

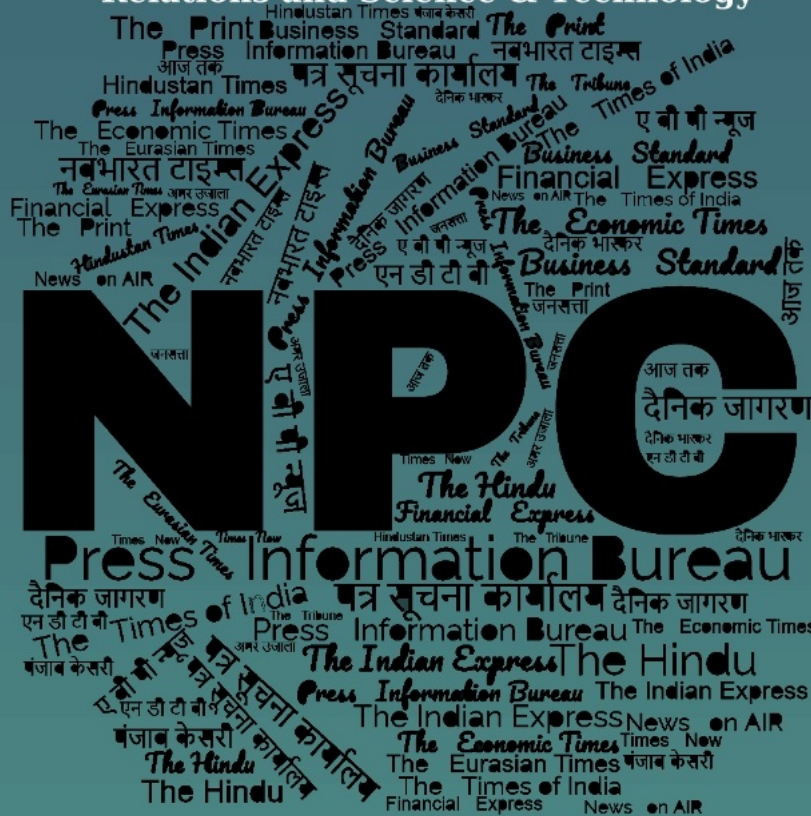
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CONTENTS

S. No.	Title	Source	Page No.
DRDO News			1-3
1	DRDO's CAS Hosts Workshop Celebrating 1,000 Hypersonic Tests on Space Vehicles	<i>Deccan Chronicles</i>	1
2	9 projects worth Rs 334 cr sanctioned under TDF scheme: Defence MoS Sanjay Seth tells Lok Sabha	<i>The Economic Times</i>	2
Defence News			4-12
Defence Strategic: National/International			
3	Pakistan plans to acquire 40 planes of China's latest stealth fighter J-35: Report	<i>The Economic Times</i>	4
4	Not just IAF, defence ministry undertakes critical review of tri-service priorities & solutions	<i>The Print</i>	5
5	No Chinese parts, no worries: Indian drone maker Zuppa offers hijack-proof systems for India's defence	<i>The Week</i>	7
6	UP's Kanpur, 'Manchester of the East', pivots to military ware hub	<i>Business Standard</i>	8
7	Army's equine, canine unit falls short on training, animal transport use: CAG	<i>The New Indian Express</i>	9
8	India-Indonesia Ties Soar: A Strategic Trade and Defence Partnership in the Making	<i>Financial Express</i>	10
Science & Technology News			12-22
9	AIIMS, Delhi developing low cost adaptive cellular therapy for treatment of multiple myeloma	<i>The Hindu</i>	12
10	Explained Why Earth's magnetic North Pole cruising to Russia and how it affects your GPS	<i>Deccan Herald</i>	14
11	Feeling emotional? Robots might sense it just by touching you	<i>The Economic Times</i>	16
12	PSLV-C60 POEM-4: Pioneering space research with cutting-edge payloads from ISRO, startups, and universities	<i>The Week</i>	17
13	Breakthrough For Bioengineering As Study Deciphers How Cells Define Their Identity	<i>The Times of India</i>	20
14	Worlds Most Expensive Indo US NISAR Satellite Likely To Be Launched-In-March: NASA	<i>The Times of India</i>	21

DECCAN Chronicle

Tue, 24 Dec 2024

DRDO's CAS Hosts Workshop Celebrating 1,000 Hypersonic Tests on Space Vehicles

The Centre for Advanced Systems (CAS), DRDO, organised a day-long workshop on hypersonics on Saturday, commemorating the completion of 1,000 hypersonic tests on space vehicles in its hypersonic wind tunnel (HWT).



The day-long workshop on hypersonics, led by Dr. Sivasubramaniam Nambi Naidu, highlighted advancements in testing, simulation, and material innovations.

Dr. Sivasubramaniam Nambi Naidu, distinguished scientist (DS) and Director of CAS, led the workshop, which provided a platform for discussing the challenges and innovations in hypersonic testing. The event emphasised advancements in testing, simulation, and material innovations, playing a critical role in strengthening India's hypersonic research ecosystem and fostering the development of next-generation aerospace technologies.

The HWT, inaugurated on December 19, 2020, by Defence minister Rajnath Singh, is a specialised testing facility simulating airflow at speeds exceeding Mach 5, or five times the speed of sound.

It has been instrumental in developing high-speed, maneuverable missiles and other technologies for both military and civilian applications. This indigenously developed facility reflects India's commitment to self-reliance (Atmanirbhar Bharat) in advanced aerospace technologies.

Dr R.R. Prahlada, former chief controller (R&D) of DRDO; U. Rajababu, Director-General of Missiles and Strategic Systems (MSS); G.A. Srinivasa Murthy, Director of DRDL, and B.V. Papa Rao, Director of ASL; were present. Scientists from ISRO and CSIR labs, professors from IISc, IITs, NITs, and DRDO researchers also attended the event.

<https://www.deccanchronicle.com/southern-states/telangana/drdo-cas-hosts-workshop-celebrating-1000-hypersonic-tests-on-space-vehicles-1849235>

THE ECONOMIC TIMES

Mon, 23 Dec 2024

9 projects worth Rs 334 cr sanctioned under TDF scheme: Defence MoS Sanjay Seth tells Lok Sabha



A view of the AMOLED Research Centre inaugurated at IIT Madras campus on 21st Dec 2024

The Indian Institute of Technology Madras (IIT Madras) on Monday announced that a research centre will develop the next generation of AMOLED displays for smartphones, tablets, watches and wearables. These displays adjust brightness, consume less battery and produce better colours and contrast. The research centre will be called a national Centre of Excellence (CoE)--‘AMOLED Research Centre’ (ARC) which has been funded by MeitY, Defence Research and Development Organisation (DRDO) and Tata Sons.

“The aim of ARC is to create a technology that will enable the growth of modular display factories (micro-factories). It has capabilities of both current and next-generation growth processes. The centre currently focuses on small-size displays such as those used in tablets, smartphones, and watches,” IIT-Madras said.

As per data from Statista – a data collection platform, around 46 million smartphone units were shipped across India in the third quarter of 2024, highlighting the growing demand for manufacturing these displays. Secretary of MeitY, S Krishnan, during the launch, said, “The Centre is working to develop a technique to manufacture AMOLED displays which can be used in digital devices including smartphones, smartwatches and tablets.

It is envisioned that the new method, which is based on the ‘economies-of-speed’, will enable a modular micro-factory concept of manufacture of these devices.”

He added that the centre is also developing the prototypes of OLED Lighting and OPV power source for mobile phones driving India’s vision for becoming self-reliant and manufacturing it for the global market.

According to IndustryARC– a market research report firm, the market size for AMOLED displays is forecasted to reach \$46.5 billion by 2030. The research paper added that the APAC region held the largest market share with 38% in 2023 and is expected to grow at a CAGR of 18.9%.

The IIT-Madras centre will comprise researchers from various fields working on developing the displays. It consists of a state-of-the-art cleanroom which houses fabrication and characterization equipment.

ARC’s principal investigator, Dr. Debducta Ray, who is also an associate professor in the Department of Electrical Engineering, IIT Madras, said, “This is the only centre in India that has the capability to develop smartphone-sized AMOLED displays. The Centre will work towards turnkey solutions, where we plan to develop, demonstrate, deploy micro-factories for smartphone displays.”

He added that the goal is to keep the unit fabrication times the same or better where the ‘economies-of-speed’ allow smaller mother-glass size during production. “This will lead to a modular production system.”

<https://economictimes.indiatimes.com/tech/technology/iit-madras-launches-research-centre-for-amoled-displays-funded-by-meity-drdo-tata-sons/articleshow/116603546.cms?>

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THE ECONOMIC TIMES

Mon, 23 Dec 2024

Pakistan plans to acquire 40 planes of China's latest stealth fighter J-35: Report

Pakistan plans to procure 40 jets of advanced Chinese stealth fighter J-35, which, if materialised, will mark the first export of China's latest jet, according to a media report on Monday. The sale would mark Beijing's first export of fifth-generation jets to a foreign ally and is expected to recalibrate regional dynamics, particularly in relation to Pakistan's rival India, the Hong Kong-based South China Morning Post reported.

The Post quoted Pakistan media reports stating that the Pakistan Air Force (PAF) had approved the purchase of 40 aircraft, expected to be delivered within two years, to replace its ageing fleet of American F-16s and French Mirage fighters. The acquisition of new aircraft was pursued despite the serious economic crisis faced by Pakistan.

There is no official confirmation in Beijing or mention of such a deal in the official media here, though speculation is rife since the J-35, primarily regarded as a jet fighter meant for Chinese aircraft carriers, was exhibited at the prestigious annual air show at Zhuhai city last month attended by top PAF officials. The land-based version of J-35 was called J-31, according to previous reports. China is currently the only country in the region to have developed stealth aircraft.

PAF chief Air Marshal Zaheer Ahmed Baber Sidhu said in January that "the foundation for acquiring the J-31 stealth fighter aircraft has already been laid", according to the Post report.

All weather allies, China and Pakistan, shared a deep military relationship shrouded in secrecy. Beijing has been helping the modernisation of all three wings of the Pakistan military as it modernised its own armed forces with billions of dollars of defence expenditure.

China has helped Pakistan to jointly develop and operate the J-17 Thunder fighter jet, the mainstay of the PAF. China has delivered four advanced naval frigates to the Pakistan Navy in the last few years to enable it to play a bigger role along with its navy in the Indian Ocean and Arabian Sea.

The reports of Pakistan's plans to acquire China's latest fighter jets come in the backdrop of the visit of top PLA General Zhang Youxia to Pakistan last month, during which he held one-on-one talks with Pakistan's Army chief Gen Asim Munir. Gen Zhang is Vice Chairman of the Central

Military Commission (CMC), the overall command of the Chinese military headed by President Xi Jinping.

A readout issued by the ISPR after the talks said their engagements focused on "matters of mutual interest, regional security dynamics, measures for regional stability, and enhancing bilateral defence cooperation".

Gen Zhang's visit coincided with the arrival of 300 Chinese troops to Pakistan to take part in counter-terrorism drills. According to Pakistan media reports, China is pressing Pakistan to allow its security firms to protect about 20,000 Chinese personnel working on the projects of the China-Pakistan Economic Corridor (CPEC), who are increasingly coming under attacks from militant groups in Pakistan.

For its part, Pakistan says it has deployed over 30,000 military and para-military personnel to protect the Chinese workers. Pakistan has been reportedly resisting Beijing's pressure to deploy Chinese troops over sovereignty concerns, according to the reports.

<https://economictimes.indiatimes.com/news/defence/pakistan-plans-to-acquire-40-planes-of-chinas-latest-stealth-fighter-j-35-report/articleshow/116602944.cms>

ThePrint

Mon, 23 Dec 2024

Not just IAF, defence ministry undertakes critical review of tri-service priorities & solutions

The Ministry of Defence is carrying out an elaborate internal study with the three armed services to understand what their priorities are when it comes to procurements over the next 8-10 years and to identify the roadblocks faced along with their solutions, ThePrint has learnt.

One such internal meeting was held at the Indian Air Force (IAF)-level recently. However, it is learnt that a similar process is on a larger scale.

Sources in the defence and security establishment told ThePrint that the trigger for this exercise being undertaken by the new defence secretary Rajesh Kumar Singh was the IAF Commanders' Conference held in November.

It is learnt that instead of Defence Minister Rajnath Singh addressing the commanders with a customary speech, he started to talk to them wanting to know their side of how and what should be procured on priority.

"It was a free and frank discussion. The defence minister was there along with the Defence Secretary, CDS, the DRDO chief and the Secretary of Defence Production and the brainstorming session took some time," a source said.

Following this, Singh has directed the defence secretary to work with others to come out with a list of priorities, problems, and solutions.

It is learnt the IAF has sought time till 26 January to finalise the list of priorities and the way forward. Similar work is being done along with other services too; the process is expected to take at least till mid-February to be completed.

The IAF is facing a critical shortage in its fighter strength as well as refuelers and even early warning aircraft, besides in several other areas.

The IAF fighter strength is down to a mere 31 squadrons, and that too on paper, against a sanctioned strength of 42. The much touted delivery of the Tejas MK 1A has been delayed by over a year with the delay in delivery of the GE engines among others.

The IAF has been wanting to go in for a 114 Multi-Role Fighter Aircraft (MRFA) since 2016 but eight years on, nothing has moved forward.

Incidentally, the MRFA came about because the previous bid to acquire 126 Medium Multi Role Combat Aircraft (MMRCA), in works since 2004, ended up in a lock jam. Later, the government went for an emergency procurement of 36 Rafale fighters. Back then, the hope was that parallelly, India will go in for 114 MRFA under the Buy and Make route even as indigenous Tejas fighters were being built.

In October, ThePrint reported as to why the officials and the government had failed to move ahead with the MRFA deal. The sources had then said that there were two main issues the government, civil servants and IAF officers were trying to find a solution to and break the “logjam”.

“Last time, the government came out with a solution to the MMRCA tender, stuck for years, by going in for a government-to-government contract for 36 Rafale. But a political slugfest erupted,” a source had said, explaining the logjam.

“Officers presented themselves in the Supreme Court and documents concerning vital national interest had to be shared. It became a political hot potato,” another government source said.

The controversy, according to the sources back then, was behind officers and officials, along with the government, playing safe.

The other issue, they had said, was about how much indigenous content the MRFA should have and how much would be manufactured in India.

Secretary in touch with all Services

Meanwhile, the sources said that the defence secretary is in touch with all the three Services.

Asked why such a process was being undertaken despite that there are already formal processes like the Defence Acquisition Council (DAC) and the Defence Acquisition Procedure (DAP), the sources said projects get delayed in spite of best efforts.

“There are multiple projects that are underway. Things get delayed because of procedures even though the DAP 2020 lays down timelines for the same. If for some reason a proposal reaches the

DAC and some questions are raised, it takes some time before the file reaches back. But by then, some other important projects came up,” a second source said.

It is very important that a proper list of priorities are made and the focus should be on clearing the immediate ones on a priority basis, according to the sources.

“For the IAF, fighter jets are important and so are the refuelers or the AWACS. Similarly for the Navy, submarines are as important as an aircraft carrier or helicopters. For the Army, tanks to new armoured personnel carriers, drones, attack helicopters to loitering munitions are all important. We need to identify and be focussed till it is struck off from the to do list,” the first source said.

The sources said that the officials, which include the defence secretary, the DRDO chief, the secretary of defence production besides service officers in charge of procurement and modernisation have been asked to not just identify the problem areas but also solutions.

“Everyone is flagging problems, and are talking about what can’t be done. Time is for solutions. Identify the problems and also come with solutions,” another source said.

<https://theprint.in/defence/not-just-iaf-defence-ministry-undertakes-critical-review-of-tri-service-priorities-solutions/2416225/>



Mon, 23 Dec 2024

No Chinese parts, no worries: Indian drone maker Zuppa offers hijack-proof systems for India's defence

India grown drone manufacturing company Zuppa Geo Navigation Technology claimed that their drones are immune to hijack as they do not have any Chinese components in them and are locally manufactured.

There has been an increased focus on building indigenous drone systems as it was found that there were Chinese spare parts in the drones used by the Indian Army. The usage of Chinese spares in defence equipment for India comes with huge potential for risks, including the transfer of data. Some time ago, the Department of Defence Production (DDP), in a letter to industry bodies, cautioned against private defence companies using Chinese parts.

In August, there was an instance of an Indian drone straying across the line of control into Pakistan. There were reports that suggested that this was an instance of hijacking.

Zuppa reportedly claimed the drone was hijacked by Pakistan as it had Chinese technology which made it vulnerable.

A few weeks ago, the company had written to the Directorate General of Foreign Trade, demanding a ban on the import from Chinese firms that allegedly violated its intellectual property rights.

According to a report in *The New Indian Express*, founder and MD of the company, Sai Pattabiram, said, "We had warned the Ministry of Defence, Ministry of Civil Aviation and National Security Council Secretariat about the possibility of such an incident happening."

The report said while many drone makers depend on Chinese products for major components in the drone, Zuppa is making these locally, including printed circuit board (PCB).

<https://www.theweek.in/news/defence/2024/12/23/zuppa-claims-its-indian-made-drones-are-hijack-proof-due-to-no-chinese-components-addressing-security-concerns-after-reports-of-pakistan-exploiting-chinese-tech-in-indian-drones.html>

Business Standard

Mon, 23 Dec 2024

UP's Kanpur, 'Manchester of the East', pivots to military ware hub

Kanpur, the erstwhile 'Manchester of the East' – a moniker it earned owing to a flourishing textile sector – is witnessing a shift into defence and aerospace manufacturing sector in north India.

Nestled in Central Uttar Pradesh, the industrial town has netted investments in an array of defence and military projects across aircraft, drones, arms and ammunition, propellant systems, among others.

Kanpur, one of the six nodes of the UP Defence Industrial Corridor (UPDIC), has received defence manufacturing investment proposals of nearly Rs 12,800 crore and 210 hectares of land been allocated to investors, so far, according to Invest UP chief Abhishek Prakash

"The Kanpur node is propelling UP's economic growth to new heights by emerging as a pivotal component of the UPDIC," he said.

Promoted by the UP Expressways Industrial Development Authority, the corridor is key to making the state a dollar trillion economy, and catalysing the overarching 'Make in UP' theme.

Among top investors, Adani Defence Systems and Technologies Limited has chipped in Rs 1,500 crore to establish one of South Asia's largest integrated ammunition manufacturing complexes in the city.

Spread over 500 acres, the plant is expected to produce a range of small, medium, and large calibre ammunition for the army, paramilitary, and police. The company has also proposed an additional investment of Rs 2,500 crore for a propellant manufacturing complex.

Additionally, Delta Combat Systems has secured land for small arms and ammunition manufacturing with an investment of Rs 150 crore. Genser Aerospace & IT has proposed Rs 3,000 crore for a 2+7-seater Light Business Jets facility. Ananth Technologies is set to invest Rs 2,000

crore to produce GEO satellites. They have also proposed an additional Rs 1,500 crore investment for a LEO satellite manufacturing unit.

Besides, Lohia Aerospace Systems plans to build an aerospace composite facility with an investment of Rs 370 crore, while National Emerging Technology Research & Analysis (NETRA) will invest Rs 360 crore to manufacture artillery shells.

French major CILAS is exploring technology transfer for laser tech to be used in defence drone manufacturing with a pipeline of Rs 500 crore. MSK Business Solutions will invest Rs 120 crore in a joint venture with Russian OEMs to manufacture radars and avionics in Kanpur node, while Raphe mPhibr will establish a dynamic drone hub with an investment of Rs 100 crore.

https://www.business-standard.com/industry/news/up-s-kanpur-manchester-of-the-east-pivots-to-military-ware-hub-124122300944_1.html



Tue, 24 Dec 2024

Army's equine, canine unit falls short on training, animal transport use: CAG

The Indian Army's Remount and Veterinary Corps (RVC) fell short of achieving half of its training objectives and failed to fully utilise its Animal Transport (AT) Units, revealed a recent audit conducted by the Comptroller and Auditor General (CAG) of India on the defence services.

The RVC, headed by the Director General, is responsible for breeding, training and managing health of the entire equine and canine population in the Indian Army. The CAG's audit report, covering the period from 2018-19 to 2020-21, was presented in the winter session of Parliament last week.

"Three out of the six short-term training goals as per the technical training directive of RVS, related to import of frozen semen of proven elite stallions from European countries to upgrade the sporting potential of Army equines; training of raptors to hunt down drones/surveillance devices; and training of local breeds of dogs to assess their suitability for employment as military working dogs, were either not achieved or under-achieved," the CAG has observed in its report.

The report contained the results of an audit of the transactions of the ministry of defence pertaining to the department of defence, army, Military Engineer Services, Border Roads Organisation, and Defence Research and Development Organisation in 2020-21.

The audit was also conducted on the deployment of the AT Units which serve as the lifeline for the soldiers deployed in the difficult terrain and in bad weather conditions. The AT Units of the Army are composed of horses and mules, and are a critical part of animal transport convoys carrying ammunition and ration essentials in high-altitude and difficult terrain of various sectors.

“In four out of five selected Animal Transport Units (ATs), the distance between the ATs and the dependent deployment ranged between 174 kilometres and 534 kilometres resulting in extra expenditure on transportation of mules and under-utilisation of ATs ranging between 89.46 per cent and 10.74 per cent,” the report found.

The Army describes mules of animal transport units as a vital link in the logistics chain in remote regions under most challenging conditions. A dedicated AT wing is an inbuilt part of all border guarding units of Indo-Tibetan Border Police tasked to operate in high altitude sub-zero terrain for supply of ammunition, rations, water and other stores. The logistic convoys have a pivotal role in keeping the axis of maintenance alive in areas where no roads exist.

<https://www.newindianexpress.com/nation/2024/Dec/24/armys-equine-canine-unit-falls-short-on-training-animal-transport-use-cag>



Mon, 23 Dec 2024

India-Indonesia Ties Soar: A Strategic Trade and Defence Partnership in the Making

As Indonesia’s President Prabowo Subianto prepares for his anticipated visit to India in 2025, the spotlight is on the increasingly robust partnership between the two nations. With bilateral trade reaching an impressive USD 29.4 billion in FY2023-24, India and Indonesia are on track to deepen their economic and defence cooperation. From energy to technology and defence manufacturing, their collaboration is expanding rapidly, providing significant opportunities for both countries in the years ahead.

A Flourishing Trade Relationship

The economic ties between India and Indonesia have grown significantly, making Indonesia one of India’s top trading partners. As noted in the latest Rubix Data Sciences report, India’s exports to Indonesia reached USD 5.99 billion in FY2024, driven by key sectors like mineral fuels, vehicles, and machinery. Indonesia’s role as India’s second-largest supplier of coal and crude palm oil highlights the strategic importance of this trade relationship, which is vital for India’s growing energy and industrial needs.

Indonesia, in turn, is capitalizing on India’s vast consumer market, with investments in sectors such as automotive, pharmaceuticals, and banking. According to Rubix Data Sciences, Indonesia’s cumulative investments in India stand at USD 653.83 million. This influx of capital and interest in India’s rapidly developing industries presents a win-win for both countries. As Indonesia continues to modernize its industrial base and diversify its economy, the potential for collaboration in sectors like electric vehicles (EVs) and clean energy is particularly promising.

Mohan Ramaswamy, Co-founder & CEO of Rubix Data Sciences, underscores the resilience and strategic focus of Indonesia's economy. He highlights how Indonesia's projected 5.1% GDP growth in 2025, coupled with a controlled inflation rate, offers a stable foundation for further economic collaboration. Moreover, Indonesia's leadership in global nickel production—projected to account for 62% of the world's supply by 2028—positions it as a key player in the global EV and battery industries. This further strengthens its appeal to Indian businesses seeking to tap into green technologies and renewable energy.

Deepening Defence Cooperation

While trade ties are flourishing, defence collaboration between India and Indonesia is equally on the rise. Both nations are increasingly focused on indigenous defence manufacturing, particularly under India's Atmanirbhar Bharat initiative, which aims to reduce dependence on foreign defence imports. This shared interest in bolstering defence capabilities has led to several key developments, including joint initiatives in military equipment production and joint defence exercises.

A notable example of this cooperation was the visit of the Indian submarine INS Sindhukesari to Jakarta in February 2024. This marked a significant milestone in the growing maritime collaboration between India and Indonesia. Earlier this month two Indian naval warships, INS Kesari and INS LCU L57, docked at Sabang Port in Aceh, further highlighting the strengthening of naval ties. The frequent visits and exchanges are helping both countries enhance their naval capabilities and ensure regional security.

The importance of Sabang Port cannot be overstated. Strategically located near the Malacca Strait—one of the world's most vital maritime chokepoints—Sabang Port offers significant advantages for India's naval operations in the Indo-Pacific. Discussions about joint infrastructure development at the port are underway, as both countries recognize its importance in securing vital sea lanes and maintaining regional stability.

Indonesia's growing interest in advanced military technology further enhances defence ties. As reported previously by FinancialExpress.com, Indonesia is exploring the acquisition of India's BrahMos missile system, one of the most advanced supersonic cruise missiles in the world. With India's successful delivery of BrahMos systems to the Philippines earlier this year, Indonesia's potential acquisition underscores the expanding defence cooperation between the two nations. A high-level Indonesian delegation also visited BrahMos Aerospace in New Delhi in September 2024 to learn more about the system's capabilities.

Shared Strategic Interests in the Indo-Pacific

Both India and Indonesia share a common interest in maintaining peace and stability in the Indo-Pacific region, especially amid growing geopolitical tensions. The Indo-Pacific is a critical region for global trade, and both nations are committed to ensuring the free and secure passage of goods through key maritime routes such as the Malacca Strait. The growing security challenges in the region, particularly the rising influence of China, have further cemented the need for closer collaboration between India and Indonesia.

While Indonesia maintains strong economic ties with China—highlighted by President Prabowo's November 2024 visit to Beijing, where several business agreements worth over USD 10 billion

were signed—its relationship with India continues to grow, especially in the defence and maritime sectors. This diplomatic balancing act allows Indonesia to enhance its security partnerships with both regional giants while maintaining its economic ties with China.

A Future of Expanding Opportunities

Looking ahead, the India-Indonesia partnership is poised to grow even stronger. Both nations are committed to enhancing trade, increasing investment, and expanding defence cooperation in ways that will benefit both economies and contribute to regional stability. As Indonesia continues to evolve as a key player in Southeast Asia and India plays a pivotal role in the broader Indo-Pacific region, their collaboration will be a cornerstone of future global security and economic development.

<https://www.financialexpress.com/business/defence-india-indonesia-ties-soar-a-strategic-trade-and-defence-partnership-in-the-making-3698327/>

Science & Technology News

THE  **HINDU**

Mon, 23 Dec 2024

AIIMS, Delhi developing low cost adaptive cellular therapy for treatment of multiple myeloma

Doctors at AIIMS, Delhi are in the process of developing a low cost antibody-based adaptive cellular therapy for the treatment of multiple myeloma, a form of blood cancer.

This kind of therapy is expected to make advanced treatments like CAR-T cell therapies more affordable and accessible for patients in India. The Chimeric antigen receptor (CAR) T-cell therapy is a form of adaptive cellular therapy in which a patient's T cells are isolated, genetically modified and infused back in the patients body to recognise and kill cancer cells, said Mayank Singh, Additional Professor in the Department of Medical Oncology at Dr B R Ambedkar Institute Rotary Cancer Hospital, (BRAIRCH), AIIMS.

It is based on targeting B-cell maturation antigen (BCMA) which helps to target specific tumour antigens which are found cancer cells especially in cases multiple myeloma. "So the therapy developed by the AIIMS researchers recognises BCMA as a target on multiple myeloma cells to eliminate them," Dr. Singh said.

As of now, the therapy has been tested on animal models and has shown promising outcomes, he said. "We intend to take this CAR-T cell therapy for phase-1 clinical trials on humans in the near

future to collect substantial evidence regarding its safety and efficacy. Our aim is to bring the cost of this therapy significantly down. There are other forms of CAR-T cell therapies, but the cost of these are very high," he said.

From genomic medicine, a revolution rolls towards cancer careHow do cancerous cells operate?

Cancer is characterised by the uncontrolled growth of cancerous cells. Generally, all cancer cells are derived from a single cell which has undergone a sequence of mutations that has converted it into a cancerous cell and these cancerous cells are involved in different symptoms associated with cancer, Dr. Singh explained.

Cancer cells proliferate at a very rapid pace which deprive normal cells of nutrients resulting in cancer associated cachexia.

What is multiple myeloma?

Multiple myeloma is a form cancer of the plasma cells which are a type of white blood cell (WBC) that produces antibodies against infection. When these cells become cancerous, they multiply at a rapid pace and crowd out normal blood-forming cells in the bone marrow. This form of cancer is often associated with relapses, Dr. Singh said.

Traditional cancer treatments like chemotherapy/radiotherapy target rapidly-dividing cells but this approach leads to cytotoxicity in normal cells as well as leading to severe side effects associated with cancer treatment.

The past two decades have seen the emergence of targeted therapies in cancer associated with targeting inherent vulnerabilities of cancer cells like too much dependence on one protein for cancer cells which has improved outcome in cancer treatments. However, cancer cells eventually develop resistance to these agents which leads to cancer relapses, he elaborated.

The past decade has also seen the emergence of immunotherapy as one of the cornerstones of cancer therapeutics with monoclonal antibodies being used to target cancer cells. Early immunotherapy may be most effective treatment for cervical cancer, researchers say. In a classical approach often these antibodies against a cancer target are loaded with the drug of interest for targeted delivery of chemotherapeutic drugs, thereby reducing the off-target effect and improving their effectiveness, Dr. Singh said.

"Antibody based therapies have ushered a new era in cancer therapeutics including development of cellular CAR-T cell therapies which include components of these antibodies to target the antigen on the cancerous cell. Immunotherapies however remain expensive thereby being out of reach for majority of the population in countries like India," he explained.

One in nine in India likely to get cancer in their lifetimeAccording to latest data from the National Cancer Registry, the estimated number of incident cases of cancer in India in 2022 was found to be 14,61,427. Furthermore, one in nine people are likely to develop cancer in their lifetime.

The problem of delayed diagnosis combined with limited access to world-class therapies is bound to create a significant health burden on India as cases are expected to rise exponentially in coming decade, Dr. Singh said.

The research group spearheaded by Dr. Singh has filed for an Indian patent for the antibody and is in process of filing a patent for their CAR-T cell therapy.

“CAR-T cell therapies has changed the way we approach and treat cancer. Development of CAR-T cell therapy has been in a nascent state in India despite the rapid pace at which it is moving around the world,” he said.

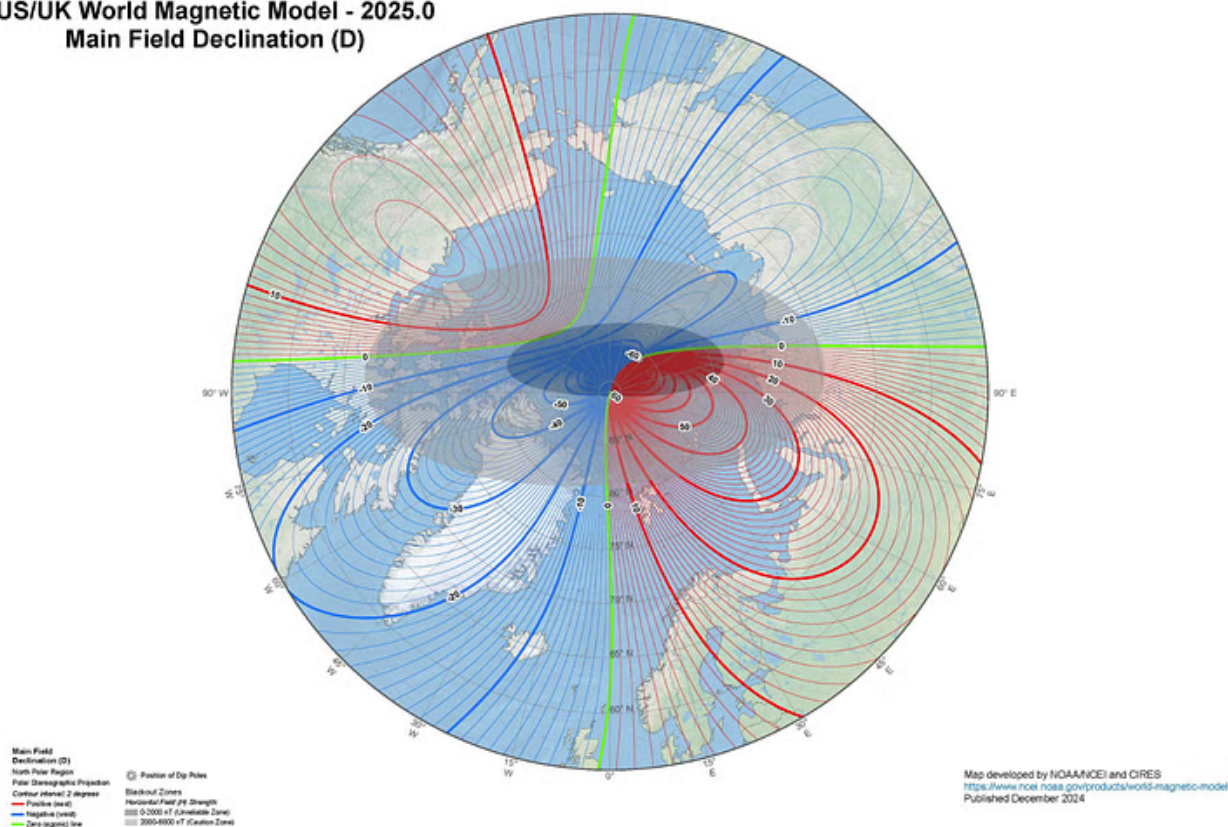
<https://www.thehindu.com/sci-tech/health/aiims-delhi-developing-low-cost-adaptive-cellular-therapy-for-treatment-of-multiple-myeloma/article69018622.ece>



Mon, 23 Dec 2024

Explained | Why Earth’s magnetic North Pole cruising to Russia and how it affects your GPS

US/UK World Magnetic Model - 2025.0
Main Field Declination (D)



Earth's magnetic North Pole is not stationary, and in fact, moves around a lot. As our GPS and other navigation systems are reliant on the positioning of the magnetic North Pole, every five years

the US National Oceanic and Atmospheric Administration (NOAA) releases the World Magnetic Model (WMM).

The WMM, NOAA says, is "a map of the Earth's magnetic field. and provides precise navigational data for all military and civilian planes, ships, submarines, and GPS units."According to an Interesting Engineering report on the 2025 model, the recent update reveals that the magnetic North Pole is shifting from Canada towards Siberia in Russia.

So why is this happening?

The pole moves due to the "flow of molten iron and nickel between our planet's two large magnetic lobes: the North American lobe beneath Canada and the Siberian lobe under Siberia."

Reportedly, in the last two decades, the Siberian lobe has been more active in regards to flow of iron and nickel, making it a strong influence on the pole. Thus, North has started shifting magnetically to Siberia.

"The current behavior of magnetic north is something that we have never observed before. Magnetic north has been moving slowly around Canada since the 1500s," William Brown, global geomagnetic field modeler at the British Geological Survey said.

"In the past 20 years, it accelerated towards Siberia, increasing in speed every year until about five years ago, when it suddenly decelerated from 50 to 35 km (31 to 22 miles) per year, which is the biggest deceleration in speed we've ever seen," Brown added.

But why is knowing the precise position of the magnetic north so important?

The British Geological Survey explained it this way: "Imagine someone planning to travel by sleigh from a chimney top in South Africa to a snow-covered roof in the UK, a journey of around 8,500 km. Using the previous WMM and setting off just one-degree off-course, he would end up approximately 150 km away from where he should."

To ensure even the most minor of such errors do not occur, this update of the WMM is 10 times more detailed than previous versions.

"WMM 2025 includes improved spatial resolution of approximately 300 kilometers at the equator compared to the standard spatial resolution of 3300 kilometers at the equator. Higher resolution provides greater directional accuracy," the NOAA team said.

WMM 2025 is set to guide our journeys for the next five years.

<https://www.deccanherald.com/science/explained-why-earths-magnetic-north-pole-cruising-to-russia-and-how-it-affects-your-gps-3329185>

Feeling emotional? Robots might sense it just by touching you

In a groundbreaking study, scientists explored how robots of the future could detect human emotions through touch, specifically by analysing changes in skin conductance. This approach measures how well the skin conducts electricity, which varies in response to sweat secretion and nerve activity—two indicators closely tied to emotional states.

The findings, published in the journal *IEEE Access*, aim to overcome the limitations of traditional emotion-detection technologies such as facial recognition and speech analysis, which often struggle in low-quality audio-visual conditions and raise privacy concerns.

How Skin Conductance Reveals Emotions

Researchers at Tokyo Metropolitan University tested the emotional responses of 33 participants by showing them a series of videos designed to evoke specific emotions. The participants' skin conductance was measured as they watched scenes from horror films, comedy sketches, and family reunion videos.

The study revealed distinct patterns in emotional responses:

Fear: Responses to fear-inducing videos lasted the longest. Scientists attributed this to an evolutionary mechanism that helps humans stay alert in dangerous situations.

Family Bonding: Emotions blending happiness and sadness showed slower responses, possibly because the contrasting feelings interfered with one another.

Humour: Laughter triggered the fastest reactions, but these were short-lived, possibly due to limited research on how skin conductance responds to humour.

The researchers wrote, "Few studies have examined how the dynamics of skin conductance responses differ among emotions, despite high responsiveness being a key feature of skin conductance."

Bridging the Gap: Physiological Signals and Robots

The study posits that while skin conductance alone provides valuable insights, combining it with other physiological indicators like heart rate, electromyography (muscle activity), and brain activity could significantly enhance the accuracy of emotion detection.

"There is a growing demand for techniques to estimate individuals' subjective experiences based on their physiological signals to provide them with emotionally evocative services," the researchers noted. Such an approach could pave the way for empathetic technologies that react to human emotions in real time.

These advancements could have far-reaching implications. For example, robots equipped with this technology might offer comfort during stressful moments, recommend tailored content to match a user's mood, or engage in more meaningful human-robot interactions.

Why Skin Conductance Matters

Skin conductance changes occur rapidly—within one to three seconds—making it a promising real-time indicator of emotional states. The study's findings align with earlier research that connects sweat gland activity with emotional arousal.

Traditional emotion-detection technologies like facial recognition and speech analysis have often been criticised for their inaccuracy in challenging environments and potential breaches of privacy. Skin conductance offers a non-invasive and potentially more reliable alternative, focusing on physiological rather than visual or auditory data.

While the study focused on human responses, its implications extend to the growing field of emotionally intelligent robotics. By analysing physiological cues, robots could one day empathise with users, improving interactions in settings such as healthcare, education, and customer service.

The integration of skin conductance into emotion-detection systems marks a significant step forward in creating empathetic technologies. Though still in its early stages, this method, especially when combined with other physiological measurements, offers a promising pathway for future advancements.

As the researchers concluded, "The results of this study are expected to contribute to the development of technologies that can be used to accurately estimate emotions, when combined with other physiological signals."

The prospect of robots understanding human emotions through touch not only brings us closer to more intuitive devices but also opens the door to a new era of human-machine interaction.

<https://economictimes.indiatimes.com/news/science/feeling-emotional-robots-might-sense-it-just-by-touching-you/articleshow/116595697.cms>



Mon, 23 Dec 2024

PSLV-C60 POEM-4: Pioneering space research with cutting-edge payloads from ISRO, startups, and universities

The Indian Space Research Organisation (ISRO) has embarked on a groundbreaking mission with the PSLV-C60 SpaDeX (Space Debris Experiment), redefining the potential of spent rocket stages in space exploration. Traditionally discarded as debris, the fourth stage of the PSLV rocket has been ingeniously repurposed into the PS4-Orbital Experiment Module (POEM-4), transforming it into a sophisticated orbital laboratory. This ambitious platform hosts an unprecedented 24

experiments, showcasing India's advancements in space technology, scientific research, and sustainable space utilisation. The launch is planned for the end of the year.

A critical feature of the SpaDeX mission is its integration of an innovative indigenous docking system, which represents a significant leap in India's space technology capabilities. Docking systems are essential in space missions, enabling spacecraft to connect seamlessly in orbit for purposes such as crew transfer, modular space station assembly, satellite servicing, and resupply missions. Over the years, countries have developed sophisticated docking mechanisms tailored to their needs.

“POEM gives scientists a chance to conduct microgravity experiments in space for up to three months. Normally, the empty stage of the rocket would just become space debris after launching the main payload. Instead, POEM allows researchers to make use of it for valuable experiments. These experimental payloads help test new ideas and technologies that could be important for future space missions. The PSLV-C60 SpaDeX mission is the fourth mission in the POEM series, known as POEM-4. This mission aims to achieve specific objectives related to space exploration and technology,” remarked space expert Girish Linganna.

The PSLV-C60 SpaDeX mission includes two small spacecraft, called 'Chaser' and 'Target,' each weighing about 220 kg. The mission aims to demonstrate space docking technologies. Both spacecraft will be launched independently and simultaneously by the PSLV-C60 rocket into a circular orbit at 470 km altitude and a 55° inclination, with a local time cycle of about 66 days.

“The POEM-4 mission will carry a total of 24 payloads. Of these, 14 are from ISRO and its centers, while 10 are from various non-government entities (NGEs), including universities and startups, which were selected through IN-SPACe (Indian National Space Promotion and Authorisation Centre). This mission marks a major improvement, with the capacity of POEM increasing three times compared to the previous POEM-3 platform, which only carried eight payloads,” remarked Linganna.

Russia had pioneered docking technology with systems like the Androgynous Peripheral Attach System (APAS), first used during the Apollo-Soyuz Test Project in 1975. Later, the SSVP system, a reliable probe-and-drogue mechanism, was widely used in the Mir space station and later integrated into the International Space Station (ISS). The United States introduced the Soft Capture Mechanism (SCM) as part of NASA's International Docking System Standard (IDSS), offering compatibility with diverse spacecraft and missions, including the ISS and future lunar explorations. China's Tiangong space station employs an advanced system derived from APAS, emphasizing autonomy and precision, while the European Space Agency's Automated Transfer Vehicle (ATV) demonstrated sophisticated docking for resupply missions to the ISS.

The POEM-4 mission by ISRO carries 14 cutting-edge payloads developed by its centers. These include five from Vikram Sarabhai Space Centre (VSSC), four from the Space Physics Laboratory (SPL) at VSSC, three from the ISRO Inertial Systems Unit (IISU), one collaborative payload from SPL and IISU, and one from the Indian Institute of Space Science and Technology (IIST). Some of these payloads include the 'RRM-TD: Walking Robotic Arm' that can perform tasks in space like walking on surfaces, repairing satellites, and supporting space station development. Then there is the Debris Capture Robotic Manipulator, a robot designed to capture and remove dangerous space

debris, keeping space safe and clean. Besides this, there is Multi-Sensor Inertial Reference System (MIRS) a navigation tool that uses multiple sensors to ensure spacecraft move and remain stable in space. There is also a Lead Exempt Experimental System (LEXS) that tests environmentally friendly, lead-free electronics in space for future sustainable technologies.

Apart from these there are 10 payloads from Non-Governmental Entities (NGEs) and start-ups such as the Amity Plant Experimental Module in Space (APEMS) that has been developed by Amity University, Mumbai and will study how plant cells (using spinach) grow and adapt in microgravity compared to Earth. It uses LEDs for light, a gel for nutrients, and cameras to monitor growth. This experiment helps understand plant growth in space, essential for future space missions. There is also the RVSat-1 payload, developed by RV College of Engineering, Bengaluru, which will study the growth of gut bacteria in space with prebiotics. This will help understand astronaut health and supports advancements in antibiotics, waste recycling, and space exploration. There is also a Green Propulsion Thruster VYOM-2U payload, developed by Manastu Space Technologies, Mumbai and demonstrates a safer hydrogen peroxide-based thruster for satellites, offering improved performance over hydrazine with high thrust, efficiency, and long continuous firing capability. Besides this, there is this MOI-TD payload, developed by TakeMe2Space Hyderabad and demonstrates an AI lab in space, processing Earth observation data in real time, testing subsystems, and using AI to capture and analyze sharp Earth images.

India's docking system, tested on SpaDeX, features a compact, low-impact androgynous design compatible with modular spacecraft configurations. "Advanced dual-motor actuation ensures precise alignment and secure connection at low velocities. Equipped with state-of-the-art sensors such as Laser Range Finders, Proximity Sensors, and Rendezvous Cameras, it supports real-time navigation and alignment. An Inter-Satellite Communication Link (ISL) facilitates seamless data exchange during docking operations, enhancing the system's autonomy and reliability. This docking system positions ISRO at the forefront of orbital assembly, servicing, and space station construction, laying the foundation for future missions, including the proposed Bharatiya Antariksh Station," remarked Srimathy Kesan, founder and CEO of Space Kidz India.

The SpaDeX mission's experimental array further underscores its significance. ISRO's Walking Robotic Arm (RRM-TD), developed by the Inertial Systems Unit, marks India's first venture into space-based robotics with walking capabilities. With seven degrees of freedom and advanced motion planning, this robotic manipulator is a precursor to modular space station operations. Complementing this is the Debris Capture Robotic Manipulator, which autonomously tracks and manages space debris using innovative visual tracking and motion prediction algorithms.

"The SpaDeX mission exemplifies ISRO's ability to foster collaboration among government institutions, academic centers, and private companies. This cooperative effort not only advances multiple fields of space science but also establishes a sustainable model for future space research. By transforming a spent rocket stage into a versatile orbital laboratory, ISRO demonstrates its commitment to innovation, resource optimization, and scientific discovery," added Kesan.

As these experiments unfold in orbit, they promise to yield valuable insights that could reshape our approach to space exploration. The success of the POEM-4 platform could pave the way for regular orbital laboratories, creating a new paradigm in sustainable space research. Through this

mission, ISRO not only showcases its technical excellence but also sets a visionary path for sustainable and inclusive space exploration.

<https://www.theweek.in/news/sci-tech/2024/12/23/pslv-c60-poem-4-pioneering-space-research-with-cutting-edge-payloads-from-isro-startups-and-universities.html>

THE TIMES OF INDIA

Mon, 23 Dec 2024

Breakthrough For Bioengineering As Study Deciphers How Cells Define Their Identity

Research released on Wednesday by Israeli and Scottish scientists sheds new light on how cells establish their specialized roles, with findings likely to transform regenerative medicine and cell therapy.

Researchers from Jerusalem's Hebrew University and the University of Edinburgh uncovered how transcription factors (TFs), critical proteins responsible for regulating gene activity, navigate complex DNA and chromatin structures to define cellular identity. The findings were published in the peer-reviewed Nature journal.

Understanding how transcription factors navigate chromatin could enable scientists to bioengineer adult cells into other cell types.

For example, skin cells could potentially be reprogrammed into heart cells to treat an organ failure, or into insulin-producing beta cells to treat diabetes. The knowledge could also help identify chromatin-related gene regulation errors that cause developmental disorders, enabling early diagnosis and more targeted interventions.

"By uncovering how transcription factors interact with chromatin architecture, we can better understand gene regulation and cellular identity. This knowledge opens exciting possibilities for regenerative medicine, enabling us to precisely control cell fate and develop therapies for diseases caused by cellular dysfunction," said Hebrew University's Yosef Buganim, who led the research with Edinburgh University's Abdenour Soufi.

Transcription factors bind to specific DNA sequences to regulate gene expression, directing cells to differentiate into specific types, such as skin, muscle, or placenta cells. While their ability to recognize DNA sequences is well-established, the exact mechanism behind their target selection within the vast genome has remained elusive. The study introduces a novel "guided search" mechanism, revealing how the 3D structure of DNA and chromatin acts as a roadmap for Tfs.

By leveraging advanced technologies, the researchers explored how TF combinations influence distinct cell identities, focusing on embryo and placenta cells. They found that transcription factors dynamically cooperate or compete based on the chromatin landscape to target genes essential for cell type determination.

One key discovery was the influence of chromatin topology, which refers to the folding and looping of DNA within the nucleus. These structures guide TFs along DNA pathways or concentrate them at chromatin junctions densely packed with critical DNA motifs.

The findings also open new doors on enhancing gene-editing techniques such as CRISPR.

<https://timesofindia.indiatimes.com/science/breakthrough-for-bioengineering-as-study-deciphers-how-cells-define-their-identity/articleshow/116510751.cms>

THE TIMES OF INDIA

Mon, 23 Dec 2024

Worlds Most Expensive Indo US NISAR Satellite Likely To Be Launched-In-March: NASA

After much delays, Nasa has announced that the world's most advanced and expensive earth observation satellite NISAR, jointly developed by India and the US for over a decade, is "likely to be launched in March" next year. It was earlier scheduled for launch in 2024.

In a statement, the US space agency said, "Nasa and Isro are looking at a likely launch date in March 2025. Short for Nasa-Isro Synthetic Aperture Radar, NISAR will scan nearly all of Earth's land and ice surfaces twice every 12 days to measure changes in the planet's ecosystems, its land and sea ice, and its solid Earth. The NISAR satellite will launch from Satish Dhawan Space Centre on India's southeastern coast."

The 2.8-tonne Nisar satellite, whose development started after India and the US signed an agreement in 2014, is designed to monitor planetary changes with unmatched precision. The over Rs 5,800-crore imaging satellite is first of its kind in the world as it features dual-frequency radar—Nasa's L-band (1.25 GHz) and Isro's S-band (3.20 GHz), which will deliver unparalleled data accuracy. Its critical components were transported from the US to India in Oct 2024, marking a significant logistical feat. However, the mission faced delays due to technical complexities with its 12-metre radar antenna reflector.

NISAR's data can help people worldwide better manage natural resources and hazards, as well as provide information for scientists to better understand the effects and pace of climate change. It will also add to the scientists' understanding of the Earth's hard outer layer, its crust.

Observations from NISAR will benefit humanity by helping researchers around the world better understand changes in the Earth's surface, including its ice sheets, glaciers and sea ice. It will also capture changes in its forest and wetland ecosystems as well as movement and deformation of the Earth's crust such as earthquakes, landslides and volcanic activity, Nasa said.

The global and rapid coverage from NISAR will provide unprecedented opportunities for disaster response, producing data to assist in mitigating and assessing damage, with observations before

and after disasters in short time frames. Its data will also help scientists understand solid Earth movements and their implications, it said.

The satellite's key capabilities include generating high-resolution images using radio signals, functioning effectively in darkness and adverse weather, detecting surface changes as small as one inch, and penetrating dense vegetation for comprehensive mapping.

<https://timesofindia.indiatimes.com/india/worlds-most-expensive-indo-us-nisar-satellite-likely-to-be-launched-in-march-nasa/articleshow/116610692.cms>

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