreement to establish an international scientific "mirror laboratory" on data storage, processing and transmission in space systems. In November 2024, a Russian Business Center was set up in India to develop trade ties between the two countries, promote export cooperation and provide a platform for interaction between the business communities.

India's digital transformation is also moving in a direction very similar to that in Russia, with rapid growth in fintech, digital government services, e-commerce and smart city infrastructure, said Yury Maksimov, co-founder of Cyberus, a Russia-based international cybersecurity development foundation, adding that this kind of progress demands strong cybersecurity. India is not just a partner but a key player in shaping the future of global cybersecurity and digital architecture, Maksimov told ET.

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India’s 'Mahasagar' vision acquire special significance amid changing equations in sub-continent

Source: The Economic Times, Dt. 24 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/indias-mahasagar-vision-acquire-special-significance-amid-changing-equations-in-sub-continent/articleshow/121376987.cms

The geopolitical equations in the Indian sub-continent have undergone a rapid change over the past month and India’s maritime security priorities need special focus. As India’s maritime vision

evolves to “MAHASAGAR” (Mutual and Holistic Advancement for Security and Growth Across Regions), the need to build on it has become all the more important in the context of the recent conflict between India and Pakistan, which has significantly changed the security context of the Indian Ocean Region. It has not only exposed the deep nexus between the Pakistani State (Military) and the terror network, but has also demonstrated India’s firm resolve to fight against terror.

In this context the Chintan Research Foundation organised a day-long conference on ‘The MAHASAGAR INITIATIVE IN THE CURRENT SECURITY CONTEXT’ in New Delhi on Friday.

With panels comprising domain experts, the conference shed light on the intricacies related to maritime security, especially in the backdrop of heightened tensions between India and Pakistan. In his keynote address, Admiral (retd) RK Dhowan, former Navy Chief emphasised on the strategic importance of the Indian Ocean, particularly in the context of the turbulence in neighbouring countries.

He highlighted the rising threats in the region, including maritime terrorism, illegal and unregulated fishing, and other evolving non-traditional challenges that require multi-dimensional responses. Addressing the security outlook post recent India–Pakistan conflict, he said, “Armed forces alone don’t go to war — nations do. What we saw recently was a whole-of-nation response and India is fully prepared to defend itself if required.”

He also lauded Prime Minister Narendra Modi’s strategic vision, linking it to the MAHASAGAR Initiative. He particularly called out the need for a cleaner, safer maritime future, extending the spirit of Swachh Bharat to the oceans through what he termed as ‘Swachh Sagar’ — a cleaner sea for future generations.

“Garbage dumping has had a detrimental impact on Indian Ocean. Collective action is needed to combat ocean dumping, plastic waste, and pollution-induced global warming,” he added. In his welcome address, Shishir Priyadarshi, President, Chintan Research Foundation, highlighted the growing importance of the maritime sector in the future growth strategies of nations.

“We should focus on peace and stability in the Indian Ocean, because this is what will lead to economic and sustained growth. And that is what the ‘G’ in MAHASAGAR stands for - sustained and holistic growth, just as the ‘R’ stands for the region, reminding us of the shared responsibility we hold across the Indian Ocean and the Global South,” he said.

With the objective of developing actionable recommendations for strengthening India’s maritime strategies by engaging in dialogue and collaboration among policymakers, academics, and experts, the conference was able to successfully achieve its goal through engaging sessions and takeaways from both experts and audiences.

From exploring India’s evolving maritime strategy and leadership in the Global South to India’s economic and strategic partnerships under MAHASAGAR, the sessions covered areas which have assumed immense strategic importance in the backdrop of sustained hostile environment in the Indian sub-continent.

Though there is acceptance of India's leadership where India has effectively balanced its role as a 'net security provider' and 'first responder' along with its commitment to regional inclusivity, more strategic adjustments are needed, according to Dr Cchavi Vasisht, Associate Fellow, Chintan Research Foundation

The panelists for the sessions comprised Amb. Rajiv Bhatia, Distinguished Fellow, Gateway House; Swati Ganeshan, Visiting Fellow, Chintan Research Foundation; SK Tripathi, former R&AW Chief; Nitin Gokhale, Founder, StratNews Global; Dr. Shalini Chawla, Distinguished Fellow, Centre for Air Power Studies; Col. Vivek Chadha, Senior Fellow, Manohar Parrikar Institute for Defence Studies and Analyses; Brig. Rahul Bhonsle, Director, Security Risks Asia; Prof. Chintamani Mahapatra, Founder and Honorary Chairman, Kalinga Institute of Indo-Pacific Studies; Captain Sarabjeet S Parmar, Distinguished Fellow, Council for Strategic and Defence Research; Mr. Jayant Mishra, Member, Executive Council, Manohar Parrikar Institute for Defence Studies and Analyses; Prof. A Subramanyam Raju, Centre for South Asian Studies, Pondicherry University; Dr. Pragya Pandey, Research Fellow, Indian Council of World Affairs (ICWA); Prof. Gulshan Sachdeva, Centre for European Studies, JNU; Amb. Preeti Saran, Former Secretary (East), Ministry of External Affairs and Ruchita Beri, Senior Fellow, Vivekananda International Foundation (VIF).

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Centre open to considering Andhra Pradesh for Tejas expansion plans

Source: The Economic Times, Dt. 24 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/centre-open-to-considering-andhra-pradesh-for-tejas-expansion-plans/articleshow/121383748.cms

Andhra Pradesh chief minister N Chandrababu Naidu met Union defence minister Rajnath Singh on Friday to pitch a series of defence-linked investments in the state. The proposals, seen as part of Naidu's broader industrial development push, were detailed in an ET report on Saturday. Sources told ET that the Centre has given a "patient hearing" to Naidu and is open to exploring several of the ideas as part of future defence planning.

Among the proposals, Naidu suggested expanding Hindustan Aeronautics Limited's (HAL) Tejas manufacturing capability in Andhra Pradesh. Currently, HAL operates three Tejas production lines-two in Bengaluru and one in Nashik. While these meet existing requirements, sources said Andhra's bid could be considered if expansion is warranted in the future.

The Centre has shown more immediate interest in another proposal-capital investment in Bharat Electronics Limited's (BEL) Defence Systems Integration Complex (DSIC) in Anantapur. According to government officials, the project will be developed in two phases. Phase-I has already received board approval and is underway. An in-principle nod for Phase-II has also been granted, with execution to begin after Phase-I is complete.

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Nibe limited secures $17.52 million export order from Israel for universal rocket launchers

Source: The Economic Times, Dt. 24 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/nibe-limited-secures-17-52-million-export-order-from-israel-for-universal-rocket-launchers/articleshow/121381376.cms

NIBE Limited, a pioneering Indian manufacturer of critical defence systems, is pleased to announce the receipt of a significant export Purchase Order valued at USD 17.52 million from a globally renowned leading technology-based company in Israel.

The order involves the manufacturing and supply of Universal Rocket Launchers with a range capability of up to 300 kilometres - a highly advanced technology being produced in India for the first time for the global market. This is a landmark achievement for NIBE Limited and a proud milestone for India's defence manufacturing sector. With this contract, we reaffirm our commitment to the Prime Minister's vision of 'Atmanirbhar Bharat' and Make in India, bringing world-class defence technology to Indian soil.

The Universal Rocket Launcher is among the most advanced in its class and is designed to outperform currently available global alternatives. This order not only marks a major step forward in NIBE Limited's international expansion but also strengthens India's strategic position in the field of modern warfare systems.

By collaborating with international defence leaders, NIBE Limited continues to develop high-impact, indigenous solutions for both the Indian Armed Forces and international clients, aligning with national priorities and advancing global defence innovation. NIBE Limited is a leading Indian defence technology company engaged in the development, manufacturing, and integration of sophisticated defence systems. With a strong focus on innovation, self-reliance, and global collaboration, NIBE plays a vital role in enhancing India's defence readiness and export capabilities.

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Samtel Avionics partner with Royal Malaysian Air Force for Su-30MKM aircraft

Source: The Economic Times, Dt. 23 May 2025,
URL: https://economictimes.indiatimes.com/news/defence/samtel-avionics-partner-with-royal-malaysian-air-force-for-su-30mkm-aircraft/articleshow/121360673.cms

The Samtel Avionics has announced strategic collaboration with Malaysia-based Aerospace Technology Systems Corp. Sdn. Bhd. (ATSC) to jointly support the Royal Malaysian Air Force’s (RMAF) fleet, particularly the Su-30MKM aircraft, with cutting-edge avionics systems, repair and overhaul services and post-sales support.

Under the agreement, ATSC and Samtel will jointly support RMAF in Malaysia for the repair, upgrade, technical services, and post-sales support related to aircraft display systems, avionics components, and automated test equipment of Su-30MKM aircraft and other RMAF aircraft in Malaysia. "The companies also agree that ATSC will procure avionics, aircraft display systems and automatic test equipment for Su-30MKM aircraft and other RMAF aircraft from Samtel," said the official statement.

“This partnership is a significant milestone in our global growth journey,” said Puneet Kaura, Managing Director & CEO, Samtel Avionics. “It aligns perfectly with our vision of providing indigenous, world-class avionics solutions to allied nations while fostering long-term industrial partnerships. Through ATSC’s strong local footprint and our technology leadership, we are confident of delivering exceptional value to the Royal Malaysian Air Force.”

ATSC, which already holds a binding contract to provide MRO services for the RMAF’s Su-30MKM fleet, will leverage this collaboration to become the centre of excellence for all related services, including spares, upgrades, modernisation, and technical support. Samtel, in turn, will supply advanced avionics and display systems, while supporting local capability development through knowledge transfer and sustained engagement.

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अब दूसरे द्वीपों पर भी मिसाइल अटैक में सक्षम होगा भारत, अंडमान में हुआ परीक्षण

Source: Aaj Tak, Dt. 23 May 2025,
URL: https://www.aajtak.in/defence-news/story/india-set-to-conduct-inter-island-missile-test-in-andaman-today-to-enhance-defense-capabilities-rpti-2247007-2025-05-23

भारत ने अंडमान और निकोबार द्वीप समूह के ऊपर आज और कल (23–24 मई 2025) हवाई क्षेत्र को बंद कर दिया है. एक नोटिस टू एयरमेन (NOTAM) के तहत बंगाल की खाड़ी और अंडमान सागर के ऊपर किसी भी विमान को उड़ान भरने की अनुमति नहीं होगी. ऐसा माना जा रहा है कि भारत एक बड़ा मिसाइल टेस्ट करने जा रहा है. यह टेस्ट सुबह 7 बजे से 10 बजे तक दोनों दिन होगा.

वायु क्षेत्र बंद होने के संदर्भ में, एक अधिकारी ने कहा कि आज हमने उच्च ऊंचाई वाले हथियार परीक्षण को सफलतापूर्वक पूरा कर लिया है और कल भी इसी तरह का एक परीक्षण किया जाएगा. यह अंडमान और निकोबार द्वीप समूह में एक नियमित अभ्यास है, क्योंकि हमने पहले भी इसी तरह के परीक्षण किए हैं. आइए समझते हैं कि यह टेस्ट क्या है और इसका क्या मतलब है...

NOTAM क्या होता है?

NOTAM यानी नोटिस टू एयरमेन एक तरह की कानूनी सूचना होती है, जो विमानों को किसी खास क्षेत्र में उड़ान न भरने की चेतावनी देती है. यह तब जारी किया जाता है, जब उस इलाके में कोई बड़ा सैन्य अभ्यास, मिसाइल टेस्ट या दूसरी गतिविधि होनी होती है. अंडमान और निकोबार में 23–24 मई को सुबह 7 से 10 बजे तक हवाई क्षेत्र बंद रहेगा. इसका मतलब है कि इस दौरान कोई भी नागरिक विमान इस इलाके में नहीं उड़ सकता. NOTAM के मुताबिक, यह क्षेत्र 510 किलोमीटर लंबा है, जो अंडमान सागर के ऊपर फैला हुआ है.

मिसाइल टेस्ट की संभावना

विशेषज्ञों का मानना है कि भारत इस दौरान एक मिसाइल टेस्ट करेगा. अंडमान और निकोबार में पहले भी कई बार मिसाइल टेस्ट हो चुके हैं. इस बार भी ऐसा ही कुछ होने की उम्मीद है. पिछली बार जनवरी 2025 में भारत ने यहां ब्रह्मोस सुपरसोनिक मिसाइल का टेस्ट किया था.

ब्रह्मोस एक बहुत तेज और सटीक मिसाइल है, जो जमीन, समुद्र और हवा से लॉन्च की जा सकती है. इसकी रेंज अब 450 से 900 किलोमीटर तक है. कुछ लोगों का मानना है कि इस बार भी ब्रह्मोस का ही टेस्ट हो सकता है, शायद इसका कोई नया वर्जन.

ऑपरेशन सिंदूर का कनेक्शन

भारत ने 7 मई 2025 को 'ऑपरेशन सिंदूर' चलाया था. इस ऑपरेशन में भारतीय सेना ने पाकिस्तान और पाकिस्तान अधिकृत कश्मीर (PoK) में आतंकी ठिकानों पर हमला किया था. ऑपरेशन सिंदूर में भारत ने ब्रह्मोस मिसाइल का इस्तेमाल कर कई आतंकी ठिकानों को तबाह किया था.

अभी भारत–पाकिस्तान सीमा पर शांति है, लेकिन सरकार का कहना है कि ऑपरेशन सिंदूर अभी खत्म नहीं हुआ है. ऐसे में अंडमान में मिसाइल टेस्ट को एक रणनीतिक कदम माना जा रहा है. यह टेस्ट भारत की सैन्य ताकत को दिखाने और दुश्मनों को चेतावनी देने का तरीका हो सकता है.

अंडमान में टेस्ट क्यों?

अंडमान और निकोबार द्वीप समूह भारत के लिए बहुत महत्वपूर्ण हैं. ये हिंद महासागर में मलक्का स्ट्रेट के पास हैं, जो एक अहम समुद्री रास्ता है. यहां से भारत अपनी मिसाइलों का टेस्ट आसानी से कर सकता है, क्योंकि यह इलाका खुला और सुरक्षित है. साथ ही, अंडमान में ट्राई–सर्विस थिएटर कमांड है, जिसमें सेना, नौसेना और वायुसेना तीनों मिलकर काम करते हैं. इस टेस्ट में भी ट्राई–सर्विस कमांड की भूमिका है, जिससे लगता है कि यह एक बड़ा और जटिल टेस्ट होगा.

ब्रह्मोस मिसाइल की खासियत

अगर इस बार ब्रह्मोस का टेस्ट हो रहा है, तो यह भारत की ताकत को और बढ़ाएगा. ब्रह्मोस की कुछ खास बातें हैं...

तेज रफ्तार: यह ध्वनि से 3 गुना तेज (Mach 3) उड़ती है.

लंबी रेंज: इसकी रेंज 450 से 900 किलोमीटर तक है.

सटीकता: यह बिल्कुल सही निशाने पर हमला करती है.

कई तरह से लॉन्च: इसे जहाज, हवाई जहाज या जमीन से लॉन्च किया जा सकता है.

चकमा देने में माहिर: यह रडार से बच सकती है और कम ऊंचाई पर उड़ सकती है.

इसका क्या मतलब है?

यह टेस्ट भारत के लिए कई मायनों में अहम है. सबसे पहले, यह भारत की सैन्य ताकत को दिखाता है. हिंद–प्रशांत क्षेत्र में चीन और पाकिस्तान जैसे देशों की हरकतों को देखते हुए भारत अपनी ताकत बढ़ा रहा है.

दूसरा, यह टेस्ट भारत की तकनीक और सेना की तैयारी को परखेगा. तीसरा, यह दुश्मनों को चेतावनी है कि भारत किसी भी खतरे का जवाब देने के लिए तैयार है

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In a major boost to Indian Navy's firepower, indigenous Naval Surface Gun aces sea trials

Source: The Week, Dt. 23 May 2025,
URL: https://www.theweek.in/news/defence/2025/05/23/in-a-major-boost-to-indian-navys-firepower-indigenous-naval-surface-gun-aces-sea-trials.html

The sea acceptance firing trials of the indigenous Naval Surface Gun (NSG) onboard a GRSE-designed and constructed Anti-Submarine Warfare Shallow Water Craft (ASW SWC) were successfully conducted with extreme accuracy using a sophisticated electro-optic based fire control system.

Sea acceptance firing trials refer to a specialised subset of sea trials carried out to evaluate the performance, accuracy, and reliability of a ship's weapon systems—especially naval guns and missile launchers—under real operational conditions at sea. These trials are a major part of the process of commissioning new weapon systems or validating upgrades to existing systems on naval vessels. The trials focus specifically on the live-firing of onboard weapons after initial factory-level quality assurance and land-based tests. GRSE (Garden Reach Shipbuilders & Engineers Ltd) said the successful trial signals a strategic shift to being a capable weapon manufacturing firm besides being a shipbuilder.

The company said the gun underwent rigorous quality checks in the factory before extensive sea trials with firing on live targets. The highly accurate and reliable gun system will be an extremely potent addition to the Indian Navy's inventory of technologically superior weapon systems, GRSE added.

"This significant achievement has been made possible with a very strong tie-up between GRSE and BHSEL (Hyd) as well as Elbit Systems Land, who are the technology and production partners for the Gun project. Two years of extensive efforts have yielded 60 per cent indigenous content in the product which will significantly increase with subsequent orders," a statement from the company read. Meanwhile, GRSE emerged as the lowest bidder for the next-generation corvette project of the Navy, valued at over Rs 2,500 crore.

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Post Op Sindoor, India's strategic requirements 'won't be left wanting'

Source: The Tribune, Dt. 24 May 2025,
URL: https://www.tribuneindia.com/news/india/post-op-sindoor-indias-strategic-requirements-wont-be-left-wanting/

Top government sources on Friday said India's strategic requirements will never be left wanting and every arrangement will be made to ensure the armed forces have what they need to defend national sovereignty.

Speaking in the aftermath of the April 22 Pahalgam terror attack in Jammu and Kashmir and the national response in the shape of Operation Sindoor, a senior official source said the military precision strike on nine terror hubs inside Pakistan and PoK and the four-day conflict between India and Pakistan would have “no impact on the Indian economy”.

India has said Operation Sindoor had only been paused and not ended and that the future of the ongoing pause on hostilities with the western neighbour would depend on the latter’s conduct.

The top source today said Defence Minister Rajnath Singh had already authorised the three Service chiefs with emergency procurement powers under the defence contingency fund.

“Those mechanisms are already in place, those resources are also already in place as a matter of routine. We do not see a very big additional demand at this moment, but whatever be it, strategic requirements will not be left wanting,” said the source.

After the Pahalgam terror attack and consequent tensions with India, credit rating agency Moody’s had said sustained escalation in tensions with India would likely weigh on Pakistan’s growth and hamper the government’s ongoing physical consolidation, setting back Pakistan’s progress in achieving macroeconomic stability.

“Pakistan macroeconomic conditions have been improving with growth, gradually rising, inflation declining and foreign exchange reserves increasing amid continued progress in the IMF programme. A persistent increase in tensions could also impair Pakistan’s access to external financing and pressure its foreign exchange reserves which remain well below what is required to meet its external debt payment needs for the next few years,” said Moody’s.

It added that comparatively the microeconomic conditions in India would be stable, bolstered by moderate, but still high levels of growth amid strong public investment and healthy private consumption.

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Pakistan modernising nuclear arsenal to counter India's edge: US intel

Source: Business Standard, Dt. 25 May 2025,
URL: https://www.business-standard.com/external-affairs-defence-security/news/pakistan-nuclear-arsenal-modernisation-india-taliban-iran-us-intel-report-125052500495_1.html

Pakistan is advancing its nuclear arsenal and related capabilities to offset India’s conventional military advantage, according to a US intelligence report. The report warns that Islamabad’s efforts to modernise its battlefield nuclear weapons remain a top priority alongside counterterrorism operations and cross-border skirmishes with regional neighbours.

The '2025 Worldwide Threat Assessment' report, released by the US Defence Intelligence Agency, notes that Pakistan perceives India as an "existential threat" and is likely to continue investing in

nuclear and military modernisation, despite losing more than 2,500 people to militant violence in 2024.

Islamabad is also focusing on maintaining the security of its nuclear materials and command-and-control infrastructure. Notably, some reports claimed that an underground nuclear storage facility in Pakistan's Kirana Hills was targeted by the Indian armed forces during the recent 'Operation Sindoor'. However, India denied hitting any such targets.

After the April 22 terrorist attack in Jammu and Kashmir's Pahalgam, India conducted precision strikes in Pakistan under 'Operation Sindoor', which was followed by days of cross-border missile and artillery fire. Despite these hostilities, both sides reached a ceasefire understanding by May 10.

Pakistan dependence on 'Iron Brother' China

The report notes that China's economic and military support plays a crucial role in Pakistan's defence posture. The US intelligence assessment highlights Pakistan's near-certain procurement of weapons of mass destruction (WMD)-applicable goods from foreign suppliers, primarily through Chinese support. These materials and technology are reportedly acquired via Chinese suppliers and intermediaries, with transit routes through Hong Kong, Singapore, Turkiye, and the UAE.

Pakistani forces conduct multiple joint military exercises with the Chinese People's Liberation Army (PLA), including an air exercise in November 2024. However, Islamabad's growing reliance on Beijing has also led to friction. Seven Chinese nationals working on China-Pakistan Economic Corridor projects were killed in attacks in Pakistan last year, the report states.

Pakistan's trouble with Taliban, Iran

The intelligence report also highlights tensions between Pakistan with Iran and the Taliban-controlled Afghanistan. In early 2024, Islamabad and Tehran engaged in high-level talks after conducting unilateral airstrikes on each other's territories in January.

Separately, the Taliban and Pakistani border forces clashed near border posts in September 2024, resulting in the death of eight Taliban fighters. In March 2025, Pakistan and Afghanistan exchanged air and artillery strikes, each blaming the other's territory for harbouring militant infrastructure.

India's perspective

The US intel report contrasts Pakistan's military efforts with India's own security posture. According to the report, Prime Minister Narendra Modi's priorities are focused on countering Chinese influence, bolstering military capabilities, and enhancing New Delhi's leadership in the region.

The intel report says that India continues to advance its domestic defence production and expand regional defence partnerships through exercises and multilateral forums like the Quadrilateral, Brics, and Asean. India also remains reliant on Russian spare parts to maintain its Russian-origin military assets, despite reducing new procurements from Moscow.

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With Karachi Naval Port In Crosshairs, Pakistan Pleaded For No-Fire Pact After Indian Missiles Destroyed Deep Targets: Report

Source: Swarajya, Dt. 24 May 2025,
URL: https://swarajyamag.com/news-brief/with-karachi-naval-port-in-crosshairs-pakistan-pleaded-for-no-fire-pact-after-indian-missiles-destroyed-deep-targets-report

Pakistan's retaliatory military action against India on 10 May, Operation Bunyan al-Marsoos, ended within eight hours after a series of Indian airstrikes prompted Islamabad to request US intervention for a ceasefire, Hindustan Times reported citing people familiar with the matter.

The Indian Air Force (IAF) launched four coordinated precision missile strikes during the intervening night of 9–10 May under Operation Sindoor, targeting Pakistani airbases, air defence systems, and command infrastructure.

Rafale jets fired SCALP missiles and SU-30 MKIs launched BrahMos missiles, with the first strike itself reportedly took out the northern air command and control centre at Nur Khan airbase in Chaklala.

According to intercepted communications referenced in the report, Pakistan had intended its operation to span 48 hours and inflict damage on Indian airbases.

However, the effort concluded by 9.30 am on 10 May following series of Indian attacks.

The report states that India's S-400 air defence system at Adampur was activated 11 times during the engagement and shot down a Pakistani SAAB-2000 airborne early warning aircraft over 300 kilometres inside Pakistani territory.

The IAF is also said to have evidence of having downed a C-130J aircraft, a JF-17, and two F-16 fighters during the operation.

The air offensive followed earlier Indian strikes on 7 May on nine terrorist training camps in Pakistan and Pakistan-Occupied Jammu and Kashmir (PoJK).

The attacks were carried out using loitering munitions and missiles of the Army, Navy, and Air Force, with key targets at Muridke and Bahawalpur struck by SCALP and BrahMos missiles.

On 10 May, Indian armed forces also destroyed a LY-80 air defence system in Lahore using a HARPY drone and a HQ-9 (Chinese equivalent of the S-300) in Malir, Karachi using a missile strike, according to the report.

The report further siad that the Indian Navy had moved strike assets 260 miles off the Makran coast and was prepared to target the Karachi Naval Port on the morning of 10 May.

In response, the Pakistan Director General of Military Operations warned of retaliation if the port was attacked. Later that same day, the Pakistan DGMO reportedly contacted India to request a no-fire agreement.

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China’s Arms Fell Short In Pakistan—Its Long Game Didn’t

Source: Swarajya, Dt. 25 May 2025,
URL: https://swarajyamag.com/defence/chinas-arms-fell-short-in-pakistanits-long-game-didnt

For years, the China-Pakistan relationship has been portrayed as an "all-weather friendship," but beneath this oft-repeated slogan lies a colder calculus. It is a relationship forged not in mutual affection but in mutual utility—anchored in Beijing’s long-standing imperative to check Indian power. Far from being a partnership of equals, this is a structurally asymmetric entente, where China plays the architect and Pakistan, more often than not, the instrument.

At the heart of this alliance is a strategic wager by China that a militarily potent but economically brittle Pakistan can serve as a permanent pressure point against India, a force that bleeds Indian bandwidth, diverts Indian deployments, and stunts Indian ambitions.

This logic, rooted in a doctrine of strategic distraction, has dictated decades of arms transfers, satellite coordination, diplomatic shielding, and, increasingly, a kind of dependency that borders on the parasitic. The recently concluded Operation Sindoor offers a moment to re-evaluate this strategy.

Pakistan’s inability to mount a credible response, despite billions in Chinese hardware and years of tactical recalibration, has triggered a fresh round of introspection—not just about the capability of Chinese military exports, but about the very foundations of Beijing’s "containment through Pakistan" doctrine.

The Fragile Shield of Chinese Steel

Over the past two decades, China has taken on the role of Pakistan’s principal military supplier and diplomatic shield. It has supplied billions of dollars’ worth of military equipment, ranging from fighter jets and missile systems to submarines and surveillance platforms.

The inventory is impressive on paper: J-10C fighter jets with advanced AESA radars and long-range PL-15 missiles; HQ-9 air defense systems; VT-4 main battle tanks; SH-15 howitzers; Type 054A/P frigates; Hangor-class submarines; and satellites like PRSC-EO1, co-developed to enhance remote sensing and intelligence capabilities.

The underlying logic behind China's arming of Pakistan is clear and has been known for decades - an emboldened and militarily capable Pakistan would compel India to divert significant resources and attention to its western front, thereby slowing or even thwarting India's ability to push back against China.

Yet when tested during Operation Sindoor, this vast Chinese-made war chest proved underwhelming. Indian strikes dismantled key Pakistani military assets with speed and precision. HQ-9 air defense systems—touted as China's answer to the US Patriot—either failed to activate or were bypassed entirely. Pakistan’s retaliatory efforts were minimal, with no substantive damage inflicted on Indian military infrastructure. In more than one case, Chinese-supplied PL-15 missile was fired at an Indian Rafale fighter but missed and was recovered largely intact—an intelligence windfall for New Delhi and a propaganda nightmare for Beijing.

The Impact On Chinese Strategy

Some have been quick to read Pakistan's failure as a reflection of the limitations of Chinese military technology. The ease with which Indian forces outmanoeuvred Chinese-supplied air defence systems, fighter jets, and radar networks in Pakistani hands has been taken as evidence that China's own arsenal may be similarly vulnerable—an unsettling prospect given Beijing's ongoing military standoff with India along the Line of Actual Control in eastern Ladakh. That conclusion, while tempting, is overly simplistic.

A large portion of what China exports is a downgraded or customised variant of its own domestic systems. While this does not necessarily make them bad, it does mean that Beijing is selective in what capabilities it shares. China is unlikely to export its most advanced versions without safeguards.

It would be naive to think that China hadn't considered the possibility of a largely intact PL-15 missile—fired from a Chinese-built J-10C at an Indian Rafale—ending up in Indian hands after landing in a field in Punjab. In essence, Islamabad gets the tools it needs to posture, not necessarily to prevail. Moreover, the best equipment is only as good as the doctrine and training underpinning it. Operation Sindoor laid bare the deficiencies in Pakistan's command structure, real-time response capabilities, and inter-service coordination. Yet, there is reputational cost for China.

The underperformance of its platforms on an active battlefield weakens its pitch to other potential buyers in Asia, Africa, and Latin America. In an era where arms exports are as much about prestige as they are about profit, this matters. The reputational cost for Beijing is not trivial, particularly as it seeks to position itself as a peer competitor to the United States and a hegemon in Asia.

Second, there is the growing realisation in India and elsewhere that the Pakistan card, while still dangerous, may not be as versatile as once assumed. The notion of China being able to "fight India to the last Pakistani" only works as long as the Pakistani military remains a credible threat. Operation Sindoor has placed a dent in that perception. However, it would be unwise to write off the strategic design altogether.

The Pakistan Army may have floundered, but it remains armed, nuclear-capable, and ideologically opposed to India. China's military and financial lifeline ensures that it will not fade quietly into irrelevance. It will regroup, retrain, and rearm. And in doing so, it will continue to serve its primary function: anchoring India to a continental conflict while China builds maritime and economic influence elsewhere.

This is the core of China's long-standing strategic calculus — use Pakistan not as a front-line warrior capable of defeating India, but as a flanking threat that forces India to remain permanently vigilant. In this model, Pakistan functions less as an independent actor and more as a strategic decoy. Its role is to stretch India's defence apparatus thin—to keep its attention split between the Line of Control in the west and the Line of Actual Control in the north.

To understand this, consider the case of the Hangor-class submarines currently being inducted by Pakistan under a $5 billion deal with China. These are AIP (Air-Independent Propulsion) capable submarines—meaning they can stay submerged for extended periods without surfacing, making

them harder to detect and destroy. By contrast, India's current submarine fleet lacks operational AIP capability.

The mere presence of these Chinese-built submarines in the Arabian Sea will compel the Indian Navy to dedicate significant anti-submarine warfare resources in the region. That is the point. It is not necessary for Pakistan's submarines to successfully engage Indian warships. Their role is to exist credibly enough to merit counter-deployment.

Every hour and dollar spent by India monitoring or hedging against a Pakistani threat is time and money not spent countering China's increasingly assertive moves in the Indian Ocean Region or the Indo-Pacific theatre more broadly. The same logic applied to the delivery of J-10C fighters to Pakistan—a move that followed India's acquisition of Rafale fighters.

This is containment through diffusion. By ensuring Pakistan's military remains just potent enough to provoke caution—even if not powerful enough to dominate—China creates a strategic cul-de-sac for India. In such a scenario, Pakistan does not need to land a decisive blow. Its job is to bleed India's bandwidth. Therein lies the enduring brilliance—and brutality—of the Chinese strategy. It is not a strategy of conquest. It is a strategy of constraint. It ensures that India cannot focus solely on Ladakh, Arunachal, or the Indian Ocean because a restless western front constantly demands vigilance. Pakistan's military may fail in execution, but its very existence, coupled with Chinese patronage, succeeds in achieving Beijing's objective.

So even as the images of bombed Pakistani air bases and silenced radar systems cause reputational damage to Beijing, its pawn still stands. Bloodied, yes. But not broken. And for China, that may be enough.

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Science & Technology News

'Indian science has always been a global front runner'

Source: Hindustan Times, Dt. 26 May 2025,
URL: https://www.hindustantimes.com/india-news/indian-science-has-always-been-a-global-front-runner-101748198398400.html

Widely regarded as one of the greatest modern scientists, geneticist and Nobel laureate Sir Paul Nurse spoke to HT about India's research landscape, impact of budget cuts on the future of research, and his work that led to him winning the Nobel Prize in Physiology or Medicine in 2001.

Edited excerpts:

Tell us a bit about your research?

What I work on is cells. We're all made of billions of cells. I work on the process called the cell cycle by which a cell reproduces itself from one to two. That requires a series of events: Events

that particularly lead to the doubling of the DNA and the segregation/separation into two newly divided cells.

What controls that overall process, what goes through all those events in the right order, and the impact that led to the Nobel Prize was the discovery that it's a very simple system: There's a particular enzyme called cyclin-dependent kinases, which increases as you go through the cycle and fires off different events at different levels. And then when it gets to the end of the cycle, it's destroyed and then it goes through it again.

It's very important — this cell cycle — because it underpins the growth and reproduction of all living things. We all came from a single cell and you wouldn't exist if it hadn't undergone all of this properly, and it has some relevance to cancer.

Why do you think cancer incidence is rising so sharply globally?

I'm not actually a cancer specialist, but it is a bit strange. The usual answer, which I'm not sure is completely correct, is to say we get older, we survive other diseases — particularly infectious diseases — which we've managed to control. And that has meant that there's a greater incidence of cancer.

The second thing is that we are better at diagnosing cancer. So, when people have it, we know that they've had it. Having said that, there's something else going on that I don't think we fully understand such as environmental factors, but I am not sure how much of that its responsible.

What role do you see AI playing in diagnosis and treatment?

It is going to be an incredibly useful tool for routine activities such as examining images to look for telltale signs that something may happen. If you see a blob somewhere and six months later that leads to cancer, then you don't actually need to know what the blob means or how it develops. That's enough to say we should be paying attention to it. It also isn't only to do with imaging, but it's to do with everything.

Maybe if you get routine tests, there might be a combination of certain factors that no doctor would take any notice at all. But, if we have the data — which AI can interrogate — then you might understand that there's a certain combination of factors that none of which are attracting attention individually, but together might mean that something will happen.

But, will it lead to new treatment? That's a more complicated business. You move in a somewhat different direction, which is to do with whether AI will help what we call discovery research about how to understand what is going on in a process like cancer. Now, the answer to that question is yes, but maybe not quite as dramatic as what I just said about diagnosis. Because the way that AI with these large language models works, it works well with only certain type of data. The sort of data that you have in medical records, where you have hundreds of thousands or millions of small differences between data out of which you see the ones that correlates.

What we do in discovery research is a much greater depth of understanding in only a few experimental situations, which doesn't turn itself so well to the standard AI approaches we have at the moment. So, we can use simple AI and we use it all the time in the lab, which is just to help us do simple experiments better. You look down on a microscope, you look at images. We want to

select certain types of cells: We do it manually or you can do it automatically with AI. It makes the work faster and more reliable. But, I don't think we have made much progress with AI up until now, which is closer to intuitive thinking. That is to try and mine creative ideas from the data because it's not actually very creative at the moment.

We think it's creative because it can write a sentence which is grammatically correct. But it isn't, of course, the basis of creative understanding. So, having creative thinking coming in from AI is something we've yet to get to. My view is actually to combine the human mind with the way computers are working rather than saying the computer's going to do this and the human is out of its hand. In other words, we use it as a machine tool to assist.

What do you have to say about the Indian research landscape?

The Indian situation in science is at a very exciting turn. I've been coming to India for 40 years and we are seeing a transformation in the capability of what Indian science can produce. Indian science, mathematics particularly, and the computing link to it has always been the front-runner in the world. We'll never forget where zero was invented a thousand years ago. It has always been a strength here.

We're on the edge of a transformation. It's being increasingly recognised how important science is and that's true for a country like India as well. It's important for new innovation and industry; for improving our health; for understanding climate change, and all the other important problems that we face. All of these are important problems and it's now being recognised by our political masters, including in India.

How do you see the budget cuts happening globally impacting overall research work?

America's been a shock to us all. Some, including myself, thought it would be a significant issue if Trump was elected. But, it's being implemented in such a silly way. Most people would say the US is the leading science nation in the world, and we are seeing it rapidly downgraded with all these initiatives. The world has a long memory, and this is going to cause more damage reputationally than perhaps they imagine, because such crazy things are being said.

The fact that it's turned out to be possible in what we thought was a democratic nation, where there's checks and balances. There are chances of ripple effects being seen because it's usually linked to populism. But, we shouldn't forget that it won't happen in China, and it's going to be the biggest gainer.

Did you expect to receive the Nobel prize when you started your research?

I don't think most serious scientists think about it, and certainly not when they're 23. If they do, there's something wrong with them. I began to think a bit later that I could win a Nobel Prize, but that was only when certain things were achieved and delivered.

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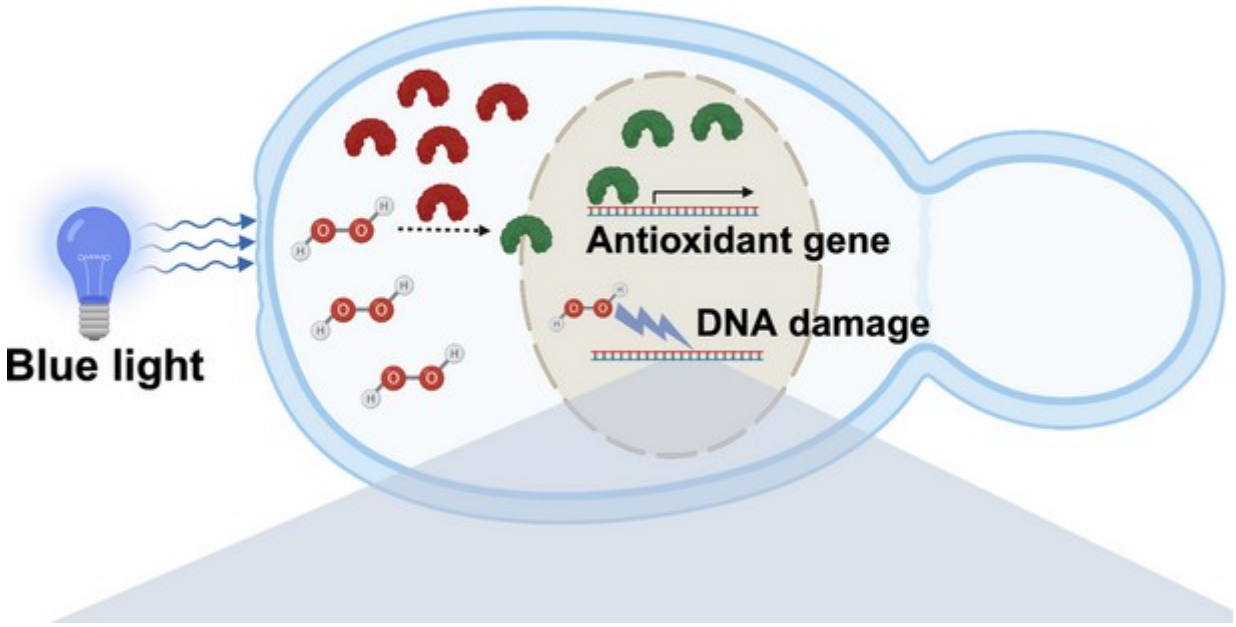
Blue light increases mutations in yeast DNA: IISER study

Source: The Hindu, Dt. 25 May 2025,
URL: https://www.thehindu.com/sci-tech/science/blue-light-yeast-dna-mutations-iiser-thiruvananthapuram/article69596515.ece

Researchers from the Indian Institute of Science Education and Research, Thiruvananthapuram, have found that blue light can greatly increase the number of genetic mutations in yeast. Since yeast is a popular model organism in biology, the findings suggest prolonged exposure to blue light could also pose similar risks to other organisms. This will need more research to confirm. These effects of blue light exposure also go beyond its known impact on sleep cycles and vision.

The study was conducted in the laboratory of Nishant K.T. His fellow authors were PhD scholars Nikilesh Vijayan and Sameer Joshi and postdoc Praseetha Sarath. The findings were published in PLoS Genetics. The DNA of every living organism changes slightly over time thanks to mutations. One kind of mutation is called loss of heterozygosity (LOH): when a cell loses genetic diversity at certain parts of its DNA. LOH can help evolution along but can also result in diseases like cancer. Scientists are trying to understand how common environmental factors like light, temperature, and the availability of nutrients influence these mutations.

In the new study, the researchers used yeast cells — the kind used in baking bread — that had a mixed genetic background, which can be used to track LOH events. They grew these cells over about 1,000 generations in different environments: normal conditions (i.e. control group), exposure to blue light, low sugar, high temperature, salty conditions, ethanol, and oxidative stress.



A schematic representation of mutational signatures associated with blue light.

Each environment had 16 yeast populations grown independently. After 1,000 generations, the researchers sequenced the DNA from each population to assess genetic changes. They found that every condition tested led to more LOH mutations compared to normal conditions, but the extent

of changes varied greatly by environment. Blue light was especially damaging: these cells had by far the most LOH mutations.

The light caused large sections of DNA to lose genetic variation, making significant parts of the genome uniform. This occurred because blue light produced reactive oxygen molecules, like hydrogen peroxide, that damaged DNA. The team also found that blue light induced unique kinds of DNA mutations. For example, it oxidised DNA bases, causing errors in DNA copying.

“Our work provides a mechanistic basis for using chronic blue light exposure as a novel antifungal agent through its genotoxicity. This is important as there is increasing resistance of pathogenic yeast to antifungal drugs,” Prof. Nishant said.

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Why China’s upcoming Tianwen-2 mission could be significant for finding clues about quasi-satellites

Source: The Indian Express, Dt. 25 May 2025,
URL: https://indianexpress.com/article/explained/explained-sci-tech/china-tianwen-2-mission-10026270/

China will launch its first mission to survey and sample a near-Earth asteroid this week. Known as the Tianwen-2 mission, the probe will investigate an asteroid called 469219 Kamoʻoalewa, which orbits the Sun at a distance relatively close to Earth. If successful, the mission will place China in a group of a handful of countries — including the United States and Japan — which have been able to sample asteroids and return the samples to Earth successfully.

“This is an ambitious mission to explore a fascinating object,” astrophysicist Amy Mainzer of the University of California, Los Angeles, told the journal Science. Here is a look at the mission, the Kamoʻoalewa asteroid, and why China wants to investigate it.

What is the Kamoʻoalewa asteroid?

Kamoʻoalewa was discovered in 2016 by the Pan-STARRS 1 asteroid survey telescope on Haleakalā in Hawaii. It is one of just seven asteroids that fall into a little-understood class known as quasi-satellites of Earth — satellites that orbit the Sun, but because of their close distance to Earth, they are gravitationally influenced by the planet.

The asteroid “travels in a highly elliptical solar orbit and appears to Earth-bound observers to be alternately leading and trailing Earth in its more circular orbit. This gives the impression the asteroid orbits Earth,” according to a report in Science.

Quasi-satellites are known to shift their orbits over time. For instance, Kamoʻoalewa has been in its current orbit for around 100 years, and is expected to remain there for the next 300 years.

Why does China want to investigate Kamoʻoalewa?

Kamoʻoalewa has garnered attention due to its unusual orbit and unknown origin. Scientists believe exploring this asteroid would help them find clues about how quasi-satellites came to be,

and how their orbits evolved over time. Moreover, some researchers suggest that Kamoʻoalewa could be the first known asteroid composed of lunar material.

In 2021, University of Arizona planetary scientist Benjamin Sharkey and colleagues wrote in the journal Communications Earth & Environment that Kamoʻoalewa might have been ejected from the Moon's surface due to a collision with some other astronomical object. They said so because the telescope that they used to investigate Kamoʻoalewa picked up a usual spectrum, or pattern of reflected light, that suggested Kamoʻoalewa is composed of silicates resembling those found in Apollo lunar samples.

The exploration of the asteroid could settle the hypothesis that the Moon was formed as a result of a collision between the Earth and another small planet (Kamoʻoalewa could be a small remnant of that collision).

"Observations and the ejecta models do not yet prove it…[the samples in an Earth-based lab could] settle the question [of origin] definitively," Mainzer said.

How will Tianwen-2 retrieve samples?

To collect the samples from Kamoʻoalewa, the Tianwen-2 mission will use a "touch-and-go" technique which has been successfully implemented by the United States' OSIRIS-Rex and Japan's Hayabusa2 missions.

In this technique, the spacecraft hovers close to the surface of the asteroid while a robotic arm fires an object or burst of gas to knock fragments into a collection chamber. Depending on the surface conditions, the Tianwen-2 probe might also use a second "anchor and attach" technique. In this, four robotic arms extend and drill into the surface to retrieve material.

After collecting the samples, the mission will drop them on Earth. The probe will then head towards the main asteroid belt for another mission. Experts, however, suggest that collecting samples from Kamoʻoalewa will be a challenging task for Tainwen-2. The issue is that, unlike previously explored asteroids, Kamoʻoalewa is quite small. It measures just 40 to 100 metres in diameter. As a result, the mission would need highly sophisticated cameras, spacecraft computers, and reaction control systems.

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IIT Guwahati develops sustainable solution using mushroom waste for wastewater treatment

Source: Deccan Herald, Dt. 25 May 2025,
URL: https://www.deccanherald.com/india/assam/iit-guwahati-develops-sustainable-solution-using-mushroom-waste-for-wastewater-treatment-3556368

Researchers at IIT-Guwahati have developed an eco-friendly alternative to conventional wastewater treatment methods by combining biochar derived from Spent Mushroom Waste and laccase, a natural enzyme, according to officials.

The technology -- BHEEMA (Biochar-based Hydrological Enzyme regulated Efficient Mechanism for Antibiotics removal) employs laccase-mediated degradation to remove antibiotics from wastewater, preventing the formation of toxic byproducts commonly associated with conventional treatment methods.

The findings of this research have been published in the prestigious Journal of Environmental Management.

The developed system has been recognised as the top seventh finalist under the Water Sanitation theme of the Vishwakarma Awards 2024, organised by the Maker Bhavan Foundation.

According to Sudip Mitra, the Head of the School of Agro and Rural Technology at IIT Guwahati, the research team targeted the removal of harmful fluoroquinolone group of antibiotics, including Ciprofloxacin, Levofloxacin, and Norfloxacin, generally found in hospital discharge, industrial effluents and surface water."

Contrary to traditional wastewater treatment methods such as advanced oxidation and membrane reactors, which are both costly and generate secondary pollutants, our approach uses laccase, a naturally occurring enzyme, to degrade the contaminants.

"To make the enzyme stable for reusability, our research group immobilised it on biochar derived from spent mushroom waste, an easily available agro-waste product in this region," Mitra told PTI.The developed biochar is a cost-effective, scalable, and sustainable alternative to activated charcoal.

On a lab scale, within three hours of application, the developed system achieved 90–95 per cent degradation efficiency of the fluoroquinolone antibiotics."

Another key feature of the developed system is that the byproducts recorded in the degradation process are non-toxic, making the technology sustainable and safe for the environment," said Anamika Ghose, a PhD scholar.

The prototype has been developed in collaboration with Latha Rangan, a professor at the Department of Biosciences and Bioengineering, IIT-Guwahati, along with her research scholars.

At a laboratory scale, the developed prototype costs between Rs 4,000–5,000, covering materials, enzyme immobilization, and reactor setup, making it a feasible option for scaling up and adoption in both urban and rural settings.

In the next step, the research team is working towards scaling up the developed prototype by engaging with stakeholders for field testing and market validation.

The research team recently organized a hands-on training session for farmers on Biochar preparation and its multiple benefits for agriculture.

Conducted in collaboration with the District Agricultural Office of Morigaon at their office premise, a total of 30 local farmers attended the training session.

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