

सितम्बर

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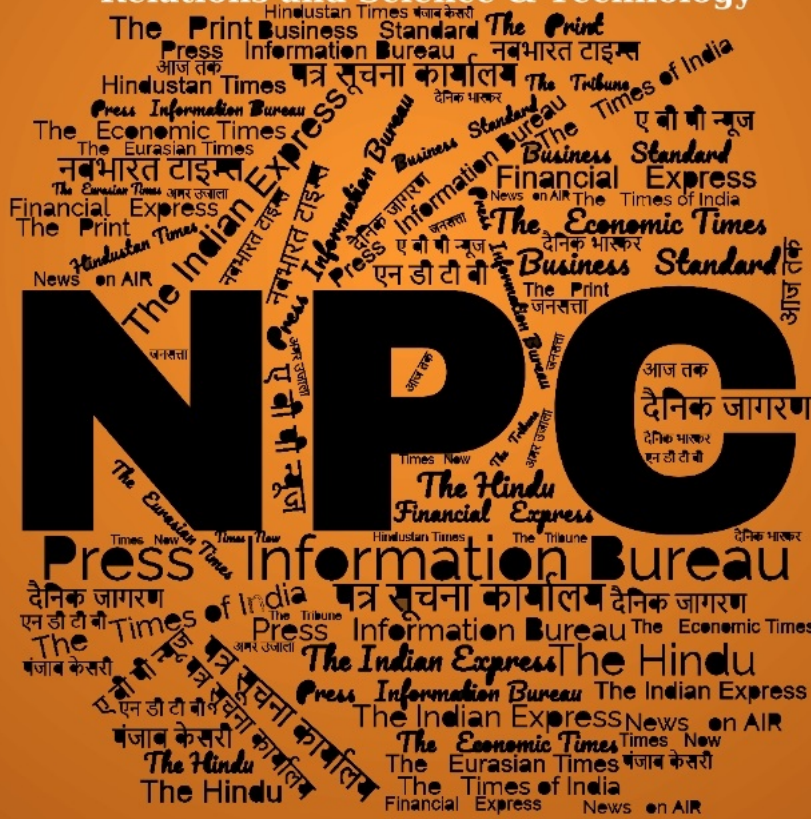
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# समाचार पत्रों से चयनित अंश Newspapers Clippings

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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# अमर उजाला

Sat, 28 Sep 2024

## **DRDO: भारतीय सेना चीन सीमा पर बढ़ा रही युद्धक क्षमता, हाइपरसोनिक मिसाइलें की जा रही तैयार**

सेना चीन सीमा पर अपनी युद्धक क्षमता को बढ़ा रही है। तोपखाना यूनिटों की जंगी क्षमता को बढ़ाने के लिए सेना विभिन्न हथियार प्रणालियों की खरीद कर रही है। इसमें 100 के-9 वज्र हॉवित्जर, स्वार्म ड्रोन, लोइटर हथियार और निगरानी प्रणालियां शामिल हैं।

सेना में तोपखाना महानिदेशक लेफ्टिनेंट जनरल अदोष कुमार ने कहा कि राष्ट्रीय सुरक्षा चुनौतियों पर विचार करते हुए तोपखाना यूनिटों की क्षमताओं को बढ़ाने के लिए विभिन्न भविष्योन्मुखी प्लेटफॉर्म और उपकरण खरीदे जा रहे हैं। उन्होंने शनिवार को आर्टिलरी रेजिमेंट की 198 वीं वर्षगांठ से पहले कहा कि हम अभूतपूर्व गति से और निर्धारित समयसीमा के अनुसार आधुनिकीकरण कर रहे हैं। रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) की ओर से हाइपरसोनिक मिसाइलों के विकास का कार्य भी प्रगति पर है।

पिनाक से मारक क्षमता का इजाफा

रॉकेटों के बारे में लेफ्टिनेंट जनरल अदोष ने कहा कि अब पिनाक रॉकेट की मारक क्षमता को 300 किमी तक बढ़ाने पर ध्यान केंद्रित किया जा रहा है। पिनाक मार्क-1 की अधिकतम मारक क्षमता 40 किमी है, जबकि पिनाक मार्क-2 की मारक क्षमता 90 किमी है।

निजी और सार्वजनिक क्षेत्रों के साथ मिलकर काम

लेफ्टिनेंट जनरल कुमार ने कहा कि सेना सेंसर फ्यूज्ड म्युनिशन (एसएफएम) और विस्तारित रेंज गोला-बारूद के विकास के लिए निजी और सार्वजनिक क्षेत्र के उद्योगों और शिक्षाविदों के साथ मिलकर काम कर रही है।

<https://www.amarujala.com/india-news/indian-army-increasing-its-combat-capability-on-china-border-hypersonic-missiles-are-being-prepared-by-drdo-2024-09-28>

## THE ECONOMIC TIMES

Fri, 27 Sep 2024

### **Indian Army enhancing combat prowess of artillery units along frontier with China**

The Indian Army is enhancing the combat prowess of its artillery units along the frontier with China by procuring an array of weapons systems, including an additional batch of 100 K9 Vajra howitzers, swarm drones, loitering munitions and surveillance systems.

Lieutenant General Adosh Kumar, the Director General of Artillery in the Army, said various futuristic platforms and equipment are being procured to bolster the capabilities of the artillery units considering national security challenges.

"Today, we are modernising at a pace like never before and as per defined timelines," he told reporters ahead of the 198th anniversary of the Artillery Regiment on September 28.

The development work is also in progress by the **Defence Research and Development Organisation (DRDO)** for hypersonic missiles, he said.

Hypersonic missiles can fly at a speed of five mach or more than five times the speed of sound. Lieutenant General Kumar said a number of 155 mm gun systems, including K9 Vajra, Dhanush and Sharang, have been deployed along the Northern borders to boost the Army's fire-power.

The Army has already deployed 100 K-9 Vajra gun systems. It is in the process of procuring another batch of 100 K-9s. "The Acceptance of Necessity (or initial tender) for repeat order of 100 guns was granted. Further process is on," the senior official said on procurement of an additional batch of K-9 self-propelled howitzers.

The K9 Vajras were originally procured for deployment in deserts, but following the eastern Ladakh standoff, the Army deployed a significant number of the howitzers in that high-altitude region.

"We are also in the process of inducting other 155 mm gun systems to include Advanced Towed Artillery Gun System (ATAGS), Mounted Gun System (MGS) and Towed Gun System (TGS)," he said.

The ATAGS is 100 per cent designed and developed by the DRDO along with two private partners. Lieutenant General Kumar said the contract is likely to be concluded soon and trials for both MGS and TGS are set to commence in 2025.

"They are lighter in weight and can be carried underslung by helicopters. K-9 Vajra gun system is ideal for mechanised operations," he said. Dhanush Guns are an "electronic upgrade" of Bofors guns. On rockets, he said "Pinaka" systems have been the success story of "Atmanirbharta" (self-reliant) drive and the equipment have added more punch and lethality to artillery's arsenal.

The focus is now on to enhance the range of Pinaka rockets to 300 kms. While the Pinaka Mark-I has a maximum range of 40 kilometers, the Pinaka Mark-II is known to have a range of 90 kilometers. Lieutenant General Kumar said the focus has also been on boosting the Artillery's surveillance and target acquisition (SATA) regiments as well as to induct more swarm drones, loitering munitions and remotely piloted aircraft (RPAs).

"Our missile programme is progressing well at the desired pace, wherein research and development is being carried out by the DRDO to enhance range, accuracy and lethality of both ballistic and cruise missiles.

"As far as ammunition is concerned, lot of improvements are being undertaken to enhance the accuracy and lethality," he said. Lieutenant General Kumar said the Army is engaged with private and public sector industries and academia for development of Sensor Fuzed Munition (SFM) and extended range ammunition.

"To give teeth to our precision capability, we are procuring loiter munitions, swarm drones, runway independent RPAs and the like.

"Due emphasis is also being laid on strengthening our intelligence, surveillance and reconnaissance architecture to enhance battlefield transparency, so as to have effective sensor to shooter linkages, also called 'Kill Chains'," he said

<https://economictimes.indiatimes.com/news/defence/indian-army-enhancing-combat-prowess-of-artillery-units-along-frontier-with-china/articleshow/113744289.cms>



Sat, 28 Sep 2024

## **Tata To Manufacture 150 DRDO-Developed WhAP Armoured Vehicles For Morocco**

In a significant achievement for the Make in India initiative, Tata has secured a contract to manufacture 150 Wheeled Armoured Platform (WhAP) combat vehicles for the Moroccan defense forces.

According to defense officials, the contract was formalized between the Indian firm and Morocco, marking a pivotal step in enhancing military collaboration. The WhAP vehicles were developed by the Vehicles Research and Development Establishment (VRDE) in collaboration with Tata.

The contract stipulates that the vehicles will be delivered to the Moroccan forces over a span of three years. This order represents the largest contract for Indian-made armored vehicles, both domestically and internationally. Additionally, Indian paramilitary forces have also expressed interest in the indigenous armoured vehicle, further underscoring its significance.

Trials for the WhAP have been conducted in Morocco over the past several months, demonstrating the vehicle's capabilities. Officials noted that manufacturers would closely collaborate with teams from the Defence Research and Development Organisation (DRDO) to implement upgrades throughout the supply period.

The WhAP is an indigenously designed and developed amphibious wheeled combat vehicle. The DRDO highlights that the design philosophy of this platform aligns with global trends, focusing on modularity, scalability, and reconfigurability to accommodate various operational roles.

The WhAP is capable of traversing challenging terrains, including muddy or slushy environments, and has been engineered to withstand mine blasts. Variants of the WhAP, such as the Infantry Protected Mobility Vehicle (IPMV) and the paramilitary version, have already been inducted into the Indian Army and paramilitary forces.

<https://ddnews.gov.in/en/tata-to-manufacture-150-drdo-developed-whap-armoured-vehicles-for-morocco/>



Sat, 28 Sep 2024

## **BrahMos Aerospace to have job reservation for Agniveers**

BrahMos Aerospace Pvt Limited (BAPL) — a joint venture between Defence Research and Development Organisation (DRDO) and Russia's NPO Mashinostroyeniya — has announced employment reservations for Agniveers, making it the first major company to have declared this officially.

In an order issued Thursday, it said that there will be recruitment of Agniveers for at least 15 per cent of technical and general administration vacancies in various work centers of BrahMos Aerospace and for at least 50 per cent of vacancies for security and administrative functions at its centers, where it has outsourced such tasks.

It added that recruitment of Agniveers will be done for at least 15 per cent of contractual vacancies through third party contract staffing depending upon their experience and qualification and that the industry partners associated with BrahMos Aerospace will be encouraged to recruit at 15 per cent of Agniveers in their establishments for tasks related to BAPL.

While the CAPFs had announced a 10 per cent employment reservation for Agniveers, this is the first major company to have announced this move. A few state police forces have also said they will recruit Agniveers when they leave the Armed Forces.

In the office order, BAPL said it would be expanding at a fast pace with the new orders coming in from the Indian Armed Forces and the scope of business in the international market will also likely to increase.

“In order to cater for the increasing work orders, we need additional manpower. During the recruitment and selection of the manpower it is ensured that the individuals are not only qualified but also trained and well disciplined keeping the nature of the job at BrahMos,” it said.

It added that the soldiers coming out of Agnipath scheme, well trained, qualified, disciplined and motivated through rigorous selection and training process, therefore, if recruited in BAPL, in their respective fields will be assets to the organisation.

Announced in June 2022 after a gap of two years in military recruitment due to the Covid 19 pandemic, the Agnipath scheme was aimed at recruiting soldiers, airmen and sailors to the Indian Armed Forces for a period of four years.

At the end of the four-year tenure, up to 25% of them can apply voluntarily to join the services on a regular basis, subject to merit and organisational requirements.

The biggest difference between a soldier employed on regular service and one recruited under the Agnipath scheme is that the former will draw pensions post-retirement, while Agniveers are not entitled to any pensionary benefits barring the 25 per cent of Agniveers, who would eventually get absorbed into the defence forces after four years.

The scheme has been embroiled in a political controversy with several opposition leaders objecting to it.

<https://indianexpress.com/article/india/brahmos-aerospace-job-quota-agniveers-9591782/>



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Fri, 27 Sep 2024*

### **Defence Secretary leads an Indian delegation to Kenya; Holds talks with Principal Secretary, Ministry of Defence of Kenya to further strengthen bilateral defence cooperation**

Defence Secretary Shri Giridhar Aramane led an Indian delegation to Kenya on an official visit from September 26 to 27, 2024 on the invitation of Principal Secretary, Ministry of Defence Dr Patrick Mariru. The delegation comprised senior officers from Ministry of Defence and Ministry of External Affairs.

On the first day of his visit, the Defence Secretary had a productive and substantive engagement with the Principal Secretary, Ministry of Defence of Kenya. Wide-ranging discussions were held on further strengthening bilateral defence cooperation including specialised training, maritime information sharing, military medicine, and defence industry.

Both the countries agreed to collaborate in promoting security and stability in the Indian Ocean region. In this regard, both sides also recalled BAHARI, the Joint Vision Statement to guide bilateral maritime cooperation. The Vision Statement was issued during the State visit of President William Ruto to India in December 2023.

The Defence Secretary also called on Cabinet Secretary (Defence Minister), Ministry of Defence of Kenya Ms Roselinda Soipan Tuya. He conveyed the greetings of Raksha Mantri Shri Rajnath Singh and discussed ways to further augment bilateral defence cooperation. The Cabinet Secretary also conveyed her greetings to the Raksha Mantri and reiterated her commitment for further strengthening defence cooperation between the two countries.

On September 27, 2024, the Defence Secretary visited Kenyan Naval base Mtongwe in Mombasa. He was accompanied by Principal Secretary Dr Mariru. They jointly laid the foundation stone of a new Radiology Complex, being built and equipped under the bilateral defence partnership.

In his address, Defence Secretary highlighted the longstanding, friendly, close and strong relationship between India and Kenya. He also emphasised the rich historical ties that date back to centuries, rooted in trade, migration, and cultural exchanges. The Defence Secretary was received by Brigadier John Sankale Kiswaa, Deputy Commander of Kenya Navy at Mtongwe Naval Base, Mombasa. They also discussed cooperation between the navies of the two countries.



The visit was consistent with the periodic high-level exchanges between India & Kenya, and is expected to further strengthen the bilateral defence cooperation.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2059653>



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*Fri, 27 Sep 2024*

## **Need for Future Strategic Leaders to enhance quick decision-making in technology driven battlespace: CDS Gen Anil Chauhan**

Chief of Defence Staff General Anil Chauhan highlighted the need for Future Strategic Leaders to enhance quick decision making in today's technology driven battlespace, where timelines are shrinking rapidly.

Delivering the closing address at the pioneering Tri Services Future Warfare Course that concluded on 27 Sep 2024, the CDS underscored that Artificial Intelligence, Machine Learning, advancements in Stealth Technology & Hypersonics and also Robotics will dictate the character of Future Wars.

A dynamic security environment coupled with the proliferation of niche technologies, changing character of warfare and lessons learnt from recent and ongoing conflicts necessitates the preparation of future leaders who should be able to appreciate the nuances of modern warfare.

Accordingly, the course focused on key areas related to future warfare; future trends, air and space warfare, non-kinetic warfare, maritime operations and multi-domain operations. Key outcomes include integrated operational concepts, enhanced joint force capabilities, advanced technologies for future battlefields and strengthened tri-service cooperation. This would enable the course participants to lead and shape the future of warfare, ensuring a unified and effective response to emerging challenges.

Gen Anil Chauhan, along with the Vice Chiefs of the three services were briefed on the outcomes of the week -long course and deliberations were carried out on the contours of the subsequent courses.

Apart from being personally driven by the Chief of the Defence Staff, the course was rank agnostic, with participants having service ranging from 13 to 30 years. The Future Warfare course aims to create a cadre of tech-enabled military commanders equipped with handling the complexities of the modern battlespace.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2059581>



**Press Information Bureau  
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**Ministry of Defence**

*Fri, 27 Sep 2024*

## **Indian Ocean Rim Association Seminar**

The second edition of the Indian Ocean Rim Association (IORA) seminar on Illegal, Unreported and Unregulated (IUU) Fishing was conducted at Naval War College, Goa on 25 Sep 24. The seminar reviewed the IUU fishing activities in the Indian Ocean Region (IOR), its implications in the economic, environmental and security domain, and the legal voids in tackling these activities that could be pursued by the IORA member states.

Delegates from 17 IORA countries including Australia, Bangladesh, France, Indonesia, Kenya, Madagascar, Mozambique, Malaysia, Maldives, Mauritius, Oman, Somalia, South Africa, Seychelles, Sri Lanka, Thailand and Tanzania participated in the issue based discussions to counter the ever growing menace of IUU Fishing in IOR.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2059304>



*Sun, 29 Sep 2024*

## **Studying Chola naval campaigns, reducing Scottish pipe bands: Armed forces propose shedding colonial practices**

Mid-career courses for officers comprising land campaign studies of Indian Generals and maritime strategies of Indian kings, drafting a tri-service Act instead of three individual service Acts, reduction of the number of Scottish-origin pipe bands in the Army and giving a greater degree of pan-India character to certain arms of the Army.

These are some of the changes being discussed within the Indian military to shed the last of the colonial vestiges that continue to be part of the Armed Forces, senior officials told The Indian Express.

According to officials, some of these points also feature in a publication on 'Colonial Practices and the Armed Forces – A Review' that was launched by Defence Minister Rajnath Singh at the maiden Joint Commanders Conference in Lucknow earlier this month.

Officials said efforts have been on to inculcate an India-centric strategic thought in young military minds by including in courses texts written by ancient Indian strategists instead of including only thoughts propagated by Western military thinkers and writers.

Towards this, they said, the Secunderabad-based College of Defence Management (CDM) is drafting a syllabus in consultation with the Indic Studies department of Gujarat University which will be made a mandatory part of mid-career courses to be attended by officers of the three services.

It could include land campaign studies of Indian Generals in history such as the INA, Marathas or Sikhs as well as ancient maritime strategies and naval exploits of past Indian rulers such as Raja Raja Chola I and his son Rajendra Chola, King Marthand Varma at Colachel and Kunjali Marakkar IV among others. It could also include the governance model of Emperor Chandragupta Maurya.

Additionally, other professional military education institutes have begun conducting regular seminars by top Indology authorities to propagate indigenous ethics, law and warfare concepts.

For instance, the Army Training Command has drafted reading material on ancient Indian concepts and doctrines for Army personnel, while the CDM has published books on the subject.

Some of these include the 'Pearls of Ancient Indian Wisdom' with extracts from the Gita, Panchatantra, Arthashastra, Chanakya Niti and Thirukkural.

The Armed Forces are also in the process of identifying obsolete laws and rules so that they can be weeded out, even as work is on to do away with individual service Acts and come up with a consolidated tri-service Act.

There may also be a study to see if the Army's infantry regiments can be given a more pan-India character, like its other arms incrementally over a period of time. Additionally, more Indian poetry, prayers, songs will be used in military training institutions replacing colonial era literature, such as IF by Rudyard Kipling and the current prayer in English at NDA.

Officials said that while the Indian Air Force and the Navy have one Scottish-origin pipe band in each of their regional command headquarters, the Army has them in each unit. The Army is discussing whether they can be reduced to one at each regional command headquarters purely for ceremonial purposes.

The Indian military has shed most of its colonial-era vestiges since the country's independence in 1947. But there was an upswing in efforts after Prime Minister Narendra Modi, while speaking at the Combined Commanders Conference in Gujarat's Kevadia in 2021, talked about increasing indigenisation in the national security system, including in the doctrines, procedures and customs practised in the Armed Forces.

Some of these include changing several Army unit crests, the naval ensign, giving out Indian names to military platforms, weapon systems, exercises, operations. There is also an enhanced use of Indian tunes and instruments in the Republic Day parade and the Beating Retreat ceremony.

<https://indianexpress.com/article/india/studying-chola-naval-campaigns-reducing-pipe-bands-armed-forces-look-at-changes-9593536/>

## THE ECONOMIC TIMES

*Fri, 27 Sep 2024*

### **India-Oman joint military exercise Al Najah concludes successfully**

The 5th edition of the IndiaOman Joint Military Exercise Al Najah concluded on September 26 with a grand closing ceremony held at the Rabkoot Training Area in Oman. The event was attended by notable dignitaries, including Amit Narang, the Indian Ambassador to Oman, and Captain Harish Srinivasan, the Indian Defence Attache to Oman.

From the Omside, Brigadier General Abdulkadhim Bin Ibrahim Al-Ajmi, Commander of the 11th Infantry Brigade, and Lieutenant Colonel Masood Mubarak Al-Ghafri, Commanding Officer of the Frontier Force, were present to mark the occasion, the Ministry of Defence stated in an official press release. The ceremony followed an impressive joint live-fire demonstration that showcased the interoperability and joint capabilities of the Indian Army and the Royal Army of Oman.

This demonstration was crucial for illustrating how both forces could work together in peacekeeping operations under a United Nations mandate. Approximately 60 soldiers from both armies participated in this significant display of military cooperation.

The demonstration featured a series of tactical exercises, including the simulated isolation and clearance of a village in a desert environment, where joint forces comprising Indian and Omani Armoured Personnel Carrier troops conducted house clearance drills and hostage rescue operations. Snipers from both sides also demonstrated their marksmanship, effectively engaging targets throughout the exercise.

A highlight of the event was the deployment of advanced Indian-made equipment, such as drones for real-time surveillance and ballistic shields for room interventions and hostage protection. These technologies underscored the commitment of both nations to enhancing their military capabilities and preparedness.

The exercise culminated in a flag ceremony, an equipment display, and the exchange of pleasantries between the contingents. The successful completion of the joint exercise reflects the dedication of both countries to maintaining global peace and security. It not only enhanced the tactical skills of the participating forces but also strengthened the bilateral military relations between India and Oman.

<https://economictimes.indiatimes.com/news/defence/india-oman-joint-military-exercise-al-najah-concludes-successfully/articleshow/113728079.cms>

## THE ECONOMIC TIMES

*Fri, 27 Sep 2024*

### **Fighter engine deal likely this year, says HAL CMD**

India is likely to finalise the terms and sign a deal to acquire the advanced fighter jet engine technology from the US this financial year, in time to start producing them for the next generation Light Combat Aircraft that are under development, chairman and managing director of Hindustan Aeronautics Ltd (HAL), DK Sunil, has told ET.

The official, who recently took charge of India's largest aeronautical company, said several major orders are in the pipeline and HAL is set to double its order book to ₹2.1 lakh crore within the next year, given the government's strong push towards the Make in India policy. He added production of the LCA Mk1A aircraft is on track and the fighters would be delivered as soon as engines ordered from the US arrive.

"We are expecting that in this financial year we should be able to do it (finalise and sign the jet engine contract). We expect three years for the plant to start delivering and we will be on time," he said.

The timeline for the jet engine plan matches the development plans for LCA Mk2 version that will be powered by the GE 414 Made in India under technology transfer. The HAL CMD said while

initially US manufacturer GE had agreed to a 56% technology transfer, this was increased to 80%, including critical technologies, after intervention from the higher levels of government.

In the coming days, a negotiation committee will be formed to clear the technical and commercial aspects of the deal with experts from the defence ministry, HAL, Aeronautical Development Agency and Gas Turbine Research Establishment.

Interestingly, the deal - pegged at over \$1 billion - will also heavily involve the private sector, with the CMD saying that a significant part of the work will be outsourced. Indian companies that have specialised expertise in this area include MTAR Hyderabad, Indo MIM Bengaluru, L&T, Godrej and Azad engineering, among others.

"HAL outsources about 40-45% of its work and it will be a similar model. We will give machining outside as well as some parts to whoever has got this kind of equipment," he said.

The new CMD also expressed confidence that the order book for HAL is likely to expand significantly in the coming months on the back of a strong government push for Make in India. The official said that the present order book stands at about ₹1.10 lakh crore and contracts in the pipeline are likely to increase it to ₹2.1 lakh crore within a year.

This will include upcoming contracts for 97 additional LCA Mk1A aircraft and an order for 156 light combat helicopters, besides several orders for the Advanced Light Helicopters. "These orders will easily give us work for the next five to six years. The LCA Mk2, Indian Multi Role Helicopter and Advanced Medium Combat Aircraft will take us into the next decade," he added.

<https://economictimes.indiatimes.com/news/defence/fighter-engine-deal-likely-this-year-hal-cmd/articleshow/113714152.cms>

## THE ECONOMIC TIMES

Mon, 30 Sep 2024

### **India gears up for fifth consecutive winter troop deployment along LAC amid ongoing trust deficit with China**

India is gearing up to keep its troops stationed forward along the Line of Actual Control (LAC) for a fifth consecutive winter amid lingering trust issues with China. The preparations include maintaining troop presence in the harsh terrains of eastern Ladakh, Arunachal Pradesh, and Sikkim.

Despite ongoing political and diplomatic talks indicating "progress and narrowing of differences," top defence sources told TOI that "the trust deficit on the ground with the People's Liberation Army (PLA) remains very high."

China continues to strengthen its military positions and build permanent defenses along the 3,488-km LAC, suggesting the PLA is not planning to return to peacetime locations soon. The Indian Army is transitioning from its summer to winter posture, with significant winter stocking underway.

General Upendra Dwivedi and commanders-in-chief of the Army's seven commands will review the operational situation in Gangtok, Sikkim, on October 9-10.

Recent political-diplomatic talks have suggested a possible breakthrough in the military confrontation in eastern Ladakh. These talks included the 30th and 31st meetings of the Working

Mechanism for Consultation & Coordination on India-China Border Affairs (WMCC) on July 31 and August 29. National Security Advisor Ajit Doval also met Chinese Foreign Minister Wang Yi on the sidelines of a BRICS meeting in St. Petersburg on September 12.

However, military corps commander talks last occurred on February 19, where China rejected India's proposal to resolve face-offs at Depsang Plains and the Charding Ninglung Nallah track junction near Demchok.

A senior officer stated, "Disengagement at Depsang and Demchok, if it happens, will only be the first step. Till the subsequent de-escalation and deinduction of troops take place for restoration of status quo ante, the threat will remain."

Due to buffer zones established after previous disengagements, Indian troops cannot access 26 of their 65 patrolling points in eastern Ladakh.

An officer added, "Even the buffer zones were meant to be only temporary arrangements. China continues to make unreasonable demands and is playing the long waiting game. India has to be careful about not falling into China's trap."

"If the two sides agree to a broad framework, the actual disengagement modalities at Depsang and Demchok can be worked out at the military level," he added.

The Army maintains a high level of operational preparedness, with troop adjustments and adequate reserve forces in each LAC sector to handle any contingency. Political and diplomatic discussions are seen as the potential path to breaking the current stalemate.

<https://economictimes.indiatimes.com/news/defence/india-gears-up-for-fifth-consecutive-winter-troop-deployment-along-lac-amid-ongoing-trust-deficit-with-china/articleshow/113799499.cms>

## THE ECONOMIC TIMES

Sun, 29 Sep 2024

### **France slashes Rafale Marine fighter jets' price after talks**

India and France are inching closer to signing a deal for the Rafale Marine fighter jets required for Indian aircraft carriers, with the two sides coming to a final price bid for the acquisition. Sources said that after several rounds of negotiations in the defence ministry, the price offer has been significantly reduced and the deal would be benchmarked on the 2016 deal for 36 Rafale jets that were acquired for the Air Force.

The acquisition, which has been in the works for over three years, is also likely to be discussed during the visit of National Security Advisor Ajit Doval to Paris this week. The naval fighter acquisition as well as an order for three additional Kalvari class submarines to be built in Mumbai are the two major defence deals being processed with France.

The Navy has a requirement of 26 fighter jets capable of operating from its aircraft carriers. In a series of trials, it evaluated both Boeing F/A 18 Super Hornet and Rafale M before selecting the latter on technical grounds.

For more than a year, commercial discussions have taken place between India and France for a final signing of the contract. The deal is being processed under the government-to-government route, as was the case for the previous acquisition of Rafale jets for the Air Force.

Sources said besides compatibility with the Air Force fleet, the naval jets will be equipped with specialised anti-ship weaponry and long-range fuel tanks for tasks at sea. They will also get the Meteor beyond visual range air-to-air missiles, which are by far the most advanced in the region.

Earlier, the Rajnath Singh-led Defence Acquisition Council had approved certain amendments that led to the offering of a final price bid. Among them were dropping of an earlier plan to integrate an Indian radar and weapons on the naval jets.

The plans were dropped due to the high cost involved in replacing the radar and more importantly the estimated timeline of eight years to complete the integration. The Rafale Ms are being bought as a stop gap arrangement till the development of indigenous twin-engined deck-based fighters that is being undertaken by the Aeronautical Development Agency.

<https://economictimes.indiatimes.com/news/defence/france-slashes-rafale-marine-fighter-jets-price-after-talks/articleshow/113792148.cms>

## THE ECONOMIC TIMES

Mon, 30 Sep 2024

### **HAL's advanced light helicopters to join offshore missions of ONGC**

In a big win for the indigenous advanced light helicopter (ALH) programme, the chopper has been chosen to undertake offshore missions for Oil and Natural Gas Corporation (ONGC), beating several foreign competitors for the requirement to fly out personnel and equipment to oil rigs in the open seas.

The helicopters will be operated by Pawan Hans Limited, which will initially place an order for 10, with the total requirement expected to cross 28 in the coming years. The order will open up a new civilian market for the Hindustan Aeronautics Limited (HAL) chopper that is extensively used by the armed forces, with over 340 of the machines flying all over the country - from naval ships to high altitude helipads on the northern borders. Sources said the bid by Pawan Hans, offering ALH for offshore missions, emerged as technically compliant and the lowest priced, and has taken major foreign suppliers who dominated the market in the past by surprise.

It is learnt that defence secretary Giridhar Aramane was instrumental in making a strong case for the platform. Work is currently on to ensure all civil certifications required for the helicopters to be operated by Pawan Hans. While the air frame is already certified, the engine for the helicopters will now be built under Directorate General of Civil Aviation (DGCA) supervision and a new glass cockpit will be offered. The civilian version is expected to be ready by the middle of next year.

While ALH is already used extensively by the Navy and Coast Guard for missions at sea, including landing and taking off from warships in rough weather, offshore missions require civil certifications and DGCA approval. HAL has already manufactured around 350 of the helicopters and is negotiating a contract for 50 additional machines for the Indian Army. Once the certifications are in place, a large civilian market could open up for ALH, with large requirements expected from state governments, national disaster relief force and for high altitude tourism.

<https://economictimes.indiatimes.com/news/defence/hals-advanced-light-birds-to-join-offshore-missions-of-ongc/articleshow/113792385.cms>

## First memorial for military intelligence heroes unveiled in Pune

India has unveiled its first memorial dedicated to the Military Intelligence (MI) personnel who lost their lives in service. The memorial, called Satark Park, is located in Wanowrie, Pune cantonment. Inspired by MI's motto "Sada Satark" (always alert), the park honors MI heroes with busts and brief descriptions of their contributions.

The memorial features the busts of several decorated MI personnel, including Kirti Chakra awardees Naik Pratap Singh and Brigadier Ravi Datt Mehta, and Shaurya Chakra awardees Sepoy Om Shiv Sharma, Naik Jangbir Singh, and Havildar S Samy Kannan.

It has been constructed by the Military Intelligence Training School and Depot (MITSD) with support from Roadway Solutions India Infra Ltd. Since 1962, 40 MI personnel, including 11 officers, have died in various operations, primarily in Jammu and Kashmir and the North Eastern borders. Their stories, previously unpublished due to the secretive nature of their work, will now be shared with the public.

War Widow Sunita Mehta, wife of Brigadier Mehta, expressed pride in the memorial. "It will be a big honour for the families. The people will appreciate their rich contributions. They have been unsung heroes of the country."

As told to TOI, BK Singh, director of RSII, stated, "When you look at the walls of valour, you see the greatness of MI personnel. Each of those 40 busts represents an unwavering commitment to their tasks. Each represents a life that refused to be cowed down by enemies. Through this structure, we will always honour and remember them."

Lt Gen LN Singh (retd), former commandant of MITSD, highlighted the significance of this memorial. "There is not a single public memorial of MI in the country," he noted. He also reiterated the importance of public awareness about these unsung heroes: "The memorial will help the general public to know about the unsung heroes of MI, whose contributions are known only within our fraternity."

The memorial includes a cement platform with the MI Corps pledge and a map of India, along with weatherproof busts made of resin and fibreglass. It also features symbols and a tank representing MI's role in various formations. Veterans and family members believe the public should have learned these stories long ago.

One veteran, requesting anonymity, said, "Keeping the names of those who fought four decades ago made no sense. What did we achieve? Our inspiring stories have remained limited to a small circuit of the intelligence community."

Satark Park aims to inspire future generations and honor the brave MI personnel who served the nation with dedication.

<https://economictimes.indiatimes.com/news/defence/first-memorial-for-military-intelligence-heroes-unveiled-in-pune/articleshow/113782780.cms>



## **In five years, over 1,000 defence startups have emerged in India. Can they grow and meet modern battlefield demands?**

Sky has never been the limit for them. Almost a decade ago, Sameer Joshi, a fighter pilot, and Julius Amrit, an IITIM alumna, were part of Team Indus that geared up for an audacious challenge—land a rover on the Moon. Though they didn't clinch the Google Lunar XPrize, they earned enough funds, as finalists, to dream big. In 2018, Joshi and Amrit launched a defence startup, NewSpace Research and Technologies (NRT), in Bengaluru. It is now India's mostfunded defence and aerospace startup, with a kitty of Rs 72 million.

NRT makes long-endurance drones, which can fly for long durations, and robotic swarms—in which a multitude of robots are coordinated to perform complex tasks such as search-and-rescue missions and destruction of enemy assets—for the Indian armed forces. “Our patented swarming technology is the world's first high-density swarm solution delivered to a national defence force,” says Joshi, a former MiG-21 and Mirage-2000 pilot. He says their systems perform flawlessly even in extreme, high-altitude conditions, subtly alluding to the rugged Himalayan terrain where Indian and Chinese forces remain at loggerheads.

NRT is not alone on this new frontier of India's defence sector. In five years, over a thousand defence startups have come up, developing everything from robotic swarms to drone-dropped bombs. The next test is whether they can get enough funding to scale up and meet the evolving demands of modern battlefields.

### **Arms & The Firms**

As the ongoing conflicts in Ukraine and West Asia have revealed, aircraft, artillery and tanks, which were once integral to old battle plans, have retreated. Cutting-edge technologies such as artificial intelligence, unmanned aerial vehicles, unmanned underwater vessels and facial recognition systems are taking centre stage. The blasts triggered by communication devices in Lebanon are a stark reminder of the shifts that have taken place in this new faceless war.

Vrinda Kapoor, founder and CEO of Delhi-based 3rdiTech, says India's defence startups are involved in two tasks—producing cutting-edge products and/or developing breakthrough technologies. Her company, which employs nearly 100 people, is focused on the latter. “Our goal is to position ourselves as India's first semiconductor major. It is an untapped market with immense potential.

The annual defence procurement for the semicon industry in India is about Rs 5,000 crore,” she says, adding that her firm will also supply for other sectors such as automotive and telecommunications, apart from focusing on exports. Kapoor's 3rdiTech is one of the companies involved in a strategic technology partnership that is at the heart of India's collaboration with the US to develop a national security semiconductor fabrication plant.

Announced after the meeting between PM Narendra Modi and US President Joe Biden in Delaware last week, the partnership is between the US Space Force, 3rdiTech and Bharat Semi. Unlike in other sectors, startups in defence work closely with the government. Several companies have secured contracts through Innovations for Defence Excellence (iDEX), a government initiative that was launched in 2018, to offer financial support and guidance to startups.

According to data available with the ministry of defence, 500 startups have signed contracts under iDEX and Technology Development Fund, another scheme to handhold startups. Defence startups range from Delhi-based Aero Arch, which has secured an order from the Indian Army to produce robotic MULE — multi-utility legged equipment — that can carry loads across challenging terrains, to Pune-based Zeus Numerix that develops precision guidance kits for 81mm mortars, and drone-dropped bombs.

“Modern wars have taught us that the most successful weapon systems share key traits: small, precise, effective, autonomous and reliable— what we call SPEAR,” says Abhishek Jain, chief business officer of Zeus Numerix. It began as an informal group of faculty and students at IIT-Bombay and evolved into a commercial enterprise in 2004.

Jain says their flagship products—the 81mm guided mortar, which he compares to Israel’s Iron Sting, and drone-dropped munitions— are in high demand both in India and abroad. Iron Sting, a 120 mm guided mortar munition, developed by Haifa-based Elbit System, was used for the first time by Israel only last year in its war against Hamas. While some companies are making drones, others are busy developing antidrone technology. The flagship product of Big Bang Boom Solutions, a Chennai-based startup, is an advanced antidrone system that can detect and neutralise drones from up to 10 km away, giving the armed forces a strategic edge in the battlefield.

“Given the evolution of drones in conflicts like Ukraine and in our own country, it is crucial for military forces to have competent anti-drone technology,” says founder Shivaraman Ramaswamy, who earned a doctorate in nanomagnetism before venturing into the defence sector.

Big Bang Boom Solutions has embarked on another ambitious project— develop situational awareness systems for armoured vehicles, which could be instrumental in unmanned tanks in the future. The See-Through Armour project, developed in collaboration with the Indian Army, integrates militarygrade cameras and AI-powered systems in tanks, providing commanders with a 360-degree panoramic view from inside the vehicle.

This real-time data allows for swift detection of threats, such as low-flying drones, that might otherwise escape notice. Big Bang Boom Solutions raised Rs 250 crore in its latest round of funding in September. It was led by Mumbai Angels Network, Vyom Family Office, SBI Startup Branch Chennai and Asquare Investing. Meanwhile, Ahmedabad-based Optimized Electrotech is developing surveillance systems. Founded by 43-year-old Sandeep Shah, it specialises in multispectral imaging and weapon sights. Its products— NoctVision, InfiVision and ClearVision— offer surveillance solutions for ranges spanning 5 km to 30 km. These are priced between Rs 50 lakh and Rs 5 crore.

Its WolfSight is a rugged weapon sight tailored for infantry units, while Gun Sight has nightvision capabilities. Its clients include the Indian Army, Gujarat Police and Indian Railways. What has given an impetus to defence startups have been the recent changes in government policies, including emphasis on indigenisation of production and more weapon procurement from private companies. For instance, it was in 2016, when the government came out with the Defence Procurement Procedure—which encouraged indigenisation and reduced import dependency—that Shah decided to found Optimized Electrotech after handing over his former company, which worked in the space sector and collaborated closely with the Indian Space Research Organisation, to a shareholder.

### **Funding Needed**

While defence startups are preparing for future wars, they are battling concerns of their own. The foremost among them are whether they can secure consistent funding and scale up. According to Tracxn, which tracks startup funding, India’s defence-tech industry has attracted \$184 million in

total equity funding since 2020, with top beneficiaries being NRT, IdeaForge, Garuda Aerospace, Tonbo Imaging and Axio.

This is miniscule. A single quick commerce startup, Zepto, raised \$1 billion, or 5.5 times more, in the current year alone. Defence startups' association with the government is often a hindrance for funding. Shah of Optimized Electrotech says many venture capitalists (VCs) are constrained by limited partners, often foreign investors, who are hesitant to invest in government-focused sectors, particularly defence. He says that without a steady flow of capital, there won't be much difference between hand-to-mouth MSMEs and groundbreaking defence startups.

Defence startups can also have long gestation periods. Many startup founders rue that VCs often prefer investing in software as a service (SaaS) and consumer tech sectors, which offer shorter cycles and more predictable returns. Says Navneet Kaushik, a retired commander of the Indian Navy, who has founded Jamwat Ventures Angel Fund: "Defence is one of the hottest sectors right now, but there aren't enough people funding it because they don't understand the sector."

In March, his fund secured an initial commitment of `40 crore, with a potential to expand to `100 crore. Ajay Kumar, a former defence secretary, has also thrown his hat in the ring by launching MGF-Kavachh, an alternate investment fund focused on defence, space and deep tech. "We have closed our first deal. Threefour more deals are in the pipeline," says Kumar, adding that the fund has raised `400 crore.

While most startups are satisfied with the government's support and funding over the past few years, some call for more reforms, such as streamlining of procurement processes through online platforms for faster disbursal. Jain of Zeus Numerix stresses on the need to overhaul weapon-testing procedures, which are constrained by regulations like the Arms Rules, 1962, under which a manufacturer is permitted to proof-test firearms only at the place of business or a factory.

He suggests a more agile approach to testing, similar to the Israeli method of immediate field trials, which would significantly accelerate the process of refining and adapting weapon designs. Joshi of NRT says the crucial lesson from the wars in Ukraine and West Asia is the need for a rapid deployment of tactical assets. He thinks that requires startups.

"The nimbleness of startups is attuned to this kind of requirements. They have the potential to build long-term strategic capabilities for India and its allies."

<https://economictimes.indiatimes.com/news/defence/in-five-years-over-1000-defence-startups-have-emerged-in-india-can-they-grow-and-meet-modern-battlefield-demands/articleshow/113771530.cms>

# ThePrint

*Fri, 27 Sep 2024*

## **Azerbaijan inducts JF-17 fighters from Pakistan as Armenia looks to India to beef up**

Pakistan has notched a third major success in exporting the JF-17, with Azerbaijan becoming the latest country to add the fighter jet to its fleet.

This comes at a time when the Caucasian country is locked in a standoff with its neighbour, Armenia, after taking the Nagorno-Karabakh region from it. While Azerbaijan is moving away

from its traditional arms supplier, Russia, and growing closer to Turkey and Pakistan, Armenia has been deepening its defence ties with India, which is already a major supplier to the country.

Pakistan's success with the JF-17—developed jointly with China and co-produced by the two countries— also comes even as India is trying to export the Light Combat Aircraft (LCA) Tejas manufactured by Hindustan Aeronautics Limited (HAL), but no talks have borne fruit as yet.

The acquisition of the JF-17s was announced by Azerbaijan's ambassador to Iran, Ali Alizada, in a post on X Wednesday. Alizada has also served as envoy to Pakistan.

On that day, Azerbaijani President Ilham Aliyev inspected a JF-17C (Block III) aircraft at capital Baku's Heydar Aliyev International Airport, where it was showcased as part of a defence exhibition. Aliyev was accompanied by Defence Minister Zakir Hasanov and senior Pakistani military officials.

Pakistan and Azerbaijan inked the \$1.6-billion deal in February. Under the agreement, Azerbaijan will receive eight JF-17C Block-III aircraft from Pakistan besides ammunition. This will include the air-to-surface missiles.

The lightweight and multirole JF-17C fighter jets are co-produced by Pakistan Aeronautical Complex (PAC) and the China Aviation Industry Corporation (AVIC). They have air-to-air and air-to-ground combat capabilities and high manoeuvrability at medium and low altitudes, as described in a report by Türkiye Today.

Pakistan has previously exported JF-17s to Myanmar and Nigeria, and there have also been reports that Iraq may purchase the fighters.

In Myanmar, however, the fighters—acquired between 2019 and 2021 following an agreement signed in 2016—were declared unfit last year, prompting its military junta to send a “stern message” to Islamabad. The Myanmar Air Force grounded the jets due to malfunctions and flaws, The Economic Times reported.

### **South Caucasus rivalry**

Speaking at an event (the Global Armenian Summit) earlier this month, Armenian Prime Minister Nikol Pashinyan had questioned why his country could not buy weapons from India if Azerbaijan could do so from Pakistan.

As reported by ThePrint in July, Armenian troops were spotted wearing an India-made helmet-mounted thermal imaging monocular manufactured by Bengaluru-based Tonbo Imaging. Since then, Armenia has reached out to India for the procurement of Indian missiles, including the indigenous beyond-visual range Astra air-to-air missile, and to upgrade its Su-30 fighter aircraft fleet. As reported by ThePrint, talks are on and still at a nascent stage.

In 2022, India's Kalyani Strategic Systems Limited (KSSL) won an export order for the supply of artillery guns to Armenia. Armenia has also bought the Pinaka rocket system from India.

Meanwhile, Azerbaijan's cooperation with Pakistan and Turkey has gathered significant steam. In July, the leaders of the three countries met in Astana on the sidelines of the Shanghai Cooperation Organization.

Islamabad's defence ties with Baku go back to 2003, when the two countries signed a military agreement. Aliyev's father and predecessor, Heydar Aliyev, had visited Pakistan earlier that year, while Pervez Musharraf, then president of Pakistan, returned the visit the following year.

### **Talks to export Tejas**

During Aero India in Bengaluru last year, HAL chief managing director C.B. Ananthkrishnan had said that India was in talks with Malaysia, Argentina, Egypt and Botswana for the sale of the LCA Tejas.

HAL submitted a proposal to Malaysia's Ministry of Defence to supply 18 Tejas aircraft in response to a global tender floated by the Royal Malaysian Air Force.

The Indian company, however, was unable to become the final contender and lost to South Korea's Korean Aerospace Industries, which had on offer its FA-50. No other talks have fructified, either.

<https://theprint.in/defence/yet-another-win-for-pakistan-azerbaijan-inducts-jf-17-fighters-as-armenia-looks-to-india-to-beef-up/2286457/>

## THE WEEK

*Fri, 27 Sep 2024*

### **China's naval might takes a hit as its newest nuclear-powered attack submarine sinks during sea trials**

China suffered a major embarrassment as various reports revealed that its newest nuclear-powered attack submarine sank in port during sea trials even as Beijing is in the process of ramping up its maritime might.

The Zhou class vessel may have sank in May or June and China apparently tried to cover up the incident that happened at Wuchang shipyard near Wuhan.

Satellite imagery showed that the submarine sank alongside a pier while under construction. Satellite images from Planet Labs PBC, analysed by The Associated Press, show what appears to be a submarine docked at the Shuangliu shipyard on the Yangtze River before the incident.

An image taken June 15 appears to show the submarine either fully or partially submerged just under the river's surface, with rescue equipment and cranes surrounding it. Booms surround it to prevent any oil or other leaks from the vessel.

A satellite image taken August 25 shows a submarine back at the same dock as the submerged vessel. It is not clear if it was the same one.

A Chinese embassy spokesperson in Washington said they are not aware of the situation. "We are not familiar with the situation you mentioned and currently have no information to provide," Reuters quoted the Chinese official as saying.

A US official said it was not surprising that China's navy would hide it.

"In addition to the obvious questions about training standards and equipment quality, the incident raises deeper questions about the PLA's internal accountability and oversight of China's defence industry - which has long been plagued by corruption," the official has been quoted as saying.

Some media reports suggested that the vessel may have been carrying nuclear fuel when it was sunk. The setback comes even as Beijing has become increasingly assertive in pursuing its claim to virtually the entire South China Sea, which is crucial to international trade.

As of 2022, China had six nuclear-powered ballistic missile submarines, six nuclear-powered attack submarines, and 48 diesel-powered attack submarines, a Pentagon report on China's military

claimed.<https://www.theweek.in/news/defence/2024/09/27/chinas-naval-might-takes-a-hit-as-its-newest-nuclear-powered-attack-submarine-sinks-during-sea-trials.html>

<https://www.theweek.in/news/defence/2024/09/27/chinas-naval-might-takes-a-hit-as-its-newest-nuclear-powered-attack-submarine-sinks-during-sea-trials.html>

# ThePrint

*Fri, 27 Sep 2024*

## **Nuclear submarine will be a leapfrog for India-France ties, bring New Delhi into exclusive club**

India's dependable partner and long-time friend, France, is once again back to help New Delhi realise its strategic ambitions.

The two-day India-France strategic dialogue between National Security Advisor Ajit Doval and the French President's Diplomatic Advisor Emanuel Bonne is set to take place in Paris on 30 September and 1 October. But, just before this upcoming dialogue, France has offered India major deals including nuclear-powered attack submarines or the SSNs.

India's existing fleet of submarines does not yet have an SSN.

### **Upcoming India-France Strategic Dialogue**

This would be the first bilateral strategic engagement between the two friends after French President Emmanuel Macron's state visit to India in January 2024 as the Republic Day chief guest. The nine-month delay can perhaps be attributed to political instability in Macron's universe, with a hung government in search of an acceptable prime minister after uncalled-for snap elections in July. Moreover, France was also conducting Olympic and Paralympic Games in the middle of this chaos.

Finally, Paris has a brand-new prime minister in the form of Michel Barnier, and the government can run other agendas in the face of mounting debt crises and political divides. Macron, too, seems to have switched attention quickly to foreign policy and defence, which are key areas of a French president's mandate—and his attention is once again on India.

In the run-up to this strategic dialogue, the time-tested and celebrated India-France defence partnership is ready to leapfrog into the realm of submarine technology. Let's decode this better.

So far, India has only twice leased an SSN from Russia to experience its operational aspects. Those were called the Chakra SSNs that were returned to Russia after the lease. India never developed its own SSNs. France's offer, thus, could catapult India into yet another exclusive club of a select few countries that possess a whole range of submarines. This will add formidable capabilities to its stealth and firepower in the choppy waters of today's geopolitical churning.

It has offered to support the construction of nuclear-powered attack submarines (SSNs). In a first, India has been offered state-of-the-art Unmanned Underwater Vehicles (UUVs), advanced sea drones that will be used for a whole range of activities in the fluid universe of the seas. Finally, France has also offered a 100 per cent transfer of technology (ToT) for 110 kilo Newton thrust aircraft engines for India's Advanced Medium Combat Aircraft (AMCA) programme.

These crucial plans might be discussed when Doval meets Bonne in a few days. But what makes these offers so special? And will they even fly?

### **Latest in India-France defence cooperation**

Not long after the news broke about India finalising a 26 Rafale Marine jet deal for aircraft carrier INS Vikrant, it was reported that the Indian Navy could be procuring at least two Rafale simulation centres for training its crew, including pilots.

Additionally, the Indian Air Force may be looking at acquiring more Rafale fighters to ramp up its depleting squadrons. Although it would be better for India to focus on its indigenous AMCA programme to reduce dependence on imports. It is much better to collaborate with trusted foreign partners like France to co-develop the 110 KN engine required for AMCAs, which by the way, has been on offer from the French side for a while now.

France's footprint in India's defence industrial ecosystem has been growing in line with the latter's vision for self-reliance. In a recent development, Dassault Aviation – which makes both Rafales and Mirage-2000 jets that India uses – has already progressed in establishing a Maintenance, Repair and Overhaul (MRO) facility near Noida to service them both. It may be recalled that Dassault is also a contender to supply 114 jets to the IAF for its Medium Role Fighter Aircraft (MRFA) programme, although a final decision on that remains far-fetched.

As stated earlier, New Delhi has to find the right balance between procurement and 'Make in India'. A skewed dependence on the former will always stem India's progress in self-reliance. The other major French player in the Indian defence ecosystem is Safran, which manufactures engines for the Rafale jets. A 100 per cent French design, these M-88 engines could be entirely produced in India at Safran's MRO facility in Hyderabad, if they receive a significant order.

Then, Safran is also collaborating with Hindustan Aeronautics Limited (HAL) to design, develop and manufacture a turboshaft engine for the Indian Multi-Role Helicopter (IMRH) and the Deck Based Multi Role helicopters (DB-MRH). But there is more. Paris' significant splash in the ever-vibrant pool of India's defence industry comes at a time when the Navy is aspiring to build at least two nuclear attack submarines.

### **Sea power differentials**

India seeks to strengthen its sea-based deterrence in an equation where the favour is tilted toward China. Beijing boasts of having the world's largest navy by sheer number of vessels. These are mainly the six Jin-class nuclear-powered Ballistic submarines with significantly higher firepower than India's Arighat or its predecessor, Arihant. Also, the power differential with Pakistan has been declining as Beijing's support for Islamabad's submarine capabilities is more conspicuous than ever.

For effective nuclear deterrence at sea, India requires at least two more SSBNs so that one can be deployed at all times, and some SSNs as well. What kind of submarines are the French offering and how are they different from what India already has or has been developing?

To understand this, it's important to draw the big picture of how India's submarine capabilities are dispersed. Currently, India has a total of 18 subs. Out of these, two are ballistic missile subs (SSBNs). The first was Arihant and the second was Arighat. The latter was commissioned with huge fanfare by Defence Minister Rajnath Singh recently.

India had originally planned for four SSBNs. The remaining two are reportedly being built but the exact details remain a state secret. As mentioned above, India still doesn't have SSNs. It has diesel-electric attack submarines called SSKs. We operate 17 of these boats, which can be

broadly divided into the Sindhughsoh (referred to as kilo) Class which is designed by Germans. Then there is the Kalvari Class, which is based on the French Scorpene-Class and falls under India's Project 75. By the way, India, in partnership with the Mazagaon Dock, has recently placed a fresh order with France to build three more Kalvari Class submarines.

Finally, there is also the long-standing diesel-electric air-independent propulsion-enabled submarine project, P-75(I), which is still awaiting a decision. The choice is between Germany's ThyssenKrupp Marine Systems (TKMS) and Spain's Navantia, both with respective Indian partners to build the project.

Now the French have offered the development of SSNs, based on their own Barracuda class subs with significant ToT. The finer details are not yet known and could be discussed when the two sides meet in Paris shortly. Regarded as the crown jewel of military capability, if the deal on SSNs comes through, it would be the most staggering success for the India-France defence bonhomie.

### **Dronification of future maritime warfare**

France has also offered India advanced UUVs that could be used for a variety of tasks including surveillance, research, weaponry, search and operation and of course defence. But once again, the nation faces a tilted power balance with China operating the HSU-001 UUVs, which is roughly comparable to UUVs operated by the United States and United Kingdom's UUV versions. Beijing has reportedly tested them around the Taiwan Strait region.

Therefore, it is high time that New Delhi starts preparing for these tactical capabilities, which are equally effective in hybrid warfare and are a defining feature of security challenges in the Indo-Pacific.

The India-France defence partnership has come a long way and has created space for more. The real lasting push, however, will only come when these partnerships are complemented by technological cooperation and innovation. These are going to be the hallmarks of future defence industry cooperation. Most likely the still classified India-France Defence Industrial Roadmap already contains substantive plans to be steered at the NSA level.

And perhaps that is why it is the NSA who's travelling to Paris for the upcoming strategic dialogue.

<https://theprint.in/opinion/nuclear-submarine-india-france-ties/2286794/>



*Sun, 29 Sep 2024*

## **What changes the Armed Forces are considering to shed colonial influences, and why**

To do away with colonial vestiges in the Indian military and its traditions, the Armed Forces are considering several changes. These include officers studying Indian strategists in their career courses instead of Western experts, reducing the number of Scottish-origin pipe bands in the Army, and giving a more pan-India character to certain arms of the Army.

Drafting a tri-service Act instead of three individual service Acts is also being considered. We explain what aspects the Armed Forces are looking at, and why.

### **What changes are being considered?**



As part of efforts to inculcate an indigenous strategic thought in young military minds, texts written by ancient Indian strategists are being increasingly included in career courses instead of literature written by western military thinkers and writers.

For instance, the Secunderabad-based College of Defence Management (CDM) is drafting a syllabus in consultation with the Indic Studies department of Gujarat university, which will be made a mandatory part of mid-career courses to be attended by officers of the three services.

It could include land campaign studies of Indian forces like the INA, Marathas and Sikhs; maritime strategies of rulers like Raja Raja Chola I and his son Rajendra Chola, King Marthand Varma, Kunjali Marakkar IV, among others; and the governance model of ancient Indian emperor Chandragupta Maurya.

The Armed Forces are in the process of identifying obsolete laws and rules that can be weeded out. Also, at present, the Army, the Navy, and the Air Force have a different service Act governing each. Work is on to bring in a consolidated tri-services Act, which will reduce redundancies and promote smoother operations.

The Army is discussing whether Scottish-origin pipe bands can be reduced to one at each regional command headquarters—from one in almost every unit—and be kept for purely ceremonial purposes.

There may also be a study to assess if the Army's infantry regiments can be given a more pan-India character, like the artillery and armoured divisions, instead of the current system of a Jat regiment, Bihar regiment, etc.

### **What changes have already been made by the Armed Forces?**

Several colonial-era military customs and practices have been done away with in the last few years, by changing several Army unit crests, the naval ensign, and giving out Indian names to military platforms and weapon systems. Most joint exercises with other nations as well as operations and seminar halls in military complexes are being given Indian names.

More Indian tunes and instruments have been used in the Republic Day and the Beating Retreat ceremonies in the last few years. The Christian hymn Abide With Me was replaced by the patriotic Hindi song Ae Mere Watan Ke Logon after the Beating Retreat ceremony of 2022. Earlier this year, the Indian Navy permitted wearing the traditional kurta-pyjama attire into its naval messes.

Professional military education institutes are conducting regular seminars by Indology authorities to propagate indigenous ethics, law and warcraft concepts.

### **Why the changes?**

The idea is to “Indianise” the Indian military further, doing away with colonial influences. This process has been on since India gained freedom from British rule in 1947, but there was an upswing in the efforts after Prime Minister Narendra Modi, while speaking at the Combined Commanders Conference in Gujarat's Kevadia in 2021, talked about increasing indigenisation in the national security system, including in the doctrines, procedures and customs of the Armed Forces.

<https://indianexpress.com/article/explained/armed-forces-colonial-influences-changes-explained-9594168/>

## Explainer: The Growing Use of Thermobaric Weapons

Russia's use of thermobaric weapons in Ukraine has drawn significant attention due to their devastating effects, but the development and deployment of these powerful bombs are not limited to Russia. Many countries, including the United States, China, and others, have also invested in thermobaric technology for its unique capabilities in modern warfare. The ODAB-1500 bomb used by Russia in a recent strike near Kupyansk highlights one application of these weapons, but this is part of a broader trend that has been evolving for decades.

### What Are Thermobaric Weapons?

Thermobaric weapons, often called “vacuum bombs” or “enhanced blast weapons,” rely on the atmosphere's oxygen to fuel their explosive power. Unlike conventional explosives that contain both fuel and oxidizer, thermobaric bombs release a fuel cloud, which, when ignited, causes a high-temperature explosion. This explosion generates a blast wave of immense pressure, followed by a rapid vacuum effect as the oxygen in the vicinity is consumed. The combination of intense overpressure and the subsequent vacuum makes these weapons particularly destructive in enclosed spaces such as bunkers, buildings, and tunnels.

The shockwave produced by thermobaric bombs can destroy structures, while the blast's pressure differential causes catastrophic damage to the human body, including rupturing organs and lungs. This dual impact of extreme heat and pressure is why these weapons are both feared and controversial in modern conflict zones.

### A Historical Overview

While Russia has become synonymous with thermobaric weapons in recent years, the technology's roots trace back to the United States. During the Vietnam War in the 1960s, the US military sought more effective methods to clear minefields. This led to the development of fuel-air explosives (FAEs), early predecessors of modern thermobaric bombs. The CBU-55 and CBU-72 were some of the first FAEs, and they demonstrated their effectiveness in clearing large areas by creating overpressure explosions that detonated hidden mines.

Over time, the US refined its thermobaric capabilities. During Operation Desert Storm in 1991, US forces used FAEs to destroy Iraqi bunkers and minefields. The reputation of these weapons grew due to their psychological and physical impacts on enemy forces, leading to their incorporation into various modern military arsenals. The US continues to maintain a range of thermobaric-capable weapons, including the AGM-114N Hellfire missile, which employs a Metal Augmented Charge (MAC) thermobaric warhead.

### Russia's Focus on Thermobaric Weapons

Russia has emerged as a leader in the development and use of thermobaric weapons, deploying them in conflicts ranging from Afghanistan in the 1980s to the Chechen Wars in the 1990s and more recently in Syria and Ukraine. The Soviet Union began developing thermobaric bombs and rocket systems in the late 20th century, with notable examples like the TOS-1 multiple rocket launcher system and ODAB-series bombs. These weapons were designed to target enemy fortifications and urban environments where conventional explosives were less effective.

Russia's TOS-1, mounted on a tank platform, has become one of the most recognizable thermobaric systems. It was used during the Soviet invasion of Afghanistan and later saw action in Chechnya. The TOS-1 fires thermobaric rockets capable of devastating entrenched enemy positions, making it a valuable asset in urban warfare. More recently, Russia's ODAB-1500 bomb, used in Ukraine, showcased the continuing evolution of these weapons. Equipped with advanced guidance systems, such as the Universal Correction and Guidance Module (UMPK), it can deliver precision strikes with massive destructive power.

### **Global Proliferation of Thermobaric Technology**

The spread of thermobaric technology is not limited to Russia or the United States. Several other nations have developed and deployed these weapons, recognizing their strategic value. China, for instance, has created a range of thermobaric systems, including artillery rockets and infantry weapons. North Korea is also reported to have thermobaric artillery systems, which it has reportedly supplied to allied non-state actors in the Middle East.

According to information in the public domain, Iran has developed thermobaric weapons, including artillery rockets, which have been used by its proxies in regional conflicts. This highlights the potential for non-state actors to access and deploy these weapons, raising concerns about their use in unconventional warfare and terrorist attacks. In fact, improvised thermobaric explosive devices (IEDs) were used in the Bali bombings in 2002, demonstrating the destructive potential of these weapons outside of military contexts.

India and Brazil are also among the countries that have developed thermobaric weapons. India's focus on this technology has been in response to its strategic needs in the region, while Brazil has sought to enhance its military capabilities. South Korea and Serbia have also reportedly developed thermobaric systems, further illustrating the global proliferation of this technology.

### **Ethical and Legal Controversies**

The use of thermobaric weapons has been the subject of significant ethical and legal debate. Their devastating effects on both infrastructure and human bodies have led to calls for regulation and, in some cases, outright bans. In 1980, an effort was made to ban thermobaric weapons under the United Nations Convention on Certain Conventional Weapons, but it failed to gain sufficient support.

Critics argue that thermobaric bombs should be classified as weapons of mass destruction, especially when used in populated areas. The intense blast and vacuum effects can lead to horrific civilian casualties, particularly in urban warfare. However, many nations maintain that thermobaric weapons are a necessary tool for specific military objectives, particularly in environments where fortified positions or tunnels make conventional explosives less effective.

### **The Future of Thermobaric Weapons**

Despite the ethical concerns, thermobaric weapons remain a key component of military arsenals around the world. Their ability to destroy hardened targets and fortifications with fewer resources makes them a valuable asset in modern warfare. In urban combat, where enemy forces often hide in buildings or underground, thermobaric bombs provide a unique capability to flush out or eliminate entrenched positions.

The continued development and proliferation of these weapons suggest that they will remain a fixture in global conflicts for the foreseeable future.

<https://www.financialexpress.com/business/defence-explainer-the-growing-use-of-thermobaric-weapons-3623496/>

*Fri, 27 Sep 2024*

## **Army Prepares for Apache Helicopter Induction After 6-month Delay**

After more than six months of delay, the Indian Army is finally set to receive its first batch of three AH-64E Apache attack helicopters in December. Originally scheduled for delivery in May and July, the delay was attributed to manufacturing setbacks caused by supply chain issues, according to a defence source. Despite these challenges, Boeing has now confirmed the delivery schedule, with three helicopters arriving in December and another three expected in the months following.

The procurement of the Apache helicopters marks a significant milestone for the Army's aviation capabilities. Priced at approximately \$800 million, the acquisition of these six helicopters, signed in February 2020, forms part of the Army's ongoing effort to modernize its aerial attack fleet. As part of this deal, Boeing provided training for six pilots and 24 technicians from the Indian Army in the US., ensuring readiness for the new equipment. The Apaches are expected to be deployed in desert regions where their combat abilities, particularly in countering armoured threats, will be maximized.

In preparation for the Apache induction, the Army raised the 451 Aviation Squadron at Jodhpur in March 2023, which will operate these helicopters. These will be the second attack helicopters in the Army's inventory, following the indigenous Light Combat Helicopter (LCH) developed by Hindustan Aeronautics Ltd. (HAL). The Army plans to use the LCH primarily in high-altitude areas like Ladakh, where it is specifically designed to perform better than the Apaches, which face operational limitations at high altitudes.

The delay in Apache delivery was also addressed at the political level. When Defence Minister Rajnath was in the US recently, he had raised the issue of the delay in the delivery of these helicopters with the US authorities.

The Army has been advocating for the procurement of additional Apaches, with discussions ongoing about acquiring 11 more units. In 2022, the Chief of Defence Staff (CDS) ordered a study to assess the overall need for armoured helicopters across India's armed services, which endorsed the requirement for 39 attack helicopters, including the Apache.

The Indian government's broader strategy for enhancing its attack helicopter fleet involves not just foreign acquisitions but also ramping up the indigenous production of the LCH.

As reported previously, approval has been given by the Defence Acquisition Council (DAC) for the purchase of 156 LCH units for the Army and Air Force. This is in addition to the 15 units currently being procured under limited series production. The Army's growing helicopter fleet also includes 75 Rudra helicopters, the armed version of HAL's Advanced Light Helicopter (ALH).

While the Apaches offer formidable firepower, their deployment will complement rather than replace indigenous platforms like the LCH. Together, these helicopters will enhance the Army's aerial warfare capabilities across varied terrains, from the deserts to the high-altitude zones, ensuring robust operational readiness for future conflicts.

As the Army prepares to welcome its new Apache helicopters, the ongoing modernization efforts underline India's focus on strengthening its defence capabilities with both foreign technology and

domestic innovation. This balanced approach will likely provide the Army with the tactical flexibility needed in a complex and evolving security environment.

<https://www.financialexpress.com/business/defence-army-prepares-for-apache-helicopter-induction-after-6-month-delay-3623654/>



*Mon, 30 Sep 2024*

## **SAAB's Gripen Fighter Jets: A game-changer or a risky proposition for India's defence needs?**

As India advances toward the procurement of 114 Multi-Role Fighter Aircraft (MRFA) for the Indian Air Force (IAF), Sweden's SAAB has thrown its hat into the ring, making a compelling case for its Gripen jets. SAAB's ambition is to establish a comprehensive ecosystem in India, promising not just advanced technology but also a significant transfer of knowledge and manufacturing capabilities.

However, despite its promises, the Gripen faces stiff competition and scrutiny, particularly in light of India's push for indigenous defense manufacturing under the 'Aatmanirbhar Bharat' initiative.

### **SAAB's Gripen Jets: Technological Marvels**

At the core of SAAB's offer are the Gripen-E and Gripen-F variants, designed with advanced avionics, powerful engines, and versatile payload capabilities. The Gripen E, powered by the GE FE14G engine, boasts impressive range and a capacity to carry a wide range of weaponry through its ten hardpoints.

Kent-Ake Molin, Head of Gripen for India Programme, highlights the aircraft's advanced technology, stating, "We envisioned Gripen E to be an extension of the pilot's mind and body, and we achieve it through advanced Human Machine Collaboration (HMC)."

This HMC is a key selling point, with SAAB emphasizing its ability to seamlessly integrate the pilot's decision-making with the machine's capabilities. The Gripen-E's cockpit, redesigned with this concept in mind, incorporates a hands-on-throttle-and-stick (HOTAS) setup, reducing distractions and enhancing situational awareness. The aircraft's radar and infrared tracking systems are top-notch, and it can carry a versatile mix of armaments, making it suitable for both air-to-air and air-to-ground missions.

Additionally, the fighter jet has undergone extensive upgrades, including a new AESA radar and increased fuel capacity, allowing it to stay airborne longer than previous models. Its integration of Artificial Intelligence (AI) is another factor that sets it apart, providing the pilot with timely, relevant information to execute missions more effectively.

### **The India Proposition: Local Manufacturing and Technology Transfer**

A major part of SAAB's proposal is the establishment of a production and upgrade ecosystem within India, aligning with the 'Aatmanirbhar Bharat' initiative. SAAB already has a successful model in place in Brazil, where it has set up local production and test facilities for the Gripen. According to Molin, SAAB is eager to replicate this success in India.

“We have already established a supply chain in India, and we are looking to gear up and see how we can build or establish a supply network for Gripen in India, to be made in India, being part of the Gripen industrial global system and also to export to other nations,” he said.

This approach seems tailor-made for India’s defense goals. By manufacturing the jets locally, SAAB aims to reduce dependency on foreign equipment and bolster India’s defense industry. The company claims it can deliver the first batch of fighter jets within three years if awarded the contract, emphasizing that it has the capability to ramp up production quickly.

However, while SAAB’s plans for local production and technology transfer sound promising, the reality of such deals is often more complex. Building a supply chain in India from scratch and integrating it with SAAB’s global system will require significant investment, time, and coordination. Moreover, SAAB’s success will depend on how effectively it can collaborate with Indian companies, both large and small, to create a sustainable ecosystem.

### **Potential Drawbacks: Can SAAB Deliver?**

While SAAB’s Gripen-E offers cutting-edge technology and a commitment to local production, there are potential drawbacks that cannot be ignored. One of the primary concerns is the extent of SAAB’s reliance on foreign original equipment manufacturers (OEMs) for key components. Many critical parts of the Gripen, including the engine, radar systems, and avionics, are sourced from the US, Britain, and other European nations. This reliance could pose challenges for India’s defense self-reliance goals and expose the country to supply chain risks in the future.

Moreover, SAAB’s proposal must contend with India’s commitment to the Light Combat Aircraft (LCA) Tejas program. The government has been investing heavily in the indigenous Tejas fighter, which has seen significant improvements in recent years. While the Gripen may offer more advanced capabilities, India may be reluctant to fully embrace a foreign jet at the expense of its own defense projects.

Another potential issue is whether SAAB’s ambitious promises will translate into tangible benefits for India. The company’s track record in Brazil is impressive, but the Indian defense landscape presents unique challenges. The integration of advanced technologies like Artificial Intelligence and quantum computing, as promised by SAAB, will require substantial investment in infrastructure and expertise in India. These are areas where the country is still developing, and there is a risk that the technology transfer may not be as seamless or rapid as anticipated.

### **High Stakes for India’s Air Power**

SAAB’s Gripen-E undoubtedly presents a strong contender for India’s MRFA program, offering state-of-the-art technology, local production, and a substantial transfer of knowledge. However, the decision to go with the Gripen involves weighing these advantages against several risks, including dependency on foreign OEMs and the potential impact on India’s indigenous defense projects.

As India moves closer to making a decision, the Gripen’s future in the country will depend not just on its technological prowess, but also on SAAB’s ability to deliver on its promises of local production and technology transfer. For India, the stakes are high, and the Gripen offers both opportunity and risk in equal measure.

<https://www.financialexpress.com/business/defence-saabs-gripen-fighter-jets-a-game-changer-or-a-risky-proposition-for-indias-defence-needs-3625907/>

## Space: The New Battlefield for Future Warfare

The nature of warfare is evolving, with space emerging as a critical domain in shaping future battles. Lessons from the ongoing Russia-Ukraine war and the Israel-Hamas conflict have provided key insights into how countries can harness space-based technologies to gain a tactical advantage. The Indian Army, keen to remain at the forefront of modern military strategies, is actively exploring the use of space technology to enhance its artillery systems and overall combat capabilities.

### Learning from Global Conflicts: Adapting to a New Warfront

Recent conflicts have showcased how space-based systems, particularly satellite navigation and communication networks, are playing pivotal roles in modern warfare. Lt Gen Adosh Kumar, Director General of Artillery for the Indian Army, noted the growing reliance on precision strikes and the vulnerabilities that arise when these systems are compromised. From jamming GPS signals to targeting key satellite infrastructure, modern combat has highlighted the importance of securing space assets.

Drawing from these observations, the Indian Army is making concerted efforts to adapt its strategies. One significant change is in the deployment of the 'Pinaka Multi Barrel Rocket Launcher System', a powerful tool in India's artillery arsenal. Pinaka's range has been upgraded from 40 kilometers to 75 kilometers, allowing it to strike enemy targets more accurately and from a safer distance. With these enhancements, India is positioning itself to handle future conflicts where reliance on space-based precision will be critical.

### NavIC: India's Indigenous Navigation System

A key component of India's strategy is the integration of NavIC (Navigation with Indian Constellation), an indigenous satellite navigation system developed by ISRO. NavIC is designed to reduce India's dependency on foreign GPS systems, which have been unreliable in the past, especially during the 1999 Kargil War when Western powers disrupted India's access to GPS. NavIC promises greater control and security over India's navigational needs, offering a robust alternative for both military and civilian purposes.

NavIC operates with a constellation of seven satellites, covering India and areas extending up to 1,500 kilometers beyond its borders. Its L5 frequency band, a protected frequency exclusive to India, ensures minimal interference from other systems. This is a significant improvement over the widely used GPS, which shares its frequency with other global systems. By providing better accuracy and reliability, NavIC will give the Indian military an edge in precision targeting and navigation, especially in GPS-denied environments.

The introduction of NavIC into India's armoured vehicles and artillery systems is a game changer, especially as future wars are likely to involve more contested space domains where traditional GPS systems could be jammed or disrupted. The integration of NavIC into the Pinaka system, for instance, allows the Indian Army to continue executing precise strikes, even if foreign satellite systems are compromised or denied.

### Preparing for Space-Driven Warfare

The evolution of space-based warfare is already reshaping military strategies worldwide, and India is no exception. Countries like the US and Russia have long been developing capabilities to fight in space, including anti-satellite (ASAT) weapons and satellite jammers. India, aware of these global trends, is focusing on developing its own counter-space technologies to protect its satellites and ensure its dominance in space-based operations.

One of the key lessons from the ongoing Russia-Ukraine war is the importance of space for real-time intelligence, surveillance, and reconnaissance (ISR). Satellites provide critical data that allow for swift, informed decisions in the heat of battle. The Indian military is actively working on enhancing its ISR capabilities, integrating satellite data into its command structures to improve battlefield awareness and decision-making.

### **The Role of Artillery in Future Warfare**

The Indian Army is also looking at space as a vital component in its artillery modernization efforts. One example is the adaptation of Area Denial Ammunition Systems (ADMS), inspired by the Russia-Ukraine war, where landmines are deployed via rockets over a 30-40 kilometer range. The Pinaka system is being adapted for this purpose, enabling the Indian Army to deploy landmines remotely and more safely, minimizing risks to personnel.

Furthermore, the need for precision strikes without reliance on GPS has become a priority. As witnessed in the April 2023 Iranian missile strike on Israel, which failed due to navigation disruptions, the Indian Army is preparing to counter similar scenarios by integrating GPS-denial systems into its artillery. These systems would ensure that India's artillery can function effectively in environments where satellite signals may be jammed or denied by adversaries.

### **The Space-Driven Future of Warfare**

As countries like India continue to embrace the strategic advantages of space, the future of warfare is being rewritten. Satellites, once seen as passive tools for communication and navigation, are now integral to modern combat operations, providing real-time intelligence, precision targeting, and battlefield awareness. The Indian Army's ongoing efforts to incorporate space-based technologies, from NavIC to advanced rocket systems, demonstrate its commitment to staying ahead in this rapidly changing domain.

<https://www.financialexpress.com/life/science-space-the-new-battlefield-for-future-warfare-3625891/>





**Press Information Bureau**  
**Government of India**

**Ministry of Science & Technology**

*Fri, 27 Sep 2024*

## **Prime Minister Shri Narendra Modi inaugurated PARAM Rudra Supercomputer at S.N. Bose National Centre for Basic Sciences (SNBNCBS)**

The inauguration of the PARAM Rudra supercomputer at the S.N. Bose National Centre for Basic Sciences (SNBNCBS) in Kolkata by the Prime Minister Shri Narendra Modi brings high performance computing facilities to the Eastern Region, benefitting around 10-12 institutions and thousands of researchers working in this region.

Developed under the National Supercomputing Mission (NSM), the PARAM Rudra series under the aegis of Ministry of Electronics and IT (MeitY) and Department of Science and Technology (DST), including installations in Pune and Delhi, is set to revolutionize research across multiple fields such as advanced materials, high-energy physics, earth sciences, and cosmology, marking a significant advancement in India's scientific and technological capabilities.

The PARAM Rudra supercomputer at S.N. Bose Centre, an autonomous institute of the Department of Science and Technology (DST) is expected to provide much-needed high-performance computing power to institutes in the Eastern Region. This facility will enable collaboration among the computational researchers in Institutes like Bose Institute, Saha Institute of Nuclear Physics (SINP), Indian Institute of Chemical Biology (IICB), and the Indian Institute of Science Education and Research (IISER) Kolkata. It will enable scientists in these institutions to perform complex calculations and simulations much faster, reducing the time required to solve intricate scientific problems.

The 838 TFLOPS NSM facility is poised to significantly enhance research across a variety of scientific domains through advanced high-performance computing capabilities.

In materials science it will help high-throughput Computational Materials Design, accelerate the discovery and design of new materials along with rapid identification and development of new materials.

In Earth Science, it will support Computational Modelling of Earth and Planetary Materials. This includes integrating first-principles calculations with LHDAC (Laser Heated Diamond Anvil Cell) experiments.

In biological sciences, it will facilitate the use of machine learning to study biomolecular functions, aiding in the understanding of diseases and the development of new treatments. In Chemical Science it can help exploring the electronic structure of molecules to understand chemical reactivity benefitting quantum chemistry.

Additionally, the supercomputer will be crucial for high-energy astrophysics research, providing insights into the fundamental properties of matter and the universe. It will help understand Non-Equilibrium Properties of Strongly Interacting Matter by conducting calculations related to dense matter as studied in the ALICE experiment at CERN and modelling the universe's structure and dynamics, including the interplay of gravitational waves, high-energy photons, and astrophysical neutrinos.

However, the benefits of the PARAM Rudra supercomputers extend far beyond the boundaries of scientific research. As the Prime Minister pointed out, the advent of such high-performance computing technologies will not only help India compete globally in areas like space exploration and semiconductor manufacturing but will also have a tangible impact on the everyday lives of citizens. The new capabilities of these machines are expected to play a crucial role in disaster management, economic growth, and in enhancing the ease of doing business, making them central to India's progress in Industry 4.0.



In addition to supporting advanced research, the PARAM Rudra supercomputer will significantly improve India's ability to predict weather and climate-related phenomena.

The PARAM Rudra supercomputer is a reflection of India's commitment to self-reliance in high-performance computing. By investing in such advanced technologies, the country is ensuring that its scientific community has access to the tools needed to drive innovation and make global contributions.

The inauguration of this supercomputer represents a crucial step in India's scientific journey, where advanced computing capabilities will not only fuel research but also improve the quality of life for citizens across the nation.

As India continues to prioritize technological advancements, the PARAM Rudra series will play a key role in shaping the nation's future in science, industry, and beyond.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2059690>



## **Control over Assembling Nanostructures can help Create New Materials useful for Biomedicine, Electronics**

A new breakthrough in understanding the process of controlling the assembly of tiny molecular units into complex structures holds promise for creating new materials that could revolutionize industries like electronics, healthcare, and beyond.

Supramolecular self-assembly is a process where small molecules spontaneously organize into larger, well-defined structures without external direction. Understanding this process is crucial for creating new organic materials that can be used to develop nanodevices—tiny machines useful for performing specific tasks at the molecular level.

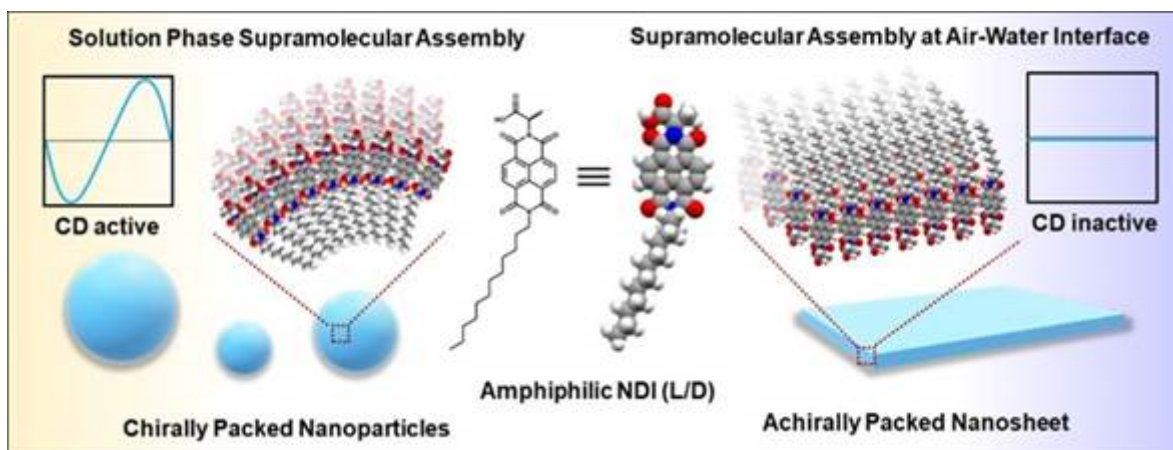
A group of Indian researchers from the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru, in collaboration with the researchers from Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru both autonomous institutes under Department of Science and Technology (DST) explored the self-assembly behaviour of specific molecules called chiral amphiphilic naphthalene diimide derivatives (NDI-L and NDI-D). They experimented with two different methods of assembling these molecules-- Solution Phase Assembly and Air-Water Interface Assembly.

The former involved assembling of molecules in a liquid solution leading to formation of spherical nanoparticles. These tiny particles displayed unique optical properties, such as strong mirror-imaged circular dichroism (CD) signals, which are important for materials that interact with light in precise ways.

The air water interface assembly involved assembling of molecules at the boundary between air and water, which the researchers also tested. At the air-water interface, instead of forming spherical nanoparticles, the molecules arranged themselves into flat, two-dimensional layers with irregular edges. Interestingly, these layers did not exhibit the same optical properties as the solution-assembled nanoparticles, indicating that the environment in which molecules assemble plays a critical role in determining their final structure and properties.

This discovery, recently published in ACS Applied Nano Materials, opens up exciting possibilities for creating new materials with tailored properties. For example, in the field of biomedicine, such materials could be used to develop more effective drug delivery systems that target specific areas of the body. In electronics, these materials could lead to the development of faster, more efficient devices.

This research by Dr. Goutam Ghosh, Mr. V.M.T. Naidu Moram and Dr. Padmanabhan Viswanath from CeNS along with Mr. Tarak Nath Das and Prof. Tapas Kumar Maji from JNCASR showcases the potential of using different assembly techniques to guide the formation of nanostructures, enabling scientists to create materials with specific functionalities. The findings not only advance the field of material science but also provide a foundation for future innovations in various industries.



<https://pib.gov.in/PressReleasePage.aspx?PRID=2059688>

# THE ECONOMIC TIMES

Sun, 29 Sep 2024

## Australian scientist confirm 100-year-old theory, discover new cell type that can heal chronic injuries

Scientists from the South Australian Health and Medical Research Institute (SAHMRI) and the University of Adelaide have announced the discovery of a previously unknown cell type called EndoMac progenitors. This finding, a result of nine years of dedicated research, fills a crucial gap in the understanding of how mammals heal. It could pave the way for new treatment options for chronic conditions, particularly diabetes.

### Characteristics of EndoMac Progenitors

EndoMac progenitor cells were identified in the outer layer of the aortas of adult mice. These cells possess the unique ability to transform into two types of important cells: endothelial cells, which help form blood vessels, and macrophages, which are immune cells responsible for tissue repair and defense.

Dr. Sanuri Liyanage from SAHMRI stated, "The EndoMac progenitor cells possess the unique ability to transform into two specific cell types of cells: endothelial cells that form blood vessels and macrophages that are immune cells responsible for tissue repair and defence."

She elaborated, "These cells have an important job: to help grow blood vessels when the body calls for it." Furthermore, Dr. Liyanage mentioned, "They are activated by injury or poor blood flow, at which point they rapidly expand to aid in healing."

### Implications for Human Health

The implications of the discovery of EndoMac progenitor cells could be revolutionary for treatments in humans. Because these cells do not express typical "self" markers, they are less likely to be attacked by the immune system, making them ideal candidates for stem cell therapy.

Ongoing research suggests that these cells could significantly improve healing in conditions like diabetes, where the body struggles to repair itself effectively. According to the researchers, the cells showed remarkable potential when transplanted into diabetic wounds, leading to rapid

improvements in healing. Dr. Liyanage noted, "When we transplanted these progenitors into diabetic wounds, we saw a dramatic improvement in healing within days."

### **Historical Context of the Discovery**

This discovery is particularly noteworthy as it addresses a long-standing hypothesis. For almost a century, scientists have theorized that such cells existed, but until now, an adult version had never been found. The team, led by SAHMRI's Professor Peter Psaltis, has made significant strides in identifying these cells, which were hidden in the aorta of adult mice.

### **Future Research Directions**

The researchers are now investigating the presence of similar cells in the human body, seeking to unlock their full potential for regenerative medicine. With more research, these cells could become pivotal in advancing treatments for patients whose bodies struggle to heal naturally. The findings have been published in the journal *Nature Communications*, emphasizing the need for ongoing exploration in this promising field of study.

<https://economictimes.indiatimes.com/news/science/australian-scientist-confirm-100-year-old-theory-discover-new-cell-type-that-can-heal-chronic-injuries/articleshow/113760116.cms>

# THE ECONOMIC TIMES

*Sun, 29 Sep 2024*

## **Chandrayaan-3 landed on a 3.85 bn-year-old lunar crater, says researcher**

Scientists have identified that India's Chandrayaan-3 mission may have landed in one of the Moon's oldest craters. Researchers from the Physical Research Laboratory and Indian Space Research Organisation (ISRO) analyzed images from the mission and satellites to make this discovery. The crater is believed to date back to the Nectarian period, around 3.85 billion years ago.

According to a PTI report, S Vijayan, an associate professor in the Planetary Sciences Division, Physical Research Laboratory, said that the landing site provides a unique geological setting. "Chandrayaan-3 landing site is a unique geological setting where no other missions have gone.

The images from the mission's Pragyan rover are the first on-site ones of the Moon at this latitude. They reveal how the Moon evolved over time," he said.

The crater, roughly 160 kilometers in diameter, was found partially buried under material thrown out from the South Pole-Aitken basin. This basin is known to be the Moon's largest impact basin. When an impact basin of this size forms, material from deep within the Moon is ejected to the surface.

"Forming of ejecta is similar to when you throw a ball on sand and some of it gets displaced or thrown outwards into a small pile," Vijayan explained.

The Pragyan rover, deployed by the Vikram lander of the Chandrayaan-3 mission, also observed ejecta from another impact crater near the landing site. The images from the rover and satellites showed materials from various regions of the Moon.

"Further, near the landing site, ejecta or material 'thrown out' from another impact crater further away was observed -- images captured by the Pragyan rover revealed that material of the same nature was present at the landing site," Vijayan said.

The Pragyan rover was deployed on the lunar surface by the Vikram lander, onboard the Chandrayaan-3. "Together, the images from the mission and satellites showed that the Chandrayaan-3 landing site consists of material deposited from different regions of the Moon," he said. The Chandrayaan-3 mission, launched by ISRO from Bengaluru, achieved a soft landing near the Moon's south pole on August 23, 2023. The landing site was later named Shiv Shakti Point on August 26, 2023.

Researchers validated their findings by observing other craters from the Nectarian period, most of which were found to be severely degraded. This further supports their discovery of a buried crater and illustrates the effects of space weathering. The study's results were published in the journal Icarus.

<https://economictimes.indiatimes.com/news/science/chandrayaan-3-landed-on-a-3-85-bn-year-old-lunar-crater-says-researcher/articleshow/113779381.cms>



Sat, 28 Sep 2024

## **IIT Kanpur unveils India's first detonation tube research facility, aims to advance research in combustion & propulsion**

The Indian Institute of Technology (IIT) Kanpur has launched a Detonation Tube Research Facility (DTRF) in the Combustion and Propulsion Laboratory of the institute to advance research and knowledge in combustion and propulsion.

The facility, funded by the Aeronautics Research and Development Board, DRDO, and the Indian Space Research Organization (ISRO), has been Developed by Prof. Ajay Vikram Singh and his research group from the Department of Aerospace Engineering, a press release issued by IIT Kanpur informed.

Notably, the facility had successfully demonstrated the propagation of a detonation wave in a laboratory setting for the first time in India, accomplishing this feat in a record time of two years, the release added.

As per IIT Kanpur, the DTRF will enable research that can help in the following ways:

- Prevent mining, industrial, and home accidents
- Predict the path of wildfires
- Increase the efficiency of high-speed detonation-based engines
- Strengthen safety protocols in oil, gas, and pharmaceutical industries
- Enhance understanding of supernovas

Furthermore, the DTRF is also designed to advance aerospace applications and support studies on flame acceleration, deflagration-to-detonation transition, and safety in industries handling flammable materials.

Additionally, research into detonation-based engines can help develop powerful devices that operate on the principle of multiple explosions, potentially replacing current engines in aircraft and rockets for more efficient travel, informed IIT Kanpur in the release.

Notably, the Rotating Detonation Engines (RDEs) which comprise a key focus of the facility, offer up to 25% greater fuel efficiency, higher energy density, and fewer moving parts, making them ideal for space exploration and military aircraft.

Prof. Ajay Vikram Singh, associate professor in the Department of Aerospace Engineering at IIT Kanpur informed that the DTRF will explore the physics behind detonations and explosions to advance knowledge in the field of combustion and propulsion.

“We are studying flame acceleration mechanisms in confined spaces, which are critical for preventing severe explosions in processing units and storage facilities. The knowledge will help to stop accidental detonations and enhance safety in various end-use cases. We are also carrying out research on high-speed detonation-based engines to control these phenomena for more efficient energy conversion,” Prof Singh stated.

Lauding Prof Singh and his team on the achievement, IIT Kanpur Director Prof. Manindra Agrawal said he believes the Detonation Tube Research Facility will elevate India’s status in the global aerospace community.

He added that the launch of the DTRF positions IIT Kanpur at the forefront of propulsion research, providing the nation with tools to innovate in critical sectors, thereby placing India among a select group of countries capable of exploring advanced detonation technologies.

<https://www.hindustantimes.com/education/news/iit-kanpur-unveils-india-s-first-detonation-tube-research-facility-aims-to-advance-research-in-combustion-propulsion-101727509889051.html>

# ThePrint

Sun, 29 Sep 2024

## **How govt plan to deploy small nuclear reactors can help power India’s transition to net zero**

Within the atomic and nuclear power community, there is much excitement over India’s plans to deploy small indigenous reactors, which will help the country transition away from fossil fuels, in partnership with the private sector. They will replace captive thermal power facilities in order to reach net-zero emissions by the current target year of 2070.

The government plans to deploy 40-50 of these nuclear reactors over the next decade in partnership with the private sector. This is part of the 220-megawatt Bharat Small Reactor (BSR) that Finance Minister Nirmala Sitaraman had unveiled in her budget speech in July. The announcement officially changed India’s nuclear policy because the Atomic Energy Act of 1962 did not allow private companies to participate in generating nuclear power.

The BSRs will play an important role in steadily shifting India’s nuclear strategy to generate large amounts of power to reduce emissions, meet net-zero climate targets, and provide power for hard-to-decarbonise industries like steel and cement.

The BSR reactor technology and scale are modelled along the small modular reactors (SMR) that are gaining popularity worldwide but with significant differences. Policy discussions and regulations that have commenced are expected to lead to changes that will eventually see reactors modelled after the Kalpakkam reactor in Tamil Nadu over the next few decades.

India currently has 23 reactors operating in eight nuclear plants across the country. However, the Kalpakkam observatory, located about 75 km from Chennai, is India's first focus for the new Prototype Fast Breeder Reactor programme, which will contribute to BSRs.

As of today, nuclear energy provides less than 3.5 percent of the country's total power, despite being the fifth largest source of electricity for the country.

"Forty-five or so BSRs will have an installed electricity generation capacity of 10 gigawatts, which is much higher than the current capacity of 8.18GW. This will make India a part of the global supply chain for SMRs when the demand for SMRs is expected to multiply to reach net-zero before 2050 in the US and Europe, which have contributed most of the CO2 emissions responsible for global warming today," said R. Srikanth, dean at the National Institute of Advanced Studies, who heads the energy, environment, and climate change programme. ThePrint explains what the BSR programme will do and how it will differ from the initiatives of other nations that are using smaller nuclear reactors to transition towards greener energy.

### **What are small reactors**

Small modular reactors (SMR) refers to a newly developed and upcoming class of small land-based nuclear fission reactors, which can be built and fabricated in specialised factories but can be assembled on site. These can provide an electrical output anywhere from 5 megawatts to 300 megawatts per day, approximately a third of the power generated by conventional nuclear plants. The city of Mumbai, for context, uses up to 3,500 megawatts (MW) per day on average and touched a peak of 4,300MW in May of this year.

SMRs are becoming increasingly popular in many countries in Europe, the US, and South Asia. China and Russia today have operational reactors. These take anywhere from 2 to 5 years to become functional.

### **How Bharat Small Reactors differ from Small Modular Reactors**

Small reactors that will be a part of the BSR programme are different from SMRs. While they are indeed small in size compared to traditional fission reactors associated with ones like Fukushima and Chernobyl, they do not come pre-fabricated. The Indian programme will base its design on the existing plant at Kalpakkam, the Madras Atomic Power Station (MAPS). This was India's first fully domestically built nuclear plant with two functioning units. Each generates 200 megawatts of electricity and has been operational since the 1980s.

### **Future reactors will be built based on Kalpakkam's design, explained Srikanth.**

"Because of the huge land requirements, vagaries of the weather, the intermittency of solar & wind power generation, and the social & environmental implications of large dams for hydropower, renewables like solar, wind, and water alone cannot provide the 24x7 electricity required to meet the rapidly growing baseload and peak demand of the country" he explained. "To replace coal, another form of baseload power is required."

### **Advantages of smaller reactors**

Having single, large projects is a major capital risk, explained Srikanth, and when private players come into the picture, smaller and quicker reactors are more economical and start functioning quicker.



Another advantage of smaller reactors when compared to traditional ones is the smaller exclusion zone—that is, the radius of distance to be maintained from the plant in case of an accident. While for reactors like Chernobyl, this was 30km, newer, smaller reactors including those that will be built in India will have exclusion zones of 2.5km, 1km, or even half a kilometre.

The technology has been well established with a functioning reactor in India for at least 30-40 years, thus increasing the country's experience with the design and its features. There are other "passive" safety features as well: there is no need for backup electricity to pump in water as the reactors will automatically flood in case of overheating. However, renewables continue to have the cost advantage.

Hybrid renewable energy systems today combine solar, wind, biomass, and lithium storage, explained Upendra Tripathy, Former Secretary of MNRE and Founder-Director of International Solar Alliance. "The cost of solar energy has come down drastically due to increasing volumes, more efficient technology, and policy support from governments. Fission-based atomic energy has a long way to go to be as ubiquitous and affordable as solar is today."

He added that at the moment, according to India's Nationally Determined Contribution (NDC) to the United Nations Framework for Climate Change (UNFCCC), the operating capacity currently is about 6 gigawatts, with 4 GW in the pipeline. India is currently targeting 63 gigawatts by 2032.

### **Tech behind Bharat Small Reactors**

The reactor at Kalpakkam is a pressurised heavy-water reactor (PHWR). It uses heavy water—oxygen with the hydrogen isotope deuterium instead of hydrogen—as a coolant, and typically uranium for fuel. The heavy water prevents boiling and also enables more economical use of uranium. The smaller size of the reactor also results in comparatively less nuclear waste generation.

"While private companies will come in and construct the reactors as per the NPCIL design approved by the Atomic Energy Regulatory Board (AERB), they are not involved in the design of it or in the disposal of nuclear waste, which the government will continue to be responsible for," explained Srikanth.

### **Where & when will these BSR reactors be built**

Small reactors are expected to replace coal power, ultimately, and are thus planned to be built where today's coal power plants are. Srikanth, who has been involved in policy proposal discussions for reactors, explained that they have proposed building reactors by repurposing land so that the transition to nuclear can continue alongside coal briefly to prevent loss of base power.

Former Union Power Secretary Alok Kumar explained that India has a lot of "captive" power plants that run on coal and the existing reactor design will be made safer to be built on these plots of land. This will enable the reactors to use the same electrical grid connections and water supply as well.

"The larger legal challenge will be the regulatory framework now," explained Kumar. "With a lot of difficulties, the government has now permitted the joint venture between NPCIL and NTPC to set up a plant in Rajasthan, and even for a government project it took a long time." Unit 7 at Rajasthan Atomic Power Plant was approved in 2009, with construction beginning in 2010, finally reaching criticality (sustained nuclear fission chain reaction that produces power) just last week.

The Rajasthan Atomic Power Plant's Unit 7 reactor does not fall under BSR, as it is a larger reactor that provides 700 megawatts.

The very first reactors might become operational by the end of the decade, explained the experts, as the next steps since budget allocation would be for regulation and policies to come into place before private industries start building nuclear reactors.

<https://theprint.in/science/how-govt-plan-to-deploy-small-nuclear-reactors-can-help-power-indias-transition-to-net-zero/2289564/>



*Mon, 30 Sep 2024*

## **Longshot Space aims to reach orbit with massive cannon**

US Based Longshot Space has just received \$8 million in funding to build the world's biggest gun in the Nevada desert. The design of the canon is based on the German World War II gun, Vengeance 3 (V3), which used a series of secondary propellant charges to increase the velocity of a projectile.

Longshot Space has been steadily improving its technology, with its latest gas gun capable of shooting projectiles at Mach 4.2. The startup has bagged an Air Force contract, with the primary backer being Starship Ventures.

On the left the Space Gun from Things to Come, and on the right, the Columbiad as illustrated in From the Earth to the Moon. (Image Credit: Public Domain). The hypersonic accelerator is meant to provide low-cost, on-demand access to Earth orbit. There is a requirement to inject tremendous quantities of materials into space to meet the demands of the orbital economy.

Rockets are expensive, and there are limits to which progressively bigger rockets can be built. Kinetic space launches can bring down the costs further, and potentially allow for lifting vast quantities of raw materials, supplies, satellites, or anything else into Earth orbit. The forces however, would be too extreme for launching humans. Longshot Space intends to use a reusable vehicle on its space canon.

### **Kinetic Orbital Launches**

When humans started discovering the wonders of the cosmos after the invention of the telescope, one of the earliest and most obvious methods of reaching the skies was to use a giant gun. The Jules Verne novel From the Earth to the Moon featured a massive, ground shaking cannon known as the Columbiad.

The design was a combination of a cannon, a howitzer and a mortar, with a magazine that used gunpowder that hurled an artillery shell which was actually a space capsule, while the barrel was positioned at a 45 degree angle. The 1936 movie Things to Come, that got a shoutout in the first season of the Rocket Boys series, also uses a giant gun to launch a spaceship beyond Earth orbit.

<https://www.news9live.com/science/longshot-space-aims-to-reach-orbit-with-massive-cannon-2709234>

## First science paper published on Chang'e-6 lunar samples

A team of Chinese researchers have published the first scientific research paper based on examination of the samples returned from the far side of the Moon by the Chang'e 6 mission. These are the first far side samples to be returned to the Earth, with the paper noting unique characteristics that are distinct from all the near side samples studied in Earth labs so far.

The study was conducted by the National Astronomical Observatories operated by the Chinese Academy of Sciences, the Lunar Exploration and Space Engineering Centre, as well as the Beijing Institute of Spacecraft System Engineering.

The researchers discovered that the samples of lunar soil or regolith have a lower density when compared to previous samples, indicating a composition that is loosely structured and more porous. The amount of the plagioclase group of minerals is much higher than the samples returned by the Chang'e 5 mission, while the content of another mineral, olivine, is much lower.

The examination has also revealed that the samples are primarily composed of breccia, agglutinate, glasses, leucocrate and primarily basalt. There are also trace quantities of thorium, uranium and potassium, which is a different from the samples returned by the Chang'e 5 mission as well as the NASA Apollo missions.

### Why are sample return missions important?

So far most of the missions to the surface of the Moon have been oriented towards exploration and science research. The Odysseus Lander by Intuitive Machines became the first commercial mission to successfully execute a soft landing on the lunar surface, paving the way for commercial lunar activities.

Humanity is now looking at the Moon as the seventh continent, and any sustainable effort will require the use of locally available resources, for constructing facilities and extracting rocket fuel. For this purpose, it is necessary to prospect and understand what resources are available on the Moon.

Laboratories on Earth can examine the material much more comprehensively than any sensors or instruments packed onto a spacecraft. The Chan'e 6 mission was launched on 3 May 2024, and returned on 25 June 2024, bringing back nearly two kilograms of lunar soil. The paper has been published in the National Science Review magazine.

<https://www.news9live.com/science/first-science-paper-published-on-change-6-lunar-samples-2708637>

## **Researchers call for greater collaboration between industries and research institutes**

Although India has a lot of talent in science and technology research, it is not being translated into innovation and product development due to lack of coordination between research institutes and industries, said Prof V Ramgopal Rao, Group Vice-Chancellor at BITS Pilani.

He addressed this issue while delivering the S V Narasaiah Memorial Lecture at the Indian Institute of Science (IISc) in Bengaluru on Saturday.

Prof Rao's lecture was titled -- Synergizing academic research and innovation for product development: A Blueprint for Atma Nirbhar Bharat.

“Although India ranks No 1 in number of institutions and stands second in number of students enrolled in higher education institutions, we are 40th in for innovations, 54th in percentage of GDP allocated for R&D. India's growth rate is 11 per cent in scientific publications as compared to the world average of 4 per cent. We need to focus on impact and translation of knowledge into wealth,” he lamented.

“Indian research is ‘solution looking for a problem’ rather than ‘solution to a problem’. NEP is good but it is not yet implemented in the right spirit. Ease of doing research is lacking. It takes one year to get any equipment for research. He suggested that an idea factory approach would help foster innovation by bringing together unlike minds, different disciplines and different attitudes.

Prashanth Sakhamuri, the managing director of HHV and son of S V Narasaiah said, “He never cared much for his own pockets due to his leftist political leaning, his main aim was to advance India's technological capabilities through collaboration with research institutes like IISc.”

S V Narasaiah born September 28, 1924 who started out as a journalist and activist and later founded the Hind High Vacuum Pvt Ltd (HHV) at IISc in 1965 an industry leader in vacuum technology and thin-film optics.

<https://www.deccanherald.com/science/researchers-call-for-greater-collaboration-between-industries-and-research-institutes-3211412>

