

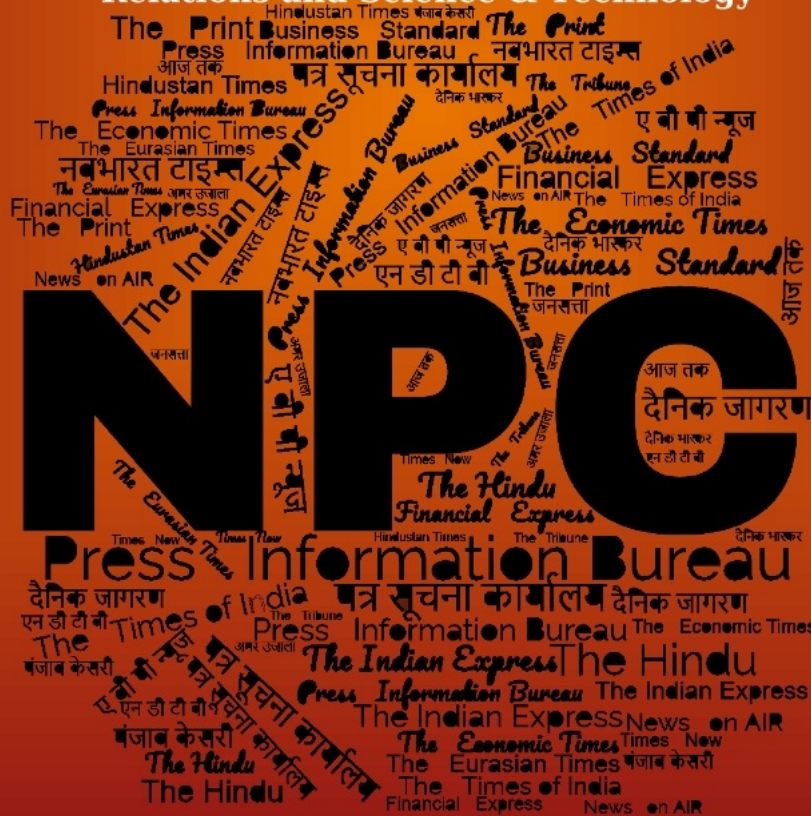
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Sixth-generation aero-engine can be developed by tying up with foreign firm: DRDO chief

The only way India can develop a sixth-generation aero-engine and other technologies required is by co-development with a foreign manufacturer, Samir V. Kamat, Chairman of the Defence Research and Development Organisation (DRDO), said while noting that India currently invests only 5% of its defence budget for research and development, which needs to be increased to 15%.

To realise that capability, he said the country will have to invest close to \$4 billion to \$5 billion, that's ₹40,000 crore to 50,000 crore. His remarks come against the backdrop of huge delays in the development of indigenous fighter jets, while China has made rapid progress in this area. Incidentally, India is in talks with France for the co-development of a 110KN engine for the fifth-generation jet, Advanced Medium Combat Aircraft (AMCA), that is on the drawing board and at least a decade away from the roll-out of a prototype.

There are still critical issues that need to be worked out before an agreement can be reached, sources said on the status of discussions between India and France.

The decision for the co-development of a new engine was announced during Prime Minister Narendra Modi's visit to Paris in July 2023. Since then discussions have been going on between the DRDO's Aeronautical Development Agency (ADA), Gas Turbine Research Establishment (GTRE), and Safran to work out the specifications and other modalities.

"If we look at what we need to do in terms of technologies, the first priority is aero-engines. Today, we have demonstrated a fourth-generation aero-engine for our fighter aircraft but going ahead we will need a sixth-generation aero-engine where the thrust to weight ratios exceed 10," Mr. Kamat said, speaking at an event two days ago.

He detailed various technologies that need to be developed such as single-crystal blade powder metallurgy discs and ceramic matrix composites for static parts to begin with.

"And if we have to do this and deliver an aero-engine the only way I can see is if we do a co-development with a foreign Original Equipment Manufacturer."

Elaborating further, he said various facilities have to be set up — testing facilities for each sub-system, a high-altitude test facility, flying test-bed, manufacturing facilities to make the disc which would need investing in a forge press which can press 50,000 tonnes, and so on.

In this regard, Mr. Kamat said that when it comes to platforms India had reached a "certain level of maturity" in fighter aircraft, but needs to build capacity. "Today, we are not able to deliver 16

aircraft per year. For that we should increase our capacity. Whether it should be in the public sector, private sector or joint, is a decision we all have to arrive at.”

Further, addressing an oft demand that a separate assembly line should be set up by the private sector for the LCA, Mr. Kamat noted that only U.S., and may be Russia, has two players in the fighter space. Overall, in other countries you have only one major player because the volumes are not sufficient, he stated adding, “So we have to take a call and support whatever decision we arrive at after due deliberations.”

The jet-engine technology is a closely guarded secret due to its extreme criticality in modern warfare. India made unsuccessful attempts in the past to develop an engine locally under the now shelved ‘Kaveri’ project. The Kaveri project was sanctioned by the Cabinet Committee on Security (CCS) in 1989 and over the course of 30 years, before it was shut down, saw an expenditure of ₹2035.56 crore and the development of nine full prototype engines and four core engines.

The General Electric (GE) F-414 engine deal, which Hindustan Aeronautics Ltd. bagged, is for manufacturing licence of an already operational engine. The deal gives India access to several technologies and industrial processes involved in the manufacture of jet engines and will upskill the capabilities of the Indian industry, both public and private, officials stated earlier.

The F-414 engines are meant to power the LCA-MK2, a larger and more capable variant of the LCA currently in service, and also the initial version of the under-development AMCA. The AMCA is planned in two phases — MK1 with the GE414 engine and a MK2 with an engine to be co-developed with France.

Speaking at the same event, Indian Air Force (IAF) chief Air Chief Marshal A.P. Singh said that R&D loses its relevance in case it is not able to meet timelines. “Technology delayed is technology denied. There has to be an increased aptitude for acceptance of risks involved and failures in R&D,” he stated, adding that they haven’t yet received the first 40 LCA.

<https://www.thehindu.com/news/national/sixth-generation-aero-engine-can-be-developed-by-tying-up-with-foreign-firm-drdo-chief/article69081772.ece>



Press Information Bureau
Government of India

Ministry of Defence

Thu, 09 Jan 2025

Raksha Mantri Shri Rajnath Singh to chair Ambassadors' Round-Table in New Delhi in the run up to Aero India 2025

As a prelude to Aero India 2025, Raksha Mantri Shri Rajnath Singh will chair the Ambassadors' Round-Table in New Delhi on January 10, 2025. Invitations have been extended to Ambassadors and High Commissioners of over 150 friendly countries for participating in the event. They would be briefed on the major events of Aero India 2025, and extended a personal invite from Raksha Mantri for their senior most leadership. Raksha Mantri Shri Sanjay Seth and senior officials from the Ministry of Defence & Armed Forces would be attending the event.

The 15th edition of Aero India - Asia's biggest aero show - is scheduled to be held at the Air Force Station, Yelahanka in Bengaluru, Karnataka from February 10 to 14, 2025. The five-day event comprises a curtain raiser event, inaugural event, Defence Ministers' Conclave, CEOs' Round-Table, iDEX start-up event, breath-taking air shows, a large exhibition area comprising India Pavilion and a trade fair of aerospace companies. The broad theme is '*The Runway to a Billion Opportunities*'.

The first three days of the event (February 10th, 11th & 12th) will be business days, while 13th & 14th have been set as public days to allow people to witness the show. The event will provide a platform for forging partnerships between foreign & Indian firms and the discovery of newer avenues in the global value chain to accelerate the indigenisation process.

Aero India attracts a large number of exhibitors from the world's leading industries in the field of aerospace and defence. It provides a unique opportunity for the industry to showcase their capabilities, products and services to the targeted audience. The biennial event serves as a platform for industry leaders to connect and shape the future of aerospace & defence industries.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2091447>

American defence firms pose bigger risk than Beijing: Top US official

American defence companies are hurting the nation's security interests by prioritising share buybacks over delivering weapons to the US military and its allies, according to the outgoing US envoy to Japan.

Ambassador Rahm Emanuel said the firms are more focused on increasing their stock value than on investing in production capacity. This has contributed to delays in weapons shipments, which could harm US security and weaken American alliances, he said in an interview on Wednesday.

"The US defense industry is a bigger risk to America's security and the credibility of our deterrence than China is," Emanuel said in Tokyo.

Emanuel, who was confirmed as ambassador to Japan in 2021, said he had witnessed the damaging impact of years-long delays in defence equipment shipments on US military and its allies.

"I can't tell you how many times here I've had to use my political capital to cover for their failure," he said.

One solution - he added - would be to ban defence contractors from buying back their own stock for several years if they fail to deliver orders on time.

Rising geopolitical tensions and conflicts in the Middle East and Ukraine have fueled demand for defence products, benefiting companies like RTX Corp., Northrop Grumman Corp. and Lockheed Martin Corp.

In 2023, Lockheed Martin and RTX spent a combined total of \$18.9 billion on stock buybacks, compared with just \$4.1 billion on capital expenditures, according to data.

<https://economictimes.indiatimes.com/news/defence/american-defence-firms-pose-bigger-risk-than-beijing-top-us-official/articleshow/117094784.cms>

BSF, BGB hold informal meeting at Petrapole to strengthen border coordination

Amidst recent objections by the Border Guard Bangladesh (BGB) over the Border Security Force's (BSF) attempts to erect fences in certain areas along the India-Bangladesh border, the two forces

held an informal meeting at the Integrated Check Post (ICP) at Petrapole in West Bengal's North 24 Parganas district on Thursday. The pre-scheduled meeting, aimed at fostering mutual cooperation and enhancing coordination along the border, was attended by BSF South Bengal Frontier inspector-general Maninder PS Pawar and BGB brigadier-general Mohammad Humayun Kabir.

The discussions between the two forces focused on effective border management, measures to prevent illegal crossings, combating cross-border crimes, and fostering a secure and peaceful environment in the region, a statement by the BSF South Bengal Frontier said.

The meeting assumes significance in the wake of recent instances of BGB raising objections to BSF's efforts to build border fences in certain areas along the Indo-Bangladesh border.

Pawar emphasised the importance of mutual cooperation in ensuring the stability and prosperity of border regions, while Kabir expressed the BGB's readiness to work closely with their Indian counterparts to resolve issues amicably, the statement added.

Both sides reaffirmed their commitment to strengthening bilateral relations and pledged to enhance joint efforts to address border challenges, it added.

The fencing work in Sukdevpur area of Malda's Kaliachak III block was briefly paused on Monday after the BGB claimed it was being conducted on Bangladeshi territory. However, the issue was resolved through discussions, and construction resumed without further disruptions on Tuesday.

The BSF officials on Wednesday had said the construction of a barbed wire fence along the India-Bangladesh border in Malda district has resumed peacefully, after a temporary halt following objections from the BGB.

In response to reports in a section of the Bangladeshi press alleging that the BGB had taken control of a 5-km stretch of Indian land along the International Border, the BSF on Tuesday dismissed the claims as "baseless and irresponsible."

<https://economictimes.indiatimes.com/news/defence/bsf-bgb-hold-informal-meeting-at-petrapole-to-strengthen-border-coordination/articleshow/117086085.cms>

ThePrint

Thu, 09 Jan 2025

As govt looks to overhaul defence ecosystem, top officials suggest faster procurement, more R&D funds

Faster procurement timelines, cutting down archaic processes, eradicating entry barriers for new players and providing a level playing field for all—these are some of the steps the defence ministry is looking to take in 2025. It further plans to use India's buying power to attract foreign players and set aside more funding for indigenous research and development.

The ministry is also trying to make the export process easier for companies while looking at tie-ups with foreign Original Equipment Manufacturers (OEMs) for joint development and production of critical technologies like aero engines and setting up of specific test facilities with focused funding.

These ideas, among others, were put forward by two officials of the defence ministry including Defence Secretary Rajesh Kumar Singh at a seminar held this week.

This comes with the ministry declaring 2025 as a “Year of Transformation” with expectations that new, lighter and simpler Defence Acquisition Procedures (DAP) will be rolled out, replacing the 2020 version.

Singh said India is currently spending 1.9 percent of its GDP on defence and this can be easily boosted with the growth in GDP.

But “even 2 percent share is proving to be very difficult to spend because of lack of domestic absorptive capacity”, he said, adding: “So resources are no longer a constraint, we need to find pragmatic solutions and make them work.”

He further said that when it comes to the aerospace sector, *Atmanirbharta* is a source of as much angst as it is a source of commitment or passion. “There is a feeling that sometimes there is a tradeoff with capabilities, and I don’t blame you for that,” he said, adding that “the fact is that in India, we have not been able to develop many critical technologies, jet engines, radars etc”.

According to the defence secretary, part of the problem is that India transitioned directly from a primary agricultural sector economy to a service sector-led economy.

“Our manufacturing base is large and still the 5th largest in the world, but it is still relatively small as a percentage of our economy. Just 15-16 percent. And that lack of wide industrial base combined with inability to do real mass production in many commodities is one of the reasons why we have not been able to make the kind of breakthrough in aerospace as we have in other areas in defence like land systems, which is closely linked to our automobiles, space or missiles,” he said.

He added that the procurement policy in India’s defence system “in many ways was broken”.

“We have not been able to do things in time. The timelines we have given ourselves are too luxurious. Very basic things like preparing RFPs in time even before you go for an Acceptance of Necessity were not done. Thereafter, you all know that we have been gold-plating many of our requirements and the evaluation was taking too long. It’s time to call a spade a spade and have a different approach,” Singh said.

The defence secretary added that when it comes to procurement, they will tackle it over the course of the next six months to a year, both in terms of process timelines and procedures themselves.

However, he said that “the advantages that incumbents have in our system and the entry barriers we create for new entrants is another area which we need to tackle”.

“Our industrial policy is such that defence is the last vestige of the license permit raj. We still have industrial licensing, perhaps inevitable, but needs to be much faster. When people want to export,

we create so many hurdles for them. That it is a real challenge when it comes to ease of doing business,” said Singh.

He went on to say that defence is largely monopolistic with either PSUs or few large private sector companies now.

“We are not able to get enough competition,” he said, pointing that a level playing field has to be offered to all including MSMEs and start-ups to drive innovation.

He said the FDI policy in the defence sector was liberal but only Swedish firm SAAB has come in with 100 percent holding. “I know there will be more. We will have to use our buying power and use strategic partnership as we have done for our transport aircraft to bring in global OEMs to set up bases in India, using ToT in short and medium terms.”

He added, “You will have to go in for global buys as you also set up indigenous supply lines and eventually create a large manufacturing base.”

‘Aero engines top priority’

Speaking at the same seminar, Defence Research and Development Organisation (DRDO) chief Dr Samir V Kamat said India invests only 5 percent of its defence budget on R&D. “This has to increase to 10-15 percent if we have to achieve all our goals. The government is sanguine about this and hopefully, in the next 5-10 years we will transition from 5 to 15 percent of the defence budget on R&D.”

Kamat identified aero engines as the top priority for the country and the only way forward he sees is co-development with a foreign OEM since this will involve a lot of key technologies India does not have. “But one has to realise that if we want this capability the country will have to invest close to 4-5 billion dollars. That’s Rs 40,000-50,000 crore because we should not repeat the mistakes that we have made in the past.”

He added: “If we want to develop an aero engine, we have to set up testing capabilities for each subsystem, set up a high altitude flying test facility, flying test bed, set up manufacturing facility which can make discs which would mean investing in a forge press which can press 50K tonnes. It is a commitment that a country will have to make.”

On the issue of aero platforms like fighter aircraft, Kamat said the country has reached a certain level of maturity but scaling is the issue. “Today we are not able to deliver 16 aircraft per year, we need to expand our capacity. Whether it should be in a private sector, public or joint is a decision that one has to arrive at,” he said, adding that he wondered whether a country can afford two players in the fighter stream since numbers will be less.

He further said that warfare is evolving and India has to invest heavily in unmanned platforms, manned and unmanned teaming, MALE (medium altitude, long endurance) and HALE (high altitude, long endurance) drones, pseudo-satellites besides early warning aircraft.

<https://theprint.in/defence/as-govt-looks-to-overhaul-defence-ecosystem-top-officials-suggest-faster-procurement-more-rd-funds/2438389/>

Navy gets delivery of sixth and last Kalvari-class submarine

The sixth and final Kalvari-class submarine, built by Mazagon Dock Shipbuilders Limited (MDL), was handed over to the Indian Navy today. The submarine, named “Vaghsheer”, is scheduled for commissioning on January 15.



Vaghsheer underwent a series of comprehensive and rigorous tests and trials over the past year. The Naval Group of France collaborated with MDL to build the Kalvari-class submarines, a variant of the Scorpene-class designed by the Naval Group.

The Indian Navy has already commissioned the earlier five submarines in the class — Kalvari, Khanderi, Karanj, Vela, and Vagir.

The state-of-the-art technology used in the Kalvari-class submarines ensures superior stealth capabilities, enabling the vessel to emit minimal noise during undersea operations.

Designed for a variety of missions, the submarine is capable of anti-submarine warfare, intelligence gathering, area surveillance and special operations. It is equipped with wire-guided torpedoes, anti-ship missiles, advanced sonar systems, and precision-guided weapons. Additionally, it can launch missiles from beneath the sea.

Vaghsheer distinguishes itself from its sister submarines with indigenously developed features, including an internal communication and broadcast system, main batteries and Ku-band satellite communication capabilities.

The Kalvari class is a conventional diesel-electric-powered submarine, renowned for its ‘silent’ undersea operations. Its modular construction allows for future upgrades, such as integrating Air

Independent Propulsion (AIP) technology, which extends underwater endurance. On December 30, the Ministry of Defence signed a Rs 1,990 crore contract for the future incorporation of AIP technology into the Kalvari class.

AIP is a marine propulsion technology that enables non-nuclear submarines to remain submerged for longer durations. Conventional diesel-electric submarines need to surface every three to four days to recharge their batteries, whereas submarines with AIP can stay underwater for eight to 10 days. This significantly enhances stealth and operational effectiveness.

<https://www.tribuneindia.com/news/india/navy-gets-delivery-of-sixth-and-last-kalvari-class-submarine/>



Fri, 10 Jan 2025

Putin's Upcoming Visit to India: Will Russia offer the Su-57 Stealth Fighter amid growing regional tensions?

As India prepares to host the Aero-India 2025 exhibition in February, all eyes will be on Russia's Su-57 (Sukhoi-57) stealth fighter jet, which is set to make its debut appearance at the event. For aviation enthusiasts, defence analysts, and policymakers alike, this could mark a significant turning point in India's defence landscape. The Su-57, Russia's first fifth-generation stealth fighter, will be showcased at Yelahanka Air Force Station in Bengaluru, alongside an impressive lineup of other fighter jets from both India and around the world. However, the spotlight will likely shine brightest on this advanced aircraft, as it becomes a symbol of the growing strategic defence ties between India and Russia.

The Su-57: Russia's Fifth-Generation Stealth Fighter

Manufactured by Sukhoi, the Su-57 is one of the most advanced stealth fighter jets in the world. The aircraft has already made its presence felt on the international stage, including at China's Aero Show in November last year, and was recently inducted into Russia's Air Force. As the first fifth-generation fighter jet developed by Russia, the Su-57 is expected to showcase cutting-edge capabilities in stealth, speed, and manoeuvrability—setting it apart from older fourth-generation fighter jets.

What makes the Su-57 especially intriguing is its potential strategic value to India, which has long relied on Russian defence technology. With China rapidly advancing its own military capabilities, including the introduction of its J-20 and J-35 stealth fighters, and its recent claims of developing a sixth-generation stealth bomber, India's need for next-generation aircraft has become more pressing than ever.

Putin's Visit and Potential Offer to India

The timing of Russian President Vladimir Putin's anticipated visit to India could provide a unique opportunity for India to solidify its defence ties with Russia. Speculation is rife that during his visit, Putin may offer India the Su-57 as part of a larger defence cooperation deal. More significantly, the two countries may explore the possibility of co-manufacturing the Su-57 under India's flagship "Make in India" initiative.

India has been a long-time partner of Russia in the defence sector, with the two nations collaborating on the production of the Su-30 fighter jets for over two decades. Given India's growing emphasis on self-reliance in defence production, particularly through the Make in India program, Russia's offer of joint manufacturing for the Su-57 could bolster India's position in the region, ensuring a modernized and indigenous fleet of fighter jets.

The Challenge from China and the Need for Upgraded Aircraft

India's defence priorities are increasingly shaped by the growing military capabilities of neighbouring China. China's rapid advancements in stealth fighter technology, exemplified by its J-20 and J-35 aircraft, and its ambitious claims regarding the development of sixth-generation jets, have raised concerns in New Delhi. As China continues to enhance its defence technology, India finds itself in a race to keep up, especially in the realm of aerial combat capabilities.

Moreover, the delay in receiving crucial aviation engines from the United States has only added to India's defence challenges. The slow delivery of engines has caused delays in the production of the Mark-1A variant of India's indigenous LCA Tejas fighter jet, pushing the project one year behind schedule. With the growing regional threat and a delay in the LCA Tejas program, the need for advanced fighter jets, like the Su-57, has never been more critical.

India's Air Force Chief on the Country's Aviation Deficit

Addressing the increasing gap in military aviation capabilities, Indian Air Force (IAF) Chief Air Chief Marshal AP Singh recently expressed concern over India's lag behind China in both aviation technology and production of fighter aircraft. He advocated for greater participation of private companies in India's aerospace sector, alongside government-owned entities like Hindustan Aeronautics Limited (HAL), to accelerate the production of state-of-the-art aircraft and reduce dependency on foreign suppliers.

The chief's comments underscore the urgency of diversifying and modernizing India's air combat fleet. For India to regain its strategic advantage, particularly against adversaries like China and Pakistan, it will need to adopt cutting-edge technologies and increase its self-sufficiency in defence production.

What's Next for India and the Su-57?

As Aero-India 2025 approaches, the Su-57's debut will be closely watched by global defence experts and military strategists. The aircraft's inclusion in the exhibition provides a rare opportunity for India to evaluate Russia's most advanced fighter jet and determine its potential fit within the Indian Air Force's future combat fleet.

If Putin offers the Su-57 during his visit to India, it could lead to a new phase in defence cooperation between the two countries, centered around joint manufacturing and the development

of next-generation aircraft that could counter China's growing military presence in the region. With an eye on its defence modernization, India may also push for faster delivery timelines and greater involvement of domestic aerospace companies in the production process.

The outcome of these discussions will have long-term implications for India's strategic position in the Indo-Pacific and its efforts to balance the military power dynamics in the region. As global superpowers like China and the US continue to develop and deploy cutting-edge military technology, India's decision to move forward with a modernized fleet of stealth aircraft like the Su-57 could be pivotal in ensuring its air superiority in the years to come.

<https://www.financialexpress.com/business/defence-putins-upcoming-visit-to-india-will-russia-offer-the-su-57-stealth-fighter-amid-growing-regional-tensions-3710950/>



Thu, 09 Jan 2025

After 'Stealth' J-35A From China, Pakistan Discusses Acquiring 5th-Gen KAAN Fighters From Turkey: Reports

During the recently held eighth Pak-Turk Industrial Expo Joint Working Group meeting in Pakistan, the two sides discussed bilateral defense and industrial cooperation, including the possible export of Turkey's KAAN fifth-generation fighter jet to the Pakistani Air Force (PAF). According to Turkish reports, the talks were attended by representatives of 32 institutions, including defense giants from both countries. In addition to exploring the potential export of KAAN to Pakistan, both nations reportedly also discussed the design and co-development of an all-new helicopter.

Pakistan and Turkey are close allies. In 2021, the two states signed a formal agreement to boost defense cooperation by undertaking joint arms manufacturing and have since made concerted efforts to boost engagement and collaboration. The potential deal for KAAN is one of the components of this growing partnership, especially as Turkey seeks customers for its fifth-generation jet and Pakistan harbors ambitions to modernize its air force.

In July 2023, reports and social media posts from Pakistani military bloggers suggested that Pakistan was on the cusp of signing a contract to join the 'KAAN' stealth fighter jet project. No agreement to that end has been signed—yet. The KAAN has come a long way since. Manufactured by Turkish Aerospace Industries (TUSAŞ), KAAN made its first flight in February 2024, catapulting Turkey into the elite group of countries that have indigenously developed a fifth-generation aircraft.

Though envisioned as an air-superiority fighter, some experts believe that the KAAN has evolved into a multi-role fighter, more on the lines of the F-35. This also explains Pakistan's sustained interest in the aircraft. While the discussions on KAAN's export continue to take place, there is a

paucity of information about the nature of these talks and whether Islamabad would join the program as a co-developer or purchase the aircraft.

Previous reports suggested that Pakistan might join the program as a collaborator, contributing technology and shouldering financial burdens. However, as EurAsian Times explored in detail in a previous report, a cash-starved Pakistan may not bring much to the table for the development of KAAN. A source in Pakistan told EurAsian Times that the two sides are seriously discussing the export of KAAN but emphasized that making assumptions at this stage would be premature. Islamabad, unlike India, the source added, likes to keep its big-ticket military acquisitions under wraps.

Additionally, Group Captain Johnson Chacko (retd) shared some predictions about Pakistan's acquisition of KAAN with the EurAsian Times. He said: "Pakistan might have officially joined the KAAN stealth aircraft project. Multiple subsystems would be manufactured in Pakistan. A joint production line is likely being established. This will reduce the financial burden considerably and provide jobs for Pakistanis."

The prospect is, nevertheless, intriguing because Pakistan might have already decided to buy China's newly unveiled J-35 fifth-generation combat aircraft.

Two Fifth-Gen Stealth Fighters For Pakistan?

A host of speculative reports suggest that the Pakistan Air Force has approved the purchase of 40 Chinese J-35 aircraft, which should be delivered in the next two years. Air Chief Marshal Zaheer Ahmed Baber Sidhu, the chief of Pakistan's Air Force, said in January 2024 that the "foundation for acquiring the J-31 stealth fighter aircraft has already been laid" and that it would join the PAF's fleet "shortly." The J-35 is believed to be a more advanced and "production-ready" iteration of the earlier FC-31 model.

The J-35 is a medium-sized fighter with a tailplane wing configuration and a surface-attack capability. The acquisition of the aircraft by the Pakistani Air Force (PAF) would significantly bolster its capability. Though details about the J-35 currently remain shrouded in secrecy, Chinese experts have claimed that the J-35 is the "most stealthy" aircraft in the world. Pakistan was previously known to be working on its fifth-generation aircraft under Project Azm. The PAF officially unveiled Project Azm in July 2017 to develop a Fifth-Generation Fighter Aircraft (FGFA), new munitions, and an unmanned aerial vehicle (UAV), among other platforms. However, with no new development on the aircraft in several years, the project is believed to have been shelved or postponed indefinitely.

This is perhaps where the Turkish fifth-generation fighter project KAAN and the Chinese J-35 come into the picture. Pakistan's acquisition of military platforms has historically been influenced by its ambition to outmatch its arch-rival, India. While neither of the two has a fifth-generation aircraft yet, India's Advance Medium Combat Aircraft (AMCA) is still better placed than Pakistan's Project Azm.

With the acquisition of a fifth-generation stealth aircraft, Pakistan will effectively have a more technologically advanced air force. However, whether a cash-strapped Islamabad can afford to buy two different stealth fighters (the Chinese J-35 and the Turkish KAAN) remains to be seen.

Indian Air Force veteran and a seasoned aviation expert, Air Marshal Anil Chopra (retd), told EurAsian Times: “Pakistan and Turkey will keep talking for export of KAAN. For Turkey, Pakistan is a close friend of the Islamic world and an excellent market for Turkish jets. About 200 Pakistani technicians are already working in TAI right now, and Turkey is eager to set up facilities in Pakistan.

“However, Turkey’s KAAN is not going to be ready for induction before 2030. On the contrary, China (with a more advanced aviation industry) can deliver the J-35 faster than Turkey can deliver the KAAN. China knows marketing the J-35 to Pakistan would boost the aircraft’s export potential elsewhere.”

On whether Pakistan would purchase both fifth-generation fighter jets that it has shown interest in, Air Marshal Chopra said, “Pakistan cannot afford to buy two different stealth aircraft. The collaboration on the KAAN program might ultimately translate into Pakistan acquiring some sophisticated fifth-generation technologies that it can use in the production of its indigenous fifth-generation aircraft, if at all.

“Moreover, these talks are likely to continue because Pakistan’s military is made up of a majority of Chinese equipment. They realize they need to diversify. Through KAAN, they strengthen their defense cooperation with a trusted and reliable partner, Turkey.”

Nevertheless, Pakistan’s acquisition of a fifth-generation stealth fighter jet would put India in a very precarious situation. India’s AMCA is still under development and is anticipated to enter service only by the mid-2030s. This practically means that Pakistan would beat India in the fifth-generation race and have an edge in air combat in the next couple of years. Advanced stealth aircraft are harder to intercept by air defense systems, and hence, they can launch first strikes.

India is currently starved for choices. The only two options available are the US F-35 Lightning II and the Russian Su-57, and none perfectly align with its strategic needs. In addition, India is also currently staring at a depleted squadron strength—down to just 31, as opposed to the sanctioned strength of 42.

India is also struggling with inducting aircraft that were ordered long ago. Speaking at a seminar recently, Indian Air Force (IAF) chief AP Singh lamented the snail-paced delivery of the Tejas aircraft that have been ordered since 2009-10. “We should go back to 1984 when we conceived that aircraft. The first aircraft flew in 2001, 17 years later. The induction started another 15 years later, in 2016. Today, we are in 2024. I do not have the first 40 aircraft also, so this is the production capability,” the IAF chief said. On the contrary, Pakistan has acted swiftly and inducted J-10CE 4.5th generation fighters acquired from China in the last few years to counter Indian Rafale.

Against that backdrop, Pakistan’s procurement of a fifth-generation aircraft would further widen the gap that exists between the Pakistani and the Indian Air Force. Together with the F-16 and J-10C, these aircraft could give Pakistan an edge over India.

<https://www.eurasiantimes.com/after-stealth-j-35a-from-china-pakistan/>

Science & Technology News



Press Information Bureau
Government of India

Ministry of Science & Technology

Thu, 09 Jan 2025

India Takes a Giant Leap in Genomics: Launch of Indian Genomic Data Set & IBDC Portals to Empower Global Research

"India's Genomic Revolution: 10,000 Whole Genome Samples Now Accessible Globally"
"Prime Minister Modi Congratulates Scientific Community as India Poised to Lead the Next Generation Revolution in Biotech"

Making a vital move towards self-reliance in the field of genomics, Dr. Jitendra Singh, Union Minister of State (Independent Charge) for Science and Technology, today announced that India is no longer dependent on foreign genomic data. At the Genome India Data Conclave, held at Vigyan Bhavan, New Delhi,

Under the leadership of Prime Minister Narendra Modi the Indian Genomic Data Set unveiled and Union Minister Dr. Jitendra Singh launched the 'Framework for Exchange of Data Protocols (FeED)' and the Indian Biological Data Centre (IBDC) Portals, making 10,000 whole genome samples accessible to researchers across India and the globe.

Addressing the conclave, Dr. Singh proudly stated, "India has developed its own genomic data set, a monumental achievement that will fuel future medical and scientific breakthroughs. The entire collection of 10,000 whole genome samples, archived at IBDC, is now made available for research purposes not only within India but globally. This data set will serve as a critical resource for genomics research, contributing to advancements in personalized healthcare and medicine."

The Indian Biological Data Centre (IBDC) will facilitate seamless access to valuable genetic information, enabling researchers to explore genetic variations and design more accurate genomic tools. The 10,000 whole genome sequencing (WGS) samples come from diverse Indian populations and provide a rich catalog of genetic variations. This initiative is set to position India as a leader in genomics, enabling the development of genomic chips tailored to the Indian demographic, thereby enhancing the precision of genetic studies.

Dr. Singh emphasized the significance of the 'GenomeIndia' project, spearheaded by the Department of Biotechnology (DBT), which aims to create a robust and comprehensive database of India's genetic diversity. The data will serve as a foundation for cutting-edge research and will catalyze innovations in areas such as mRNA-based vaccines, protein manufacturing, and genetic

disorder treatments. He said in India there is diversity not only in food, culture and geography but also in Genome.

The launch of the 'Framework for Exchange of Data (FeED)' Protocols under the Biotech-PRIDE Guidelines ensures that the high-quality, nation-specific data will be shared in a transparent, fair, and responsible manner. The Biotech-PRIDE Guidelines, introduced in 2021, are a testament to India's commitment to ethical and secure data sharing.

Dr. Singh highlighted the impressive growth of India's bioeconomy, which has surged from \$10 billion in 2014 to over \$130 billion in 2024, with projections to hit \$300 billion by 2030. The Minister attributed this growth to the visionary leadership of Prime Minister Narendra Modi and the new Bioeconomy Policy, which is set to make India a global leader in biotech, positioning the country to lead the 4th industrial revolution.

India now ranks 12th globally in biotech and 3rd in the Asia-Pacific region. The Minister also pointed out that India is the largest vaccine producer in the world and the third-largest startup ecosystem. The rapid rise of biotech startups—from just 50 in 2014 to over 8,500 in 2023—demonstrates India's growing leadership in biotechnology and its potential to revolutionize the global bioeconomy.

Dr. Jitendra Singh further announced a future target of sequencing 10 million genomes to accelerate India's advancements in genomics and personalized medicine. He also suggested expanding the initiative by collaborating with prominent institutions such as the Tata Memorial Hospital to enhance data enrichment efforts. Dr. Rajesh S. Gokhale, Secretary of DBT said with Genomic Data Available we can counter genetic and hereditary diseases.

Prof. Ajay Kumar Sood, Principal Scientific Adviser to the Government of India, spoke about the transformative potential of this data, emphasizing its role in the prevention and cure of genetic disorders. He also highlighted that the data generated from the GenomeIndia project would not only strengthen healthcare but also provide invaluable insights for agricultural, environmental, and industrial research.

Dr. Rajiv Bahl, Director General of ICMR; Dr. Y Narahari, CBR, IISc Bengaluru; Dr. Arvind Sahu, Executive Director RCB and senior officials from the concerned scientific ministries were present at the event, underscoring the collective effort behind the success of this project.

In his video message, Prime Minister Narendra Modi congratulated the scientific community on this achievement and laid out a roadmap for India's future in genomics. He praised the initiative as a testament to India's scientific prowess and its vision for the future of healthcare and biotechnology. This initiative will also develop an ecosystem which would act as Knowledge hub and Innovation Hub and contribute to make Viksit Bharat @2047. He also reiterated that Pro-people governance, Digital Public infrastructure development and Genomic Data Bank will empower India.

The 'GenomeIndia' project is poised to make India a global hub for genomic research, positioning the country at the forefront of the next scientific and medical revolution.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2091577>



**Press Information Bureau
Government of India**

Ministry of Science & Technology

Thu, 09 Jan 2025

**ISRO's 2025 Space missions include "uncrewed" mission
under 'Gaganyaan'**

**Dr. Jitendra Singh Reviews ISRO's 2025 Space Mission Line-Up;
Gaganyaan Orbital Test Among Highlights**

**ISRO Set for Key 2025 Missions: GSLV Launches, LVM3 Commercial
Flight, and ISRO-NASA NISAR Collaboration**

**Dr. Jitendra Singh Applauds ISRO's Innovation Drive, Calls for Public-
Private Synergy to Propel India's Space Ambitions**

Union Minister of State (Independent Charge) for Science and Technology; Earth Sciences and Minister of State for PMO, Department of Atomic Energy, Department of Space, Personnel, Public Grievances and Pensions, Dr. Jitendra Singh, today chaired a high-level review of ISRO's major upcoming space missions for 2025, alongside outgoing Chairman Dr. S. Somnath, his successor Dr. V. Narayanan, and other senior officials, including Mr. Pawan Kumar Goenka, Chairman of IN-SPACE.

With ambitious projects on the horizon, including the first "uncrewed" orbital mission under "Gaganyaan", India's space exploration efforts are poised for groundbreaking achievements.

The Indian Space Research Organisation (ISRO) is gearing up for a busy first half of 2025, with a lineup of significant missions showcasing technological prowess and international collaboration. Among the highlights is the launch of Gaganyaan's uncrewed orbital test mission. This critical endeavour will pave the way for India's human spaceflight program, aiming to validate systems for crew safety and recovery.

In addition, two GSLV missions, a commercial launch of LVM3, and the much-anticipated ISRO-NASA collaboration on the NISAR satellite are slated for the coming months. The GSLV-F15 mission in January will carry the NVS-02 navigation satellite to augment the NavIC constellation, bolstering India's positioning and navigation capabilities with indigenously developed atomic clocks.

In February, the GSLV-F16 mission will launch NISAR, a sophisticated Earth observation satellite co-developed with NASA. Equipped with advanced radar imaging technology, NISAR will provide critical data on agriculture, natural disasters, and climate monitoring.

The commercial LVM3-M5 mission, set for March, will deploy BlueBird Block-2 satellites under a contract with the U.S.-based AST SpaceMobile. This underscores ISRO's growing stature in the global space market.

Dr. Jitendra Singh lauded ISRO's strides in fostering innovation and advancing India's position as a space-faring nation. He emphasized the importance of public-private collaboration in fuelling the country's space ambitions. Dr. S. Somnath, reflecting on his tenure, expressed confidence in the upcoming missions, while Dr. V. Narayanan outlined a strategic roadmap for expanding ISRO's global footprint.

As India prepares to script another chapter in space exploration, the success of these missions will not only enhance technological capabilities but also cement the country's reputation as a leader in space science. For the millions following these developments, 2025 promises to be a landmark year for ISRO and Indian science.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2091563>



Press Information Bureau
Government of India

Ministry of Science & Technology

Thu, 09 Jan 2025

Sustainable, efficient nano catalyst developed that can minimize environmental impact in industrial chemical processes

A new copper-based catalyst with star-like Nano structure has been developed by scientists through the controlled growth of copper oxide nanostructures on a sporopollenin template offers a pathway to more sustainable industrial chemical reactions, with the potential to lower costs and reduce environmental impact across sectors, including pharmaceuticals and materials science.

To fulfil the need for replacing harmful processes with environmentally friendly methods, scientists are working towards materials that address the growing need for green solutions in catalysis, which can minimize environmental impact in industrial chemical processes.

The method of controlled growth of copper oxide nanostructures on a sporopollenin template, used by Scientists from Institute of Nano Science and Technology (INST), an autonomous institution of the Department of Science and Technology (DST), created a "morning star" structure, where bowl-shaped features of the sporopollenin and polyethyleneimine (PEI) activation facilitate the synthesis of these unique nano-star forms. This setup is optimized to perform catalysis sustainably under "green" conditions.

Sporopollenin which has a bowl-like outer structure, as a scaffold, enables the growth of copper oxide rods that form a nanostar shape. The surface of sporopollenin is functionalized with PEI,

which provides amine groups crucial for the nucleation and growth of the copper oxide nanostructures. The catalyst thus formed is useful in organic reactions and can be used in environmental remediation, nanoscale electronics, and surface-enhanced Raman spectroscopy (SERS). It has excellent efficiency in water without additives, surpassing conventional catalysts which often require high temperatures, additives, or harsh solvents and is reusable across five cycles.

By utilizing spores—an abundant biomass waste—as a foundation for high-value catalysts, this innovation which was published in *Nanoscale* 2024, exemplifies the transformation of waste into wealth, addressing a critical need. Its eco-friendly synthesis aligns seamlessly with sustainable development goals, directly tackling environmental concerns tied to conventional catalytic processes.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2091533>



Fri, 10 Jan 2025

ISRO’s SpaDex mission back on track after satellite drift, docking may be achieved on Friday

The two satellites launched by the Indian Space Research Organisation (ISRO) for a space docking experiment may soon attain the conditions needed to commence the mission. The docking experiment, originally scheduled for Thursday, was postponed after the satellites drifted more than expected during a manoeuvre to reduce the distance between them.

The space agency said in a statement on Thursday: “The drift has been arrested and spacecraft put in a slow drift course to move closer to each other. By tomorrow, it is expected to reach initialisation conditions.”

For the experiment, the two small satellites launched by ISRO on December 30 were to be progressively brought closer in orbit, halting at distances of 5 km, 1.5 km, 500 m, 225 m, 15 m, and 3 m before finally joining together. The drift occurred during a manoeuvre initiated on Wednesday evening to move the Chaser satellite from 500 metres to 225 metres, during a non-visibility period (when the satellites cannot be tracked from ground stations).

This marks the second postponement — the mission was initially planned for January 7 but was delayed to allow for more ground simulations to “improve the accuracy.”

During docking, the extended rings on both satellites will come together before joining and rigidization to secure their connection. The satellites will then share electrical power, with researchers also experimenting with commanding both satellites as a single unit.

Space docking is essential for missions requiring large payloads that cannot be carried in a single launch. India needs this technology for its future plans of bringing samples back from the Moon

and setting up a space station. A successful experiment will make India the fourth country after the United States, Russia, and China to master this technology.

<https://indianexpress.com/article/india/isros-spadex-mission-back-on-track-after-satellite-drift-docking-may-be-achieved-on-friday-9770309/>

THE ECONOMIC TIMES

Thu, 09 Jan 2025

ISRO to launch communication satellite of US-based AST SpaceMobile

The Indian Space Research Organisation's (ISRO) LVM3 rocket will launch in March a communication satellite of a US-based firm AST SpaceMobile that plans to provide space-based cellular broadband network services on smartphones. "The commercial LVM3-M5 mission, set for March, will deploy BlueBird Block-2 satellites under a contract with the US-based AST SpaceMobile," an official statement said.

The statement came after Science and Technology Minister Jitendra Singh reviewed the functioning of the Department of Space with senior officials, including the outgoing ISRO chairman S Somanath, his successor V Narayanan and Pawan Kumar Goenka, Chairman of Indian National Space Promotion and Authorisation Centre (IN-SPACe).

Narayanan, who will succeed Somanath on January 14, during the meeting outlined a strategic roadmap for expanding the ISRO's global footprint.

The joint NASA-ISRO satellite - NISAR - and a navigation satellite NVS-02 are set for launch in February on board two separate missions of the GSLV rocket, it added.

With ambitious projects on the horizon, including the first "uncrewed" orbital mission under "Gaganyaan", India's space exploration efforts are poised for groundbreaking achievements.

The ISRO has lined up significant missions showcasing technological prowess and international collaboration, which include the launch of Gaganyaan's uncrewed orbital test mission. "This critical endeavour will pave the way for India's human spaceflight program, aiming to validate systems for crew safety and recovery," the statement said.

In addition, two GSLV missions, a commercial launch of LVM3 and the much-anticipated ISRO-NASA collaboration on the NISAR satellite are slated for the coming months.

The GSLV-F15 mission in January will carry the NVS-02 navigation satellite to augment the NavIC constellation, bolstering India's positioning and navigation capabilities with indigenously developed atomic clocks.

In February, the GSLV-F16 mission will launch NISAR, a sophisticated Earth observation satellite co-developed with NASA.

Equipped with advanced radar imaging technology, NISAR will provide critical data on agriculture, natural disasters and climate monitoring.

Singh lauded the ISRO's strides in fostering innovation and advancing India's position as a space-faring nation.

He emphasized the importance of public-private collaboration in fuelling the country's space ambitions.

<https://economictimes.indiatimes.com/news/science/isro-to-launch-communication-satellite-of-us-based-ast-spacemobile/articleshow/117092871.cms>



Fri, 10 Jan 2025

10,000 human genomes database launched

India has completed and made available a year-long compilation of 10,000 human genomes from India, representing 83 population groups, or about 2% of the country's 4,600 population groups as a database. This collection will serve a template of future investigations into disease and drug therapy.

This 'Genome India' database, as it is known, will now be available to researchers across the world for investigations and is housed at the Indian Biological Data Centre (IBDC), in Faridabad, Haryana.

A first analysis of the genomes estimates around 27 million low-frequency (or relatively rare) variants, with 7 million of them not found in similar reference databases around the world. Certain population groups show higher frequencies of alleles, or different versions of the same gene. Over the last two decades, many countries have created databases of the genomes of their population — for a variety of purposes including estimating disease risks, adverse drug reactions, establishing genealogy and DNA-profiling databases.

However, a major focus of the Indian reference genomes is to have researchers study diseases. "The discoveries from Genome India are not just scientific — they hold the potential for targeted clinical interventions, advancing precision medicine for better healthcare," said Union Minister of State (independent charge) for Science and Technology Jitendra Singh, at an event here to announce the project.

Researchers wishing to access the genomes must send in a proposal that will be perused by an independent committee with a commitment that will adhere to data sharing and privacy policies. Though the database stores information on population groups, this data will not be classified by the names of castes or tribes but will be numerically coded, Rajesh Gokhale, Secretary, Department of Biotechnology told The Hindu.

Describing the project as “historic”, Prime Minister Narendra Modi, in a video address, said this paved the way for India strengthening the biotechnology economy as well as biotechnology-based manufacturing. Experts associated with the project said that while only a small fraction of India’s population groups were studied, the door was open to expanding the database to a million genomes.

“Though costs are a limiting factor, a million would dramatically scale insight into India’s genetic diversity,” said Kumaraswamy Thangaraj of the Centre for Cellular Microbiology, Hyderabad and one of the leaders of the project.

<https://www.thehindu.com/sci-tech/science/10000-human-genomes-database-launched/article69081500.ece>



Thu, 09 Jan 2025

How will AI revolutionize drug development?

The potential of using artificial intelligence in drug discovery and development has sparked both excitement and skepticism among scientists, investors and the general public.

“Artificial intelligence is taking over drug development,” claim some companies and researchers. Over the past few years, interest in using AI to design drugs and optimize clinical trials has driven a surge in research and investment. AI-driven platforms like AlphaFold, which won the 2024 Nobel Prize for its ability to predict the structure of proteins and design new ones, showcase AI’s potential to accelerate drug development.

AI in drug discovery is “nonsense,” warn some industry veterans. They urge that “AI’s potential to accelerate drug discovery needs a reality check,” as AI-generated drugs have yet to demonstrate an ability to address the 90% failure rate of new drugs in clinical trials. Unlike the success of AI in image analysis, its effect on drug development remains unclear.

We have been following the use of AI in drug development in our work as a pharmaceutical scientist in both academia and the pharmaceutical industry and as a former program manager in the Defense Advanced Research Projects Agency, or DARPA. We argue that AI in drug development is not yet a game-changer, nor is it complete nonsense. AI is not a black box that can turn any idea into gold. Rather, we see it as a tool that, when used wisely and competently, could help address the root causes of drug failure and streamline the process.

Most work using AI in drug development intends to reduce the time and money it takes to bring one drug to market – currently 10 to 15 years and US\$1 billion to \$2 billion. But can AI truly revolutionize drug development and improve success rates?

AI in drug development

Researchers have applied AI and machine learning to every stage of the drug development process. This includes identifying targets in the body, screening potential candidates, designing drug molecules, predicting toxicity and selecting patients who might respond best to the drugs in clinical trials, among others.

Between 2010 and 2022, 20 AI-focused startups discovered 158 drug candidates, 15 of which advanced to clinical trials. Some of these drug candidates were able to complete preclinical testing in the lab and enter human trials in just 30 months, compared with the typical 3 to 6 years. This accomplishment demonstrates AI's potential to accelerate drug development.

On the other hand, while AI platforms may rapidly identify compounds that work on cells in a Petri dish or in animal models, the success of these candidates in clinical trials – where the majority of drug failures occur – remains highly uncertain.

Unlike other fields that have large, high-quality datasets available to train AI models, such as image analysis and language processing, the AI in drug development is constrained by small, low-quality datasets. It is difficult to generate drug-related datasets on cells, animals or humans for millions to billions of compounds. While AlphaFold is a breakthrough in predicting protein structures, how precise it can be for drug design remains uncertain. Minor changes to a drug's structure can greatly affect its activity in the body and thus how effective it is in treating disease.

Survivorship bias

Like AI, past innovations in drug development like computer-aided drug design, the Human Genome Project and high-throughput screening have improved individual steps of the process in the past 40 years, yet drug failure rates haven't improved.

Most AI researchers can tackle specific tasks in the drug development process when provided with high-quality data and particular questions to answer. But they are often unfamiliar with the full scope of drug development, reducing challenges into pattern recognition problems and refinement of individual steps of the process. Meanwhile, many scientists with expertise in drug development lack training in AI and machine learning. These communication barriers can hinder scientists from moving beyond the mechanics of current development processes and identifying the root causes of drug failures.

Current approaches to drug development, including those using AI, may have fallen into a survivorship bias trap, overly focusing on less critical aspects of the process while overlooking major problems that contribute most to failure. This is analogous to repairing damage to the wings of aircraft returning from the battle fields in World War II while neglecting the fatal vulnerabilities in engines or cockpits of the planes that never made it back. Researchers often overly focus on how to improve a drug's individual properties rather than the root causes of failure.

The current drug development process operates like an assembly line, relying on a checkbox approach with extensive testing at each step of the process. While AI may be able to reduce the time and cost of the lab-based preclinical stages of this assembly line, it is unlikely to boost success rates in the more costly clinical stages that involve testing in people. The persistent 90% failure rate of drugs in clinical trials, despite 40 years of process improvements, underscores this limitation.

Addressing root causes

Drug failures in clinical trials are not solely due to how these studies are designed; selecting the wrong drug candidates to test in clinical trials is also a major factor. New AI-guided strategies could help address both of these challenges.

Currently, three interdependent factors drive most drug failures: dosage, safety and efficacy. Some drugs fail because they're too toxic, or unsafe. Other drugs fail because they're deemed ineffective, often because the dose can't be increased any further without causing harm.

We and our colleagues propose a machine learning system to help select drug candidates by predicting dosage, safety and efficacy based on five previously overlooked features of drugs. Specifically, researchers could use AI models to determine how specifically and potently the drug binds to known and unknown targets, the level of these targets in the body, how concentrated the drug becomes in healthy and diseased tissues, and the drug's structural properties.

These features of AI-generated drugs could be tested in what we call phase 0+ trials, using ultra-low doses in patients with severe and mild disease. This could help researchers identify optimal drugs while reducing the costs of the current "test-and-see" approach to clinical trials.

While AI alone might not revolutionize drug development, it can help address the root causes of why drugs fail and streamline the lengthy process to approval.

<https://www.thehindu.com/sci-tech/science/how-will-ai-revolutionize-drug-development/article69076320.ece>

THE TIMES OF INDIA

Fri, 10 Jan 2025

Historic: Scientists extract 1.2-million-year-old ice core in Antarctic

An international team of scientists has successfully drilled nearly two miles into Antarctic bedrock, extracting one of the oldest ice cores to date, estimated to be at least 1.2 million years old. The breakthrough promises to offer unprecedented insights into Earth's atmospheric and climate history, potentially reshaping understanding of Ice Age cycles and atmospheric carbon's role in climate change.

"Thanks to the ice core, we will understand what has changed in terms of greenhouse gases, chemicals, and dusts in the atmosphere," said Carlo Barbante, an Italian glaciologist and coordinator of Beyond EPICA, the research project behind the drilling effort.

The core drilling took place at Little Dome C, near the Concordia Research Station, where temperatures average around minus-35°C. Over four years, a 16-member team meticulously worked each Antarctic summer to complete the drill, finally reaching bedrock in early January.

Preliminary isotope analyses confirm the ice's age as exceeding 1.2 million years. Barbante highlighted that previous findings from an 800,000-year-old core revealed greenhouse gas levels, including carbon dioxide and methane, never exceeded pre-Industrial Revolution concentrations—even during warm periods.

However, today's carbon dioxide levels are roughly 50% higher than any levels recorded in that ancient span.

The Beyond EPICA project, led by Italy and funded by the European Union, aims to deepen knowledge of Earth's environmental past. Richard Alley, a Penn State climate scientist unaffiliated with the research, celebrated the accomplishment as “truly, truly, amazingly fantastic,” emphasising its significance for advancing climate science and understanding Earth's deeper history beyond ice records.

“The knowledge gained from this discovery will provide scientists with invaluable tools to assess both natural climate variability and the effects of human activities,” Alley added.

<https://timesofindia.indiatimes.com/science/historic-scientists-extract-1-2-million-year-old-ice-core-in-antarctic/articleshow/117102939.cms>

