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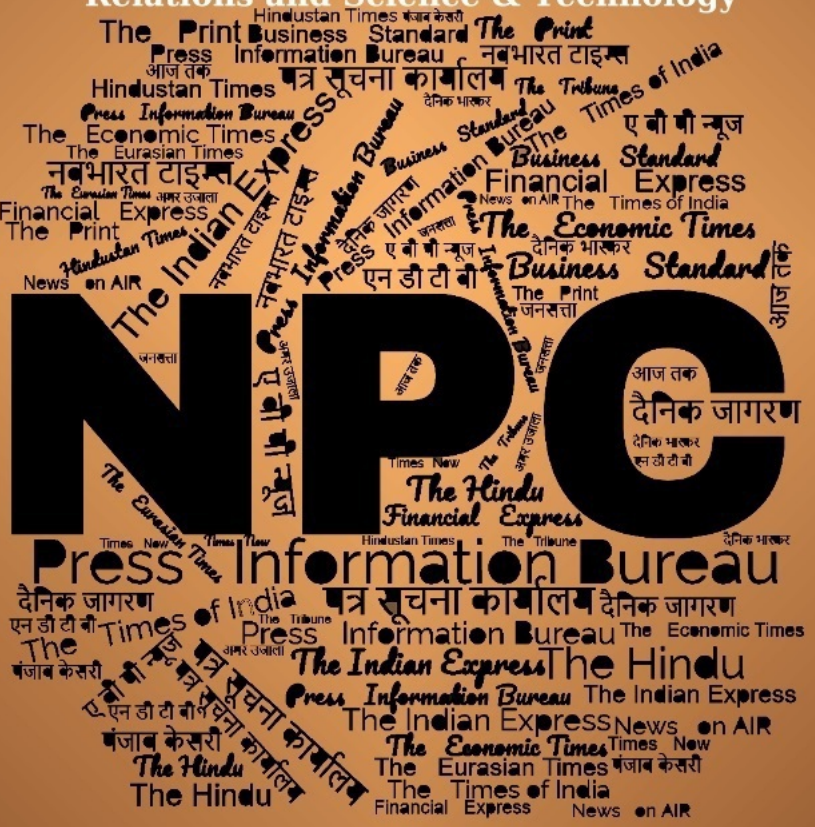
समाचार पत्रों से चयनित अंश
Newspapers Clippings

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

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology



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DRDO News

अब दुश्मन के ठिकानों का हवा में होगा 'एक्स-रे'! DRDO बना रहा अगली पीढ़ी का ‘फोटोनिक रडार’, फाइटर जेट की क्षमता होगी घातक

Source: Zee News, Dt. 09 Mar 2026

DRDO Photonic Radar: अब तक अधिकतर आधुनिक फाइटर जेट में गैलियम नाइट्राइड (GaN) आधारित रडार इस्तेमाल हो रहे हैं. जो पुराने गैलियम आर्सेनाइड (GaAs) रडार से ज्यादा ताकतवर और भरोसेमंद माने जाते हैं. लेकिन फोटोनिक रडार केवल एक नया सेमीकंडक्टर अपग्रेड नहीं है. इसमें रेडियो सिग्नल बनाने और प्रोसेस करने के लिए इलेक्ट्रॉनिक सर्किट की जगह लेजर और ऑप्टिकल फाइबर का इस्तेमाल किया जाता है.

DRDO Photonic Radar: भारत में रडार तकनीक तेजी से बदल रही है. डिफेंस रिसर्च एजेंसी (DRDO) अब नई तकनीक फोटोनिक रडार पर काम कर रही है. इसके शुरुआती प्रोटोटाइप लैब में तैयार किए जा चुके हैं. भविष्य में इसे लड़ाकू विमानों में लगाने की योजना है. रिपोर्ट के मुताबिक यह रडार सिस्टम में बड़ा बदलाव ला सकती है. जैसे कभी Active Electronically Scanned Array (AESA) रडार आने से हुआ था.

मौजूदा रडार से कैसे अलग?

अब तक अधिकतर आधुनिक फाइटर जेट में गैलियम नाइट्राइड (GaN) आधारित रडार इस्तेमाल हो रहे हैं. जो पुराने गैलियम आर्सेनाइड (GaAs) रडार से ज्यादा ताकतवर और भरोसेमंद माने जाते हैं. लेकिन

फोटोनिक रडार केवल एक नया सेमीकंडक्टर अपग्रेड नहीं है. इसमें रेडियो सिग्नल बनाने और प्रोसेस करने के लिए इलेक्ट्रॉनिक सर्किट की जगह लेजर और ऑप्टिकल फाइबर का इस्तेमाल किया जाता है.

इसकी रेंज अधिक

फोटोनिक रडार बहुत चौड़े फ्रीक्वेंसी बैंड में काम कर सकता है. इससे यह टारगेट को ज्यादा साफ तरीके से पहचान सकता है. सरल शब्दों में कहें तो यह ऐसे है जैसे किसी पुराने कैमरे की जगह अल्ट्रा-एचडी कैमरा इस्तेमाल करना. यानी रडार केवल किसी वस्तु को ढूंढेगा ही नहीं, बल्कि उसके छोटे-छोटे हिस्सों तक की पहचान भी कर सकेगा. इसका फायदा हवाई युद्ध में दुश्मन विमान की पहचान, मिसाइल ट्रैकिंग और स्टेल्थ टारगेट पकड़ने में मिल सकता है.

जैमिंग से भी ज्यादा सुरक्षित

इसे इलेक्ट्रॉनिक जैमिंग से रोकना मुश्किल होता है. क्योंकि यह कई फ्रीक्वेंसी पर एक साथ काम कर सकता है. सिग्नल को ज्यादा सटीक तरीके से नियंत्रित किया जा सकता है. स्टेल्थ विमान आम तौर पर कुछ खास फ्रीक्वेंसी पर रडार से बचने के लिए डिजाइन किए जाते हैं. लेकिन अगर रडार कई फ्रीक्वेंसी पर काम करे तो ऐसे विमानों को पकड़ने की संभावना बढ़ जाती है.

भारत में तैयार हुआ प्रोटोटाइप

हैदराबाद स्थित LRDE के वैज्ञानिकों ने इस तकनीक का एक प्रोटोटाइप तैयार किया है. यह लगभग 1.3 सेंटीमीटर तक की हाई-रिजॉल्यूशन पहचान करने में सक्षम है. इस तकनीक में वावेलेन्थ डिवीजन मल्टीप्लेक्सिंग का इस्तेमाल किया गया है. इससे रडार, कम्युनिकेशन और इलेक्ट्रॉनिक वॉरफेयर सिस्टम एक ही ऑप्टिकल नेटवर्क पर काम कर सकते हैं. इससे विमान के अंदर वायरिंग कम होगी. सिस्टम ज्यादा हल्का और बेहतर बनेगा.

कहां होगा इनका इस्तेमाल?

इस तकनीक को छोटे आकार में बदलना और फाइटर जेट में फिट करना सबसे बड़ी चुनौती है. इसलिए शुरुआत में इसे मौजूदा रडार के साथ हाइब्रिड सिस्टम के रूप में इस्तेमाल किया जा सकता है. यानी फाइटर जेट में मुख्य रडार GaN-आधारित AESA रहेगा. जबकि फोटोनिक रडार का छोटा मॉड्यूल खास काम जैसे स्टेल्थ टारगेट पहचानने के लिए लगाया जा सकता है.

इसे भारत के भविष्य के लड़ाकू विमान AMCA के अगले संस्करणों में शामिल करने की योजना है. जिन्हें 2030 के दशक के मध्य तक सेवा में लाने का टारगेट है. फोटोनिक रडार आने वाले समय में हवाई युद्ध की तस्वीर बदल सकता है. इससे रडार की रेंज, सटीकता और जैमिंग से बचने की क्षमता पहले से कहीं ज्यादा बेहतर हो सकती है.

https://zeenews.india.com/hindi/zee-hindustan/national/drdo-developing-photonic-radar-for-india-future-fighter-jets/3134411

Defence News

Indian Contingent Departs For Seychelles For Joint Military "Exercise Lamitiye – 2026"

Source: Press Information Bureau, Dt. 09 MAR 2026

Indian Armed Forces contingent arrived at Seychelles to participate in the Eleventh edition of Joint Military Exercise "LAMITIYE-2026" with Seychelles Defence Forces (SDF). The Joint Exercise will be conducted at Seychelles Defence Academy from 09-20 March 2026. 'LAMITIYE' meaning 'Friendship' in the Creole language is a biennial training event and has been conducted in Seychelles since 2001.

This edition marks a significant milestone with the participation of all three services of the Indian Armed Forces. The contingent comprises of personnel from the ASSAM Regiment and participation from Indian Navy and Indian Air Force including INS Trikand and a C-130 aircraft.

The exercise will strive to enhance synergy in the domains of Sub-conventional Operations in Semi-Urban environment and cooperation and interoperability between both the sides during Peace Keeping Operations. The exercise will also build and promote bilateral military relations in addition to exchanging skills, experiences and good practices between both the armies.

Both sides will jointly train, plan and execute a series of tactical drills for neutralisation of likely threats that may be encountered in Semi-Urban environment, while exploiting and showcasing New Generation Equipment and technology. The 12 days long Joint Exercise will include Field Training Exercises, combat discussions, case studies, lectures & demonstrations, culminating with two days of Validation Exercise.

The exercise will contribute immensely in developing mutual understanding and magnify jointness between the troops of both the nations.

https://www.pib.gov.in/PressRelease age.aspx?PRID=2236791&reg=3&lang=1

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India was world’s 2nd largest importer of arms in 2021–25, accounted for 8.2% of global arms receipts, think tank says

Source: Economic Times, Dt. 09 Mar 2026

Synopsis

India ranks as the world's second largest arms importer. The nation is increasingly sourcing weapons from Western countries like France, Israel, and the USA. This shift marks a move away from Russia, though Russia remains a key supplier. India's defense imports are driven by ongoing tensions with China and Pakistan. The country is also developing its own defense manufacturing capabilities.

India was positioned as the world's second largest arms importer during 2021- 25, with an 8.2 per cent share of total global imports, according to a new report by the Stockholm International Peace Research Institute (SIPRI). The think tank noted that India has shifted its arms relations away from Russia towardsWestern suppliers, however it stood as Moscow's top arms buyer between the period.

"India was the world’s second largest recipient of major arms in 2021–25 with an 8.2 per cent share of total global arms imports," SIPRI said, adding that its arms imports are driven by its tensions with both China and Pakistan. "These tensions have regularly led to armed conict, as they did briey between India and Pakistan in May 2025, with both sides using imported major arms."

The last decade has witnessed a shift in India's defence imports as the arms receipts fell by 4 per cent between 2016–20 and 2021–25. The report partially attributed the decrease to New Delhi's growing ability to design and produce its own weapons.

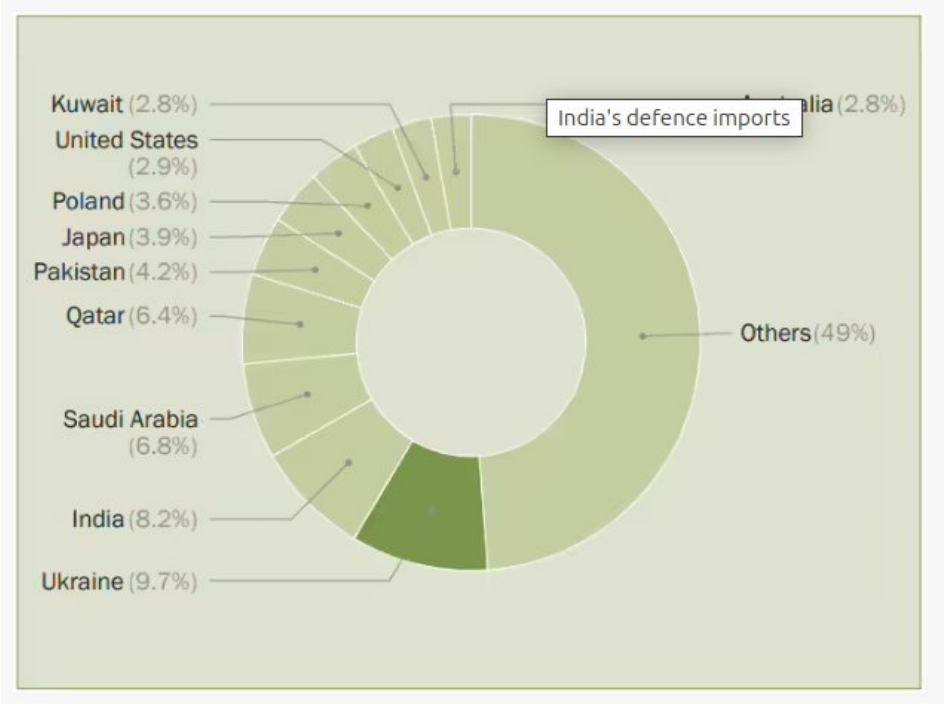
The country is continuing and probably increasing reliance on foreign suppliers, SIPRI said on India's recent defence order to France and Germany. However, India has shifted its arms relations away from Russia towards Western suppliers, especially France, Is-

rael and the USA, over the past decade, the think tank noted, as Moscow's share of Indian arms imports dropped from 70 per cent in 2011–15 to 51 per cent in 2016–20 and then to 40 per cent in 2021–25.

Ukraine, India, Saudi Arabia, Qatar and Pakistan stand as top ve defence imports globally, cumulatively receiving 35 per cent of total global arms imports between 2021-25.

Ukraine, India, Saudi Arabia, Qatar and Pakistan stand as top ve defence imports globally, cumulatively receiving 35 per cent of total global arms imports between 2021-25.

Russia's share of global arms exports declined sharply from 21 per cent in 2016-20 to 6.8 per cent in 2021-25, mainly due to major drops in exports to countries such as Algeria, China and Egypt.



India's defence trade

In April 2025, India signed an Inter-Governmental Agreement (IGA) with France for the procurement of 26 Rafale Aircraft (22 Single-Seater and four Twin-Seater) for the Indian Navy. The pact includes training, simulator, associated equipment, weapons and performance-based logistics, along with additional equipment for the existing Rafale eet of the Indian Air Force. The delivery of these aircraft is expected to be completed by 2030, with the crew undergoing training in France and India.

The Ministry of Defence also signed a pact with US-based Metrea Management for wet leasing of one ight refuelling aircraft for providing air to air refuelling training to pilots of IAF and Indian Navy. Under the pact, the company had to provide FRA (KC135 Aircraft) within six months.

Last month, India and France signed a contract for 26 Rafale-Marine ghter jets. The government has established numerous facilities in collaboration with French companies to boost defence manufacturing. This includes the ongoing partnership between

Safran and HAL for the development of the Indian Multi Role Helicopter (IMRH) and establishment of MRO facility for M-88 engines mounted on Rafale aircrafts.

India and France have also undertook Scorpène program (P75 – Kalvari), whose 6th submarine was delivered on January 15, 2025 to the Indian Navy, and have decided to continue the cooperation in Submarines.

Another partnership includes Safran's joint venture with Bharat Electronics Limited to produce the HAMMER Missiles in India. Alongside this, Airbus has established a H125 Final Assembly Line with ATA Advanced Systems.

As a latest development, the defence ministry inked a Rs 2,182 crore contract for the procurement of Surface-to-Air Vertical Launch - Shtil missiles and associated missile holding frames with JSC Rosoboronexport, Russian Federation.

Shifting its defence sourcing towards the West, Indian government inked a 10- year framework for US-India major defence partnership last year, wherein the US Secretary of War Pete Hegseth asserted that India is a priority country for the US in defence co-operation.

Indigenous defence manufacturing

India is rapidly scaling up its indigenous defence manufacturing with a Rs 7.85 lakh crore allocation under the latest Budget, marking an increase of 15.19% over Budgetary Estimates (BE) of FY 2025–26. This accounts for 14.67% of the Union Budget, highest among the ministries.

Out of the defence budget, Rs 1.39 lakh crore has been allocated for procurement from domestic defence industries. The government has reserved around 75% of the capital acquisition budget for domestic defence industries in FY27.

India’s defence budget rose from Rs 2.53 lakh crore in 2013–14 to Rs 7.85 lakh crore in 2026-27, marking about a three-fold rise.

Global suppliers of arms and ammunition

As per data released by SIPRI, the ve largest suppliers during 2021-25 were the USA, France, Russia, Germany and China, accounting for 70 per cent of all arms exports.

US, French, German and Chinese arms exports rose between 2016–20 and 2021–25, the think tank noted, while Russian exports fell sharply.

America's arms exports grew by 27 per cent between the period and its share of total global arms exports rose from 36 per cent to 42 per cent. In the last five years, USA’s share of total global arms exports was more than the next seven largest suppliers’ shares combined.

Arms exports of the 27 current EU member states went up by 36 per cent between 2016–20 and 2021–25, with combined arms exports accounting for 28 per cent of total global arms exports in 2021–25.

https://economictimes.indiatimes.com/news/defence/india-was-worlds-2nd-largest-importer-of-arms-in-202125-accounted-for-8-2-of-global-arms-receipts-think-tank-says/articleshow/129313577.cms

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Does India have low-cost killer kamikaze drones like Iran's Shahed?

Source: India Today, Dt. 09 Mar 2026

Low-cost drones are reshaping warfare, as seen in Ukraine for the last four years, and now in the Iran war. Iran's low-cost Shahed drones have inspired the US's LUCAS. In India, low-cost, deep-strike drone projects like Sheshnag-150 and Project KAL are picking pace.

India's Sheshnag-150 drone (R), an indigenous long-range loitering munition inspired by Iran's Shahed-136. (AI Image for Representation/India Today)

In Iran's war with the US and Israel, low-cost drones have given Tehran unprecedented leverage. Iran's Shahed-136 drone has been the inspiration for indigenous models, costing between $20,000 and $50,000 per unit. In fact, the US's Low-cost Uncrewed Combat Attack System, aka LUCAS drone, is based on the same design as Shahed. India, too, is ramping up its firepower capability with indigenous long-range strike drones.

Before proving its mettle in the current war, Iran's Shahed-136 drone made its mark in the Russia-Ukraine conflict, forcing Kyiv to spend millions in intercepting them. That Iran, a country without an effective air force, could hit deep inside countries, reveals the power of its drones and missiles. The US's low-cost LUCAS drones look very similar to Iran's Shahed-136.

Before the Ukraine-Russia war, it was the conflict between Armenia and Azerbaijan over Nagorno-Karabakh that showed how drones and loitering munitions could tilt the balance of military power. Azerbaijan won the war and its extensive use of drones, especially those from Israel and Turkey, is credited for its victory.

The newer dimension to this is low-cost drones that push the enemy into a financial and material attrition. For example, the Shahed-136 kamikaze drones cost anywhere between $20,000 to $50,000 each. But the US and Israel are spending millions on intercepting them. Each Patriot missile costs $4 million, while some interceptors could cost up to $12 million.

Therefore, low-cost drones and interceptors have become vital in modern warfare.

India has two low-cost long-range striking drone projects. While the Sheshnag-150 is being developed by Bengaluru-based startup NewSpace Research and Technologies (NRT), the second is Project KAL, by Noida-based IG Defence, The two would give the Indian armed forces a cost-effective edge to carry out precision attacks.

India has several indigenous drones already in operation or inducted with its armed forces. While major high-end platforms like Medium Altitude Long Endurance (MALE), and High Altitude Long Endurance (HALE) UAVs are in trials or development, smaller tactical, surveillance, swarm, and combat drones from Indian private firms and DRDO have been delivered, inducted, and used operationally, including in exercises and real scenarios.

What are India's Seshnag and Project Kal Strike Drones?

India's armed forces have inducted several indigenous attack drones, primarily loitering munitions, for precision strikes. One such indigenous drone is the Nagastra-1 from Solar Industries, inducted since 2024 with batches delivered. These one-way systems enable infantry-level precision attacks with minimal collateral damage.

The SkyStriker 'suicide drones', developed by Bengaluru-based Alpha Design (ADTL) in collaboration with Israel's Elbit Systems, also made their operational debut during Operation Sindoor in the forward areas of Jammu and Kashmir.

However, low-cost Shahed-type drones are now being developed in India.

Project KAL, is reportedly in its early stages, and is designed as a deep-penetration strike drone with a range of up to 1,000 km and an endurance of three to five hours. It can fly into enemy territory, spot targets, adjust its path, and deliver a high-explosive payload.

Meanwhile, the Sheshnag-150, named after the mythological multi-headed serpent king, is a long-range swarming attack drone, with autonomous systems capable of deep strikes and saturation attacks.

Weighing about 150 kg, Sheshnag also boasts a 1,000-1,200 km range, and can 25-40 kg payload, and over five hours of flight time. What sets it apart is its AI-powered swarm tech — multiple drones can team up autonomously to evade defences and hit targets together. Sheshnaag-150 first flew in February 2025, and the project gained urgency after Operation Sindoor last year.

The Sheshnag-150 drone, developed by Bengaluru-based startup, NewSpace Research and Technologies. (Image: X via VivekSi85847001)

NRT's Sheshnag series also include shorter-range versions like SN-20, that can go up to 20 km, and SN-50, which can carry out attacks up to 50 km.

VEM Technologies is also developing a similar low-cost drone, according to reports. However, the specifics remain undisclosed.

Last year, IG Drones successfully completed First-Person View (FPV) drone trials in high-altitude regions along the Line of Actual Control (LAC) with China. The trials featured its cutting-edge Striker FPV drone, designed for tactical combat, surveillance, and intelligence-gathering missions.

Project KAL aims to develop long-range strike drones to expand the India's indigenous combat drone capabilities. (Image: File)

How Iran's Shahed Drones have Inspired Low-Cost Drones Globally

Iran's Shahed-136 drone has been the inspiration for the indigenous models as they cost just $20,000-$50,000 per unit, and can overwhelm expensive air defences when launched in swarms. In the Russia-Ukraine war, these drones, rebranded as Geran-2 by Russia, have targeted power grids and military sites, forcing Ukraine to spend millions on intercepts. Their simple design, long range (up to 2,500 km), and 40-50 kg warhead make them a game-changer in asymmetric battles.

Even the US has developed a drone based on the same design as Shahed — the Low-cost Uncrewed Combat Attack System, aka LUCAS drone. Priced at around $35,000, LUCAS has been used in strikes against Iranian itself. This shows how effective these low-cost drones are.

To give you an idea, let's take the example of the MQ-9B SkyGuardian or SeaGuardian variant, made by General Atomics Aeronautical Systems. Though it features longer endurance, of over 40 hours, higher altitude capabilities, certifiable for civil airspace integration, and enhanced sensors and payload options, a single unit of the MQ-9B typically costs $30-80 million, based on the configuration.

For that price, around 600 to 1,500 Shahed-136 drones could be produced.

US Central Command chief, Admiral Brad Cooper, called it "indispensable", saying it turns Iran's own weapon against them.

Iran's Shahed-136 drone. (Image: File)

Defence experts and journalists have weighed in on the drones' potential.

Indian Army veteran and drone expert Anshuman Narang, in an X post, urged the Indian forces to operationalise the indigenous Shahed-style drones "at the earliest".

The Indian Army is raising specialised drone warfare units equipped with indigenous UAVs.

Aviation enthusiast Arihant Ray, said on his X account, "India's own Shahed 136/Geran drone equivalent is here. Meet Sheshnaag... We can mass produce this and use them in swarm to saturate, degrade and destroy individual units of hostile IADS."

Meanwhile, Jammu and Kashmir-based journalist Ahmed Ali Fayyaz, former bureau chief for The Hindu, posted about Project KAL, explaining, "Classified as a kamikaze (one-way attack) or loitering munition, [KAL is] designed to carry explosive payloads directly into a target."

As drone warfare is evolving rapidly, it's proving to be effective in the trenches in Eastern Europe, to the skies protected by air defence systems in the Middle East. Defence experts say this is a very timely development, given tensions along India's borders. As development progresses, more details are expected soon.

Sourcehttps://www.indiatoday.in/india/story/iran-war-middle-east-crisis-pushes-india-to-fast-track-long-range-strike-drones-shahed-136-project-kal-sheshnag-2879136-2026-03-09

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India’s two biggest defence deals—Rafale & Subs—must deliver more than platforms, will be seminal

Source: Times of India, Dt. 09 Mar 2026

India is inching closer to two of the most consequential defence procurement decisions in its recent history: the acquisition of 114 multi-role fighter aircraft under the MRFA programme—now increasingly centred on the Rafale—and the long-awaited Project-75I submarine programme.

In my talk with Defence Secretary Rajesh Kumar Singh, the quest for 114 Multi Role Fighter Aircraft (MRFA) has finally concluded with Dassault Aviation Rafale.

Even after years of delays and shifting priorities, both deals will shape the trajectory of India's military capability and will be seminal for the Indian defence acquisition for decades. With IC content, source code, weapon—domestic weapon– and integration, the negotiation process for Rafale will test the nerves of both in all fairness for meaningful "indigenisation".

Yet the real question is not whether these deals will eventually be signed. It is whether India can structure them in a way that truly advances indigenisation and operational sovereignty, rather than merely expanding its inventory of sophisticated foreign platforms.

That is not the conclusion. Critically, India's 114-aircraft MRFA (Multi-Role Fighter Aircraft) programme raises an important strategic question: can India realistically run three major fighter programmes simultaneously?

Those programmes would include: Dassault Rafale under the MRFA acquisition, HAL Tejas Mk2 (Medium Weight Fighter) and Advanced Medium Combat Aircraft (AMCA), India's fifth-generation stealth project?

Rafale MRFA: Complexity Beyond the Aircraft

The process surrounding the proposed government-to-government Rafale deal has begun to move, but its timeline remains uncertain. Industry officials and sources within the Indian Air Force (IAF) and the Ministry of Defence suggest that a final agreement is unlikely before late 2026 or even early 2027.

That delay reflects the extraordinary complexity of the negotiations. The deal involves not only the purchase of aircraft but also domestic production arrangements, technology transfer protocols, industrial partnerships, delivery schedules and the fine print of long-term support.

On paper, indigenisation commitments—whether framed as 40% or even 50% domestic content—sound promising. In practice, however, these numbers often mask deeper dependencies. As Defence Secretary Rajesh Kumar Singh put it candidly while discussing negotiations, "We are negotiating; we will do as much as possible." The phrase captures both the ambition and the ambiguity surrounding India's push for local manufacturing.

The challenge lies not merely in assembling aircraft in India, but in securing meaningful technological depth. Without it, domestic production risks becoming an exercise in licensed assembly rather than capability building.

New Variants, New Capabilities

The aircraft themselves will undoubtedly represent a significant technological step forward. Once the agreement is signed, the IAF is expected to receive the newer Rafale F4 variant and eventually the F5 configuration, rather than the earlier F3R standard delivered in the initial batch of 36 fighters inducted by 2022.

These newer variants promise important upgrades: enhanced connectivity, improved sensor fusion, advanced digital architecture and more capable software systems. In an era of network-centric warfare, these improvements could significantly strengthen the IAF's operational effectiveness.

But the sophistication of these aircraft also brings new challenges—particularly when it comes to integrating indigenous systems and weapons.

The Source Code Constraint

One of the most sensitive issues in the Rafale ecosystem is access to source codes. As is common practice among advanced aerospace manufacturers, Dassault has not provided full source code access for the Rafale systems currently operated by India.

Source codes govern the aircraft's sensors, avionics and weapons integration. Without them, India cannot independently modify or deeply customise the aircraft's software architecture.

The IAF can still integrate external systems through a controlled interface that allows Indian missiles, electronic warfare suites or helmet-mounted displays to communicate with the aircraft. However, such integration occurs within limits set by the original manufacturer.

This arrangement ensures operational usability but restricts deeper autonomy. As threats evolve and new weapons are developed domestically, India's ability to rapidly integrate them without external approval remains constrained.

That is why technology-transfer negotiations are not merely a technical detail in the MRFA discussions—they are central to India's strategic objectives. True self-reliance requires more than production lines; it requires control over the technologies that define future combat capability.

The Submarine Decision—clear for cabinet note(CCS)

Running parallel to the Rafale negotiations is another crucial procurement: Project-75I, India's next conventional submarine programme. India's long-delayed Project-75I (P-75I) submarine programme is finally approaching a decisive stage, with the proposal expected to move toward Cabinet approval.Germany's Thyssenkrupp Marine Systems (TKMS) has emerged as the frontrunner foreign collaborator after other competitors gradually withdrew from the tender.

The Defence Secretary has confirmed that it is going to happen soon. During the talk, he tells me that it is just now off to the Cabinet Committee on Security (CCS).

The project aims to build six advanced conventional submarines for the Indian Navy under the Strategic Partnership model, combining foreign design expertise with domestic shipbuilding.

It is a clean sheet, much needed and will require less negotiation as compared to Rafale. As the focus area is advanced submarines equipped with air-independent propulsion (AIP) and modern combat systems, capabilities essential for maintaining underwater deterrence in the increasingly contested waters of the Indo-Pacific.

Additionally, what P75I needed fits well with the Indian Navy: TKMS is offering an advanced variant of its Type-214/Type-212 family, widely regarded as among the most capable conventional submarines in service globally. These submarines are known for fuel-cell-based AIP systems that allow extended submerged operations, low acoustic signatures designed for stealth, advanced combat management systems and compatibility with modern heavyweight torpedoes and cruise missiles.

If cleared, it will become one of the largest naval procurements in India's history and a critical component of New Delhi's effort to reinforce underwater deterrence in the increasingly contested Indo-Pacific.

Like the MRFA programme, Project-75I also seeks to combine foreign technology with domestic shipbuilding. And like the fighter deal, its ultimate success will depend on how effectively technology transfer and industrial partnerships are structured.

Tejas2 to AMCA—we need all

Taken together, these two programmes represent more than procurement exercises. They are tests of India's defence-industrial strategy. Each programme serves a different role in India's long-term airpower structure. But together they also create enormous financial, technological and industrial pressure.

However, large imports historically tend to absorb capital budgets, leaving indigenous programmes vulnerable to delays.

Here, the defence secretary assures me, on a very positive note: "budget is not an issue".

India must balance three competing priorities: rapidly strengthening its military capabilities, ensuring value for money in large defence contracts and building genuine domestic technological capacity—Kumar's priorities, national priorities.

Achieving all three simultaneously is difficult—but not impossible. It requires unusual clarity in structuring government-to-government arrangements, careful sequencing of domestic production and transparent management of complex technology integration.

The Rafale and Project-75I decisions will inevitably face criticism—over costs, timelines and foreign dependence. But if negotiated wisely, they could also accelerate India's transition from a major arms importer to a country capable of designing, integrating and producing advanced defence systems.

The stakes, therefore, extend far beyond aircraft numbers or submarine tonnage. These deals will reveal whether India's long-stated goal of defence self-reliance is finally moving into what we call advanced technology, advanced reality.

https://timesofindia.indiatimes.com/blogs/strategic-frontier/indias-two-biggest-defence-deals-rafale-subs-must-deliver-more-than-platforms-will-be-seminal/

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भारतीय नौसेना खरीदेगी 60 'UH-M' हेलीकॉप्टर, युद्धपोतों से उड़ान के लिए होंगे खास डिजाइन, दुश्मन की गतिविधि पर तुरंत देंगे प्रतिक्रिया

Source: Zee News, Dt. 09 Mar 2026

Indian Navy UH-M Helicopter: इन हेलीकॉप्टरों को बनाने की जिम्मेदारी Hindustan Aeronautics Limited (HAL) को दी गई है. प्रोटोटाइप हेलीकॉप्टर शुरुआती उड़ान परीक्षण पूरे कर चुके हैं. फिलहाल उनका सर्टिफिकेशन चरण चल रहा है. HAL का टारगेट 2027 तक पूरी तरह सर्टिफिकेशन हासिल करना है. जबकि 2028 से इनका प्रोडक्शन शुरू हो सकता है.

Indian Navy UH-M Helicopter: भारतीय नौसेना अपने हेलीकॉप्टर बेड़े को आधुनिक बना रही है. नौसेना ने 60 नए UH-M Utility Helicopter Maritime हेलीकॉप्टर खरीदने का फैसला किया है. यह हेलीकॉप्टर स्वदेशी HAL Dhruv प्लेटफॉर्म पर आधारित है. इसे खास तौर पर समुद्र में युद्धपोतों से ऑपरेशन के लिए तैयार किया जा रहा है.

इन हेलीकॉप्टरों को बनाने की जिम्मेदारी Hindustan Aeronautics Limited (HAL) को दी गई है. प्रोटोटाइप हेलीकॉप्टर शुरुआती उड़ान परीक्षण पूरे कर चुके हैं. फिलहाल उनका सर्टिफिकेशन चरण चल रहा है. HAL का टारगेट 2027 तक पूरी तरह सर्टिफिकेशन हासिल करना है. जबकि 2028 से इनका प्रोडक्शन शुरू हो सकता है.

इसकी डिजाइन कैसी है?

UH-M हेलीकॉप्टर को खास तरह डिजाइन किया गया है. इसे जहाजों पर आसानी से रखा जा सकता है. इसमें फोल्ड होने वाली टेल बूम और रोटर ब्लेड दिए गए हैं. इससे इसे डेस्ट्रॉयर, फ्रिगेट और एयरक्राफ्ट कैरियर के छोटे हैंगर में भी आसानी से स्टोर किया जा सकता है. यह डिजाइन नौसेना के लिए इसलिए

अहम है क्योंकि समुद्र में जहाजों पर जगह सीमित होती है. ऑपरेशन के दौरान हेलीकॉप्टर को जल्दी तैयार करना जरूरी होता है.

समुद्री माहौल के लिए मजबूत सिस्टम

HAL ने इस हेलीकॉप्टर में एक बेहतर गियरबॉक्स सिस्टम लगाया है. जो ज्यादा पावर संभाल सकता है. इससे हेलीकॉप्टर गर्म, नम और खारे समुद्री वातावरण में भी भरोसेमंद तरीके से काम कर सकेगा. समुद्र में लहरों के बीच डेक पर लैंडिंग और टेकऑफ करना काफी चुनौतीपूर्ण होता है. इसलिए हेलीकॉप्टर को इसी हिसाब से मजबूत बनाया गया है.

कई तरह के मिशन में इस्तेमाल

UH-M को कई अलग-अलग नौसैनिक मिशनों के लिए तैयार किया गया है. इसमें नाक के हिस्से में AESA Radar लगाया गया है. जो समुद्र में कई टारगेट पर एक साथ नजर रख सकता है. इसके अलावा हेलीकॉप्टर का इस्तेमाल समुद्री निगरानी और एंटी-पाइरेसी ऑपरेशन सर्च एंड रेस्क्यू मिशन, मेडिकल इवैक्यूएशन (घायलों को निकालना) जहाजों और दूरदराज चौकियों तक सामान पहुंचाने में किया जाएगा.

नौसेना के लिए क्यों अहम है?

भारतीय नौसेना का ऑपरेशन क्षेत्र हिंद महासागर में बहुत बड़ा है. ऐसे में जहाजों से उड़ान भरने वाले हेलीकॉप्टर निगरानी, बचाव और लॉजिस्टिक सपोर्ट में अहम भू निभाते हैं. UH-M हेलीकॉप्टर नौसेना को एक स्वदेशी और भरोसेमंद प्लेटफॉर्म देगा. इससे स्पेयर पाट्र्स और अपग्रेड भी देश में ही आसानी से किए जा सकेंगे. ये हेलीकॉप्टर धीरे-धीरे नौसेना के बेड़े में शामिल होने लगेंगे. पुराने हेलीकॉप्टरों की जगह लेते हुए समुद्री ऑपरेशन की क्षमता को मजबूत करेंगे.

https://zeenews.india.com/hindi/zee-hindustan/national/indian-navy-induct-60-uh-m-maritime-helicopters-based-on-hal-dhruv/3134533

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A drone that can fly and drive underwater: How AVATAAR amphibious system redefines multi-domain defence operations

Source: The Week, Dt. 09 Mar 2026

Capable of operating seamlessly in air and underwater, AVATAAR is designed for diverse defense and civilian applications, including intelligence, surveillance, reconnaissance.

AquaAirX Autonomous Systems, a Bengaluru-based deep-tech startup that specialises in designing and building multi-domain amphibious and autonomous systems, was recently in the news when it raised ₹12.5 crore in a seed funding round from Rainmatter, the investment arm of Zerodha.

In what comes as proof that India's defence tech continues to evolve with new technologies, AquaAirX unveiled India's next-generation surveillance-class amphibious drone, AVATAAR, which has a wide range of defence and other applications.

The amphibious drone can operate seamlessly in the air and underwater and can be used in several missions of the armed forces, including tactical intelligence, surveillance, and reconnaissance (ISR) and search and rescue operations.

According to the company, AVATAAR combines endurance, agility, and intelligence to deliver real-time situational awareness across domains.

The company says the drone is built for defence, security, and research and "redefines what's possible at the intersection of air, sea, and autonomy."

It has been confirmed that the drone has achieved Technology Readiness Level 6, which means the fully functional prototype of the drone has been tested in the relevant operational environment and proved efficient, marking the transition of the machine from the lab to real-life applications.

The defence applications of AVATAAR will include constant multi-domain surveillance of ports and berths to detect possible threats, support for precision loitering and target-acquisition operations, and high-fidelity inspection of platforms, pipelines, cables, and subsea assets with autonomous data.

It can also assist in ISR operations, offering real-time intelligence, surveillance, and reconnaissance for littoral and near-shore operations.

Besides, the multi-domain drone can also be used for rapid-response search and pin-point recovery support in complex surface and subsurface environments, according to the company.

https://www.theweek.in/news/defence/2026/03/09/a-drone-that-can-fly-and-drive-underwater-how-avataar-amphibious-system-redefines-multi-domain-defence-operations.html

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India, Indonesia near BrahMos Deal; cost, number of units to be finilised

India, Indonesia near BrahMos deal; cost, number of units to be finalised

Rezaul H Laskar and Rahul Singh

letters@hindustantimes.com

NEW DELHI: India and Indonesia are close to an agreement on the supply of the BrahMos cruise missile system, though crucial elements such as the pricing and number of batteries to be supplied remain to be finalised, people familiar with the matter said on Monday.

If the deal goes ahead, Indonesia will be only the second foreign customer for the BrahMos missile jointly developed by India and Russia. India signed a deal worth almost $375 million in January 2022 to equip the Philippine Marines with three batteries of the missiles.

The people cited above said, on condition of anonymity, that the BrahMos deal was discussed during Indonesian defence minister Sjafrie Sjamsoeddin's visit to India last November and President Prabowo Subianto's state visit to India in January 2025, when he was the chief guest at the Republic Day celebrations.

If the deal goes ahead, Indonesia will be the second foreign customer of the missile

"Discussions are continuing on crucial issues such as the cost, the number of units and transfer of technology, which is a key issue for Indonesia," one of the people said.

There was no immediate word from Indian officials on the proposed deal. Indonesian defence ministry spokesperson Rico Ricardo Sirait told Reuters on Monday that an agreement between the two sides on the BrahMos missile system was "part of the modernisation of military hardware and defence capabilities, especially in the maritime sector". Rico's statement appeared to indicate that the Indonesian side is interested in the missile's naval variant.

The deal is expected to be around $450 million, as previously reported by HT. India used the missile against Pakistan during the four-day military confrontation in May 2025 under Operation Sindoor.

Source: Hindusthan Times, Dt. 10 Mar 2026

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Iran's ballistic missile breaches Turkish airspace, shot down by NATO air defence

Iran's ballistic missile breaches Turkish airspace, shot down by NATO air defence

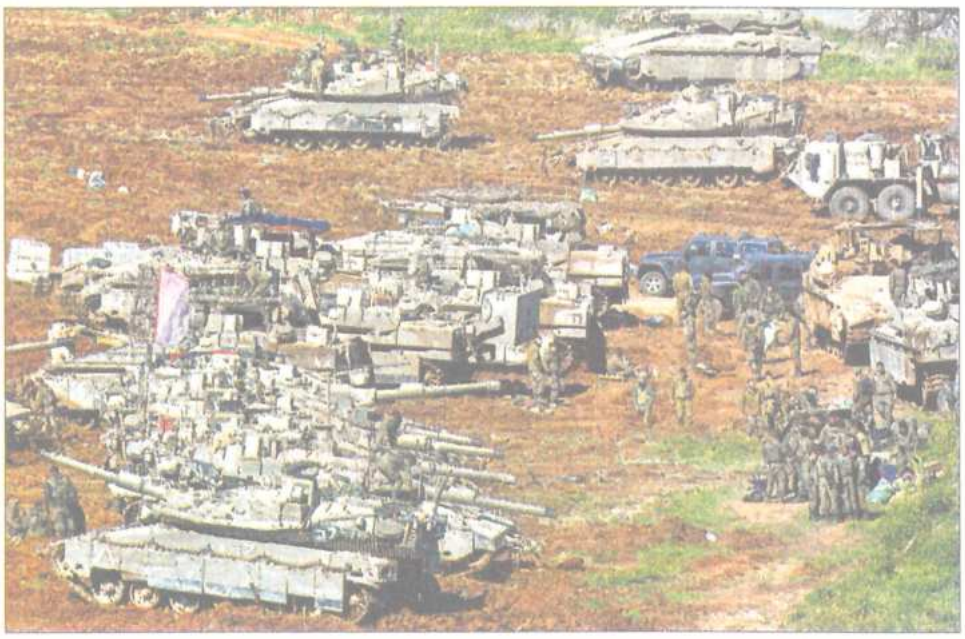
Reuters
Ankara, March 9

TURKEY SAID on Monday that NATO air defences shot down a second Iranian ballistic missile that had entered its airspace and warned that it would move against any such threats, which increasingly pose a test for Ankara and the alliance.

The incident in southern Turkey marks the second intercepted missile from Iran in the last week. Turkey, NATO's second-largest army and Iran's neighbour, had warned Tehran on Saturday against attacking again, but it has not suggested it wants to formally call on bloc members for further protection.

A NATO spokesperson confirmed that the alliance had intercepted a missile heading to Turkey, and that it stood firm in its readiness to defend allies. Unlike last week's incoming missile, which was downed outside Turkey, the latest missile entered Turkish airspace. Its fragments fell in a region sitting between a critical airbase to the west and a radar base to the east, both of which are used by the United States and NATO.

"We once again emphasise that all necessary measures will be taken decisively and without hesitation against any threat directed at our country's territory and airspace," the Turkish Defence Ministry said, adding there had been no casualties in the incident.



Israeli soldiers gather near vehicles on the Israeli side of the Israel-Lebanon border, following an escalation between Hezbollah and Israel in northern Israel on Monday. REUTERS

"We also reiterate that it is in everyone's interest to heed Turkey's warnings in this regard," it said. President Tayyip Erdogan said Turkey had delivered the necessary warnings to Iran after the missile incident.

"Iran continues to take wrong and provocative steps," Erdogan said after a cabinet meeting in Ankara.

He said that Turkey would continue to take additional measures after deploying six F-16 fighter jets to northern Cyprus earlier on Monday, adding that Turkey's main goal was to keep the country out of the "blaze" of the Iran war.

Turkey, an emerging leader in the global defence industry, lacks its own fully fledged air defences despite development efforts, and has relied on NATO air defences stationed in the eastern Mediterranean Sea in both incidents in the last week.

Turkey did not immediately comment on any formal steps within NATO. It had previously said it had no intention of invoking the bloc's Article 4 that would call allies to consult if a member is threatened.

That could lead to Article 5, which would call NATO to defend its attacked ally.

Oil refinery hit

Tehran was choked in black smoke after an oil refinery was hit, an escalation in strikes on Iran's domestic energy supplies. WHO chief Tedros Ghebreyesus warned ON X: "Damage to petroleum facilities in Iran risks contaminating food, water and air — hazards that can have severe health impacts especially on children, older people, and people with pre-existing medical conditions."

Source: The indian Express, Dt. 10 Mar 2026

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Japan deploys its first long-range missile

Japan deploys its first long-range missile

MARI YAMAGUCHI
Tokyo

Japan is preparing to deploy its first batch of domestically developed long-range missiles, with their launchers arriving at an army camp on Monday as the country accelerates its offensive capability in response to rising challenges in the region.

The upgraded Type-12 land-to-ship missiles will be deployed at Camp Kengun in Japan's southwestern prefecture of Kumamoto by the end of March, completing the process of deployment, Chief Cabinet Secretary Minoru Kihara said.

Army vehicles carrying their launchers and other equipment arrived early in the morning in a highly secretive mission criticised by local residents who protested outside the camp.

Opponents have complained about the lack of transparency and said the

deployment would instead escalate tension and make the missiles the target of attacks.

The Defence Ministry last year moved up the schedule of the missiles' deployment by one year as Japan accelerates a military buildup in the southwestern region as China escalates tension around Taiwan, the self-governing island Beijing claims as its own.

The upgraded Type-12 missile, developed and produced by Mitsubishi Heavy Industries, has a range of about 1,000 km and can reach mainland China, a significant extension from the 200-km range of the original.

It will be deployed next at Camp Fuji in Shizuoka, west of Tokyo, later this year. Japan considers China a growing security threat and has pushed a military buildup on southwestern islands near the East China Sea.

It has deployed PAC-3 interceptors and midrange surface-to-air missiles on many of the islands, including Okinawa, Ishigaki and Miyako.

Defence Minister Shinjiro Koizumi last month said Japan will deploy the midrange SAMs on Japan's westernmost island of Yonaguni, just east of Taiwan, by March 2031. *(AP)*

Source: The Pioneer, Dt. 10 Mar 2026

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Science & Technology

Tdb-Dst Supports Babycue Pvt. Ltd., Cuttack (Odisha) For Development Of Rapid Diagnostic Platform For Childhood Diarrhea

Source: Press Information Bureau, Dt. 10 Mar 2026

The Technology Development Board (TDB), Department of Science & Technology (DST), Government of India, has extended financial support to M/s BabyCue Private Limited, Cuttack (Odisha) for its project titled "A Disposable Paper Analytical Platform for Rapid Differentiation of Childhood Diarrhea." The project focuses on the commercialization of an indigenous rapid diagnostic kit designed to enable timely and accurate differentiation between bacterial and non-bacterial diarrhea in children.

The proposed product, DiaCue Diagnostic Kit, represents a significant indigenous innovation integrating biotechnology and material science to address the widespread public health challenge of childhood diarrhea in India. The kit is designed as a rapid, non-invasive, and cost-effective point-of-care diagnostic solution that can be deployed even in resource-constrained environments such as rural health centers and field settings.

The DiaCue platform is based on Lateral Flow Assay (LFA) technology that utilizes disease-specific fecal biomarkers for rapid detection. The system employs gold nanoparticle–based colorimetric detection, allowing results to be interpreted visually without the need for specialized laboratory instruments. The use of proprietary biomarkers and custom-designed reagents ensures high sensitivity and specificity, enabling reliable differentiation between bacterial and non-bacterial infections.

The testing process is simple and suitable for point-of-care applications. A fresh stool sample is collected using a sample loop or swab and mixed with an extraction buffer. After settling, the clear supernatant is applied onto the LFA strip, where it migrates and interacts with immobilized reagents to produce a visible color change. The presence or absence of colored lines on the strip indicates whether the infection is bacterial or non-bacterial, enabling rapid clinical decision-making within minutes.

Key advantages of the DiaCue diagnostic platform include rapid differentiation of bacterial and non-bacterial diarrhea, reduction in unnecessary antibiotic usage and antimicrobial resistance, ease of use in both clinical and field environments, and minimal dependence on sophisticated laboratory infrastructure.

The technology has been developed in collaboration with National Institute of Pharmaceutical Education and Research Hyderabad and clinically validated at ESIC Hospital Hyderabad. The proprietary biomarker detection methodology is protected under an international patent filing, ensuring intellectual property protection and enabling scalable commercialization.

Speaking on the occasion, Shri Rajesh Kumar Pathak, Secretary, TDB, stated, “Indigenous innovations in rapid diagnostics are essential for strengthening primary healthcare delivery and improving clinical decision-making. By supporting the commercialization of the DiaCue diagnostic platform, TDB aims to promote affordable, accessible, and technology-driven healthcare solutions that address critical public health challenges such as childhood diarrhea.”

Promoters of BabyCue Private Limited expressed gratitude for the support and noted that the assistance from TDB will enable the company to accelerate product development, scale manufacturing capabilities, and deploy the diagnostic solution widely to benefit healthcare providers and patients.

https://www.pib.gov.in/PressReleasePage.aspx?PRID=2236903&reg=3&lang=1

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What is black rain? How oil fires, smoke, and atmospheric pollution can turn rainfall dark and potentially harmful

Source: The Times of India, Dt. 09 Mar 2026

Recently, the rare scientific phenomenon received global attention after reports from Tehran in March 2026 indicated that residents observed ‘dark rain’ following airstrikes on oil storage facilities. This led to massive fires that released thick smoke into the atmosphere. When rain clouds formed over the city, the raindrops fell into the clouds, thus forming dark rain. This was witnessed as black droplets fell over the city. At the same time, residents reported headaches and breathing difficulties. Emergency

officials in Iran indicated that the rain that fell after the fires could be dangerous or even acidic. Know the science behind black rain, its causes, environmental effects, and more.

Understanding 'black rain': Science behind the rare phenomenon and the recent Tehran incident

Black rain is an uncommon atmospheric phenomenon in which rain appears dark in colour due to large amounts of suspended matter, such as soot, ash, dust, or oil droplets. From a scientific perspective, black rain is rain that becomes contaminated during its passage through the atmosphere, particularly in highly contaminated atmospheric layers. The rain that falls from the atmosphere contains dark, often black, grey, or oily droplets.

In early March 2026, various oil installations in Tehran were targeted during military operations. This caused massive fires that led to the formation of enormous clouds of smoke. However, with the formation of rain clouds in the region, the water droplets were able to collect the particles in the atmosphere as they fell. It was observed that the rain had a dark appearance, with oily marks being left behind. Environmental experts pointed out that contaminated rain is usually caused by extremely high levels of smoke in the atmosphere.

What causes black rain or atmospheric scavenging

Rain formation takes place when water vapour condenses around small particles called condensation nuclei. These particles can be dust, salt crystals, pollen, and pollutants. In normal circumstances, the quantity of material that the raindrops carry is negligible. However, in cases when the quantity of ash in the air is unusually high, the raindrops carry enormous quantities of the material as they fall through the air.

This phenomenon is called atmospheric scavenging. In cases when the quantity of material in the air is exceptionally high, the rainwater will appear coloured.

Environmental conditions that cause black rain

Environmental events can lead to black rain:

- Industrial pollution

Factories, refineries, and coal-burning plants can release soot and carbon particles into the atmosphere. During rainfall, these pollutants may mix with water droplets and darken the rainwater.

- Wildfires

Large wildfires generate enormous smoke plumes filled with ash and burnt organic material. Rain falling through these smoke layers may appear grey or black due to the captured particles.

- Volcanic eruptions

Explosive eruptions release ash clouds composed of fine volcanic particles. Rain that passes through these ash clouds may turn muddy or dark.

- Oil fires and explosions

When petroleum burns, thick black smoke is produced, consisting of hydrocarbons and carbon particles. When rain falls in these conditions, the rain may absorb the oil residues and the soot, resulting in black or oily rain, as in the recent case in Tehran.

Black rain: Environmental and health effects

- Black rain may cause several environmental and health problems. Environmental problems
- Contamination of soil
- Contamination of agricultural land
- Pollution of lakes, rivers, and groundwater
- Damage to vegetation
- Damage to crops
- SourceHuman health problems
- Skin irritation by contact with contaminated water
- Respiratory problems by breathing in contaminated matter
- Possible contact with chemicals released in fires or accidents

Historical examples of black rain

Black rain is a rare occurrence; it has been documented in the history of several major events. The most famous incident was the nuclear attack on Hiroshima. In this attack, a nuclear bomb was dropped that threw ash, debris, and radioactive material into the air. When clouds formed, the material mixed with the rain that fell from the clouds.

Such a situation was also witnessed in the occurrence of massive pollution, wildfires, and burning oil fields.

https://timesofindia.indiatimes.com/science/black-rain-in-tehran-how-oil-fires-smoke-and-atmospheric-pollution-can-turn-rainfall-black-and-potentially-harmful-aimed-israel-iran-strike/articleshowprint/129319558.cms

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ISRO teams up with AIIMS to study impact of space missions on astronauts' health

• AIIMS SET TO DEVELOP TRAINING MODULES

ISRO teams up with AIIMS to study impact of space missions on astronauts' health

Ankita Upadhyay
New Delhi, March 9

AN ASTRONAUT in space loses 1–2% loss of bone density per month, experiences blood flow shifts in the head and legs that might affect his heart and has motion sickness because of constant movement in zero gravity conditions. Now, the All-India Institute of Medical Sciences (AIIMS), Delhi, is all set to help astronauts of India's future space missions to handle objects, conduct experiments and take care of health emergencies in zero gravity.

As part of a memorandum of understanding (MoU) signed with the Indian Space Research Organisation (ISRO), AIIMS will be developing a training module to not only prepare astronauts but advance research in space medicine as well as understand how astronauts' health will be impacted on space missions. This will cover areas such as human physiology, cardiovascular and autonomic regulation, musculoskeletal health in microgravity, microbiome and immunology, genomics and behavioural health.

Dr KK Deepak, former physiology department head who will be working on the simulations in collaboration with ISRO, along with other doctors of AIIMS, said that the MoU had been signed in the context of India's long-term vision to send humans into space and eventually establish its own space station, similar to the International Space Station. "Simulation technologies are already being used to mimic microgravity conditions on Earth. Such simulations allow researchers to study how the human body reacts to space-like environments without actually going to space," he added. Facilities at AIIMS and institutions like IIT Delhi are already involved in such work, and there is also an opportunity for Indian scientists to develop new simulation methods and technologies.

Human spaceflight requires extensive preparation, particularly in understanding how the human body behaves in space. "Astronauts experience several physiological and medical changes in microgravity, and it is essential to study both the short-term and long-term effects. India currently lacks its own comprehensive physiological data related to spaceflight, which makes research in this area extremely important," Dr Deepak added.

The MoU was signed on Monday. EXPRESS

To address this gap, ISRO and AIIMS have decided to collaborate in a structured manner.

The AIIMS Department of Physiology has already been working in the field of space physiology for more than a decade, starting around 2013. Researchers have been studying existing global literature and identifying research areas relevant to space applications. "With the new MoU in place, the collaboration with ISRO will become more structured and mission-oriented. ISRO will be able to specify the type of physiological data or research it requires for astronaut missions, and AIIMS researchers can then work toward producing that data," Dr Deepak said.

While engineering and technological aspects of space missions are handled by ISRO, AIIMS will contribute medical and physiological expertise. "By combining these strengths, the two institutions aim to conduct research that will produce reliable Indian data on how astronauts' bodies respond to space conditions," he said.

An important area of study, according to Dr Deepak, is space emergency medicine. His team has previously published a position paper on how medical emergencies might be managed in space. "Since astronauts operate in small teams and remain isolated during missions, they must be trained to deal with medical situations independently while also having access to expert consultation from Earth. Developing such protocols requires infrastructure, data collection, and specialized training," he said.

The MoU will likely lead to more intensive research collaboration, with scientists visiting each other's facilities and studying different aspects of human spaceflight. This includes understanding spacecraft environment, seating arrangements, and the day-to-day routine astronauts follow during missions.

Source: The Indian Express, Dt. 10 Mar 2026

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