

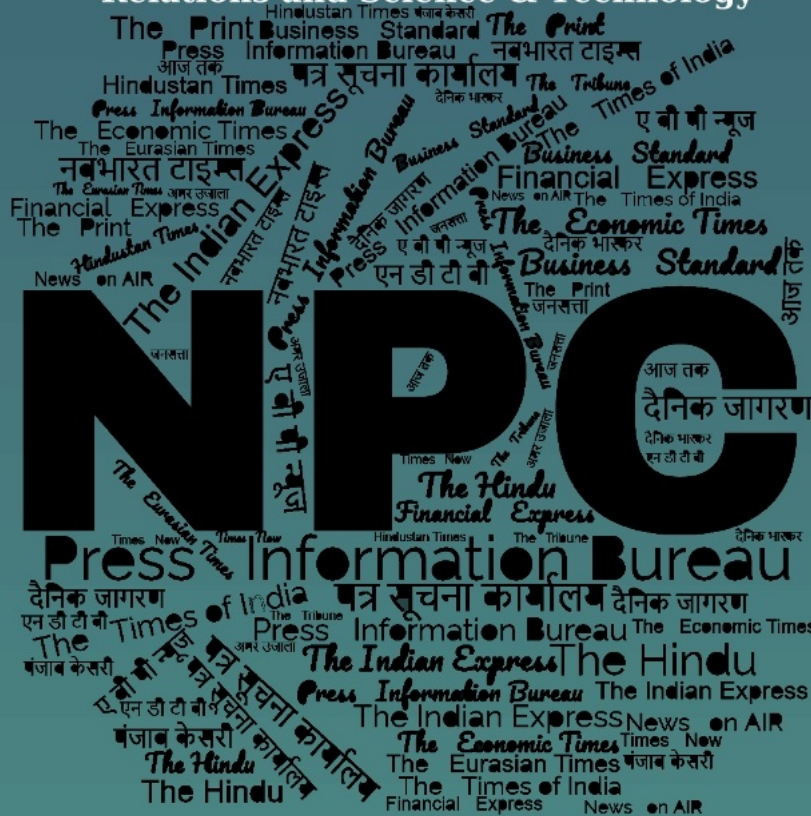
दिसंबर
Dec
2024

खंड/Vol. : 49 अंक/Issue : 227
10/12/2024

समाचार पत्रों से चयनित अंश Newspapers Clippings

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

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CONTENTS

S. No.	Title	Source	Page No.
Defence News			3-23
Defence Strategic: National/International			
1	गाइडेड मिसाइल से लैस, रडार को चकमा देने में माहिर... इंडियन नेवी को मिला नया जंगी जहाज INS तुशिल	<i>Aaj Tak</i>	1
2	INS Tushil, latest multi role stealth guided missile frigate, commissioned into Indian Navy in the presence of Raksha Mantri Shri Rajnath Singh in Russia	<i>Press Information Bureau</i>	2
3	DG DIA to visit Greece to further strengthen defence ties	<i>Press Information Bureau</i>	5
4	ICG conducts second bilateral meeting with Philippine Coast Guard as part of the ongoing cooperation framework	<i>Press Information Bureau</i>	5
5	Trump's Musk-led efficiency drive may spur defence-tech partnerships	<i>The Economic Times</i>	6
6	Explained: What's Holding Up Indian Navy's Project To Get Submarines That Can Stay Underwater Longer	<i>Swarajya</i>	8
7	With fighter jet J-35 deal, China-Pakistan alliance grows stronger. Does India need to worry?	<i>The Week</i>	10
8	EAM Jaishankar, Bahrain counterpart Alzayani discuss trade, healthcare, defence, energy in Manama	<i>ANI</i>	11
9	After Israeli missile, IAF's 'super' Sukhoi-30 to get another major upgrade	<i>Business Standard</i>	14
10	Capable Of Tracking Stealth Fighters & Ballistic Missiles, Russia To Arm India With 'Voronezh' Radar: Reports	<i>The EurAsian Times</i>	16
11	Indian Navy's 1st Nuclear Submarine Base To Be Ready In 2 Years; 'Made In India' Nuke Attack Sub By 2036	<i>The EurAsian Times</i>	19
12	Land Of The Rising Sun 'Rising Again'! Japan Challenges China In 6th-Gen Military Race With 'New Age' Tech	<i>The EurAsian Times</i>	21
Science & Technology News			24-36
13	"Twisting Layers" in Solid State: A Breakthrough in conversion of waste heat to electricity	<i>Press Information Bureau</i>	24
14	IIT Ropar successfully organized Sheet Metal Forming 2024 Conference (SMF 2024)	<i>Press Information Bureau</i>	25
15	Antimatter idea offers scientists clue to cracking cosmic mystery	<i>The Hindu</i>	26
16	'AI's benefits to humanity are enormous, we need social mechanisms to deal with the problems it creates'	<i>The Hindu</i>	29

17	You may soon become Mr India; Chinese scientists invent clothes that can turn people invisible	<i>The Economic Times</i>	32
18	ISRO is aiming to launch NISAR mission in March 2025	<i>News Nine</i>	33
19	IIT Guwahati develops tech to convert methane, carbon dioxide into eco-friendly biofuel	<i>Deccan herald</i>	34
20	IIA scientists detect emissions from novae in Andromeda galaxy	<i>Deccan herald</i>	35





Mon, 09 Dec 2024

गाइडेड मिसाइल से लैस, रडार को चकमा देने में माहिर... इंडियन नेवी को मिला नया जंगी जहाज INS तुशिल

रूस के कैलिनिनग्राद में रक्षा मंत्री राजनाथ सिंह, एडमिरल दिनेश के. त्रिपाठी समेत अन्य अधिकारियों की उपस्थिति में नए मल्टी-रोल स्टील्थ-गाइडेड मिसाइल फ्रिगेट 'आईएनएस तुशिल' को भारतीय नौसेना में शामिल किया गया. यंत्र शिपयार्ड में हुए इस कमीशनिंग समारोह में रक्षा मंत्री ने अपने संबोधन में कहा, 'आईएनएस तुशिल भारत की बढ़ती समुद्री ताकत का एक गौरवपूर्ण प्रमाण है. यह भारत और रूस के बीच लंबे समय से चली आ रही दोस्ती में एक महत्वपूर्ण मील का पत्थर है.'

रक्षा मंत्री राजनाथ सिंह ने कहा कि भारत और रूस के रिश्ते साझा मूल्यों, आपसी विश्वास और रणनीतिक साझेदारी की डोर से बंधे हैं. उन्होंने कहा, 'मिशन SAGAR (Security and Growth for All in the Region), हिंद महासागर क्षेत्र में सामूहिक सुरक्षा, समुद्री सहयोग और सतत विकास के प्रति भारत की प्रतिबद्धता का प्रतीक है; इस प्रयास में हमें हमेशा रूस का समर्थन प्राप्त हुआ है.'

यह जहाज भारत-रूस की गहरी दोस्ती का प्रमाण

राजनाथ सिंह ने कहा कि भारत के 'आत्मनिर्भर भारत' विजन को रूस से हमेशा समर्थन मिलता है. उन्होंने इसे भारत और रूस के बीच गहरी दोस्ती का एक और महत्वपूर्ण उदाहरण बताया. रक्षा मंत्री ने कहा कि आईएनएस तुशिल समेत कई जहाजों में 'मेड इन इंडिया' कंटेंट लगातार बढ़ रहा है. यह जहाज रूसी और भारतीय उद्योगों की सफल साझेदारी का एक बड़ा प्रमाण है. यह तकनीकी उत्कृष्टता की दिशा में भारत की यात्रा का उदाहरण देता है.

आईएनएस तुशिल हिंद महासागर में भारतीय नौसेना की सैन्य क्षमता को बढ़ाएगा. इस क्षेत्र में पिछले कुछ वर्षों में चीनी नौसेना की गतिविधियां बढ़ी हैं. इस जंगी जहाज का निर्माण 2.5 अरब अमेरिकी डॉलर से अधिक के समझौते के तहत रूस में किया गया है. भारत ने अपनी नौसेना के लिए चार 'स्टील्थ फ्रिगेट' को लेकर 2016 में रूस के साथ यह समझौता किया था. इस समझौते के तहत, दो युद्धपोतों का निर्माण रूस में किया जाना था, जबकि अन्य दो का निर्माण भारत में किया जाना था.

125 मीटर लंबे और 3900 वजनी तुशिल की खूबियां

आईएनएस तुशिल 125 मीटर लंबा, 3900 टन वजनी है। जहाज का डिजाइन इसे रडार से बचने की क्षमता और बेहतर स्थिरता प्रदान करता है। भारतीय नौसेना के विशेषज्ञ इंजीनियरों और रूसी शिप डिजाइन कंपनी सेवरनॉय डिजाइन ब्यूरो (Severnoye Design Bureau) के सहयोग से, INS तुशिल में स्वदेशी सामग्री को 26 प्रतिशत तक बढ़ाया गया है और भारत निर्मित सिस्टम्स की संख्या बढ़कर 33 हो गई है, जो पहले की तुलना में दोगुनी से अधिक है। इस जहाज के निर्माण में प्रमुख भारतीय कंपनियां ब्रह्मोस एयरोस्पेस प्राइवेट लिमिटेड, भारत इलेक्ट्रॉनिक्स लिमिटेड, केलट्रॉन, नोवा इंटीग्रेटेड सिस्टम, एल्कॉम मरीन, जॉनसन कंट्रोल्स इंडिया और कई अन्य ओरिजिनल इक्विपमेंट मैनुफैक्चरर के रूप में शामिल थीं।

<https://www.aajtak.in/india/news/story/ins-tushil-multi-role-stealth-guided-missile-frigate-commissioned-into-indian-navy-ntc-rpti-2117626-2024-12-09>



Press Information Bureau
Government of India

Ministry of Defence

Mon, 09 Dec 2024

INS Tushil, latest multi role stealth guided missile frigate, commissioned into Indian Navy in the presence of Raksha Mantri Shri Rajnath Singh in Russia

Raksha Mantri describes the ship as proud testament to India's growing maritime strength and significant milestone in long standing ties with Russia

"SAGAR is a symbol of India's commitment towards collective security, maritime cooperation and sustainable development in Indian Ocean Region; We have always received Russia's support in this endeavour"

INS Tushil (F 70), the latest multi-role stealth-guided missile frigate, was commissioned into the Indian Navy in the presence of Raksha Mantri Shri Rajnath Singh at the Yantar Shipyard in Kaliningrad, Russia on December 09, 2024. Raksha Mantri, in his address, described the commissioning as a proud testament to India's growing maritime strength and a significant milestone in the long-standing friendship between India & Russia, which are bound together by shared values, mutual trust, and special & strategic privileged partnership.

Shri Rajnath Singh termed Russia's support to India's vision of 'Aatmanirbhar Bharat' as another important example of deep friendship between India and Russia. "Made in India content is continuously increasing in many ships including INS Tushil. The ship is a big proof of the

collaborative prowess of Russian and Indian industries. It exemplifies India's journey towards technological excellence through jointmanship," he added.

Highlighting the deep ties between the Navies of India and Russia, Raksha Mantri stated that technical & operational collaboration is constantly touching new heights under the holistically growing relations between the two countries under Prime Minister Shri Narendra Modi and Russian President Mr Vladimir Putin. He reasserted the Indian Navy's commitment to peace and security in the Indian Ocean Region (IOR). "Our Navy has foiled the designs of piracy, arms and drug smugglers and non-state actors in various hotspots. From the Gulf of Oman to the Gulf of Aden, from Suez to Malacca & from Australia to Madagascar, the Indian Navy is playing the essential role of a net security provider in IOR. India, along with its friendly countries, believes in ensuring that maritime trade in the region remains safe and secure, thereby promoting unhindered trade across the sea," he said.



Shri Rajnath Singh added that, as a first responder, the Indian Navy is always prepared to provide quick and timely humanitarian assistance & disaster relief to its friends in the region.

Reiterating the Indian Navy's commitment to realising the Prime Minister's vision of Security and Growth for All in the Region (SAGAR), Raksha Mantri termed the vision as the backbone of India's maritime policy, which aims to promote peace, stability & economic prosperity in IOR. "SAGAR is a symbol of India's commitment towards collective security, maritime cooperation & sustainable development. In this commitment, we have always received Russia's support," he said.

Shri Rajnath Singh exuded confidence that, with new energy & enthusiasm, India and Russia will realise the full potential of its cooperation in the coming times. He emphasised that the two countries will not only strengthen the existing areas of collaboration, but also give priority to working in new and unexplored areas. "India and Russia will enter a new era of cooperation by

taking advantage of each other's expertise in areas such as Artificial Intelligence, Cyber Security, Space Exploration and Counter-Terrorism," he said.

Speaking on the occasion, Chief of the Naval Staff Admiral Dinesh K Tripathi congratulated all those involved in the project, especially the shipyard workers and all Russian and Indian Original Equipment Manufacturers for their exceptional work, flawless integration of Indian systems with Russian systems and contribution to the quality capability upgrades achieved in this project.

The event was also attended by Russian Deputy Minister of Defence Mr Alexander Vasilyevich Fomin; Governor of Kaliningrad Mr Alexey Sergeyeovich Besprozvannykh; Commander-in-Chief of the Russian Navy Admiral Aleksandr Alekseyevich Moiseyev; Ambassador of India to Russia Shri Vinay Kumar, and other senior officials from the Indian & Russian Governments, Navies, and industries.

The event was also attended by Russian Deputy Minister of Defence Mr Alexander Vasilyevich Fomin; Governor of Kaliningrad Mr Alexey Sergeyeovich Besprozvannykh; Commander-in-Chief of the Russian Navy Admiral Aleksandr Alekseyevich Moiseyev; Ambassador of India to Russia Shri Vinay Kumar; Commander Baltic Fleet of the Russian Navy Vice Admiral Vladimir Vorobyov, other senior officials from the Indian & Russian Governments, Navies, and industries.

About INS Tushil

INS Tushil is an upgraded Krivak III class frigates of the Project 1135.6 of which, six are already in service – three Talwar class ships, built at Baltiysky shipyard, St. Petersburg, and three follow-on Teg class ships, built at Yantar shipyard, Kaliningrad. INS Tushil, the seventh in the series, is the first of the two upgraded additional follow-on ships, the contract for which was signed in October 2016 between JSC Rosoboronexport, Indian Navy and the Government of India.

INS Tushil is designed for blue water operations across the spectrum of naval warfare in all four dimensions air, surface, underwater and electromagnetic. It is armed with a range of advanced weapons, including the jointly-developed Brahmos supersonic cruise missiles, vertically-launched Shtil Surface-to-Air Missiles with enhanced ranges, upgraded medium-range anti-air and surface gun with advanced stealth features, optically-controlled close-range rapid fire gun system, anti-submarine torpedoes and rockets and advanced electronic warfare and communication suite.

The ship is also capable of embarking the upgraded anti-submarine and airborne early warning helicopters, the Kamov 28 and Kamov 31, which are formidable force multipliers in themselves. The ship is powered by an advanced gas turbine propulsion plant with state-of-the-art controls and is capable of achieving speeds in excess of 30 knots. High degree of automation and stealth features further enhance its combat capability and survivability. The ship is commanded by Captain Peter Varghese a gunnery and missile specialist.

The ship's keel was laid on July 12, 2013 and was launched in water in October 2021. The ship sailed out for her maiden sea trials on January 25, 2024, and completed an exhaustive schedule of Factory trials followed by State Committee Trials and finally the Delivery Acceptance Trials, both in harbour and at sea, by September 24, 2024. The ship has successfully carried out firing trials of all her Russian weapon systems and would reach India in near combat-ready condition.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2082369>



**Press Information Bureau
Government of India**

Ministry of Defence

Mon, 09 Dec 2024

DG DIA to visit Greece to further strengthen defence ties

Director General, Defence Intelligence Agency (DG DIA) Lieutenant General DS Rana will pay an official visit to Greece from December 10-11, 2024. During the visit, DG DIA will interact with senior military leadership of Greece including Deputy Chief of Defence Vice Admiral Christos Sasiakos and the Directors at the Hellenic National Defence General Staff.

In addition, the DG DIA will participate in a think-tank interaction hosted by the Institute of International Relations to provide an opportunity to engage with experts on critical defence and strategic issues. He will also interact with Ambassador of India to Greece Mr Rudrendra Tandon to discuss India's defence ties.

The visit will feature discussions focused on exchange of information & insights aimed at addressing shared security challenges and strengthening mutual understanding. This visit underscores India's commitment to fostering deeper defence ties with Greece, and highlights the importance of strategic partnership in addressing contemporary security concerns.

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**Press Information Bureau
Government of India**

Ministry of Defence

Mon, 09 Dec 2024

ICG conducts second bilateral meeting with Philippine Coast Guard as part of the ongoing cooperation framework

Indian Coast Guard (ICG) conducted the second bilateral meeting with Philippine Coast Guard (PCG) on December 09, 2024, at ICG HQs, New Delhi as part of the ongoing cooperation framework established under the MoU signed between the two Coast Guards. The meeting focused on enhancing collaboration in key areas such as Maritime Search and Rescue (SAR), Maritime Law Enforcement, Marine Pollution Response, and Capacity Building.

The discussions were led by ICG Deputy Director General (Operations & Coastal Security) Inspector General Anupam Rai and PCG Deputy Commandant for Administration Rear Admiral Edgar L Ybanez. Both sides explored avenues to bolster joint SAR operations, ensuring swift responses to maritime emergencies through shared resources and expertise. Cooperation in

maritime law enforcement was discussed with an emphasis on addressing transnational maritime crimes such as smuggling, trafficking, and illegal fishing.

The meeting also highlighted the importance of joint efforts in marine pollution response, focusing on training and resource-sharing to tackle environmental hazards effectively. Additionally, both Coast Guards underscored the significance of capacity building through knowledge exchange, joint exercises, and training programs to enhance operational capabilities and interoperability.

During the official visit from December 08-12, 2024, the high-level four-member PCG delegation will meet representatives from Department of Defence Production to witness India's indigenous shipbuilding capabilities under the 'Aatmanirbhar Bharat' initiative.

The MoU signed in August 2023 underscores the shared vision of the ICG and PCG in ensuring a secure and pollution-free maritime environment in the Indo-Pacific region. This bilateral meeting further solidifies the professional relationship between the two Coast Guards, contributing to regional stability and enhancing cooperation in addressing maritime challenges.

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THE ECONOMIC TIMES

Mon, 09 Dec 2024

Trump's Musk-led efficiency drive may spur defence-tech partnerships

President-elect Donald Trump's planned U.S. government efficiency drive involving Elon Musk could lead to more joint projects between big defence contractors and smaller tech firms in areas such as artificial intelligence, drones and uncrewed submarines, according to interviews with company executives.

Musk has indicated that Pentagon spending and priorities will be a target of the efficiency initiative, spreading anxiety at defence heavyweights such as Boeing, Northrop Grumman, Lockheed Martin and General Dynamics. Smaller military technology companies such as artificial intelligence software firm Palantir and drone-maker Anduril have been buoyed by the prospect of Musk further loosening the grip that defence giants have held on the Pentagon's budget for many decades.

Participants at the Reagan National defence Forum, a summit in Simi Valley, California, that brought together corporate executives, U.S. military leaders and lawmakers, said they expect smaller tech firms to play a bigger role given that Musk, one of their own, is entering a position of enormous influence.

Musk and many small defence tech firms have been aligned in criticizing legacy defence programs like Lockheed Martin's F-35 fighter jet while calling for mass production of cheaper AI-powered drones, missiles and uncrewed submarines.

Such views have given major defence contractors more incentive to partner with emerging defence technology players in these areas, some having strong personal relationships with Musk and his companies such as SpaceX and Tesla, according to executives at technology and big defence firms.

One senior executive at a top defence contractor, speaking on condition of anonymity, told Reuters that contract negotiations by his company with smaller military tech providers have been "on steroids" since Trump's Nov. 5 election victory.

The amount of money available for the newer defence companies might be limited, however. Less than 20% of the Pentagon budget buys weapons systems and, historically, only around 1% goes to brand-new program purchases like those being offered by these young market entrants, according to Tara Murphy Dougherty, CEO of defence acquisition software company Govini.

These emerging firms could benefit from teaming up with the big legacy contractors if the newer companies want to quickly scale production of new weapons and deploy new technology platforms in the field, according to executives at the summit.

"What we're locked into is a current worldview in defence that everything is zero sum. If you're growing, that means I'm shrinking. I don't think that's true," Shyam Sankar, Palantir's chief technology officer, told Reuters on the sidelines of the two-day summit, which ended on Saturday.

"We need to help the Primes," Sankar said, referring to the big legacy contractors, "once you get past a zero-sum mindset, that actually everyone can be better off."

In a potential sign of things to come, Palantir announced on the eve of the summit a deal to partner on defence AI with Booz Allen Hamilton, a 110-year-old military contractor.

Musk's New Role

Trump, who takes office on Jan. 20, named Musk and Vivek Ramaswamy, the founder of a pharmaceutical company, on Nov. 13 as co-leaders of a government efficiency initiative intended to slash government spending, dismantle federal bureaucracy, cut regulations and restructure agencies.

The Pentagon, with a budget around \$850 billion, accounts for half of U.S. discretionary spending - the money formally approved by Congress during the annual appropriations process. The Collaborative Combat Aircraft, or CCA, program is a project that could offer more access to smaller defence players.

The CCA would be a smaller drone in a family of systems centered around a sixth-generation fighter jet - the Next Generation Air Dominance, or NGAD, program meant to replace the F-22 fighter jet and give the United States the most powerful weaponry in the sky.

Anduril and General Atomics were selected in April to design, build and test prototypes for the CCA program - demonstrating that smaller companies had innovative ideas for the vehicle. A future production decision would lead to billions of dollars, but a wider group including defence giants Lockheed and Northrop Grumman could also compete to win that contract.

Drone makers such as Kratos defence, AeroVironment and Hermeus are also well-positioned if there is a push to surge production of autonomous vehicles. Software providers and services

contractors such as SAIC and Leidos Holdings may benefit because their products can be deployed quickly to fill the bureaucratic functions that Musk hopes to cut, according to industry sources.

It is widely expected that space will get a boost under Trump, with SpaceX one obvious beneficiary. Company executives, military leaders and U.S. lawmakers debated at the summit the extent to which Trump and Musk would be able to overhaul the defence Department, given that its budget funds 2 million American jobs and that many programs are worth tens of billions of dollars and locked in for years.

Musk faces a major challenge to push through structural changes given that the Pentagon budget is approved by lawmakers, many of whom have defence programs in their states.

Republican U.S. Senator Deb Fischer during a panel discussion at the summit said any major changes to the Pentagon budget would have to be handled by Congress, not Musk.

Fischer offered a challenge to any defence firm advocating major reforms. "Every one of you needs to propose a program that you personally benefit from that you'd be willing to cut," Fischer said.

<https://economictimes.indiatimes.com/news/defence/trumps-musk-led-efficiency-drive-may-spur-defence-tech-partnerships/articleshow/116139928.cms>

#SWARAJYA

Mon, 09 Dec 2024

Explained: What's Holding Up Indian Navy's Project To Get Submarines That Can Stay Underwater Longer

The Indian Navy's project to acquire conventionally powered submarines that can stay underwater longer has been mired in delays for years, and, unsurprisingly, is facing yet another setback. Project 75 India (P-75I) was first envisioned in 1998 as part of a 30-year submarine-building plan, set to conclude in 2030. Under P-75I, the Navy plans to acquire six new conventional diesel-electric submarines equipped with air-independent propulsion (AIP) technology.

After years of uncertainty, two main contenders have emerged to meet the Navy's needs. One is the German submarine manufacturer ThyssenKrupp Marine Systems (TKMS), which has partnered with the state-owned Mazagon Dock Shipbuilders Limited (MDL) to bid on the project. The other is Spain's Navantia, which has teamed up with private Indian company Larsen & Toubro (L&T). Before diving into the current holdup, it's crucial to understand the significance of AIP technology.

AIP systems allow submarines to remain submerged for extended periods, reducing the need to surface and risk detection by enemy sensors. Traditional diesel-electric submarines without AIP must snorkel regularly to recharge their batteries, which power the vessel's propellers and other systems. Snorkelling involves moving near the surface with the submarine's periscope and generator exhaust pipe exposed above water. This process can increase the risk of detection, as

modern radars, like the Telephonics AN/APS-153(V) on the Indian Navy's MH-60R helicopters, can easily spot the periscope and exhaust pipes. This is a significant vulnerability in hostile waters.

In contrast, AIP allows a submarine to recharge its batteries while remaining fully submerged, minimising exposure and enhancing stealth.

Currently, the Indian Navy operates no AIP-equipped submarines, whereas Pakistan has been using French-made submarines with AIP for years and is in the process of building eight more with Chinese assistance.

Now that we've looked at AIP technology, the next question is: what's causing the delays in P-75I?

The issue lies in the Navy's requirements.

The request for proposal (RFP) mandates that the supplier offer a submarine with a sea-proven AIP system. Unfortunately, neither TKMS nor Navantia meets this criterion. Both companies recently demonstrated their technologies to the Indian Navy, but neither presented an AIP system of the size and capacity outlined in the Navy's RFP.

Navantia's AIP system, while closest to the Navy's specifications, will not be operational on its submarines until 2026 — something Indian authorities were aware of from the start. Navantia demonstrated its AIP during the trials using a combination of land and onboard systems, but it is up to the Navy to decide if this qualifies as "proven" technology. The system has already undergone more than 50,000 hours of testing and has been selected for installation in the Spanish Navy's S-80 class submarines.

Navantia's AIP has been approved by the Spanish Navy and will be fitted onto its third S-80 class submarine, further enhancing the system's readiness. Meanwhile, TKMS' AIP, originally designed for its smaller Type 214 submarines, falls short of the size requirements for the Indian Navy. The Germans would need to develop a larger AIP system to meet the specifications.

Another issue with TKMS' bid is the need to develop a new submarine design for the Indian Navy, while Navantia is offering its already operational S-80 class submarines, which were inducted into the Spanish Navy in 2023. TKMS would also need to test new fuel cell batteries, as the ones used in their submarines are produced by a different manufacturer than those offered for India. According to a report in The Financial Express, "the outcomes of the trials carried out earlier this year are being reviewed again."

"This means that the Project-75I will get delayed further," it quotes a source as saying. The Navy's insistence on a proven AIP system is partly due to concerns that India's Defence Research and Development Organisation (DRDO) might claim its indigenously developed AIP system can meet the requirement, which would only result in further delays.

India has been building Scorpene-class submarines, with plans to integrate an indigenous AIP system into the fifth and sixth vessels. However, both have missed deadlines. The current plan is to retrofit the first Scorpene-class submarine undergoing refit next year with an AIP system, though even this remains uncertain due to ongoing trials.

The challenges plaguing P-75I today were anticipated years ago. Russia, once considered a contender for the project, warned that without "drastic changes" to the Indian Navy's tender, the

program would face significant hurdles. Russia noted that no other naval force in the world operates submarines like the ones India is seeking, meaning the vessels would need to be designed from scratch.

Sweden's SAAB was the first to withdraw from the race in 2019, even before a formal tender was issued, citing "unbalanced" strategic partnership requirements. Nearly five years later, P-75I remains stuck in limbo, with no signs of moving to the next phase anytime soon.

<https://swarajyamag.com/defence/explained-whats-holding-up-indian-navys-project-to-get-submarines-that-can-stay-underwater-longer>

THEWEEK

Mon, 09 Dec 2024

With fighter jet J-35 deal, China-Pakistan alliance grows stronger. Does India need to worry?

In what could come as a major upgrade for the air superiority of the Pakistan Air Force (PAF) and its efforts to modernise its forces and improve strike capabilities, Pakistan has recently approved the acquisition of the Chinese fifth-generation stealth fighter jet Shenyang J-35.

The delivery of the fighter jets, which will enhance Pakistan's deterrence posture, is expected to happen in 24 months.

Pakistan is currently relying on its fourth-generation fighter jets JF-17 Thunder and F-16 Fighting Falcon even as India aims to enhance the capabilities of the Indian Air Force (IAF) with a fifth-generation fighter jet programme, known as the Advanced Medium Combat Aircraft (AMCA). Besides, Pakistan is expected to retire as many as 200 fighter jets by 2030.

The decision by Pakistan to acquire J-35, a twin-engine, all-weather, stealth multi-role combat aircraft, is being perceived as a move to counterbalance India's growing power in the region and enhance its depleting air power.

Recently, Pakistan news reports claimed that PAF pilots have begun training on the J-31 fighter jets in China.

Capabilities of J-35 jets

A stealthy fifth-generation fighter, J-35 is a medium-sized fighter featuring a twin-engine layout, and incorporating stealth features like edge alignment, smooth contours, and radar-absorbing materials.

It is capable of both air superiority and strike missions against ground and maritime targets. Designed for seamless interoperability, providing strong standalone combat capabilities, and enabling coordination with other battlefield equipment, the induction of the fighter aircraft into

PAF will enhance its ability to conduct offensive operations in high-threat and contested environments.

According to news agency Xinhua, J-35 fighter jets are highly maneuverable, with excellent handling and user-friendly human-machine interaction, enabling full combat effectiveness.

Does India have a reason to worry?

The induction of the fifth generation J-35 into the Pakistan Air Force is set to significantly boost the country's air power as it is considered to be superior to India's advanced fighter aircraft, such as Sukhoi Su-30MKI and Rafale.

Meanwhile, according to IDRW, Pakistan's move may prompt the US to offer India the F-35A, a fifth-generation fighter, with enhanced stealth, situational awareness, and reduced vulnerability. According to the US Air Force, F-35A is an agile, versatile, high-performance, 9g capable multi-role fighter that combines stealth, sensor fusion, and unprecedented situational awareness.

The advanced sensor package of F-35A is designed to gather, fuse and distribute more information than any fighter jets in history. If the deal goes through, this would offer India a decisive advantage over its adversaries as the fighter jet is designed to achieve unprecedented levels of reliability and maintainability.

Amid growing China-Pakistan military ties which would expedite the Shenyang J-35 deal, the US may see the deal as an opportunity to enhance the strategic ties with India to contain the growing influence of China in the region.

<https://www.theweek.in/news/defence/2024/12/09/with-fighter-jet-j-35-deal-china-pakistan-alliance-grows-stronger-does-india-need-to-worry.html>



Tue, 10 Dec 2024

EAM Jaishankar, Bahrain counterpart Alzayani discuss trade, healthcare, defence, energy in Manama

India and Bahrain underscored the growing bilateral collaboration across key sectors, including trade, healthcare, energy and defence at the 4th High Joint Commission meeting in Manama here.

External Affairs Minister S Jaishankar and his Bahraini counterpart Abdullatif bin Rashid Alzayani also highlighted the successful first Joint Working Group meeting on healthcare cooperation and emphasised the importance of further expanding ties in medical tourism and pharmaceuticals.

The Ministry of External Affairs in a joint statement released on Monday after the 4th India-Bahrain High Joint Commission (HJC) Meeting said, "The two Ministers appreciated the progress achieved in the bilateral relations pursuant to the discussions held during the third HJC held in April 2021, and the subsequent fifth and sixth Foreign Office Consultations, held in March 2022

and May 2023 respectively. Both sides agreed to continue the pace of high-level bilateral visits and meetings, and expressed satisfaction at the regular high-level exchanges between the two friendly countries."

"The two ministers also reaffirmed their commitment to explore avenues of cooperation in diverse areas including energy and hydrocarbons, renewable energy, infrastructure, trade and investments, defence and security, health, food and agriculture, hospitality, pharmaceutical industry, electronic industry, downstream aluminium, IT and data centres, space, tourism, environment, youth and sports," the MEA added.

Both sides also acknowledged the deepening of political and people-to-people ties since the historic state visits. The Indian side highlighted the increase in Indian investment in Bahrain since the state visit of the Prime Minister in 2019.

Both sides welcomed the visits by trade delegations including the visit led by Abdullah bin Adel Fakhro, Minister of Industry and Commerce of Bahrain, to India in March 2023 and December 2024, and the visit led by Noor bint Ali Alkhulaif, Minister of Sustainable Development, and Chief Executive of Bahrain EDB, in September 2024.

Bahraini side also welcomed the Indian investments and the arrival of global Indian brands to Bahrain, especially since the beginning of 2024.

The two sides also expressed satisfaction at the stability, sustainability, and diversity of bilateral trade. They agreed to work towards strengthening the trade and investment ties, and in this regard, agreed to work towards creating a bilateral Joint Working Group on Trade and Investment.

Meanwhile, Bahrain renewed its desire to conclude a bilateral agreement to eliminate double taxation with India (DTA), with the aim of strengthening cooperation in tax matters and developing economic, commercial and investment opportunities between the two friendly countries.

The two sides also welcomed the inauguration of negotiations held on September 3 - 4 for a Bilateral Investment Treaty and agreed to work towards an early conclusion. The two Ministers agreed to expedite negotiations for the early launch of acceptance of the Indian RuPay Card in Bahrain. They also agreed to work towards closer cooperation in the sectors of FinTech and Digital Payments.

Both sides emphasised the importance of bilateral collaboration in the field of health and pharmaceuticals and expressed satisfaction at the successful first Joint Working Group (JWG) meeting on Healthcare Cooperation, held in February 2022. It was agreed to work towards the implementation of the decisions taken in accordance with the country's national policies, rules and legal frameworks and noted with satisfaction that the Ministries of Health of the two countries are working towards holding the second meeting of JWG on Healthcare Cooperation at the earliest, the MEA said.

The Indian side highlighted the role of the Indian Pharmaceutical Industry as one of the world leaders and conveyed the importance of market access for Indian pharmaceutical products in the Bahraini market in compliance with Bahrain's established regulatory requirements. Both sides also

agreed to facilitate the private sectors of the two countries to increase trade in pharmaceuticals, vaccines, and medical devices.

The two Ministers acknowledged the significant potential for collaboration in advancing both nations' positions as hubs for medical tourism.

Both sides emphasised enhancing cooperation in developing the agricultural and livestock sectors. The Indian side highlighted the significant opportunities for investments in food parks in India, and in increasing food exports from India to Bahrain. The Bahraini side emphasised the importance of exchanging experiences between the two countries to foster bilateral projects aimed at achieving food security, the MEA said.

Both sides also recognised the significance of hydrocarbon trade as a vital component of this cooperation, contributing to mutual energy security and economic growth. Both committed to take steps in enhancing energy cooperation, especially in upstream and downstream sectors of Oil and Gas in Bahrain and exploring avenues for expanded trade, joint ventures, and mutual investments.

In the energy sector, both nations committed to enhancing cooperation, focusing on hydrocarbon trade, renewable energy, and green technologies. Defence ties were also a key focus, with both countries agreeing to further develop military cooperation, including the potential signing of a MoU between their armed forces.

"Both sides noted the satisfactory bilateral developments in the renewable energy sector since the signing of the MoU in 2018 and agreed to convene the 2nd meeting of the Joint Working Group at an early date. They agreed to deepen the cooperation by engaging government agencies and the private sector in bilateral engagements particularly in the fields of Solar, Wind, Green Hydrogen & Green Ammonia. The Foreign Ministers recalled that Bahrain became a member of the International Solar Alliance (ISA) in 2022," the MEA said.

The two ministers also expressed satisfaction at the progress made by the Indian Space Research Organisation (ISRO) and the Bahrain's National Space Science Agency (NSSA) in deepening collaboration in building and launching Nano/Cube-satellite and providing assistance in capacity building to Bahrain. Both sides are currently working on finalizing the draft MoU between NSSA and NSIL (New Space India Limited) to further strengthen the cooperation within the space sector.

Both sides agreed to work towards developing and strengthening the defence cooperation between the two countries, which may include the signing of a Memorandum of Understanding (MoU) between the two countries' Armed Forces.

Additionally, the Kingdom of Bahrain welcomed India joining the Combined Maritime Forces headquartered in the Kingdom of Bahrain in 2023. Bahrain appreciated the participation of the Indian Air Force Sarang Aerobatic team consisting of 05 Dhruv helicopters in the 7th Bahrain International Air Show (BIAS) in November 2024, the MEA added.

Notably, the fourth meeting of the India - Bahrain High Joint Commission (HJC), co-chaired by Jaishankar and Rashid Alzayani, was held in Manama, Bahrain on Monday. The HJC was established pursuant to an MoU signed between the two sides during the State visit of Hamad bin Isa Al Khalifa, King of Bahrain, to India on February 18-20, 2014, according to MEA.

Jaishankar visited Bahrain from December 7 - 9 at the invitation of Alzayani. Jaishankar also met the Deputy Prime Minister of Bahrain, Shaikh Khalid bin Abdulla Al Khalifa during the visit.

<https://www.aninews.in/news/world/middle-east/eam-jaishankar-bahrain-counterpart-alzayani-discuss-trade-healthcare-defence-energy-in-manama20241210032848/>

Business Standard

Mon, 09 Dec 2024

After Israeli missile, IAF's 'super' Sukhoi-30 to get another major upgrade

The Indian Air Force's (IAF's) Russian-origin Sukhoi-30 MKI frontline heavy combat aircraft are set to receive significant upgrades, including AESA radars, longer-range weapons, and an electronic warfare suite (EWS), to maintain their air combat capability for another 30 years. While the radar and weapons upgrades were announced earlier, the EWS update was revealed recently. Some of these upgrades have already been tested, and progress is being made on others.

In particular, the recently tested or cleared upgrades will enhance the SU-30 MKI's capability for the suppression or destruction of enemy air defences (SEAD/DEAD) and attacking ground targets in heavily defended areas.

The IAF currently operates 259 SU-30 MKI aircraft, most of which were licence-produced by Hindustan Aeronautics Limited (HAL). India has paid Russia over \$12 billion for these aircraft, which form the backbone of the IAF's combat fleet.

New electronic warfare suite for the SU-30 MKI

On December 3, the Ministry of Defence (MoD) announced that the Defence Acquisition Council (DAC), chaired by Defence Minister Rajnath Singh, had accorded acceptance of necessity (AoN) for five capital acquisition proposals amounting to over Rs 21,772 crore, including for the procurement of an EWS for the SU-30 MKI.

The EWS will comprise external airborne self-protection jammer pods, next-generation radar warning receivers, and associated equipment. While these aircraft already operate with an Israeli self-protection jammer pod, the MoD release said the new system "will enhance the operational capabilities of SU-30 MKI and protect it from enemy radars and related weapon systems" while carrying out missions against enemy targets protected by air defence systems.

AESA radars for the SU-30 MKI

The finishing touches on a major indigenous plan to make the IAF's SU-30 MKI fighter jets significantly more lethal have been completed, a national daily reported in July this year. To ensure that these frontline jets are capable of combat for another 30 years, the upgrades will include active electronically scanned array (AESA) radars, advanced avionics, longer-range weapons, and multi-sensor fusion.

As of July, the MoD had finalised the draft note for approval by the Prime Minister-led Cabinet Committee on Security (CCS) to upgrade the first batch of 84 jets at an estimated total cost of Rs 63,000 crore, according to the report.

The upgraded jets, called 'Super Sukhois', will rival fifth-generation fighters in capability, minus stealth. They will also support manned-unmanned teaming, working with advanced autonomous drones through artificial intelligence (AI) and data links. The IAF plans to operate these jets until 2055, the report said.

The upgrade project will reportedly equip the Su-30 MKIs with indigenous 'Virupaksha' AESA radars, increasing the detection range for enemy platforms by 1.5 to 1.7 times compared to the current Russian radars. This enhancement will allow the jets to carry longer-range weapons, including the under-development Astra-3 air-to-air missile, which will have a beyond-visual-range capability of 350 kilometres (km).

All the 84 Su-30 MKIs will be upgraded by Hindustan Aeronautics Limited (HAL) over approximately 15 years. Following the CCS approval, development and flight-testing will take seven years, after which the jets will be progressively upgraded and inducted in batches. In 15 years, India is also expected to have its own fifth-generation stealth fighter, the Advanced Medium Combat Aircraft (AMCA), featuring cutting-edge technologies. These advanced technologies will reportedly be integrated into the next batch of Sukhois slated for upgrades following the first 84 jets.

New and lethal air-to-surface missiles for the SU-30 MKI

Although the 'Super Sukhoi' upgrade programme involves a lengthy lead time, substantial additions have already been made to the SU-30 MKI arsenal this year. In May this year, the Defence Research & Development Organisation (DRDO) successfully flight-tested the RudraM-II air-to-surface missile from the SU-30 MKI platform. The flight-test met all objectives, validating the propulsion system and control and guidance algorithm, according to an MoD release.

The RudraM-II is an indigenously developed, solid-propelled air-launched missile system designed for an air-to-surface role, capable of neutralising various enemy assets. It incorporates advanced indigenous technologies developed by multiple DRDO laboratories. The RudraM-II is classified as an anti-radiation supersonic missile, designed to target enemy ground radars and communication stations during SEAD missions. The mark-1 version of the missile was tested four years ago by the SU-30 MKI.

In April, the IAF reportedly test-fired an Israeli quasi-ballistic missile, called ROCKS, from the SU-30 MKI, in a successful test that marked a significant increase in the IAF's ability to target deep inside enemy territory without even crossing its own airspace. The missile, classified as a next-generation extended stand-off air-to-surface weapon, has been developed and manufactured by Israeli defence company Rafael Advanced Defense Systems.

The missile, tailored to meet India's specific requirements, is a derivative of the Sparrow series of air-launched ballistic missile targets and integrates advanced capabilities from Israel's SPICE air-to-surface weapons series. Interestingly, it was also employed by the Israeli military in April to strike an S-300 air defence battery in Iran.

The missile's reliance on several India-sourced components has prompted the IAF to reportedly explore the possibility of placing a larger order as part of the Atmanirbhar initiative. The IAF is also pushing for the missiles to be entirely manufactured within India, added the report.

The missile is a quasi-ballistic weapon with a range of less than 300 km. Unlike regular air-to-ground systems, its quasi-ballistic nature allows the pilot to adjust its trajectory, enabling horizontal or vertical flight paths. It is designed to target high-value stationary and relocatable assets, both above ground and underground, as well as heavily fortified installations, with precise accuracy in GPS-denied environments.

The ballistic nature of its flight provides high velocity during the terminal phase, aiding deeper penetration into targets. Its stand-off capability reportedly enables it to neutralise advanced enemy air defence systems. The missile operates autonomously and can be launched from an extended range, beyond heavily defended surface-to-air threat zones.

With this upgrade, the Su-30MKI fleet will be equipped with two major missiles: the newly integrated system and the air-to-surface variant of the BrahMos supersonic cruise missile. Currently, 40 Sukhoi fighters have been modified to carry the BrahMos missile for precision air-to-ground strikes.

https://www.business-standard.com/external-affairs-defence-security/news/after-israeli-missile-iaf-s-super-sukhoi-30-to-get-another-major-upgrade-124120900939_1.html



Mon, 09 Dec 2024

Capable Of Tracking Stealth Fighters & Ballistic Missiles, Russia To Arm India With ‘Voronezh’ Radar: Reports

India and Russia are likely to finalize a deal to install a Russian Voronezh ballistic missile attack early warning radar at Chitradurga in Karnataka, as per media reports. The Sunday Guardian claimed that negotiations to acquire the US\$4 billion Almaz-Antey-developed radar are in an advanced stage. Almaz-Antey is one of Russia’s largest manufacturers of air defense systems, including radar systems, missile defense systems, and related technologies.

Voronezh Radar

The Voronezh radar system can detect and track ballistic missile launches and stealth aircraft and provide situational awareness of space objects. These radars employ phased array technology, which allows for rapid electronic steering of the beam. This makes them highly efficient and less mechanically complex than older systems like the Dnepr or Daryal radars. They are noted for their compact size, lower energy consumption, and reduced construction time compared to previous generations.

The Voronezh system's strategic importance lies in its ability to cover vast areas, including parts of Europe, Asia, and North America, from key installations spread across Russia. This network provides Russia with a comprehensive shield against potential missile threats, ensuring national security through early detection and warning.

Types Of Voronezh Radars

The Voronezh radars come in several variants, including Voronezh-M, Voronezh-DM, and Voronezh-CM, each tailored for specific detection roles or improved performance.

Voronezh-M (VHF band): Optimized for detecting objects at long ranges but with relatively lower resolution. The radar is optimized to provide initial warning of medium and long-range ballistic missiles.

Voronezh-DM (UHF band): Offers better resolution and tracking accuracy for smaller targets.

Voronezh-SM (L-band) and Voronezh-VP (planned upgrades): Enhanced precision tracking and clutter rejection capabilities. The Voronezh-VP radar, which can track incoming ballistic missiles and even low-flying targets like cruise missiles from great distances, provides the Russian Armed Forces with ample time to react. The "VP" version combines both VHF and UHF for enhanced capabilities.

Data Fusion

The different Voronezh radars can work in unison as part of an integrated Missile Attack Early Warning System to generate a comprehensive radar picture of potential missile threats and space activity. Each Voronezh radar operates independently, monitoring its assigned sector. The data collected—such as target trajectories, speeds, and classifications—are transmitted to a central processing hub.

The central system fuses this information with data from other radars, satellites, and sensors to create a unified, real-time radar picture of the entire monitored region. Voronezh radars are strategically positioned to ensure overlapping fields of view, providing redundancy and improving detection accuracy.

For example, if one radar identifies a missile launch, other radars covering nearby sectors can validate the observation and provide additional trajectory data. The system can simultaneously track hundreds of targets at long ranges, extending to 6,000 km for a large ICBM-sized ballistic missile.

Chitradurga Installation

The radar proposed to be installed at Chitradurga is likely a Voronezh-M radar. Operating from Chitradurga, it would be capable of providing early warning of missile attacks both by China and Pakistan.

The Voronezh-M is an over-the-horizon (OTH) early warning radar system. Over-the-horizon (OTH) radar functions by using the ionosphere to refract radio waves, allowing detection of targets beyond the line of sight. It transmits high-frequency signals that bounce off the ionosphere and back to the Earth, where they can detect distant aircraft, ships, or missiles. This refraction extends

the radar's range far beyond traditional line-of-sight radars, covering thousands of kilometers. However, OTH radar can be affected by ionospheric conditions, leading to variability in performance.

Russia has strategically placed Voronezh-M radars to monitor potential threats from Europe, Asia, and North America, providing critical early warning information to the Russian Space Forces. Voronezh-M radars are currently deployed in the Leningrad Region, Irkutsk Region, and Altai Territory (Barnaul). A Voronezh-M system is being installed in the Orenburg Region (Orsk).

It may be recalled that in May 2024, Ukraine attacked the Voronezh-M radar located in the city of Orsk in Russia's Orenburg Oblast.:

Sensor Fusion

Working in unison, the three types of Voronezh radars can provide a credible counter-stealth capability. The Indian Air Force (IAF) needs counter-stealth detection and tracking capability because China has deployed stealth fighters and drones in large numbers, and Pakistan is likely to acquire J-35A stealth fighters from China.

Multiband radars, such as the Voronezh types and the Russian Nebo (Sky) series, can detect and track stealth aircraft by fusing data from three different radars, each operating in VHF (Decimetric), UHF (Metric) and L (Centimetric) bands. The VHF system performs initial detection and cues the UHF radar, which in turn can cue the L-band or other centimetric wavelength radar.

At a later stage, India may acquire and install Voronezh-DM and/or Voronezh-SM systems closer to its borders with Pakistan and China and integrate them with the Voronezh-M system at Chitradurga. Alternatively, it could integrate locally developed UHF and L band radars with the Voronezh-M.

Local Manufacture

According to claims, over 50 Indian partners, including startups, will manufacture at least 60 percent of the system. The project is expected to generate substantial employment across the country.

A ten-member team from Almaz-Antey, led by Deputy Chairman Vladimir Medovnikov, reportedly visited India last month. The team traveled to Delhi and Bengaluru to identify possible offset partners, among other things. On the Indian side, the project is being handled by LRDE (Electronics and Radar Development Establishment), a part of India's DRDO (Defence Research and Development Organisation).

Conclusion

India desperately needed a ballistic missile launch early warning and counter stealth capability. The US and the Western countries had nothing to offer. Russia, once again, came to our rescue. It's conceivable that India will proceed with the deal despite US pressure not to engage with Russia since the system being acquired is purely defensive in nature.

<https://www.eurasiantimes.com/russia-to-provide-india-formidable-ballistic-missile/>

Indian Navy's 1st Nuclear Submarine Base To Be Ready In 2 Years; 'Made In India' Nuke Attack Sub By 2036

India's nuclear submarine program is gaining momentum to counter the Chinese Navy, already the world's largest. By 2036, India is expected to have its first indigenous nuclear attack submarine. Additionally, Project INS Varsha, a dedicated base for nuclear submarines, is set to become operational within the next two years. India's Navy Chief, Admiral Dinesh Tripathi, has confirmed that the country's first indigenous nuclear attack submarine is expected to be ready by 2036, with the second following within two years.

This marks the first official statement regarding the nuclear attack submarine program (SSNs). The project, covering the first two submarines, is estimated to cost Rs 35,000 crore (\$4.5B). Naval sources also told the EurAsian Times that INS Varsha, India's dedicated nuclear submarine base, is expected to become operational within two years. This facility will serve as a hub for the Indian Navy's current and future submarines. Developing nuclear attack submarines and the base will significantly bolster the Navy's strategic capabilities in the Indian Ocean Region (IOR) and the South China Sea.

India's Nuclear Attack Submarine Project

In October 2024, the Cabinet Committee on Security (CCS), chaired by the Prime Minister, approved the construction of two indigenous nuclear attack submarines. The Indian Navy requires six such submarines. Admiral Dinesh K. Tripathi, during the annual press conference on December 2, described the project as a "game changer." He emphasized that it would enhance the Indian Navy's operational capabilities and bolster the defense manufacturing ecosystem, marking a significant milestone for the 'Make in India' initiative in the next five years.

With the government's approval for two submarines, Admiral Tripathi emphasized the confidence in India's capacity to design and manufacture complex defense platforms. He pointed out that the submarine program will mirror the successful model used in India's nuclear-powered ballistic missile submarines (SSBN) project, where the Navy took the lead in design and worked closely with the defense industry for manufacturing. This approach, as seen with the Arihant nuclear submarine (SSBN) program, led to the creation of two nuclear-armed submarines.

The project will involve multiple indigenous stakeholders, including the Bhabha Atomic Research Centre (BARC), the shipbuilding centers, design agencies, and private sector partners. These entities will play a crucial role in developing India's first nuclear attack submarine, which is expected to join the Navy's fleet by 2036-37. Admiral Tripathi also highlighted the significant involvement of the private sector and the anticipated impact on secondary and tertiary industries.

India's first nuclear-powered attack submarines will transform the Indian Navy's strategic capabilities while supporting the country's goal of becoming fully Aatmanirbhar (self-reliant) by

2047. Furthermore, these submarines will serve as a key counterbalance to the growing maritime presence of China and Pakistan in the Indian Ocean Region (IOR).

India's Nuclear Submarine Fleet

There are three primary types of submarines worldwide: Diesel-Electric Submarines, Diesel-Electric Submarines with Air-Independent Propulsion (AIP), and Nuclear-Powered Submarines. Currently, India operates 16 diesel-electric-powered submarines and four nuclear-powered submarines.

- **INS Arihant:** India's first indigenous nuclear-powered ballistic missile submarine (SSBN), commissioned in August 2016.
- **INS Arighat:** India's second SSBN, commissioned on August 29, 2024, by Defence Minister Rajnath Singh. In the past week, the K4 ballistic missile fired from INS Arighat has raised concerns in both China and Pakistan. The successful missile launch was officially announced by Navy Chief Dinesh Tripathi.
- **INS Aridhaman:** The third SSBN, set to be commissioned next year.
- **S4* (Codename):** India launched its fourth SSBN at the Ship Building Center (SBC) in Visakhapatnam in October 2024.

Nuclear-powered submarines, as the name suggests, operate on nuclear energy. While India currently possesses nuclear-powered ballistic missile submarines (SSBNs), it lacks Nuclear-Powered Attack Submarines (SSNs). However, this gap is set to be addressed with the government's recent approval to construct two SSNs, marking a significant expansion in India's naval capabilities.

INS Varsha – House For Nuclear Submarines

As reported by the EurAsian Times, India is making significant strides in building a dedicated base for its nuclear submarines i.e. INS Varsha. This underground base is located near the coastal village of Rambilli in Andhra Pradesh, approximately 70 km from the Visakhapatnam naval base. It is expected to become operational within the next two years.

India has long recognized the need for a stealthy naval base capable of housing nuclear attack submarines. The second phase of Project Varsha has been delayed since 2010 due to a forest-land acquisition issue. However, in 2018, the Modi government swiftly cleared the obstacles and expedited the project.

Six years later, this highly secure and advanced naval base is nearing completion. It is set to reshape naval power dynamics not only in the Bay of Bengal and the Indian Ocean Region but also across the Indo-Pacific. Although the exact cost of INS Varsha remains undisclosed, estimates suggest it could reach around US\$3.75 billion. The base is designed to accommodate over 12 nuclear-powered submarines, including the Arihant-class and the future S5-class vessels.

INS Varsha will also play a pivotal role in strengthening security cooperation with Quad partners—the United States, Japan, and Australia—while fostering technological collaborations and joint ventures with like-minded nations. Moreover, the base will significantly enhance India's ability to

project naval power and extend its influence across the vast Indo-Pacific region, enabling the Indian Navy to operate far beyond its immediate waters.

Regional Threats To India

India is rapidly developing its naval capabilities through a comprehensive nuclear submarine plan while closely monitoring the growing naval strength of neighboring China and Pakistan. Pakistan is working toward becoming a 50-ship force, with many of its warships and submarines being built with Chinese assistance, highlighting Beijing's intent to enhance Pakistan's naval strength.

China, for its part, is set to increase its submarine fleet. By next year, China will add five new submarines to its current fleet of 60, raising the total to 65. This includes six Ballistic Missile Submarines (SSBNs), six Nuclear-Powered Attack Submarines (SSNs), and 48 Diesel-Electric Attack Submarines, of which 21 are equipped with Air Independent Propulsion (AIP) technology.

According to Navy Chief Admiral Dinesh Tripathi, India is adapting its strategies to address potential regional threats. India is in the final stages of negotiations to acquire three additional Kalvari-class submarines and Rafale M jets, with procurement contracts expected to be signed soon. Major warship and submarine construction programs are also underway, with the Navy on track to become a 175-warship strong force.

The growing tensions in the Indo-Pacific region have sparked global concerns about the possibility of a large-scale conflict. In this context, India is preparing for maritime conflicts, positioning itself to play a key role if such a conflict erupts in the region.

<https://www.eurasiantimes.com/indias-strategic-naval-expansion-indigenou/>



Mon, 09 Dec 2024

Land Of The Rising Sun ‘Rising Again’! Japan Challenges China In 6th-Gen Military Race With ‘New Age’ Tech

In stark contrast to its previous pacifist posture, Japan is rapidly boosting its military might in the face of growing security challenges from China.

Japan is co-developing its next-generation fighter jet and CCA drone with the United Kingdom and Italy under the ‘Global Combat Air Program’ (GCAP). Given that all three members have ratified the GCAP treaty, which formally establishes the GCAP International Government Organization (GIGO), an organization tasked with managing the industrial framework, setting capability requirements, and supervising the development of the next-generation fighter jet, the project is catching pace. Japan's Mitsubishi Heavy Industries, Italy's Leonardo, and Britain's BAE Systems lead the project as system integrators.

A Mitsubishi Heavy Industries (MHI) spokesperson recently stated that Japan and Britain are also investing in the design and development of Collaborative Combat Aircraft (CCA) to add a multi-mission capability to the program. The GCAP is expected to have enhanced sensors, AI-powered networked data systems, and manned fighter aircraft supplemented by unmanned “adjuncts,” like drones.

Notably, the recent statement comes weeks after Japan’s MHI unveiled concept designs for Collaborative Combat Aircraft (CCA) at the International Aerospace Exhibition 2024. MHI unveiled two different models for CCA. One was an ‘expendable ISR variant’ called the Affordable Rapid Prototype Missile Drone Concept (ARMDC-20X), which would detect, identify, and communicate threats to the crewed next-generation aircraft.

The other CCA was a ‘tactical combat variant’ that has not been named yet. MHI displayed a 1:10-scale model of the tactical combat CCA featuring an internal payload compartment. Furthermore, the Japanese firm produced a video demonstrating two CCAs operating alongside a next-generation crewed fighter jet, which had remarkable similarities with the GCAP concept aircraft.

A few seconds into the video, an unmanned aircraft is seen detecting a “threat aircraft”—a Chinese J-20-like platform. Immediately after detection, the CCA relays information to the manned fighter through the data link. Then, the fighter directs the combat CCA to destroy the hostile aircraft using an air-to-air missile fired from its internal weapons bay.

At the time, MHI clarified that these loyal wingman drone models on exhibit were not the final design as the CCA project was still in its conceptual stage. However, by 2035, when the first GCAP aircraft enters service, MHI expects to have a fully operational version of these autonomous systems. The comments suggest that work on CCA is now taking place on a war footing.

Having said that, this is one of the latest examples of Japan’s expanding offensive combat capability, a prospect once unthinkable for Japan. In fact, Tokyo is now making all-around efforts to zoom ahead of its rivals in the Indo-Pacific region, signaling a military resurgence for the land of the rising sun.

Japan Is Mounting A Military Challenge To China

Japan’s development of next-generation combat aircraft is believed to be part of a broader attempt to leverage novel technology to counterbalance air power dynamics in the region, particularly due to rising tensions with China. Tokyo is also concerned that it may eventually be drawn into an Indo-Pacific conflict triggered by China’s invasion of Taiwan. China is also developing a next-generation fighter jet. In fact, China debuted a mock-up of its sixth-generation fighter at the China Air Show in Zhuhai last month. Referred to as the “Baidi” or “White Emperor,” the fighter jet is intended to be an “integrated space-air fighter” that can fly at supersonic speeds and escape out of Earth’s atmosphere to function in space.

However, as the EurAsian Times explained earlier, the GCAP is expected to surpass all other sixth-generation fighter programs, including the US Next-Generation Air Dominance (NGAD), the Franco-German Future Combat Air System (FCAS), and the Chinese Baidi. Thus, Japan could gain an unprecedented advantage in the region. Japan’s military modernization is not limited to the GCAP. The country has also purchased two F-35 Lightning II stealth aircraft variants from

Lockheed Martin: the F-35A and the F-35B. To counter-balance China's burgeoning naval might, Japan is also working to convert its Izumo-class helicopter carriers into aircraft carriers capable of operating the F-35 STOVL variant. For Japan, China's increased military activity in the East China Sea and Taiwan Strait makes carrier operations with cutting-edge fighter jets more necessary.

In addition, Japan has launched a sustained effort to increase its firepower. For instance, it recently placed a fourth follow-on order for a fifth-generation stealth air-to-surface land attack cruise missile called 'Joint Strike Missile (JSM), which will be carried by the F-35A. The stealth-on-stealth combination of F-35A and JSM would allow Japan to penetrate China's sophisticated Anti Access/Area Denial (A2/AD) system along its coastline. The missile could give Japan a first-strike advantage in the contested Indo-Pacific without being detected by enemy air defenses.

Japan is also acquiring the Joint Air-to-Surface Standoff Missile Extended Range (JASSM-ER) and related equipment, as well as 400 Tomahawk sea-launched cruise missiles from Washington. It is also developing its own long-range missiles. In addition to these offensive weapons, Japan is also investing in cutting-edge drones to monitor its expansive maritime domain. It recently announced a possible acquisition of MQ-9B SeaGuardian drones, which will be responsible for conducting ISR operations over the country.

These purchases indicate that Japan is preparing for modern warfare. In the past, Japan had focused primarily on modernizing and strengthening its land Self-Defense Forces, believing that the USSR's ground invasion of Hokkaido posed the greatest threat to the country. But now that China is its main competitor, the focus is clearly on air and sea defense systems with second-strike potential.

The country is also exploring the possibility of acquiring the Aegis class destroyers, more advanced patrol airplanes, and submarines, which can support the Maritime Self-Defense Force. Besides developing a next-generation fighter with the UK and Italy, Japan is also working with its age-old ally, the United States, on developing a missile capable of intercepting hypersonic missiles. This comes amid China amassing a large arsenal of lethal hypersonic weapons, including the DF-17, YJ-21, and DF-27.

In FY 2025, Japan allocated over US\$58 billion for defense, its highest budgetary allocation to defense to date. Tokyo hopes to use this to execute the strategies laid out in the Japan Defense White Paper and its Defense Buildup program released earlier this year. This aims to better equip Japan to defend itself and its neighboring Indo-Pacific nations.

In recent weeks, Japan has faced Chinese intrusions by boats and aircraft in different parts, ratcheting up tensions between the two states. These incidents have further encouraged the country to add more capability and mount a challenge big enough to deter a mighty and aggressive People's Liberation Army. Japan's Prime Minister Shigeru Ishiba recently reiterated his country's resolve to carry out a military build-up, noting that growing tensions with China, Russia, and North Korea had drastically worsened the security situation around Japan. However, with all these military modernization plans, Japan is on course to become a country that could mount the biggest military challenge to China in Asia.

<https://www.eurasiantimes.com/japan-is-rising-against-the-dragon-once-again/>



Press Information Bureau
Government of India

Ministry of Science & Technology

Mon, 09 Dec 2024

“Twisting Layers” in Solid State: A Breakthrough in conversion of waste heat to electricity

Researchers have developed a new material with potential for highly efficient conversion of waste heat to energy by introducing twisted layers in ferecrystals, a distinctive class of misfit layered compounds. The material which has exceptionally high thermoelectric figure of merit (measure of thermoelectric performance of a material) exceeding the value two can act as tremendous heat blockers and has significant implications for thermoelectric energy conversion, a process that captures and converts waste heat from sources like industrial processes in chemical, thermal, steel plants, petroleum refineries and vehicle exhaust into electricity.

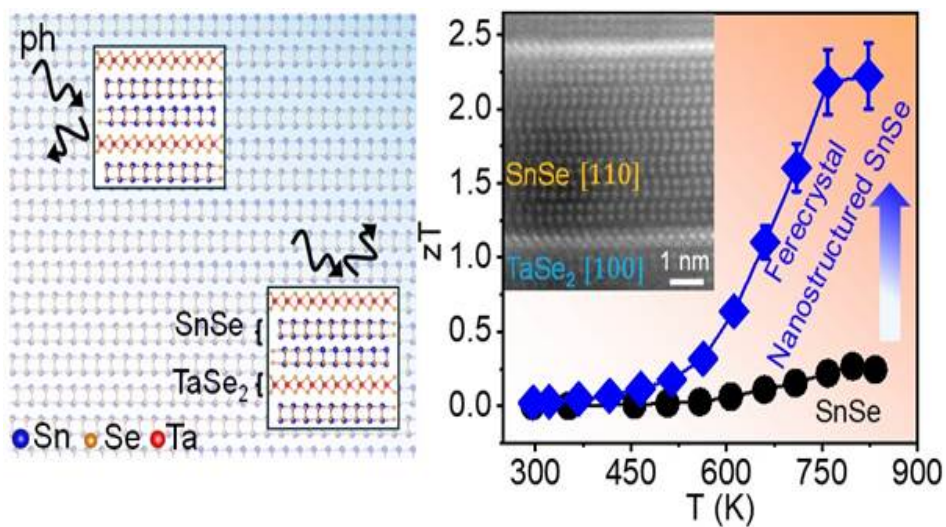
Two-dimensional (2D) superlattice materials, composed of alternating layers of two or more different structures are engineered at the atomic level, with each layer typically just a few atoms thick. The periodic stacking of different 2D materials creates a new material with unique electronic properties that are not present in the individual layers. Misfit Layered Compounds (MLCs), an interesting example of 2D natural superlattice structured materials, consist of at least two or more periodically stacked independent layers wherein the difference in the repeating patterns of the two layers in MLCs causes a misalignment along one direction.

This misalignment results cause a ‘misfit’ between the layers. Despite exhibiting weaker bonding along the stacking direction, the presence of twisting between the layers (rotational disorder) in a unique class of MLCs known as *ferecrystals*, can hamper the heat transport tremendously, effectively blocking heat waves in any material. This property of ferecrystals makes them particularly interesting for thermoelectric energy conversion, which can convert waste heat into electricity. However, imbining these ferecrystals as nanostructures in a solid-state matrix can be a daunting task and grand challenge in synthetic chemistry and materials science, but it could lead to significant advancements in thermoelectric technology and push the boundaries of current material synthesis techniques.

In a recent research paper, Professor Kanishka Biswas, his Ph.D student, Ms. Vaishali Taneja from New Chemistry Unit at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) Bengaluru, an autonomous institution under the Department of Science & Technology, Govt. of India and other research team members has synthesized ferecrystalline intergrowths as nanoscale region inside bulk SnSe along with *n*-type halide doping, This has resulted in stabilization of SnSe-

TaSe₂ ferecristal in the form of nanostructures in a solid state SnSe matrix that act as tremendous heat blockers. The thermoelectric figure of merit is achieved to be 2.3.

This study, published in *Journal of the American Chemical Society*, would be the way forward for achieving high performance in *n*-type SnSe polycrystals. To confirm that the intended intergrowth nanostructures have actually been formed, the team collaborated with Prof N. Ravishankar from IISc, Bengaluru to perform high-resolution transmission electron microscopy (HRTEM) and high-angle annular dark-field scanning transmission electron microscopy (HAADF-STEM) analysis which revealed the presence of TaSe₂ layers after every 7 bilayers of SnSe. Furthermore, they have shown the presence of extensive rotational disorder present in the ferecristals wherein SnSe and TaSe₂ sublattices are twisted (rotated) around the stacking direction (*c* axis) and are translated perpendicular to the stacking direction. The findings from this research could lead to substantial improvements in energy efficiency and contribute to greater sustainability.



A schematic and HAADF-STEM image illustrating the ferecristalline intergrowths that result in ultrahigh thermoelectric performance in Ta and Br co-doped SnSe.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2082370>



Press Information Bureau
Government of India

Ministry of Science & Technology

Mon, 09 Dec 2024

IIT Ropar successfully organized Sheet Metal Forming 2024 Conference (SMF 2024)

Rupnagar, 9th December 2024: IIT Ropar successfully hosted the Sheet Metal Forming (SMF) 2024 conference, attracting a large gathering of national and international delegates. The event

featured eminent speakers from IITs and prominent industry partners, including Auto form, Electropneumatics & Hydraulics, Altair, Tata Steel, Tata Technologies Ltd., Ford India, Fells System GmbH, and JBM Auto Ltd. SMF 2024, the flagship conference of the Sheet Metal Forming Research Association (SMFRA), provided a platform for researchers and developers from India and abroad to present and exchange ideas on metal forming technologies.

The conference commenced on December 5th with an inaugural ceremony. Prof. Anupam Agrawal, from the Department of Mechanical Engineering at IIT Ropar and Organizing Secretary of SMF 2024, welcomed the attendees, including speakers, SMFRA members, scholars, and industry guests. Prof. Rajeev Ahuja, Director of IIT Ropar, conveyed his best wishes for the success of the conference. This was followed by an address by Dr. Prabhat K. Agnihotri, Head of the Department of Mechanical Engineering and Chairman of the conference. Chief Guest Dr. Santosh Kumar, Vice President, Jindal Stainless Ltd., delivered the Rasquinha Memorial Lecture, sharing insights on the latest advancements and challenges in the field of sheet metal forming. Prof. K. Narasimhan, Secretary of SMFRA and Professor at IIT Bombay, highlighted the key challenges in metal forming for academia and underscored the importance of the SMF conference series in bridging academia and industry. The ceremony concluded with a vote of thanks by Prof. Navin Kumar, Department of Mechanical Engineering, IIT Ropar, and Co-Organizing Secretary of SMF 2024.

The event was supported by Platinum Sponsors Auto Formand Electropneumatic & Hydraulics (I) Pvt. Ltd., along with Silver Sponsor Altair Engineering India Pvt. Ltd.

Day 1 of the conference showcased presentations by leading researchers, professors, and industry leaders on the latest advancements in sheet metal forming. Day 2 included technical sessions on diverse topics, such as lightweight metal forming, hot forming for lightweight construction, and challenges in skin panel forming. Attendees had the opportunity to engage with experts and exchange ideas on cutting-edge research in sheet metal forming.

SMF 2024 featured a panel discussion on day 2, moderated by Mr. Avinash Khare, Consultant at Tool Maker's Facility, India. The panel included distinguished experts such as Prof. Hariharan K. (Associate Professor, IIT Madras), Mr. Prashant Kulkarni (Regional Manager, Altair Engineering India Pvt. Ltd.), Dr. Rahul Kumar (Tata Steel), and Prof. Ekta Singla (Associate Professor, IIT Ropar).

SMF 2024 aimed to provide insights into the future of metal forming research and promote knowledge-sharing among experts. The biennial event concluded successfully, with SMF 2024 Organizing Secretary Prof. Anupam Agrawal and Co-Organizing Secretaries Prof. Navin Kumar and Prof. Ekta Singla—receiving widespread appreciation for their efforts. The conference ended on Day 2 with a valedictory address by Prof. Anupam Agrawal.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2082411>

Antimatter idea offers scientists clue to cracking cosmic mystery

One of the most astonishing facts about the natural world is the existence of antiparticles. Theorised by the English physicist Paul A.M. Dirac in 1928 and observed in cosmic rays by American physicist Carl Anderson in 1932, an antiparticle is a ‘partner’ of a particle type that has the same mass but opposite charge. For example, the antielectron is the antiparticle of the electron; it has the same mass and is positively charged.

Antiparticles are an inevitable consequence of describing the world in terms of quantum mechanics and special relativity.

An antiparticle is a particle travelling backward in time. This is not an oversimplification. If it sounds eerie, that’s because it is.

O antimatter, where art thou?

But where is all the antimatter made of antiparticles? It is certainly scarce, or we would have discovered it a long time ago. Still, antiparticles are detectably numerous. Our own bodies make one antielectron every 20 seconds from the decay of potassium-40. Cosmic rays raining down on us supply antiprotons, antielectrons, and even antinuclei. Every proton and neutron — constituents of the nuclei that make up all the matter we can touch — is teeming with antiquarks.

But it is when we look out at the universe as a whole that antimatter’s scarcity becomes clear. All galaxies are made of matter, not antimatter. Even in the infant universe, there had to have been a small dissimilarity between the populations of protons and antiprotons for our predictions about the outcomes of the synthesis of nuclei in the early universe and the features of the cosmic microwave background (radiation leftover from the Big Bang) to hold.

That is, for every 1.7 billion proton-antiproton pairs, there should have been an extra unpaired proton.

Something happened

Presumably the universe started out with equal amounts of matter and antimatter before something happened to distort this symmetry. That’s a good thing: otherwise matter and antimatter would have mutually annihilated to fill the universe with nothing but a fog of radiation — no raw material to make stars, planets or us.

But what spoiled the symmetry? Put differently, why is there something around us rather than nothing (but that fog)? Nobody knows for certain. What we do know is that any theory attempting to explain it must satisfy three conditions, called the Sakharov conditions. The best current theory to explain the world, the Standard Model of particle physics, falls woefully short of meeting all of them.

At least this was the lore until the authors of an August 2024 preprint paper pointed out an interesting caveat.

They showed that one of the conditions can be satisfied by the Standard Model alone, provided some new particle species helps with the process of making matter.

An unsettling discovery

Look at the world in a mirror. Does it look the same? Apples would still fall and moons would circle planets because gravity would be unchanged. Protons and neutrons would cling to form nuclei because the strong nuclear force would be preserved. But atomic nuclei won't undergo radioactive fission because that happens via the weak force. And the weak force, like a vampire, vanishes in the mirror-world.

The discovery of this fact in 1957 was profoundly unsettling because it struck at cherished notions of symmetry in nature. A parity transformation (denoted P) — the act of swapping left and right — appeared to eliminate the weak force. But soon physicists found that if they replaced a particle with its antiparticle in the mirror-world, the weak force reappeared. This action is called charge conjugation (C). It seems the universe didn't conserve P and C separately but did so when they happened together. This is called CP symmetry.

But in 1964, American physicists James Cronin and Val Fitch found that even CP symmetry is violated. And it wasn't violated all the time — which made it more nagging. They found that it was violated around once for every thousand times a process involving the weak force happened in nature. Nine years later, Makoto Kobayashi and Toshihide Maskawa in Japan found that if there were at least three variants of every quark species — with all properties the same except for the mass — CP symmetry violation is unavoidable. And all fermion particles do come in three variants, a.k.a. generations. For instance, the up quark has two other variants: the charm and top quarks.

(Around the same time, physicists also found that the strong nuclear force — involved in fission and fusion — ought to violate CP symmetry strongly but doesn't. This is called the strong CP puzzle.)

The Sakharov conditions

Now, as soon as CP symmetry violation was confirmed, the Soviet physicist Andrei Sakharov realised it's actually an essential condition to create a matter-antimatter asymmetry in the early universe. Unfortunately, the amount of CP symmetry violation the Standard Model allowed for (the ~ 1 in 1,000 rate) proved insufficient to explain the magnitude of the asymmetry.

This is where the authors of the August paper have pointed out a loophole. We have known for some time that processes involving mesons — particles made of quark-antiquark pairs — violate CP symmetry, which is just how Cronin and Fitch made their discovery. Now, if a meson could decay to particles not contained in the Standard Model, the matter-antimatter asymmetry could be controlled by the product of two quantities: the amount of standard CP violation and the fraction of decays into the non-standard particles. This fraction can't be too large: otherwise we would have detected the non-standard particles in particle colliders.

The study's conceit, then, is to introduce a mechanism that ensured this fraction was large just in the early universe but evolved to a smaller number today. This can be done if the masses of the new particles vary over time, which is possible to arrange in quantum field theory.

Hard-won progress

This mechanism has thus brought one of the three Sakharov conditions within the reach of the Standard Model five decades since these conditions came to light.

The other two conditions are: (i) A large violation in a type of charge carried by particles, called the baryon number. For example, protons and neutrons have a baryon number of 1 and their antiparticles carry a value of -1. (ii) Interactions must occur out of thermal equilibrium, meaning that particle processes in the forward and backward directions do not occur at the same rate.

While the Standard Model does not meet these conditions adequately, the work discussed here serves as an important step towards understanding why matter overwhelmingly dominates over antimatter in our universe today.

<https://www.thehindu.com/sci-tech/science/proposed-mechanism-antimatter-absence-sakharov-conditions-standard-model/article68964127.ece>



Tue, 10 Dec 2024

‘AI’s benefits to humanity are enormous, we need social mechanisms to deal with the problems it creates’

Artificial intelligence, unarguably, has been transforming the lives of people in ways that were unimaginable till recently. While it has contributed immensely to improving efficiencies across systems, its unprecedented and unregulated pace has also caused anxieties in terms of deepfakes and potential job losses.

Dr. Raj Reddy, Moza Bint Nasser University Professor of Computer Science and Robotics at Carnegie Mellon University and Padma Bhushan awardee, has been a strong proponent of AI and the promises it holds for the world.

“AI is primarily to be seen as enhancing the mental capabilities of human beings. Anything you use your brain for, AI will be able to enhance what you do. And to me that is the main definition of AI, just like engineering as a field enhances the physical capabilities of human beings,” he notes. Dr. Raj Reddy

Reddy was recently in Bengaluru to deliver the inaugural lecture of Dr. V.S. Arunachalam Memorial Lecture organised by CSTEP. He spoke about the potential of AI to bridge literacy gaps and language divide and eliminate poverty and hunger with the help of AI-applied technologies that may aid in facilitating better food, energy and water security, medical care and education. One

of the interesting ideas proposed by Dr. Reddy was taking the help of AI to avoid future lockdowns.

“During COVID-19, lockdown was introduced arbitrarily in India which turned into a major disaster for poor people,” he pointed out. “In the future, if you have an intelligent watch that measure all the vital statistics like temperature, heart rate, oxygen level, blood pressure and so on, then you can precisely say whether you have COVID and if you should self-quarantine. Then you may need a health passport...That type of technology is now possible.”

He pointed out that the cost of providing smart-watches to all citizens would be only about 20% of the loss to the GDP in 2020 due to COVID-19. While acknowledging concerns such as job losses due to the advent of AI, he said that it will happen over a few decades which gives enough time to create societal mechanisms to deal with it through options. The options include Universal Basic Incomes, absorbing a higher number of people into more elastic jobs such as teaching, nursing, and so on.

Talking about misinformation, he proposed delaying social media postings by 24 hours during which AI technologies can be utilised to weed out deep fakes and malicious content.

The Hindu caught up with Dr. Reddy to understand more about his views.

What are the specific branches of AI that you currently find most interesting?

The most interesting area is machine learning. We have talked about machine learning in the past but we did not have the data and we did not have the computing power until recently. Now with the advent of those two things, the question is what can a computer learn by itself without your having to spoon feed it?

Alan Turing made a proposal in 1950 to make a computer learn like a child where it goes through the same experiences as a child and learns from that. He said, why don't we teach the machine like we teach a child?

That idea has never been picked up until recently. We have been talking about it, but nobody knows how to do it. How do you put a computer in a classroom with all the other children and have it do the homework and submit the answers at the end of the day. It will happen... The issue now is that it may not need to learn all of that because it already knows. The current systems have already absorbed knowledge in thousands of books.

The most interesting research problem is how machine learning can become an adjunct to human learning. What is happening with machine learning is that we are discovering new knowledge that we did not have before. It is not learning like human beings learn, but it creates new knowledge by discovering new patterns and solving new problems.

Governmental regulations are not able to keep up with the pace at which problems due to AI are arising. Do you think our ecosystems are mature enough to adapt to the pace at which technology is evolving?

The pace of change in technology is amazing. And societal systems that we have are not able to keep up with it. This will lead to a lot of disruption and dislocation.

We need to plan for it and if something becomes very serious, we have to do something. That is what happened with Australia. All the children were spending a lot of time looking at social network. So, they have now said no social network for people under the age of 16, which is one way of controlling it.

It may be impossible though because everybody has a smartphone. Parents and companies can control it, but there may still be ways to bypass it.

But that's been the case. There are movies that come with the disclaimer that you have to be at least 12 years or older to watch them. But it's not always controlled. So, we need to see what can be done.

With the help of AI, is there a possibility of prevention of pandemics in the first place?

No. Viruses are more powerful than human beings. There will always be pandemics. The only question is how to minimize the impact. We can't shut down the whole society because of the pandemic.

What I'm saying is there will be another pandemic in the next 10, 20 years and there is no way to control it. But when it happens, we should not have to lock down everybody. We need to create some technology and AI enabled smart watches can help.

Are there particular set of problems that AI can very efficiently solve in a socially, economically and demographically complex country like India?

One is the language problem. If I take you from where you are 300 miles in a direction, you can't talk to the people there. But with AI and speech technologies we may be able to overcome this. It's a wonderful opportunity.

Do you think currently the benefits of AI outweigh the problems generated due to it?

My personal feeling is the benefits will be so big that the world will find ways to handle the problems.

AI can help with solving language differences, improving literacy and so many other problems. You can simply ask the computer to help you explain a certain idea to you. That's a fantastic benefit to every person.

Do you think that way AI has the potential to democratize society?

Sure, provided you have a tool, and you know how to use it; And that means the right kind of education.

The opportunity is there. I don't know whether society or when society will do it. It's partly a function of what the government chooses to do. Even if the government wants to do it, you need to have teachers. So first we need to start to teach the teachers about AI.

What are your thoughts about the potential of AI to be a tool to exploit workers given the exploitative nature of many businesses in the name of efficiency?

Exploiting people has nothing to do with AI. If anything, AI ought to make it possible for people to work less but produce 10 times more. That might lead to some people being laid off. So, the question is, what do you do with them?

One way is that the government or the company must pay your salary partly. What we can do is maybe provide them with tax-intensive incentives where people are told only to work half the time and paid half the salary, and the other half comes from the government.

<https://www.thehindu.com/sci-tech/science/ais-benefits-to-humanity-are-enormous-we-need-social-mechanisms-to-deal-with-the-problems-it-creates/article68961309.ece>

THE ECONOMIC TIMES

Mon, 09 Dec 2024

You may soon become Mr India; Chinese scientists invent clothes that can turn people invisible

Chinese researchers have discovered a way for you to achieve powers of Mr India as they have developed a material that changes colour at a molecular level based on the surrounding light, creating a new form of camouflage that could help people blend into their environments – much like a chameleon. The study that was published in peer-reviewed journal Science Advances. “In other words, applying this technology to clothing could make an individual effectively ‘invisible’,” said lead researcher Wang Dongsheng, in an interview published last week by China Science Daily.

According to Wang and his team from the University of Electronic Science and Technology of China, the innovation has potential applications in the military, architecture and beyond.

What did they discover?

As per the study, the researchers said they set out to make active camouflage an intrinsic function of colour-switchable materials, in a process they dubbed self-adaptive photochromism (SAP).

Key to the transformation is a molecular compound that changes its structure when exposed to specific wavelengths of light. To the naked eye, the material appears to blend seamlessly with its environment.

In nature, the chameleon and octopus both rely on active camouflage, altering their appearance to blend into their surroundings. Man-made systems typically achieve the effect through complex electronic devices, resulting in high costs and limited usability.

In contrast, SAP technology provides a simpler and more efficient approach to achieving adaptive camouflage, without relying on external power sources or complex electronics, according to the researchers.

To demonstrate this, the team placed a transparent container filled with an SAP solution into translucent acrylic boxes of various colors—red, green, and yellow, with black ink as a control—and observed the solution change color accordingly.

In another experiment, the container blended into its surroundings when placed in a matching-colored environment, such as red, green, or yellow plant clusters, within 30 to 80 seconds, the study revealed.

The study suggests that the rapid color-changing capabilities of SAP materials open up exciting possibilities in areas such as camouflage, encryption, and stealth technology.

Wang, the lead researcher, highlighted the potential of SAP materials for use in camouflage systems, smart coatings, and fashion design.

The materials are reliable across a temperature range of minus 20 to 70 degrees Celsius (minus 4 to 158 Fahrenheit), making them suitable for military and architectural applications, the researchers noted.

Wang, whose team has been conducting foundational research on light-sensitive molecules and materials since 2008, told the South China Morning Post that future investigations will explore the further potential of SAP materials.

“We have not yet fully mimicked all colours within the visible light spectrum in this work, that would be revealed in our future work,” he said. Purple and blue are missing from the current SAP materials, but future improvements could address this gap.

“By adding more photochromic molecules to the material or adjusting its composition, we aim to achieve finer distinctions in colour, and faster changing speed.”

<https://economictimes.indiatimes.com/news/science/you-may-soon-become-mr-india-chinese-scientists-invent-clothes-that-can-turn-people-invisible/articleshow/116127653.cms>



Mon, 09 Dec 2024

ISRO is aiming to launch NISAR mission in March 2025

The NASA-ISRO synthetic aperture radar satellite is the first collaboration of its kind between the Jet Propulsion Laboratory (JPL) operated by the US National Aeronautics and Space Administration (NASA) and the Space Applications Centre (SAC), a major research and development centre for the Indian Space Research Organisation (ISRO).

The NISAR mission was originally scheduled to launch in 2024, but NASA engineers determined that the 12 metre wide radar antenna reflector would be better protected during the bumpy ride to space and the tricky deployment operations by a thermal coating. This antenna was then shipped

back to USA, where NASA applied the thermal coating, which was then transported back to India on C-130 Hercules cargo aircraft in October.

The satellite landed at the Hindustan Aeronautics Limited airport in Bengaluru, after which it was transported to the UR Rao Satellite Centre for further integration and testing. In a written response to the Lok Sabha on the status of the NISAR mission, Space Minister Jitendra Singh said, “The Radar Antenna Reflector, was delivered to ISRO by NASA in October 2024, which is re-integrated with the satellite and currently undergoing necessary tests. Also, due to the eclipse season, the conditions are not conducive for deployment of NISAR’s boom and the Radar Antenna Reflector. In view of the afore-mentioned factors, NISAR is now likely to be launched during March 2025.”

Monitoring the health of the planet

The earliest possible launch opportunity was in February 2025, which has previously been reported as the date that ISRO is aiming to launch NISAR. We now know that the flight is now slotted for March 2025. ISRO will be launching the NISAR satellite on the GSLV Mk II rocket, which has a spotty launch history, but the successful GSLV-F14 flight has increased confidence in the launch vehicle. NISAR has a pair of radar payloads on board, one developed by JPL and the other by SAC. The satellite will be able to peer through clouds and forests to monitor the health of the planet, including quantities of carbon stored, ground water levels, and the movements of glaciers.

<https://www.news9live.com/science/jitendra-singh-indian-nuclear-plants-among-safest-in-world-2769754>



Mon, 09 Dec 2024

IIT Guwahati develops tech to convert methane, carbon dioxide into eco-friendly biofuel

Researchers at the Indian Institute of Technology (IIT) Guwahati have developed an advanced biological method to convert methane and carbon dioxide into cleaner biofuels using methanotrophic bacteria, officials said on Monday.

This innovative approach represents a significant leap toward sustainable energy solutions and climate change mitigation, they said. The research, published in *Fuel*, a leading journal by Elsevier, addresses two critical global challenges--the harmful environmental impact of greenhouse gases and the depletion of fossil fuel reserves.

Debasish Das, professor in the Department of Biosciences and Bioengineering, IIT Guwahati, explained that the greenhouse gas methane is 27 to 30 times more potent than carbon dioxide and is a significant contributor to global warming.

"While turning methane and carbon dioxide into liquid fuels can reduce emissions and provide renewable energy, existing chemical methods are energy-intensive, expensive, and produce toxic by-products, limiting their scalability," he said.

Das said that their team has developed a fully biological process that uses a type of methanotrophic bacteria to convert methane and carbon dioxide into bio-methanol under mild operating conditions.

"Unlike traditional chemical methods, this process eliminates the need for expensive catalysts, avoids toxic by-products, and operates in a more energy-efficient manner," the professor said.

The researchers claimed that the method achieved upto 87 per cent reduction in carbon monoxide, hydrocarbons, hydrogen sulphide and smoke emissions.

According to Das, this research is a breakthrough as it demonstrates that bio-methanol, derived from bacteria feeding on methane and carbon dioxide, can be a viable alternative to fossil fuels.

He said, unlike conventional biofuels that rely on crops and create competition with food production, their method uses greenhouse gases, avoiding the 'food vs fuel' issue.

"It is an environmentally and economically viable solution, utilising inexpensive resources while contributing to emissions reduction," he added.

The professor asserted that with the potential to reduce reliance on fossil fuels and minimise greenhouse gas emissions, this advancement represents a significant stride toward a cleaner and greener future.

"The biological conversion of methane and carbon dioxide into bio-methanol not only provides a cleaner fuel alternative but also has industrial applications as a precursor for producing chemicals like formaldehyde and acetic acid," Das said.

"This process offers immense potential to decarbonise critical industries, including oil and gas, refineries, and chemical manufacturing, paving the way for a more sustainable future," he said.

<https://www.deccanherald.com/science/iit-guwahati-develops-tech-to-convert-methane-carbon-dioxide-into-eco-friendly-biofuel-3309631>



Tue, 10 Dec 2024

IIA scientists detect emissions from novae in Andromeda galaxy

Researchers from the Indian Institute of Astrophysics (IIA), Bengaluru, have detected ultraviolet emissions from 42 novae — a rare class of stellar explosions — and even captured four of them during their outburst phase.

Astronomers Judhajeet Basu, Krishnendu S, Sudhanshu Barway, Shatakshi Chamoli, and GC Anupama identified far-ultraviolet emissions from novae in the Andromeda Galaxy, the closest neighbour to the Milky Way. Novae are transient astronomical events where a star rapidly brightens and gradually fades.

Using archival data from the UV Imaging Telescope (UVIT) aboard Isro's space-based multi-wavelength telescope, Astrosat, the team compiled a comprehensive catalogue of observations. In close binary star systems, a white dwarf — the dense, hot remnant of a sun-like star — can pull matter from its companion star through a process called accretion. This matter forms an accretion disk around the white dwarf, emitting ultraviolet and blue light waves due to its extreme heat.

The accumulation of matter on the white dwarf eventually triggers runaway thermonuclear reactions, resulting in a nova eruption. These eruptions release intense light and enrich the galaxy's chemical composition by dispersing material into the interstellar medium.

"The central region of Andromeda is quite bright, so we used advanced imaging techniques to uncover more novae. Both methods yielded identical results, confirming the authenticity of our findings," said Sudhanshu Barway, a faculty member at IIA.

Judhajeet Basu highlighted the significance of their discovery: "This is the first time ultraviolet emissions from extragalactic novae in their dormant phase (quiescence) have been detected. While past observations captured outbursts, quiescent novae reveal features of the accretion disk, and some even show pre-eruption dips. The novae catalogued in this study can now aid other astronomers in refining their calculations."

<https://www.deccanherald.com/science/iaa-scientists-detect-emissions-from-novae-in-andromeda-galaxy-3310650>

