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Govt to soon give nod for indigenous stealth fighters

The stealth fighter could be put into production in the next seven to eight years

By Rahul Singh

New Delhi: The government is likely to approve India's homegrown fifth-generation fighter programme - the advanced medium combat aircraft (AMCA) - by mid-year, with design, development and first prototypes set to cost around ₹15,000 crore, people familiar with the development said on Tuesday.

The Indian Air Force's modernisation map envisages the deployment of around 240 stealth fighters (six squadrons) 2032 onwards, with the stealth planes forming an important element of future air combat, said a senior official, one of the people cited above.

AMCA will be developed in two phases.

"The first two squadrons will consist of Mk-1 version of AMCA. The remaining four squadrons will be raised with a more advanced Mk-2 version with a raft of sixth-generation technologies," said a second official. Sixth-generation technologies are more advanced than those in any fighter jet currently in service globally.

The stealth fighter could be put into production in the next seven to eight years, Hindustan Times has learnt.

The Mk-1 stealth fighters will be powered by American GE 414 engines, with indigenous engines likely to replace the imported power plant in the Mk 2 version, said a third official. "AMCA is a top focus area for the Defence Research and Development Organisation, and IAF is firmly backing the project," he said.

DRDO is looking at incorporating sixth-generation technologies in AMCA. There is a possibility of equipping AMCA with directed energy weapons, superior anti-missile systems, advanced missile approach warning systems and teaming it with unmanned systems, IAF chief Air Chief Marshal RKS Bhaduria said at Aero India-2021 last month.

Experts said AMCA will be a crucial indigenous project.

It will take Indian research and development and defence manufacturing to a much higher scale in terms of technology, said Air Vice Marshal Manmohan Bahadur (retd), additional director general, Centre for Air Power Studies. "It is imperative that the timeline laid down for the project is practical since breakthrough technologies will be getting implemented and the IAF's operational plans will depend on it," Bahadur added.

India was earlier planning to co-develop a stealth fighter with Russia, but the proposed multi-billion dollar fifth generation fighter aircraft (FGFA) project was abandoned after IAF expressed strong reservations about the project due to high cost and the extent of technology transfer.



LCA Tejas flying during the air show on day-two of Aero India 2021 at Air Force Station, Yelahanka, in Bengaluru. (ANI Photo)

Boosting indigenisation in the defence sector is a top priority for the government. India has set aside ₹70,221 crore -- 63% of the military's capital budget for 2021-22 -- for buying locally produced weapons and systems.

The allocation for indigenous procurement - made for the second consecutive year - will power the purchase of Tejas LCA (light combat aircraft) Mk-1A jets, light combat helicopters, basic trainer aircraft, Arjun Mk-1A tanks, Astra beyond-visual-range missiles, Pinaka rocket systems and anti-tank missiles, as previously reported by HT.

<https://www.hindustantimes.com/india-news/govt-to-soon-give-nod-for-indigenous-stealth-fighters-101615917481953.html>



Wed, 17 March 2021

INS Dhruv that can track satellites, strategic missiles, to join Navy soon

INS Dhruv will play a critical role in triangulating incoming ballistic missiles in conjunction with geostationary satellites and land-based radars. It will have a key role in India's anti-ballistic missiles capability

By Shishir Gupta

New Delhi: With India at the centre of the Indo-Pacific pushback to China's rapidly-expanding People's Liberation Army Navy (PLAN), India is set to commission INS Dhruv to track satellites, strategic missiles and map the Indian Ocean bed later this year, people aware of the developments said on Wednesday.

The 15,000-tonne ship, part of a classified project, will not only create maritime domain awareness for India in the Indian Ocean but also act as an early warning system for adversary missiles headed towards Indian cities and military establishments. "Final checks are going on the vessel at Vizag before the commissioning, which is expected in the first half of 2021 but neither the date nor the month is decided," said a senior official familiar with the strategic project.

INS Dhruv has been developed with the help of the Defence Research and Development Organisation (DRDO) and Indian Navy with India's Strategic Force Command and National Technical Research Organisation (NTRO) as main intelligence consumers. The indigenously-developed surveillance ship has been built by Hindustan Shipyard Ltd at its Visakhapatnam facility under the Atma Nirbhar Bharat Abhiyan initiative.

INS Dhruv is equipped with the active electronically scanned array radars, or AESA, considered a game-changer in radar technology, and can scan various spectrums to monitor satellites of adversaries that are watching over India. It can also, as one official in South Block put it, understand the range and true missile capability of adversary nations that it finds in the Indo-Pacific.

Once the vessel is commissioned, India will be the only country outside the P-5 - the US, the UK, China, Russia and France - to have this capability

Officials said INS Dhruv will act as a major force multiplier to India's ocean surveillance capabilities. The Indian Navy already monitors the region from the Gulf of Aden to all the ingress



The Indian Navy already monitors the region from the Gulf of Aden to all the ingress routes from the South China Sea (Indian Navy)

routes from the South China Sea with long-range unmanned aerial vehicles, surveillance aircraft and Boeing P8I anti-submarine warfare.

It will be able to provide the Indian Navy with an “ECG of the Indian Ocean”, a defence ministry official said, a reference to the electrocardiogram that is used to diagnose problems in the heart. INS Dhruv will help Indian Navy plan better offensive operations in all three dimensions — sub-surface, surface and aerial.

Strengthening the Indian Navy’s capabilities is key to countering China’s influence in the Indian Ocean given how Beijing’s sea doctrine has taken priority over its land forces. Experts believe the Indo-Pacific will be the front-line of the future as PLAN’s nuclear submarines try to avoid detection before crossing the first island chain in the South China Sea.

Although China has claimed that the Quad will never have tangible deliveries - in 2018, China had even called it a seafoam before describing it a security threat two years later - the security grouping is already monitoring the Indo-Pacific and sharing real-time intelligence to check Beijing creation of military leverage over the busiest shipping lanes in the world and carrying billions of dollar worth of cargo.

<https://www.hindustantimes.com/india-news/ballistic-missile-tracking-its-dhruv-to-join-india-s-strategic-assets-in-2021-101615886801327.html>



Wed, 17 March 2021

India to commission nuclear missiles tracking 15,000-tonne Ship INS Dhruv soon

INS Dhruv has been jointly developed by the Defence Research and Development Organisation (DRDO), National Technical Research Organisation (NTRO) and Indian Navy

India is all set to commission the INS Dhruv (codenamed VC 1118) ship, capable of tracking nuclear missiles and satellites from a distance, into the Navy. This ocean surveillance ship is also equipped with game changer active electronically scanned array (AESA) radars that can help India collect accurate data not just about an enemy nation’s missile range and capabilities, but will also track our own strategic missiles that are in the trial stage.

The sophisticated surveillance systems needs 14 MW of power to fire up and that will be generated by INS Dhruv itself.

The highly classified project is being given the final touches in Vizag before the commissioning. It has gone through a series of tests and sea trials starting 2018. According to sources aware of the development, INS Dhruv is now ready to be commissioned after being delayed by months due to Covid-19 pandemic.



Image used for representational purpose only. (Indian Navy Twitter handle)

The timing could not be better as India faces an aggressive relationship with China which is not just in eastern Ladakh, but in the Indian Ocean region too. The Chinese Navy, now the biggest in the world, is a force to reckon with. INS Dhruv is being seen as a force multiplier that will give the Indian Navy a 360 degree view of the Indo-Pacific and help plan offensive operations with a high degree of accuracy.

INS Dhruv has been jointly developed by the Defence Research and Development Organisation (DRDO), National Technical Research Organisation (NTRO) and Indian Navy. The indigenously-developed surveillance ship has been built at Hindustan Ship Yard Ltd in Vishakhapatnam under

the Make in India initiative. This 15,000-tonne ship, which is also one of the largest warships built at an Indian shipyard, has cost nearly Rs 725 crore.

During the initial days of its construction, the ship was kept under wraps in a covered dry dock to keep it away from the prying eyes of enemy satellites and spying missions.

So far, only four other countries — China, France, Russia and the US — have the capabilities that INS Dhruv carries.

<https://www.news18.com/news/india/india-to-commission-nuclear-missiles-tracking-15000-tonne-ship-ins-dhruv-soon-3541160.html>



Wed, 17 March 2021

India becomes 5th country in the world to have nuclear missile tracking vessel

By Rajat Pandit

India has joined the elite club of nations that possess nuclear missile tracking vessels with the country's Navy commissioning its highly secretive Ocean Surveillance Ship, codenamed VC-11184.

This is expected to boost India's ballistic missile defense capability and electronic warfare in the maritime domain, according to reports.

While the actual commissioning ceremony was held in October last year, the information was not made public, *The Economic Times* reported. It said the commissioning was delayed due to the COVID-19 pandemic, "but all tests and trials were completed in 2020 to ensure it is ready to enter service".



India's ballistic missile tracking vessel, VC-11184. (Image: Twitter)

The VC-11184's construction started in 2014 at Hindustan Shipyard Limited in Visakhapatnam. The program has been highly confidential ever since and is under the direct control of the National Security Advisor and the Prime Minister's Office.

While VC-11184's official name has not been disclosed yet, its current designation is based on the yard number where it was constructed. Very few images of the ship have surfaced on social media. The construction was carried out at covered dry docks to avoid being detected by satellites.

According to the reports, the ship would be operated by India's technical intelligence agency NTRO (National Technical Research Organisation), the DRDO (Defense Research and Development Organisation), and the Indian Navy. Having the same 'norms of conduct' as the Intelligence Bureau (IB) and the Research and Analysis Wing (R&AW), NTRO is a top-tier intelligence-gathering organization.

At present, only four other nations — the United States, France, Russia, and China — possess such ships. The VC11184 would enable the Indian strategic experts to track the developmental trials of its missiles and increase the effectiveness of the BMD (ballistic missile defense) shield by detecting similar launches by India's close adversaries like Pakistan or China, acting as an 'early warning' ship.

The ship has a displacement of 15,000 tons and carries three distinctive dome-shaped antennas laden with sensors and electronic warfare equipment. According to the reports, 14 megawatts of power would be generated by the vessel to operate the sensors themselves.

The ship, one of the largest to be built by an Indian shipyard, is part of the 'Make in India initiative'.

<https://eurasianimes.com/india-becomes-5th-country-in-the-world-to-have-nuclear-missile-tracking-vessel/>



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नौसेना का खतरनाक हथियार जो परमाणु मिसाइलों को भी करेगा सेकेंड में ढेर, इससे नहीं बच सकते दुश्मन के सैटेलाइट भी

आईएनएस ध्रुव एक्टिव इलेक्ट्रॉनिक स्कैन्ड एरे रडार्स या AESA से लैस है। AESA को रडार टेक्नोलॉजी में गेम चेंजर समझा जाता है। यह रडार अलग-अलग ऑब्जेक्ट्स का पता लगाने के साथ ही दुश्मन के उन सैटेलाइट्स पर भी नजर रखती है जो अंतरिक्ष से भारत की जासूसी करते हैं।

इंडियन नेवी को जल्द ही एक ऐसा हथियार मिलने वाला है जिसके बाद वह समंदर में चीन और पाकिस्तान की किसी भी हिमाकत का जवाब देने में पूरी तरह से समर्थ हो सकेगी। जल्द ही नेवी में आईएनएस ध्रुव से लैस किया जाएगा। आईएनएस ध्रुव यानी वह हथियार जिसके बाद नेवी परमाणु मिसाइल को ट्रैक करने से लेकर दुश्मन के सैटेलाइट और आने वाली बैलेस्टिक मिसाइल का पता भी लगा सकेगी। इसके अलावा आईएनएस ध्रुव लैंड बेस्ड सैटेलाइट्स का पता भी लगा सकेंगे। रक्षा विशेषज्ञ इसे भारत की एंटी-बैलेस्टिक मिसाइल की क्षमता में अहम रोल अदा करने वाला हथियार करार दे रहे हैं।

सर्विलांस शिप INS Dhruv

आईएनएस ध्रुव या VC11184 सर्विलांस शिप एक रिसर्च वेसल और मिसाइल की रेंज पता लगाने वाला जहाज है। इसे हिन्दुस्तान शिपयार्ड लिमिटेड (HSL) ने तैयार किया है। यह जहाज इलेक्ट्रॉनिक इंटेलेजेंस तक इकट्ठा करने वाली क्षमता से लैस है।

इस शिप को पहले सिर्फ शिपयार्ड की तरफ से मिले नंबर से ही जाना जाता था। शिप का प्रयोग सैटेलाइट्स और मिसाइल को ट्रैक करके भारत के रणनीतिक हथियारों और एंटी-बैलेस्टिक मिसाइलों को मदद करने में किया जाएगा।

इंडियन नेवी के इस जहाज को नेशनल टेक्निकल रिसर्च ऑर्गनाइजेशन (NTRO) और डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (DRDO) की तरफ से ऑपरेट किया जाएगा।

एक सीक्रेट मिशन के तहत हुई तैयार

इस जहाज पर जारी विकास कार्य और इससे जुड़ी हर जानकारी बहुत ही सीक्रेट रखा गया था। साल 2019 की शुरुआत में इसके सी-ट्रायल्स की खबरें आई थीं। अक्टूबर 2020 में बिना कमीशनिंग सेरेमनी के इसे नौसेना में शामिल कर दिया गया था।

हालांकि आधिकारिक सूत्रों की मानें तो शिप को भी अभी नेवी में कमीशन करना बाकी है। इस शिप के ऑपरेट होते ही भारत, अमेरिका, चीन, फ्रांस और रूस की श्रेणी में आ जाएगा। इन देशों के पास पहले से ही इस तरह के जहाज हैं।



15,000 टन का यह जहाज हिंद महासागर में भारत के रक्षा घेरे को मजबूत करेगा.

चीन की नौसेना इस समय हिंद-प्रशांत क्षेत्र में सक्रिय है और भारत इसका केंद्र बिंदु है। आईएनएस ध्रुव, चीनी नौसेना के बढ़ते कदमों पर ब्रेक लगाने का जरिया है।

दिल्ली, मुंबई रहेंगे हर हमले से सुरक्षित

15,000 टन का यह जहाज हिंद महासागर में भारत के रक्षा घेरे को मजबूत करेगा। बड़े भारतीय शहरों और मिलिट्री संस्थानों की तरफ आने वाली खतरनाक बैलेस्टिक मिसाइलों के हमलों को भी फेल करने का काम करेगा।

इस जहाज को नेवी के लिए एक तरह का अर्ली वॉर्निंग सिस्टम करार दिया जा रहा है। सूत्रों की तरफ से बताया गया है कि आईएनएस ध्रुव के फाइनल चेक का काम विशाखापट्टनम में जारी है और इसके बाद इस साल इसे नौसेना को सौंप दिया जाएगा।

एडवांस्ड रडार सिस्टम से लैस

आईएनएस ध्रुव एक्टिव इलेक्ट्रॉनिक स्कैन्ड एरे रडार या AESA से लैस है। AESA को रडार टेक्नोलॉजी में गेम चेंजर समझा जाता है। यह रडार अलग-अलग ऑब्जेक्ट्स का पता लगाने के साथ ही दुश्मन के उन सैटेलाइट्स पर भी नजर रखती है जो अंतरिक्ष से भारत की जासूसी करते हैं।

इस रडार की मदद से किसी मिसाइल की क्षमता और उसकी रेंज का भी पता लगाया जा सकता है। आईएनएस ध्रुव महासागर पर भारत की सर्विलांस क्षमताओं में कई गुना तक इजाफा करने वाला हथियार साबित होगा। रक्षा विशेषज्ञों की मानें तो आईएनएस ध्रुव हिंद महासागर की ECG नौसेना को सौंपने वाला हथियार है।

<https://www.tv9hindi.com/knowledge/ins-dhruv-ship-that-can-track-satellites-and-nuclear-missile-to-join-indian-navy-582082.html>



Wed, 17 March 2021

Navy में शामिल होगा ट्रैकिंग शिप, समुद्र में कर सकता है चील जैसी निगरानी

रक्षा एवं अनुसंधान विकास संस्थान (DRDO) और भारतीय नौसेना सहित अन्य एजेंसियों के सहयोग से पोत का विकास किया गया है।

नई दिल्ली: सामरिक मिसाइल प्रक्षेपण और पानी के भीतर होने वाली गतिविधियों पर नजर रखने में सक्षम भारत का सर्विलांस पोत (Surveillance Ship) सेवा में शामिल होने के लिए लगभग तैयार है। इससे जुड़े लोगों ने इस आशय की सूचना दी। इस पोत के माध्यम से अपने दुश्मनों की गतिविधियों पर नजर रखने के लिए भारत की सर्विलांस क्षमता इससे काफी बढ़ जाएगी।

उन्होंने बताया कि गोपनीय सामरिक परियोजना के तहत हो रहा पोत निर्माण पूरा हो गया है और उसके सेवा में शामिल होने के साथ भारत उन कुछ देशों में शुमार हो जाएगा जिनके पास मिसाइल ट्रैकिंग पोत हैं। फिलहाल सिर्फ अमेरिका, ब्रिटेन, रूस, चीन और फ्रांस के पास ऐसे पोत हैं।

ऊपर जिन अधिकारियों का हवाला दिया गया है, उनमें से एक ने कहा, “पोत को आधिकारिक रूप से अगले कुछ महीने में सेवा



भारतीय नौसेना में शामिल होगा खास सर्विलांस पोत. (File pic- Indian navy twitter)

में शामिल किए जाने की संभावना है।” उन्होंने बताया कि पोत के काम करने से पहले सभी महत्वपूर्ण परीक्षण/जांच किए जा रहे हैं।

उन्होंने बताया कि पोत से प्राप्त सूचनाओं/डेटा को भारत के दुश्मनों की गतिविधियों पर नजर रखने वाली शीर्ष खुफिया एजेंसियों के साथ साझा किए जाने की संभावना है। इस पोत का निर्माण विशाखापत्तनम में 2014 में हिन्दुस्तान शिपयार्ड लिमिटेड में शुरू हुआ।

क्षा एवं अनुसंधान विकास संस्थान (डीआरडीओ) और भारतीय नौसेना सहित अन्य एजेंसियों के सहयोग से पोत का विकास किया गया है। क्षेत्र में चीन के बढ़ते प्रभाव के मद्देनजर भारत भी हिन्द महासागर में अपनी सर्वांगीण गतिविधियों को विस्तार दे रहा है।

<https://hindi.news18.com/news/nation/india-ready-to-deploy-missile-tracking-warship-surveillance-ship-3520632.html>

Business Standard

Wed, 17 March 2021

First tri-service missile gets underway with roll-out of MRSAM components

The MRSAM has been developed for the army, navy and air force by DRDO, in close partnership with Israel Aerospace Industries

By Ajai Shukla

New Delhi: The Indian military's first tri-service missile, which will protect naval warships, air force bases and army combat units from airborne attacks took a step towards full-scale production on Tuesday with the roll-out of its first components.

The eponymous Medium Range Surface to Air Missile (MRSAM) has been developed for the army, navy and air force by the Defence R&D Organisation (DRDO), in close partnership with Israel Aerospace Industries (IAI).

The delivery on Tuesday was of the first batch of MRSAM components being manufactured in Hyderabad by an Indian joint venture (JV) called Kalyani Rafael Advanced Systems (KRAS).

On July 11, 2019, KRAS was awarded a \$100 million contract to build the mid-sections of 1,000 missiles. These will be integrated with MRSAM components built elsewhere into combat-ready missile systems by defence public sector undertaking, Bharat Dynamics Ltd (BDL).

Kalyani Strategic Systems Ltd holds 51 per cent of the JV, with Rafael Advanced Systems holding 49 per cent.

The MRSAM is amongst the most lethal surface-to-air missiles (SAMs) in service anywhere. Fired from under-deck canisters on-board Indian warships, it is guided by the on-board MF-STAR radar to intercept incoming anti-ship missiles at ranges out to 70 km — a feat akin to hitting a bullet with a bullet. The ship-borne version of the missile is called the Long Range Surface to Air Missile (LRSAM).

The army and air force versions, called the MRSAM, are mounted on trucks for mobility. They primarily guard against enemy fighter aircraft, striking them 70 km from where the missile battery is deployed. So high is the military's confidence in the MRSAM that in September 2016, when the army was planning to strike Pakistan-backed terrorist camps across the



The delivery on Tuesday was of the first batch of MRSAM components being manufactured in Hyderabad by an Indian joint venture (JV) called Kalyani Rafael Advanced Systems (KRAS)

Line of Control to avenge the killing of 19 Indian soldiers near Uri, the MRSAM — then still under development — was moved from BDL to protect a vulnerable air force base.

When Indian commandos crossed on LoC on the night of September 28, 2016, the MRSAM was ready for operational use. As it turned out, the missiles were not required.

KRAS will deliver more than 1,000 MRSAM production kits over the next 3-4 years. In case of export orders, the numbers could increase.

“We are confident KRAS will not only build products for the Indian armed forces but will, at the same time, trigger and help achieve Indian government’s vision of exports from India,” said Brigadier General Pinhas Yungman of Rafael Advanced Defense System.

“Apart from the missile kits, we will extend our support in maintenance and repair operations,” said Kalyani Group chief, Baba Kalyani.

KRAS plans to ramp up its employee strength to 300 technical experts by 2023.

https://www.business-standard.com/article/current-affairs/first-tri-service-missile-gets-underway-with-roll-out-of-mrsam-components-121031601270_1.html



Wed, 17 March 2021

Kalyani Rafael JV begins MRSAM missile kits delivery to armed forces

Plans to grow indigenous content in the \$100-million order

Hyderabad: Kalyani Rafael Advanced Systems (KRAS), a joint venture of Kalyani Group and Israel’s Rafael Advanced Defense Systems, has begun delivery of the Medium Range Surface to Air Missile (MRSAM) kits to the Indian Army and the Air Force.

The roll-out, from the Hyderabad facility, is part of the \$100 million order it bagged in 2019. While it has committed to deliver 1,000 such kits, the time frame of the deliveries will depend on other development efforts, CEO Rudra B Jadeja said. DRDO is the custodian of the missile programme and Bharat Dynamics (BDL) the integrator.

“We will supply through Rafael to BDL,” he said, adding the kit is Rafael Advanced Systems design.

The first lot is 100% Rafael design output and the indigenous content is not more than 30%.

KRAS is working with partners in India to increase the share to 50% by the time 250 kits are supplied and 60% when 500 kits are delivered.

Certifying partners

It has already started certifying partners. “We are already investing with our partners in the supply chain... have approximately 14 vendors in Hyderabad, Bengaluru, Belgaum, Chennai and Delhi,” he said, estimating \$50-60 million orders to be placed with the firms.

Speaking to media, after a function to handover the first batch of the MRSAM kit to Indian armed forces, Mr.Jadeja said this is second product from the plant that was established in 2017 to make Anti Tank Guided Missile. But with government of India deciding to entrust ATGM programme to DRDO, the company took up production of Spice 2000 (guided bombs).

The firm has delivered more than 200 Spice 2000 to India and also exported. The value of the order was \$30 million and several Indian firms were partners in the programme.



Executive vice-president of Rafael Brig.Gen. (retired) Pinhas Yungman, CEO of Kalyani Rafael Advanced Systems Rudra Jadeja and President-CEO of Bharat Forge Rajinder Bhatia at the flagging off ceremony on Tuesday. | Photo Credit: NAGARA GOPAL

Executive vice president and Head of Air and Missile Defence Systems division of Rafael Brig Gen (retired) Pinhas Yungman said KRAS is keen on exporting the MRSAM kits. A release said KRAS is focused on the assembly, integration and testing (AIT) of the state-of-the-art weapon systems being inducted by the defence forces. It also wants to focus on Maintenance, Repair and Operations (MRO) segment.

President and CEO (Defence) of Bharat Forge Rajinder Bhatia and Mr. Jadeja highlighted the R&D facilities established in Hyderabad, including the training provided to engineers on RF and microwave.

Second unit in TS

To queries on KRAS' plans for another unit in Telangana, Mr. Jadeja said the State government is assisting the company in identify suitable area, "which meets our requirement." But in the backdrop of the pandemic and its impact, the company, while being ready to invest on another facility, is waiting for "right orders and right environment" to move ahead with the plans. The next plant is unlikely to happen this year, he added.

<https://www.thehindu.com/news/cities/Hyderabad/kalyani-rafael-jv-begins-mrsam-missile-kits-delivery-to-armed-forces/article34086468.ece>

Defence News

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Tue, 16 March 2021 4:57PM

Indian Army de-commissions 130mm self propelled Catapult Guns and 160mm Tampella Mortars from Service

Two of the longest serving Artillery systems, the 130mm Self Propelled M-46 Catapult Guns and the 160mm Tampella Mortars were decommissioned today at Mahajan Field Firing Ranges. The ceremony was marked by the customary firing of last salvos. The decommissioning firing was attended by Lt Gen K Ravi Prasad, Director General Artillery and other senior officers.

The 130mm Catapult, with a range of more than 27 km, was a successful merger of two existing weapon systems: Vijayanta tanks and 130mm M-46 guns. This hybrid platform was a response to the need for a mobile Artillery gun system to support strike formations on the Western borders, after the 1965 and 1971 wars. The guns were inducted in 1981 and were employed successfully during a number of operations.

The 160mm Tampella mortars, with a range of 9.6km, were inducted after the 1962 war with China to fulfill the need for a weapon system to clear high



crests of the Northern borders. Originally an import from the Israeli Defence Forces, this mortar was successfully deployed on the Line of Control in the Leepa valley and the Hajipir Bowl and played a crucial part in maintaining the sanctity of the Line of Control. The mortars also played a significant part in the 1999 Kargil war.

These weapon systems, having been in the inventory of the Indian Army for close to 60 years, have been decommissioned to make way for newer equipment employing the latest technologies.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1705139>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 16 March 2021 4:57PM

भारतीय सेना ने 130 एमएम स्वचालित प्रक्षेपक तोपों तथा 160 एमएम टैम्पेल्ला मोर्टारों को सेवा मुक्त किया

सबसे अधिक सेवा देने वाली तोपखाना प्रणालियों में से दो-130 एमएम स्व-चालित एम-46 प्रक्षेपक तोप तथा 160 एमएम टैम्पेल्ला मोर्टारों को महाजन फील्ड फायरिंग रेंज में सेवा से मुक्त किया गया। समारोह में रस्मीतौर पर अंतिम रूप से तोप दागी गई। समारोह में महानिदेशक तोपखाना, लेफ्टिनेंट जनरल के रवि प्रसाद तथा वरिष्ठ अधिकारी उपस्थित थे।

130 एमएम प्रक्षेपक तोप की रेंज 27 किलोमीटर से अधिक है और यह दो वर्तमान हथियार प्रणालियों-विजयंत टैंकों तथा 130 एमएम एम-46 तोपों का सफल विलय था। यह संकर प्लेटफॉर्म मोबाइल आर्टिलरी गन प्रणाली की जरूरत के लिए था ताकि 1965 तथा 1971 के युद्धों के बाद पश्चिमी सीमाओं पर स्ट्राइक फॉर्मेशनों की सहायता की जा सके। ये तोपें सेना में 1981 में शामिल की गई थीं और अनेक कार्रवाईयों के दौरान इन्हें सफलतापूर्वक तैनात किया गया।

160 एमएम टैम्पेल्ला मोर्टार की रेंज 9.6 किलोमीटर है और इसे चीन के साथ 1962 की लड़ाई के बाद शामिल किया गया ताकि उत्तरी सीमाओं के उंचे शिखर को निर्बाध करने के लिए हथियार प्रणाली की आवश्यकता पूरी की जा सके। मूल रूप से इजराइल के रक्षाबलों से आयातित यह मोर्टार लीपा घाटी तथा हाजीपीर कटोरा में नियंत्रण रेखा पर सफलता पूर्वक तैनात किया गया और इसने नियंत्रण रेखा की पवित्रता बनाए रखने में महत्वपूर्ण भूमिका अदा की। मोर्टार ने 1991 के कर्गिल युद्ध में भी महत्वपूर्ण भूमिका निभाई।

ये हथियार प्रणालियां 60 वर्षों से भारतीय सेना में हैं और इन्हें सेवामुक्त किया गया है ताकि नवीनतम टेक्नोलॉजी वाले नए उपकरण आ सकें।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1705215>



Limited ACMI systems purchased so transfer of technology not sought: Defence ministry to PAC

The ACMI system provides an electronic replay of the entire combat sorties that helps in improving combat and operational skills of fighter pilots

New Delhi: The defence ministry has told the Public Accounts Committee (PAC) that it did not include the transfer of technology (ToT) clause in the contract for procurement of around 100 air combat manoeuvring instrumentation (ACMI) systems from Israeli firm BVR System as only a "limited quantity" of these systems were being purchased.

The ACMI system provides an electronic replay of the entire combat sorties that helps in improving combat and operational skills of fighter pilots.

"The procurement of ACMI pods and associated ground stations was for a limited quantity only and hence ToT was not envisaged at the time of procurement," the ministry told the PAC, as per the committee's report tabled in Lok Sabha on Monday.

In between 2007 and 2013, the ministry had procured around 100 ACMI pods and ground stations from BVR Systems for the Indian Air Force (IAF).

"ACMI pods are not specific to any type of aircraft and the current inventory of 100 pods is considered to be adequate to meet the needs of the IAF," the ministry said, as per the PAC report.

Further, the ongoing project of integration of software defined radios (SFRs) with the fighters would enable the IAF to undertake networked operations, it mentioned.

"The training values accrued from social network operations are more enhanced as compared to that of ACMI operations. Hence for the document of pods is not envisaged," the ministry noted.

In February 2019, the PAC had tabled its initial report on procurement of the ACMI systems from BVR System, wherein it had asked why ToT was not included while signing the contract with the company.

The ministry had asserted that ToT was not included in the contract as the same was not envisaged in the request for proposal (RFP) stage, but this response was considered by the PAC as inadequate.

Therefore, the ministry gave another response, which was quoted in the fresh PAC report tabled in Lok Sabha on Monday.

<https://www.newindianexpress.com/nation/2021/mar/16/limited-acmi-systems-purchased-so-transfer-of-technology-not-sought-defence-ministry-to-pac-2277258.html>



The HAL Tejas during the Aero India 2021 rehearsal at the Yelahanka Air Force station in Bengaluru. (Photo | Ashishkrishna HP, EPS)

Wed, 17 March 2021

IIT BHU & ballistic expert Jeetendra Kochar join hand to develop technology for key government defence Projects

IIT BHU Varanasi | Jeetendra Kochar a world-renowned ballistic armor expert & developer was invited by IIT BHU to jointly work on the design and development of an advanced armor system for Indian defence force requirement.

IIT BHU is associated with Indian Ministry of Defence through DRDO for material science development for defence-related projects. The MOU was signed between IIT BHU and Life Line Security & System an organization headed by Jeetendra Kochar. On Behalf of IIT BHU Dean R&D, Prof Rajiv Prakash signed this MOU.



IIT BHU is Asia's oldest ceramic development center with a glorious history of 96 years. The founder of Banaras Hindu University, Pandit Madan Mohan Malviya ji instituted a course in Ceramic Technology as early as 1924 with the noble objective of advancing glass and ceramic technology in India.

The collaboration will initially build on two areas where both partners have an outstanding track record of expertise and IIT BHU has world-class research infrastructure: Development of Advance Armor System and Advance IOT based smart wearable. This association is seen as key development to Prime Minister Narendra Modi's dream of Make in India initiative that manages advanced processes, materials, and technologies, to guide the production mechanism that produces products with no defects with no adverse environmental and ecological effects. Currently, India is importing 70-80% of high-grade armor raw material from Europe and Asia.

Jeetendra Kochar is known in the ballistic industry for his theory of material impact which was used to produce a lightweight armor system to defeat Armor Piercing & Special type ammunition. The developed product is currently used by US, French, and German military contractors. This system has performed a key role in the operation all out to eliminate the terrorist from the valley. Mr Kochar told that there is lots of domestic as well as international demand for ballistic ceramic armor.

With IIT BHU Life Line has the plan to develop advance lightweight armor for defence purposes including reactive armor for tanks and not only fulfill the demand of the Indian market but to export the quality developed ceramics to an international market.

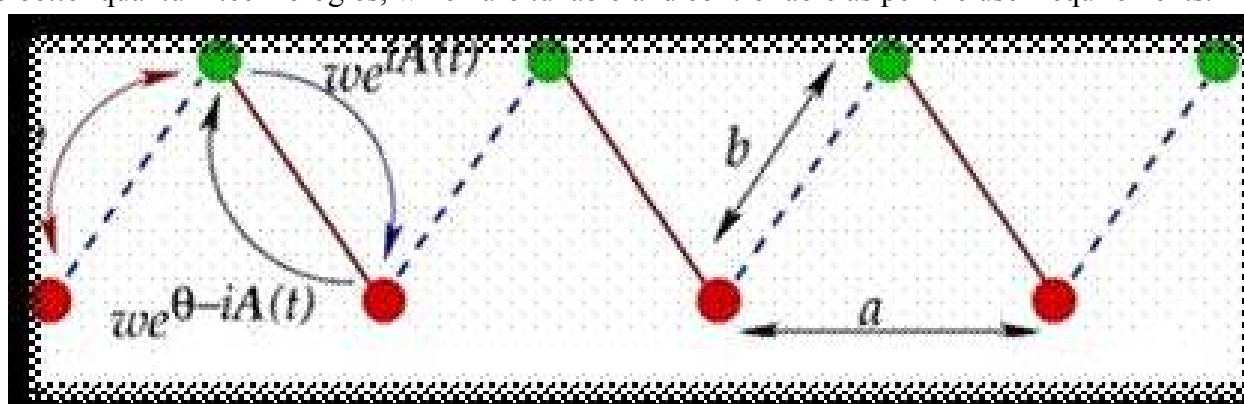
Also, this joint association will work on futuristic technology for an autonomous system including smart wearable for the defence and health sector. As IIT BHU announced this also as a major development in the coming time toward expanding Indian rural patient access to world-class medical service through IOT based low-cost equipment in rural medical centers through this new joint collaboration between two organizations. It has been a history that technology developed for defence are being converted into public tech utility for civilian benefit. The internet is one of the best examples.

<http://www.newspatrolling.com/iit-bhu-ballistic-expert-jeetendra-kochar-join-hand-to-develop-technology-for-key-government-defence-projects/>



New state of the materials discovered that can lead to better, tunable, controllable quantum technologies

Scientists have discovered a new exotic, strange state of materials in contact with an environment that alters its physical properties in the presence of an electromagnetic field, leading to better quantum technologies, which are tunable and controllable as per the user requirements.



A schematic diagram of the driven one-dimensional periodic lattice. The red and green circles denote two sublattice sites. The lattice constant is a , and two sites in a unit cell are separated by distance b . The intracell hopping amplitude is v , whereas the intercell amplitudes are $we^{iA(t)}$ and $we^{\theta-iA(t)}$ respectively for to and fro tunneling in the presence of a time-periodic vector potential $A(t)$ and a non-Hermiticity measure θ . The non-Hermiticity mimics the environmental effect on the lattice.

They have shown that, in an external electromagnetic field, geometric properties of a crystalline solid with lattices arranged in a one-dimensional periodic manner can display phase transitions, thereby altering its physical properties. The 2016 Nobel Prize for physics was awarded to the theoretical discoveries of topological phase transitions and topological phases of matter, which have played a significant role in the modern understanding of materials and their applications.

Topology is concerned with the properties of a geometric object preserved under continuous deformations, such as stretching and twisting.

Understanding various phases and phase transitions is of central importance in the study of matter. Generally, phase transitions are studied by assuming that the system is isolated, with little or negligible environmental interactions.

Dibyendu Roy, Associate Professor, and his group from Raman Research Institute (RRI), an autonomous institute of the Department of Science & Technology, Government of India, have been exploring systems in contact with the environment or the open quantum systems and their physical properties for a while.

They explored ways to control the topological phase transitions of matter in contact with an environment by an external periodic perturbation such as laser light in their present work.

While studying the geometric phase in systems in contact with an environment and examining the environment's consequence on the band-structure topology of the systems, they discovered a new metallic state of the materials coupled to an environment.

This work funded by the Department of Science and Technology, India, via the Ramanujan Fellowship, and the Ministry of Electronics and Information Technology (MeitY), India, under a grant for "Centre for Excellence in Quantum Technologies" has been published in the journal 'Physical Review B' recently.

In our everyday lives, several devices and technologies exploit some of the other aspects of quantum physics, like LEDs, semiconductor technology, and nanomaterials. Usually, the environmental interactions in such quantum systems are either neglected or are considered very small. Through this work, the RRI team has shown that if such effects are carefully taken into account, one can drastically alter the quantum system's physical behavior and lead to better quantum technologies.

[Publication link:

<https://journals.aps.org/prb/pdf/10.1103/PhysRevB.103.075441>

For more details, Dibyendu Roy (droy@rri.res.in) can be contacted.]

<https://pib.gov.in/PressReleasePage.aspx?PRID=1705076>



पत्र सूचना कार्यालय
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 16 March 2021 1:59PM

वैज्ञानिकों ने पदार्थ की नई अवस्था का पता लगाया जिससे बेहतर, ट्यूनेबल, नियंत्रण योग्य प्रौद्योगिकी के लिए नया रास्ता खुल सकता है

वैज्ञानिकों ने पर्यावरण से संपर्क में पदार्थ की एक ऐसी चौंकाने वाली अवस्था का पता लगाया है जो इलेक्ट्रोमैग्नेटिक फील्ड की उपस्थिति में भौतिक स्वभाव को बदल सकती है। इससे क्वान्टम प्रौद्योगिकी को बेहतर किया जा सकता और यह उपयोगकर्ता की आवश्यकताओं के अनुसार नियंत्रण करने योग्य और संचालित करने योग्य है।

एक बाहरी इलेक्ट्रोमैग्नेटिक फील्ड और एक क्रिस्टलीय ठोस की ज्यामितीय अवस्था को लेट्रिक्स के साथ पाक्षिक आधार पर एक आयामी ढंग से व्यवस्थित किया गया जो चरण परिवर्तन प्रदर्शित कर सकती है। अतः यह भौतिक अवस्था को बदल सकती है/ वर्ष 2016 का भौतिक के लिए नोबेल पुरस्कार टोपोलॉजिकल चरण परिवर्तन और पदार्थ के टोपोलॉजिकल चरण के सैद्धांतिक खोज के लिए दिया गया। इस अनुसंधान ने पदार्थों और उनके उपयोग को आधुनिक ढंग से समझने में महत्वपूर्ण भूमिका अदा की है।

टोपोलॉजी ज्यामिती तत्व की अवस्था से संबद्ध है जिसे खिंचाव और बदलाव जैसी निरंतर विरूपण अवस्था में संरक्षित रखा जाता है।

पदार्थ के इस अध्ययन के केंद्र में इसके परावर्तन के विभिन्न चरणों और चरण को केंद्रीय महत्व दिया गया। आमतौर पर चरण परिवर्तनों का अध्ययन करते समय यह माना जाता है कि तंत्र को छोटे या नगण्य वायुमंडलीय संपर्कों से अलग कर दिया गया है।

भारत सरकार के विज्ञान एवं प्रौद्योगिकी विभाग के अंतर्गत स्वायत्त शोध संस्थान रमण अनुसंधान संस्थान (आरआरआई) के एसोसिएट प्रोफेसर दिव्येंदु राय और उनका समूह किसी पर्यावरण के संपर्क में सिस्टम या मुक्त सिस्टम और उनकी भौतिक संरचना पर अनुसंधान में जुटा हुआ है।

उन्होंने अनुसंधान में पदार्थ के टोपोलॉजिकल चरण परावर्तन को नियंत्रित करने का तरीका ढूँढा जो किसी पर्यावरण में लेजर लाइट आदि के संपर्क जैसी बाहरी गड़बड़ी में संभव होता है।

किसी वातावरण के संपर्क में तंत्र में ज्यामितीय चरण के अध्ययन और तंत्र के टोपोलॉजी बैंड स्ट्रक्चर पर पर्यावरणीय प्रभाव के परीक्षण में उन्हें किसी वातावरण से जुड़े पदार्थ की एक नई धात्विक अवस्था का पता लगाने में सफलता प्राप्त हुई।

इस खोज के लिए भारत सरकार के विज्ञान एवं प्रौद्योगिकी विभाग ने इलेक्ट्रॉनिक और सूचना प्रौद्योगिकी मंत्रालय के रामानुजन छात्रवृत्ति योजना के अंतर्गत धन उपलब्ध कराया। यह अनुदान सेंटर फॉर एक्सीलेंस इन क्वांटम टेक्नोलॉजी के अंतर्गत दिया गया। यह खोज 'फिजिकल रिव्यू बी' जर्नल में हाल ही में प्रकाशित किया गया।

हमारे दैनिक जीवन में कई ऐसे उपकरण और प्रौद्योगिकियां ऐसी हैं जो क्वांटम फिजिक्स के अन्य आयाम पर आधारित हैं। उदाहरण के तौर पर एलईडी, सेमीकंडक्टर प्रौद्योगिकी और नैनोमैटीरियल्स को ले सकते हैं। आमतौर पर ऐसे क्वांटम सिस्टम में वातावरणीय संपर्क को या तो अनदेखा कर दिया जाता है या उन्हें बहुत कम महत्व दिया जाता है। लेकिन हाल के इस शोध में आरआरआई की टीम ने यह साबित किया कि यदि इन प्रभावों को सावधानीपूर्वक अपनाया जाए तो क्वांटम सिस्टम के भौतिक बर्ताव में बहुत बड़ा बदलाव किया जा सकता है और एक बेहतर क्वांटम प्रौद्योगिकी की तरफ बढ़ा जा सकता है।

(प्रकाशन लिंक: <https://journals.aps.org/prb/pdf/10.1103/PhysRevB.103.075441>)

<https://pib.gov.in/PressReleasePage.aspx?PRID=1705126>



Press Information Bureau
Government of India

Ministry of Science & Technology

Tue, 16 March 2021 1:59PM

Scientists develop molecular sensor that will aid identifying new drugs of therapeutic value

Researchers have recently developed a molecular sensor, which can identify cancer drugs by detecting how such chemicals modify microtubules inside living cells.

Microtubules are part of the cytoskeleton, a structural network within the cell's cytoplasm, and they alter in response to several chemicals.

Understanding tubulin modifications has remained a challenge till date because of unavailability of tools that can mark them in living cells. Researchers from inStem, Bangalore, India, in collaboration with Curie Institute, Orsay, France, funded by Indo-French Centre for the Promotion of Advanced Research (IFCPAR/CEFIPRA), a bilateral organization supported by Department of Science & Technology (DST), Government of India and Government of France decided to overcome this shortcoming and developed the first tubulin nanobody - or sensor to study the dynamics of microtubule modifications in living cells and use this for



Minhaj Sirajuddin (inStem)
Bangalore, India

identification of new cancer therapeutic drugs. This work has been recently published recently in the *Journal of Cell Biology*.

The researchers from Bangalore and Orsay devised a method to design synthetic proteins, known as nanobodies, which can bind specifically to modified microtubules. These nanobodies are similar to antibodies made in our body as a defense mechanism against pathogens. However, unlike antibodies, the nanobodies are smaller in size and easily amenable for protein engineering. The nanobody was then coupled with a fluorescent molecule to serve as a detection tool, called sensor. They developed and validated a live cell sensor against a unique microtubule modification called tyrosinated form of microtubules that is already known to be important for cell division and intracellular organization.

The tyrosination sensor is the first tubulin nanobody - or sensor - that can be used to study the dynamics of microtubule modifications in living cells. CEFIPRA researchers have shown the application of this sensor in studying the effect of small-molecule compounds that target microtubules. These chemicals are frequently used as anti-cancer drugs. Thus, the tyrosination sensor will facilitate studying microtubule functions for many researchers and will aid identifying new drugs of therapeutic value.

(Publication link: <https://doi.org/10.1083/jcb.201912107>)

[Resources: The sensor plasmids are available from Addgene for non-commercial research use.

<https://www.addgene.org/search/catalog/plasmids/?q=alay1>

For commercial applications, please contact minhaj@instem.res.in.)

<https://pib.gov.in/PressReleasePage.aspx?PRID=1705075>



Carsten Janke (Institut Curie) Orsay, France



पत्र सूचना कार्यालय
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 16 March 2021 1:59PM

वैज्ञानिकों ने आणविक सेंसर विकसित किया है जो चिकित्सीय मूल्य की नई दवाओं की पहचान करने में सहायक होगा

शोधकर्ताओं ने हाल ही में एक आणविक सेंसर विकसित किया है, जो कैंसर की दवाओं की पहचान करके पता लगा सकता है कि इस तरह के रसायन जीवित कोशिकाओं के अंदर सूक्ष्म नलिकाएं कैसे बदलाव करते हैं। सूक्ष्म नलिकाएं कोशिका के कोशिका द्रव्य के भीतर एक संरचनात्मक नेटवर्क साइटोस्केलेटन का हिस्सा हैं, और वे कई रसायनों की प्रतिक्रिया में बदल जाते हैं।

ट्यूबलिन संशोधनों को समझना आज तक एक चुनौती बना हुआ है क्योंकि ऐसे उपकरणों की अनुपलब्धता है जो उन्हें जीवित कोशिकाओं में चिह्नित कर सकते हैं। विज्ञान और प्रौद्योगिकी विभाग (डीएसटी) द्वारा समर्थित एक द्विपक्षीय संगठन, इंडो-फ्रेंच सेंटर फॉर द प्रमोशन ऑफ एडवांस्ड रिसर्च यानी, भारत-फ्रांस उन्नत अनुसंधान विकास केंद्र



मिनहाज सिराजुद्दीन (इनस्टेम) बेंगलूर, भारत

(आईएफसीपीएआर / सीईएफआईपीआरए) द्वारा वित्त पोषित क्युरी इंस्टीट्यूट, ऑर्से, फ्रांस के सहयोग से इनस्टेम, बेंगलूर, भारत के शोधकर्ताओं के साथ भारत सरकार और फ्रांस की सरकार ने इस कमी को दूर करने का निर्णय लिया। इन शोधकर्ताओं ने जीवित कोशिकाओं में सूक्ष्मनलिका संशोधनों की गतिशीलता का अध्ययन करने के लिए पहला ट्यूबुलिन नैनोबॉडी-या सेंसर विकसित किया और इसका उपयोग नई कैंसर उपचार की दवाओं की पहचान के लिए किया। यह काम हाल ही में जर्नल ऑफ सेल बायोलॉजी में हाल ही में प्रकाशित हुआ है।



कार्स्टन जान्के (इंस्टीट्यूट क्युरी) ओरसे, फ्रांस

बेंगलूर और ऑर्से के शोधकर्ताओं ने सिंथेटिक प्रोटीन को डिजाइन करने के लिए एक विधि तैयार की, जिसे नैनोबॉडी के रूप में जाना जाता है, जो विशेष रूप से संशोधित माइक्रोट्यूबल्स से बांध सकता है। ये नैनोबॉडी रोगाणुओं के खिलाफ रक्षा तंत्र के रूप में हमारे शरीर में बनी एंटीबॉडी के समान हैं। हालांकि, एंटीबॉडी के विपरीत, नैनोबॉडी आकार में छोटे होते हैं और प्रोटीन इंजीनियरिंग के लिए आसानी से उपलब्ध हैं। इसके बाद नैनोबॉडी को एक फ्लोरोसेंट अणु के साथ जोड़ दिया जाता है, जिसे पता लगाने वाले उपकरण के रूप में उपयोग किया जाता है और इसे सेंसर कहते हैं। उन्होंने एक अद्वितीय सूक्ष्मनलिका संशोधन के खिलाफ एक जीवित सेल सेंसर को विकसित किया और मान्यता प्रदान की, जिसे सूक्ष्मनलिकाएं का टायोसीनेटेड रूप कहा जाता है जो पहले से ही कोशिका विभाजन और इंटरसेल्युलर संगठन के लिए महत्वपूर्ण माना जाता है।

टायरोसिनेशन सेंसर पहला ट्यूबुलिन नैनो-बॉडी या सेंसर है - जिसका उपयोग जीवित कोशिकाओं में सूक्ष्मनलिका परिवर्तन की गतिशीलता का अध्ययन करने के लिए किया जा सकता है। सीईएफआईपीआरए शोधकर्ताओं ने सूक्ष्म सेंसर को लक्षित करने वाले छोटे-अणु यौगिकों के प्रभाव का अध्ययन करने में इस सेंसर के उपयोग को दिखाया है। इन रसायनों को अक्सर कैंसर-रोधी दवाओं के रूप में उपयोग किया जाता है। इस प्रकार, टायरोसिनेशन सेंसर कई शोधकर्ताओं के लिए सूक्ष्मनलिका कार्यों का अध्ययन करने की सुविधा प्रदान करेगा और चिकित्सीय मूल्य की नई दवाओं की पहचान करने में सहायता करेगा।

[प्रकाशन लिंक: <https://doi.org/10.1083/jcb.201912107>]

[[संसाधन: सेंसर प्लास्मिड गैर-वाणिज्यिक अनुसंधान उपयोग के लिए एडडेगेने से उपलब्ध हैं। <https://www.addgene.org/search/catalog/plasmids/?q=a1ay1>

वाणिज्यिक अनुप्रयोगों के लिए, कृपया minhaj@instem.res.in पर संपर्क करें।]

<https://pib.gov.in/PressReleasePage.aspx?PRID=1705132>

ISRO to attempt solar mission by end of 2021

The scientific mission will see the satellite travel 1.5 million kilometres from the Earth to study the Sun's atmosphere

By Anonna Dutt

New Delhi: India is likely to attempt its first solar mission at the end of the year after the Covid-19 pandemic delayed the launch of the Aditya L-1 mission, earlier slated for the first half of 2020, according to people in the national space agency.

The scientific mission will see the satellite travel 1.5 million kilometres from the Earth to study the Sun's atmosphere. The satellite will be sent to the L1 or Lagrangian point between the Earth and the Sun, which is where the gravitational pull of both the bodies on the satellite is equal to the centripetal force needed to keep satellite in orbit.

These points are like parking spots in space from where a satellite can make observations without burning much fuel. This point between the Earth and the Sun allows an uninterrupted view of the solar surface.

The mission will carry six scientific payloads that will study the visible surface of the sun called photosphere, the irregular layer over it called the Chromosphere, and the layer of plasma called Corona, which extends for thousands of kilometers and has a very high temperature of around 6,000 Kelvin (5726.85 degrees Celsius), according to the Indian Space Research Organisation (ISRO). The mission is almost ready for launch, people aware of the developments said.

This will be one of the two big-ticket missions that the national space agency plans to conduct during the year; the other being the launch of the first unmanned flight under the Gaganyaan mission, which is also planned in December 2021.

The generic space training – survival training in snow, water and steppe, parabolic flights, theoretical classes on orbital mechanics, and astronavigation – of the four selected Indian Air Force pilots for the first Gaganyaan mission is nearing completion at the Gagarin Cosmonaut Training Centre, according to a reply by the government in the Lok Sabha. An expert team has been constituted to define the training curriculum specific to the Indian mission.

The preliminary design reviews of space foods, potable water, crew health monitoring system, emergency survival kits and crew medical kit have been completed, according to the government's answer.

The agency is yet to set a date for its third mission to the Moon with only a lander and rover that will attempt a soft landing on the lunar surface. The government green-lit the third mission soon after the lander-rover of the Chandrayaan 2 mission crashed and lost communication just 2.1km from the surface.

Isro has planned eight launch missions during the year other than the one commercial PSLV-C51 mission that was launched last month and carried the first satellite by an Indian start-up. The other missions scheduled for the year include the earth observation GISAT-1 that was to be launched on March 5 but was postponed. This was to be the first heavy satellite to be launched by the modified Geo-Synchronous Launch Vehicle with higher payload capacity.

The 10th satellite in the NavIC constellation is also scheduled to be launched this year.

<https://www.hindustantimes.com/science/isro-to-attempt-solar-mission-by-end-of-2021-101615861321649.html>

Researchers find a novel way to correct autonomous quantum errors

Joint Army- and Air Force-funded researchers have taken a step toward building a fault-tolerant quantum computer, which could provide enhanced data processing capabilities.

Quantum computing has the potential to deliver new computing capabilities for how the Army plans to fight and win in what it calls multi-domain operations. It may also advance materials discovery, artificial intelligence, biochemical engineering and many other disciplines needed for the future military; however, because qubits, the fundamental building blocks of quantum computers, are intrinsically fragile, a longstanding barrier to quantum computing has been effective implementation of quantum error correction.

Researchers at University of Massachusetts Amherst identified a way to protect quantum information from a common error source in superconducting systems, one of the leading platforms for the realization of large-scale quantum computers. The research, published in *Nature*, realized a novel way for quantum errors to be spontaneously corrected.

ARO is an element of the U.S. Army Combat Capabilities Development Command, known as DEVCOM, Army Research Laboratory. AFOSR supports basic research for the Air Force and Space Force as part of the Air Force Research Laboratory.

"This is a very exciting accomplishment not only because of the fundamental error correction concept the team was able to demonstrate, but also because the results suggest this overall approach may amenable to implementations with high resource efficiency, said Dr. Sara Gamble, quantum information science program manager, ARO. "Efficiency is increasingly important as quantum computation systems grow in size to the scales we'll need for Army relevant applications."

Today's computers are built with transistors representing classical bits, either a 1 or 0. Quantum computing is a new paradigm of computation using quantum bits or qubits, where quantum superposition and entanglement can be exploited for exponential gains in processing power.

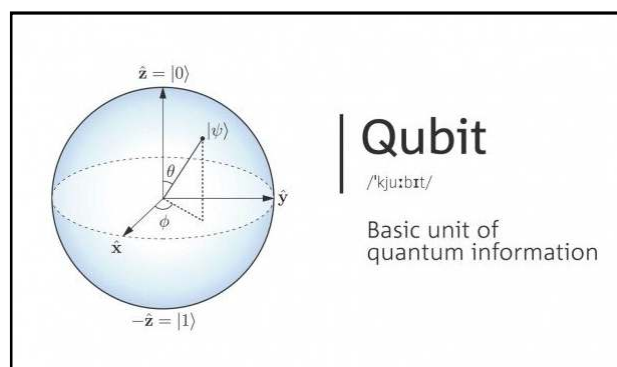
Existing demonstrations of quantum error correction are active, meaning that they require periodically checking for errors and immediately fixing them. This demands hardware resources and thus hinders the scaling of quantum computers.

In contrast, the researchers' experiment achieves passive quantum error correction by tailoring the friction or dissipation experienced by the qubit. Because friction is commonly considered the nemesis of quantum coherence, this result may appear surprising. The trick is that the dissipation has to be designed specifically in a quantum manner.

This general strategy has been known in theory for about two decades, but a practical way to obtain such dissipation and put it in use for quantum error correction has been a challenge.

"Demonstrating such non-traditional approaches will hopefully spur more clever ideas for overcoming some of the most challenging issues for quantum science," said Dr. Grace Metcalfe, program officer for Quantum Information Science at AFOSR.

Looking forward, researchers said the implication is that there may be more avenues to protect qubits from errors and do so less expensively.



Credit: The Army Research Laboratory

"Although our experiment is still a rather rudimentary demonstration, we have finally fulfilled this counterintuitive theoretical possibility of dissipative QEC," said Dr. Chen Wang, University of Massachusetts Amherst physicist. "This experiment raises the outlook of potentially building a useful fault-tolerant quantum computer in the mid to long run."

More information: Jeffrey M. Gertler et al, Protecting a bosonic qubit with autonomous quantum error correction, *Nature* (2021). DOI: [10.1038/s41586-021-03257-0](https://doi.org/10.1038/s41586-021-03257-0)

Journal information: [Nature](https://www.nature.com)
<https://phys.org/news/2021-03-autonomous-quantum-errors.html>



Wed, 17 March 2021

New imaging technology could help predict heart attacks

Researchers have developed a new intravascular imaging technique that could one day be used to detect coronary plaques that are likely to lead to a heart attack. Heart attacks are often triggered when an unstable plaque ruptures and then blocks a major artery that carries blood and oxygen to the heart.

"If unstable coronary plaques could be detected before they rupture, pharmacological or other treatments could be initiated early to prevent heart attacks and save lives," said research team leader Seemantini Nadkarni from the Wellman Center for Photomedicine at Massachusetts General Hospital. "Our new imaging technique represents a major step toward achieving this."

In *The Optical Society (OSA) journal Biomedical Optics Express*, the researchers report a preclinical demonstration of their new intravascular laser speckle imaging (ILSI) technique in a living animal model. They show, for the first time, that ILSI can identify the distinct mechanical features of plaques that are most likely to rupture under physiological conditions of cardiac motion, blood flow and breathing.

"Reducing mortality from heart attacks in the general population requires a comprehensive screening strategy to identify at-risk patients and detect high-risk vulnerable plaques while they can be treated," said Nadkarni. "By providing the unique capability to measure mechanical stability—a critical metric in detecting unstable plaques—ILSI is poised to provide a new approach for coronary assessment."

Capturing mechanical stability of plaques Although intravascular technologies have been developed to evaluate microstructural features of unstable plaques, recent studies have shown that mechanical features, in addition to microstructural and compositional features, influence plaque rupture.

"Measurement of the plaque mechanical properties is crucial in identifying unstable plaques with a propensity for rupture and subsequent heart attack," said Nadkarni. "ILSI provides the unique capability to quantify an index of mechanical properties of coronary plaques, thus providing a direct assessment of mechanical stability."

To estimate mechanical properties, ILSI uses laser speckle patterns that are formed when laser light is scattered from tissue. When viewed with a high-speed camera, the speckles fluctuate in



The researchers showed that ILSI can be used to identify plaques that were most likely to rupture under physiological conditions. Pictured is the animal catheterization laboratory with the portable ILSI system on the cart (right). Credit: Seemantini Nadkarni, Wellman Center for Photomedicine

time due to the viscoelastic properties of the plaque. This allows the researchers to measure and discriminate the mechanical properties of unstable plaques, which tend to be rich in lipids.

"For this new study, we developed a small diameter intravascular catheter that incorporates an optical fiber that delivers light to the coronary artery wall," said Nadkarni. "We also used a small-diameter fiber bundle, polarizer and GRIN lens to image the reflected speckle patterns onto a CMOS sensor."

For preclinical testing, the researchers evaluated the ability of their ILSI instrument to detect unstable plaques in a human coronary to swine xenograft model. This model system uses human coronary arteries that are sutured onto the beating heart of an anesthetized living pig. They assessed the mechanical properties of plaque inside the arteries by calculating the rate, or time constant, of fluctuations in the intensity of the speckle pattern and then compared their results with histopathological findings.

"The time constants in unstable plaques were significantly and distinctly lower than other stable plaques in the coronary wall," said Nadkarni. "These results demonstrated the exquisite diagnostic sensitivity and specificity of ILSI for detecting human lipid pool plaques that were most likely to rupture under physiological conditions."

The researchers say that the new technique could be easily integrated with other intracoronary technologies such as optical coherence tomography or intravascular ultrasound to combine the mechanical findings from ILSI with morphological information to improve the evaluation of plaque stability.

The researchers plan to continue to evaluate the capability of their ILSI instrument for rapid assessment of the coronary vasculature in live animals. Once these preclinical studies are complete, they will assess the safety of the catheter for use in humans and then begin the process of gaining regulatory approval for clinical use.

More information: Zeinab Hajarjian et al, In-vivo mechanical characterization of coronary atherosclerotic plaques in living swine using intravascular laser speckle imaging, *Biomedical Optics Express* (2021). DOI: [10.1364/BOE.418939](https://doi.org/10.1364/BOE.418939)

Journal information: [Biomedical Optics Express](https://phys.org/news/2021-03-imaging-technology-heart.html)
<https://phys.org/news/2021-03-imaging-technology-heart.html>



Wed, 17 March 2021

Half of COVID survivors struggle with depression: Study

By Steven Reinberg

Tuesday, March 16, 2021 (HealthDay News) -- To the lingering damage of COVID-19 infection, add this side effect: New research shows that more than half of those sickened by COVID-19 report depression.

Among more than 3,900 people who had COVID-19 surveyed between May 2020 and January 2021, 52% suffered symptoms of major depression, researchers found.

"People who have been ill with COVID-19 can experience depressive symptoms for many months after their initial illness," said lead researcher Dr. Roy Perlis. He is a professor of psychiatry at Harvard Medical School and associate chief of research in the department of psychiatry at Massachusetts General Hospital, in Boston.

The combination of chronic stress during the pandemic and disruption of people's social networks is already a recipe for depression and anxiety, Perlis said.

"This observation reinforces the importance of understanding whether this is an effect of COVID-19 itself, or simply the stress of dealing with the pandemic plus an acute illness," Perlis added.

The researchers also found that those with depression were more likely to be young, male and have suffered from severe COVID-19.

Earlier studies had found a connection between depression and the loss of smell and taste among COVID-19 patients, but Perlis and his colleagues did not find this relationship.

Rather, they found a link between headaches during COVID-19 and a higher risk of depression. However, it's possible that people with depression were more likely to say they had headaches when they were sick, the study authors noted.

The study could not prove cause and effect. It's possible that those who said they were suffering from depression had their symptoms before they had COVID-19, or that they were slower to recover from depression after being sick or were more at risk for COVID-19 in the first place, the researchers stressed.

"Depression is a very treatable illness. Because the rates of depression are currently so high, it's especially important to ensure that people are able to access care," Perlis noted.

"In the same way our leaders in government and public health are working to encourage people to seek vaccination, we need to encourage people to seek care if they experience symptoms of depression," he said.

Brittany LeMonda, a senior neuropsychologist at Lenox Hill Hospital in New York City, said that the findings "are interesting, given that we are still understanding the psychiatric and neurologic manifestations of COVID-19."

Interestingly, headache during infection, but not other symptoms, was an independent factor for depression, she said. "Individuals with a history of headache and [physical symptoms, such as pain or weakness] are often more likely to have psychiatric symptoms," she explained.

"Underlying factors may predispose someone to develop headache with COVID-19 that also puts them at higher risk for developing depression post-illness," LeMonda said.

People with a history of depression and anxiety were also more likely to contract COVID-19 and have a more prolonged recovery from the virus, she noted.

"People with anxiety about their health and depression are more likely to experience anxiety in general, and it may be that depression and anxiety and certain COVID-19 symptoms are bi-directionally related," LeMonda said.

The report was published online March 12 in *JAMA Network Open*.

More information

For more on COVID-19 and mental health, head to the U.S. Centers for Disease Control and Prevention.

SOURCES: Roy Perlis, MD, MSc, professor, psychiatry, Harvard Medical School, associate chief, research, department of psychiatry, Massachusetts General Hospital, Boston; Brittany LeMonda, PhD, senior neuropsychologist, Lenox Hill Hospital, New York City; *JAMA Network Open*, March 12, 2021, online

<https://consumer.healthday.com/3-15-half-of-covid-survivors-have-symptoms-of-depression-study-2651018733.html>

