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

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THE ECONOMIC TIMES

Sat, 25 Sept 2021

We can fund upto Rs 10 crore to develop innovative products, says DRDO Chairman

Synopsis

DRDO chairman G Satheesh Reddy said the quality of the product developed within the country should be good only then the product could be sold the worldover.

Chairman of Defence, Research and Development Organisation (DRDO) G Satheesh Reddy on Friday said it would fund upto Rs 10 crore for research projects to promote and develop innovative products. "The DRDO has a scheme 'Technology Development Funding' to spend on young graduates, those who can join incubation centres and have an idea to convert into a design and a product and we'll support them with Rs 1 crore," he said.

Reddy was delivering the convocation address on Friday after handing over degrees to 293 students of the Indian Institute of Information Technology, Design and Manufacturing (IIITDM), Kancheepuram, through virtual platform.

Noting that the country was looking for innovation from the youngsters, he said it is technology that can make the country prosperous. "Come out with new technologies, innovate first-of-its-kind products. Our products have to go all over the world. The world should be flooded with products from India," said Reddy, also the secretary of the Department of Defence (research and development).

Maintaining that the product developed in the country with innovation should be priced lower but offer reliability, he said the quality of the product should be good only then could the product be sold the worldover. "That is how we will earn a lot of foreign exchange. And that is how the country becomes prosperous," he said. A country to become prosperous, the seed is with the institutes like IIITDM where people learn about technology, science and come out with design and manufacturing, he said. "I would like to say that DRDO supports these things in a big way," he said. Appealing to the new graduands, he said through the website of DRDO, a student or an institute can look for options to use the funds from the DRDO.

"If you are establishing an industry and you come out with a design; and if we see that the design is useful for the defence of the country, we can fund you upto Rs 10 crore, that is, through an industry," he said. IIITDM chairman (Board of Governors) professor S Sadagopan and IIITDM Director professor D V L N Somayajulu were among those present on the occasion.

<https://economictimes.indiatimes.com/news/defence/we-can-fund-upto-rs-10-crore-to-develop-innovative-products-says-drdo-chairman/articleshow/86484152.cms>



Chairman of Defence, Research and Development Organisation (DRDO) G Satheesh Reddy

Tech can make country prosperous: DRDO Chief

Chennai: A total of 293 students graduated at the ninth convocation of the Indian Institute of Information Technology, Design and Manufacturing (IIITDM) Kancheepuram, held virtually on Friday.

The Institute is planning to launch a M.Tech. in Mechanical Engineering with a specialisation in AI and Robotics, and M.Tech. in Power Electronics and System Design shortly.

This year, it commenced an M.Tech. programme in Computer Science with specialization in Data Science and AI.

Delivering the convocation Address, DRDO Chairman and Secretary, Department of Defence (R and

D) G Satheesh Reddy said 'Today, the country is looking for innovation from youngsters to come out with the products of first-of-its- class in the world... What is that which can make this country prosperous?'

'It is the technology which can make this country prosperous. And for the country to become prosperous, the seed is with the institutes like IIITDM where people have to learn science and technology and come out with design and manufacturing where lot of innovation comes out', he said.

Elaborating on how DRDO can support such innovation, Dr. Satheesh Reddy said, 'DRDO has got a scheme called 'Technology Development Funding.' It funds youngsters who are coming out of the colleges as just young graduates and who can join these incubation centres to convert their ideas into a design and a product'.

He said the DRDO supports this project with Rs one crore funding for an idea which actually works for the defence of the country or the security of the country.

'If you are establishing an industry and coming out with a design and if we see that the design is useful to the defence or the security of the country, and come out with that product, we can fund you up to Rs 10 crore', he said.

<https://newstodaynet.com/index.php/2021/09/25/tech-can-make-country-prosperous-drdo-chief/>



G Satheesh Reddy

DRDO lab prepares blueprint to convert six C-295 aircraft for use by Indian Coast Guard

The possible use of the C-295 as a specialised surveillance vehicle following modifications was revealed at Aero India 2019 by former chairman of DRDO S Christopher

By Aksheev Thakur

Bengaluru: The Centre for Airborne Systems (CABS), Bengaluru, has prepared a blueprint to modify six of the 56 C-295 military transport aircraft that are likely to be procured by the Indian government from Spain for maritime usage by the Indian Coast Guard.

The defence ministry signed a contract with Airbus Defence and Space, Spain, Friday, for procurement of the C-295 aircraft for the Indian Air Force. Under the deal, 16 aircraft will be supplied in a fly away condition while 40 will be made in India by Tata Advanced Systems Ltd.

The aircraft procured for the coast guard will be modified into a Multi-Mission Maritime Aircraft (MMMA) variant for airborne surveillance with C4ISR (Command, Control, Communications, Computers Intelligence, Surveillance and Reconnaissance) capabilities for the ICG at CABS — a DRDO laboratory in Bengaluru.

The possible use of the C-295 as a specialised surveillance vehicle following modifications was revealed at Aero India 2019 by former chairman of DRDO S Christopher.

“We have the blueprint ready. The MMMA will empower ICG to discharge its responsibilities within the Exclusive Economic Zone (EEZ) and Indian Search and Rescue Region (ISRR). Almost 70 per cent of the sensors required for this programme are similar to the sensors developed for Airborne Early Warning and Control (AEW&C) for the Indian Air Force (IAF) and the same can be used with minor adaptations,” a senior CABS official said.

The MMMA would include Active Electronically Scanned Array (AESA) radar to carry out detection and tracking of air and sea surface targets. It will enable detection of small targets from medium altitudes.

Talking about the roles and capabilities of MMMA, a scientist with DRDO said, “The primary roles of MMMA would include maritime surveillance, pollution surveillance, cargo, air ambulance and search and rescue.”

India’s coastline of 7,516 kilometres and 2.01 million square kilometres has vital installations and islands of strategic importance. With the growing incidents of piracy, smuggling and other unlawful activities, DRDO claims MMMA would meet a key ICG requirement.

<https://indianexpress.com/article/cities/bangalore/drdo-c-295-aircraft-indian-coast-guard-7532767/>

UoH ACRHEM gets patent for inventing green method to develop energetic plasticizers

Hyderabad: The Advanced Centre of Research in High Energy Materials (ACRHEM), a DRDO's centre of excellence in the University of Hyderabad (UoH), has been granted a patent for inventing a green and cost-effective method for producing various types of bis (fluoroalkyl) carbonates.

The invention is titled "Green Method for the Synthesis of Bis (Fluoroalkyl) Carbonate". Dr. Balaka Barkakaty, project scientist at ACRHEM, and her two project assistants, Saheli Dey and Nitesh Singh, are the inventors of this patent.

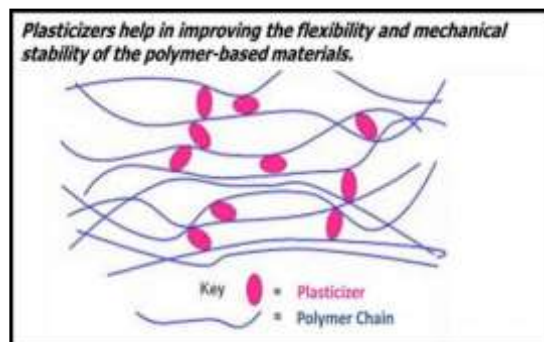
This patented invention at ACRHEM is for the discovery of a "new generalized method" that outlines an "easy, green, no-solvent and cost-effective method" for producing various types of bis (fluoroalkyl) carbonates in high purity and high yields.

The conventional methods for synthesizing bis (fluoroalkyl) carbonates utilize environmentally hazardous chemicals such as phosgene or triphosgene. Other alternative methods are not practically viable for industrial applications. These fluorinated organic carbonates are potential plasticizers for energetic applications because of their known stability under high voltage applications. A few of the developed compounds at ACRHEM in this category are currently under investigation at DRDO for practical applications.

The general role of plasticizers is to increase the flexibility of plastics or polymers used in a wide range of applications from the automobile industry to healthcare and consumer products. In defense-based industries, plasticizers are used to improve the mechanical properties of the composite propellant, especially the binder. However, mixing the ingredients of composite propellant with non-energetic plasticizers dilutes the overall energy content of the system.

Over the last few decades, research into developing novel energetic plasticizers have been gaining a lot of interest. The main focus of these energetic plasticizers is to enhance the mechanical properties and safety characteristics of the energetic formulation without diluting the overall energy content of the system.

<https://newsmeter.in/science-health/uoh-acrhem-gets-patent-for-inventing-green-method-to-develop-energetic-plasticizers-683713>



Dr. Balaka Barkakaty

ACRHEM at UoHb receives patent for green method in energetic plasticizers

Hyderabad, Sep 24 (UNI) The Advanced Centre of Research in High Energy Materials (ACRHEM), a DRDO's centre of excellence in the University of Hyderabad (UoH), has been recently granted a patent for their invention titled "Green Method for the Synthesis of Bis(Fluoroalkyl)Carbonate".

Dr Balaka Barkakaty (Project Scientist at ACRHEM) and her two project assistants, Ms. Saheli Dey and Ms. Nitesh Singh, are the inventors of this patent.

This patented invention at ACRHEM is for the discovery of a 'new generalized method' that outlines an 'easy, green, no-solvent and cost-effective method' for producing various types of bis(fluoroalkyl)carbonates in high purity and high yields, the University said in a release here on Friday.

The conventional methods for synthesizing bis(fluoroalkyl) carbonates utilizes environmentally hazardous chemicals such as phosgene or triphosgene and other alternative methods that are not practically viable for industrial applications.

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The main focus of these energetic plasticizers is to enhance the mechanical properties and safety characteristics of the energetic formulation without diluting the overall energy content of the system.

<http://www.uniindia.com/acrhem-at-uoh-receives-patent-for-green-method-in-energetic-plasticizers/south/news/2515550.html>

Government to boost Army firepower with 118 new Arjun tanks

New Delhi: It seems that the Indian government is not letting any opportunity to strengthen the Armed Forces. Following the inking of a Rs 20,000 crore deal to buy 56 C-295 transportation aircraft from Airbus, the Defence Ministry has sealed a contract to procure 118 Main Battle Tanks (MBTs) Arjun for the Indian Army at a cost of Rs 7,523 crore. This will be a major boost to the combat capability of Armed Forces on land.

Sources said that the Defence Ministry placed the order Thursday, for the Arjuna Mk-1A tanks with the Heavy Vehicles Factory (HVF), Avadi, Chennai.

The MBT Mk-1A is a new variant of the Arjun tank. The new designs will enhance fire power, mobility and survivability. It will also have 72 new features and more indigenous content from the Mk-1 variant

"The Ministry of Defence (MoD) placed an order with Heavy Vehicles Factory (HVF), Avadi, Chennai for supply of 118 Main Battle Tanks (MBTs) Arjun Mk-1A for the Indian Army, September 23," the Defence Ministry said in a statement.

"The order, worth Rs 7,523 crore, will provide further boost to the 'Make in India' initiative in defence sector and is a big step towards achieving 'Aatmanirbhar Bharat'," the Defence Ministry added.

The ministry said the tanks would ensure effortless mobility in all terrains, besides precise target engagement during day and night. The tank has been designed and developed by the Defence Research & Development Organisation (DRDO) by incorporating numerous upgrades on Arjun MBT, the in-service main battle tank with the Indian Army.

"The MK-1A is equipped with accurate and superior firepower, all-terrain mobility and an invincible multi-layered protection provided by an array of advanced technology systems. It can take on the enemy during day and night conditions and in both static and dynamic modes," the ministry said.

The ministry also informed that MBT Arjun Mk-1A has been designed and developed by Combat Vehicles Research and Development Establishment (CVRDE), along with other laboratories of DRDO within two years (2010-12).

"The development activities commenced from June 2010 and the tank was fielded for user trials in June 2012. It took only two years to develop and field the MBT Arjun Mk-1A for user trials from the user requirement," the Defence Ministry informed.

<https://www.orissapost.com/government-to-boost-army-firepower-with-118-new-arjun-tanks/>

भारतीय सेना को मिलेंगे 118 अर्जुन टैंक, रक्षा मंत्रालय ने दिया आर्डर, 7523 करोड़ रुपये आएगी लागत

रक्षा मंत्रालय ने गुरुवार को भारतीय सेना के लिए 7523 करोड़ रुपये की लागत से 118 मेन बैटल टैंक (MBT) अर्जुन टैंक एमके 1ए की आपूर्ति के लिए आर्डर दिया है। यह सेना की लड़ाकू क्षमताओं को बढ़ावा देने के लिए एक बड़ा कदम है।

By Tanisk

नई दिल्ली: रक्षा मंत्रालय ने गुरुवार को भारतीय सेना के लिए 7523 करोड़ रुपये की लागत से 118 मेन बैटल टैंक (MBT) अर्जुन टैंक एमके 1ए की आपूर्ति के लिए आर्डर दिया है। यह सेना की लड़ाकू क्षमताओं को बढ़ावा देने के लिए एक बड़ा कदम है। रक्षा मंत्रालय ने अर्जुन एमके-1ए टैंकों के लिए चेन्नई के हेवी व्हीकल फैक्ट्री (HVF) को आर्डर दिया। एमबीटी एमके-1ए अर्जुन टैंक का एक नया वैरिएंट है। ये टैंक नए वर्जन हैं, जो 72 आधुनिक तकनीक से लैस हैं। इनकी फायर पावर बढ़ाई गई है।



मंत्रालय ने एक बयान में कहा कि रक्षा मंत्रालय (MoD) ने 23 सितंबर को भारतीय सेना के लिए 118 मेन बैटल टैंक (MBT) अर्जुन एमके-1ए की आपूर्ति के लिए चेन्नई के हेवी व्हीकल फैक्ट्री (HVF) को आदेश दिया है। 7,523 करोड़ रुपये का यह आर्डर रक्षा क्षेत्र में 'मेक इन इंडिया' पहल को और बढ़ावा देगा और 'आत्मनिर्भर भारत' की दिशा में एक बड़ा कदम है। मंत्रालय ने कहा कि टैंक दिन हो या रात किसी भी समय सटीक निशाना साधने के अलावा किसी भी इलाके में सहज गतिशीलता सुनिश्चित करेंगे। इसे रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) ने डिजाइन और विकसित किया है।

मंत्रालय ने कहा कि हेवी व्हीकल्स फैक्ट्री को दिया गया उत्पादन आदेश एमएसएमई सहित 200 से अधिक भारतीय विक्रेताओं के लिए रक्षा निर्माण में एक बड़ा अवसर खोलेगा, जिसमें लगभग 8,000 लोगों के लिए रोजगार के अवसर होंगे। यह अत्याधुनिक रक्षा प्रौद्योगिकियों में स्वदेशी क्षमता का प्रदर्शन करने वाली एक प्रमुख परियोजना होगी। एमबीटी अर्जुन एमके-1ए को दो साल (2010-12) के भीतर डीआरडीओ की अन्य प्रयोगशालाओं के साथ कांबेट व्हीकल रिसर्च एंड डेवलपमेंट एस्टैब्लिशमेंट (CVRDE) द्वारा डिजाइन और विकसित किया गया है।

मंत्रालय ने कहा कि इस विकास गतिविधियां जून 2010 से शुरू हुईं और टैंक को जून 2012 में उपयोगकर्ता परीक्षणों के लिए मैदान में उतारा गया। उपयोगकर्ता की आवश्यकताओं के अनुसार परीक्षणों के लिए एमबीटी अर्जुन एमके -1 ए को विकसित करने और क्षेत्र में लाने में केवल दो साल लगे।

<https://www.jagran.com/news/national-defence-ministry-places-order-for-118-arjun-tanks-for-indian-army-at-a-cost-of-rs-7523-crore-22048108.html>

Jagran Explainer | How Arjun Mark 1-A is different from its predecessor and why its inclusion is significant

The order, worth Rs 7,523 crore, will provide a further boost to the 'Make in India' initiative in the defence sector and is a big step towards achieving Aatmanirbhar Bharat

New Delhi: The Defence Ministry on Thursday sealed a contract to procure 118 Main Battle Tanks (MBTs) Arjun for the Indian Army at a cost of Rs 7,523 crore, in a major move to boost its combat capabilities. The defence ministry placed the order for the Arjuna Mk-1A tanks with the Heavy Vehicles Factory (HVF), Avadi, Chennai. The MBT Mk-1A is a new variant of Arjun Tank designed to enhance firepower, mobility and survivability, infused with 72 new features and more indigenous content from the Mk-1 variant.

"The Ministry of Defence (MoD) placed an order with Heavy Vehicles Factory (HVF), Avadi, Chennai for supply of 118 Main Battle Tanks (MBTs) Arjun Mk-1A for the Indian Army on September 23. The order, worth Rs 7,523 crore, will provide a further boost to the 'Make in India' initiative in the defence sector and is a big step towards achieving Aatmanirbhar Bharat," the ministry said in a statement.

The ministry said the tanks would ensure effortless mobility in all terrains, besides precise target engagement during day and night. It has been designed and developed by the Defence Research & Development Organisation (DRDO) by incorporating numerous upgrades on Arjun MBT, the in-service main battle tank with the Indian Army.

It said the production order to Heavy Vehicles Factory will open up a large avenue in defence manufacturing for over 200 Indian vendors including MSMEs, with employment opportunities to around 8,000 people. "This will be a flagship project showcasing the indigenous capability in cutting edge defence technologies," the ministry said.

It said the MBT Arjun Mk-1A has been designed and developed by Combat Vehicles Research and Development Establishment (CVRDE), along with other laboratories of DRDO within two years (2010-12).

How it is different from its predecessor Arjun Mark 1?

As per the defence ministry, the Mark-1A variant adds 72 new features — 14 major and 58 minor — to the previous variant Mark-1. Apart from the firepower, the Arjun Mark 1-A tank has been integrated with automatic target tracking and will allow the crew to track moving objects and target them automatically. The new system will also engage the targets even when the tank is on the move. Other major upgrades include new transmission systems and an improved gunner's main sight.

Apart from the above-mentioned features, the Mark 1-A gun is controlled by a computerised integrated fire control, which ensures that it has a high first-round kill capability. Besides the traditional fin-stabilised armour-piercing discarding sabot and high explosive squash head ammunition, the Mark 1-A can also fire thermobaric and penetration-cum-blast ammunition.

In another major difference with its predecessor, the Arjun Mark 1-A is 68 tonnes heavier than the Arjun Mark 1. The previous model, Arjun Mark 1 weighs 62.5 tonnes and with the addition of armour and new systems over the years, the Arjun Mark 1-A weighs 68.5 tonnes. The Arjun tank,



first envisaged in 1972, was meant to replace the Russian T-72 that is still in service and was intended to weigh just 48 tonnes.

<https://english.jagran.com/india/jagran-explainer-how-arjun-mark-1a-is-different-from-its-predecessor-and-why-its-inclusion-is-significant-10032714>

The Indian EXPRESS

Sat, 25 Sept 2021

Explained: What's new in Arjun Mark-1A, and why its acquisition is significant

*The acquisition of 118 tanks — that would come at the cost of
Rs 7,523 crore — would equip three armoured regiments of the tank*

By Sushant Kulkarni

Pune: The Ministry of Defence said on Thursday that it has placed an order worth Rs 7,523 crore to Heavy Vehicles Factory (HVF), Chennai for supply of 118 units of the Main Battle Tank Arjun's Mark-1A variant for the Army.

What's new in Arjun Mark-1A?

The development of Arjun was started by the Defence Research and Development Organisation (DRDO) in the late 1980s, primarily to augment the predominantly Russian-made armoured fleet until then.

Trials of the earliest Arjun variant began in the early 1990s and the tank was inducted in 2004. Work on the variant Mark-1A, or Mk-1A, began in June 2010 and the tank was fielded for trials in June 2012. For the next three years, extensive trial evaluations were conducted by both the DRDO and the Army, followed by more trials, including field trials, in subsequent years.



MoD has said that the Mark-1A has more indigenous content from the Mark-1 variant, thus reducing the dependence on foreign vendors for key components. (Source: PIB)

The Mark-1A variant adds 72 new features — 14 major and 58 minor — to the previous variant Mark-1. These additions have resulted in better all-terrain mobility and manoeuvrability in different modes of operation, better target acquisition, and precision firing during both day and night with a 360° view, and a multi-layered robust protective armour named 'Kanchan'. The additions, along with its robust 120 mm rifled gun, have contributed to its categorisation as the 'hunter killer'. The DRDO is currently conducting trials of firing guided missiles from Arjun.

The Defence Ministry has said Mk-1A has more indigenous content than Mk-1, thus reducing dependence on foreign vendors. The new variant is also said to have added some comfort features for the four-member crew, who operate in tough conditions when deployed, and has a better transmission system. Some of the features also prepare the tank better for network-centric warfare — or effective use of information technology and computer networking in the battlefield.

What is the significance of the acquisition?

The acquisition of 118 tanks would equip three armoured regiments, as one regiment comprises 40 to 50 tanks. This acquisition holds significance in light of the Pakistan Army's latest acquisition of two tanks, VT-4 and Al-Khalid. Both tanks, which are of Chinese origin, are comparable to the Russian origin T-90 tanks that are in use by the Indian Army.

Arjun Mark-1A is ideally suited for desert terrain, and even more effective and lethal compared to earlier variant due to the new additions. In exercises where Arjun squadrons were pitched

against those of the T-90, Arjun is said to have matched the Russian opponent in some aspects and outperformed in some others.

However, the weight of the tank puts a limitation on its deployability in high-altitude terrains. While the 72 new additions have significantly increased efficacy, they have also added somewhere between 5 and 6 tonnes to a system that was already on the heavier side.

The Defence Ministry said in a press statement: “By virtue of these capabilities, this indigenous MBT proves to be at par with any contemporary in its class across the globe. This tank is particularly configured and designed for Indian conditions and hence it is suitable for deployment to protect the frontiers in an effective manner.”

How big a stride is this for indigenous capability?

The new variant is said to have increased the proportion of the indigenous components. The Ministry has said the order will provide a further boost to the ‘Make in India’ initiative in the defence sector and is a big step towards ‘Aatmanirbhar Bharat’. “This production order to the Heavy Vehicles Factory opens up a large avenue in defence manufacturing for over 200 Indian vendors including MSMEs, with employment opportunities to around 8,000 people. This will be a flagship project showcasing the indigenous capability in cutting-edge defence technologies.”

Senior DRDO officials have said that from their perspective, Arjun Mark-1A was ready for induction into the Army by 2018-19. The development of the tank was led by the Chennai-based DRDO facility Combat Vehicles Research and Development Establishment (CVRDE) along with the other DRDO laboratories.

In February, Prime Minister Narendra Modi had handed over the prototype Arjun Mk-1A to Chief of Army Staff General M M Naravane at a ceremony in Chennai. Officials from the Ordnance factories have said it will take at least two-and-a-half to three years till the first batch of the tank is delivered to the Army.

<https://indianexpress.com/article/explained/defence-ministry-arjun-mark-1a-battle-tank-significance-explained-7531432/>

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Explained: As India plans Agni V test, here's how it'll boost deterrence and why China is not amused

As India gets ready to carry another test of its first ICBM, Agni V, before its induction into its arsenal, here's all you need to know about the missile

First, it was nuclear submarines for Australia and now a test of a long-range missile capable of carrying nuclear warheads. If you are a preeminent power in the neighbourhood with global superpower ambitions, such developments would be enough to rile you up. And that is exactly how China responded to news that India was planning a test of the Agni V missile ahead of its formal induction into its arsenal. Though it's not the first test of the inter-continental ballistic missile (ICBM), it does represent another move towards deterrence. Here's all you need to know.



The Agni V missile has been tested at least seven times. This a Ministry of Defence photograph shared after a test in June 2018

Why is the test significant?

Agni-V is India's first ICBM — normally regarded as having a range of more than 5,000km — and has been under development for more than a decade. After its fifth test firing in January 2018, the Ministry of Defence had said that all the objectives for the test of the “long-range surface-to-surface ballistic missile... have been successfully met” and it “reaffirms the country's indigenous missile capabilities and further strengthens our credible deterrence”.

However, although reports have said that the missile was to be inducted into the Armed forces after two more tests the same year — in June and December — making it seven successful tests in total, another test was lined up, which got delayed, however, due to the Covid-19 pandemic. The upcoming test — said to have been scheduled for September-end, it's set for some time in October, reports said — described as its “first user trials” was reportedly to assess the ability of the missile to carry multiple warheads, known in defence jargon as multiple independently targetable reentry vehicles (MIRV).

However, a report in Times Of India said that while India is working on MIRVs, the first tests of the technology won't be held before two years. Reports say that a test on June 28 this year of the Agni P (for Prime), “a new generation advanced variant of Agni class of missiles” also involved a trial of MIRV capabilities, although it's been suggested that that test had used “decoys” instead.

What is MIRV?

MIRV capability allows a missile “to deliver multiple nuclear warheads to different targets” and was first developed by the US in the 1960s.

“In contrast to a traditional missile, which carries one warhead, MIRVs can carry multiple warheads,” says the US-based Centre for Arms Control and Non-Proliferation (CACNP).

The warheads on such missiles can be released “at different speeds and in different directions” with some known to be capable of hitting targets “as far as 1,500km apart”, CACNP says, adding that “although MIRVs were not initially intended to defeat ballistic missile defences, they are much more difficult to defend against than traditional missiles”.

CACNP says that “the development of MIRV technology is not easy” as it involves a “combination of large missiles, small warheads, accurate guidance, and a complex mechanism for releasing warheads sequentially during flight”.

In the neighbourhood, both China and Pakistan are said to possess MIRV-capable missiles.

What is A Ballistic Missile?

According to the Nuclear Threat Initiative (NTI), India has the “capacity to deploy short-, medium-, and long-range ballistic missiles”. It says that the country “views its nuclear weapons and long-range power projection programmes as the key to maintaining strategic stability in the Asia-Pacific region”.

It lists the Prithvi-II, Agni-I, Agni-II, Agni-III, and Agni-IV as “India’s fully operational land-based ballistic missiles”, noting that the country also has submarine launched ballistic missiles (SLBMs).

Arms Control Association, another US-based organisation, says that ballistic missiles are “powered by rockets initially but then they follow an unpowered, free-falling trajectory towards their targets”. It notes that as of December 2017, there were 31 countries that had such missiles with only nine among them known or suspected to possess nuclear capabilities — China, France, India, Israel, North Korea, Pakistan, Russia, UK, US.

Why is China Fuming?

China habitually uses its position as a permanent member of the UN Security Council (UNSC) to condemn missile tests by India. After reports emerged of plans for another test of the Agni V, Chinese foreign ministry spokesperson Zhao Lijian said at a press briefing that “maintaining peace, security and stability in South Asia meets the common interests of all, where China hopes that all parities would make constructive efforts”.

Touching specifically upon the topic of another missile test, he referred to the UNSC Resolution 1172 of 1998 — passed in the wake of nuclear tests held by India and Pakistan — which asks the two countries “immediately to stop their nuclear-weapon development programmes, to cease development of ballistic missiles capable of delivering nuclear weapons and any further production of fissile material for nuclear weapons”.

Zhou said that “as for whether India can develop ballistic missiles capable of delivering nuclear weapons, the UNSCR 1172 already has clear stipulations”.

China hitting out against Indian weapons development is nothing new and it would have noted that with a range of 5,000-plus kilometres, Agni V brings most of the Chinese mainland under its range, enhancing its strategic deterrence vis-a-vis Beijing.

The news of the test also came at a time when the US and UK announced the formation of a new strategic defence triad with Australia, called AUKUS, in the Indo-Pacific, promising the island nation nuclear submarines to patrol the waters where China has long tried to aggressively push its territorial claims.

Australia, along with Japan, India and the US has also revived the Quad grouping which, though not a military alliance, is seen as being geared towards containing China’s influence in the Indo-Pacific region.

<https://www.news18.com/news/explainers/explained-as-india-plans-agni-v-test-heres-how-itll-boost-deterrence-and-why-china-is-not-amused-4241852.html>

Indigenous memory technology moves from lab to fab

The collaborative research can fix faulty chips, cut wastage

By Shubashree Desikan

IIT Bombay researchers have developed a “memory technology” that can, in principle, revolutionise Indian industry and the many applications that need semiconductor chips, such as in the defence sector, automobiles and future aspirations in cell phone manufacturing. Hard disks, flash memory, etc, are examples of memory technology. There is also another form of memory called the one-time programmable memory (OTP) where the memory is written once, stored for a lifetime, and retrieved and used many times. This finds varied uses, one of which is in correcting faulty chips that have been mass produced for specific applications.



Testing routine : silicon wafers of 200 millimetre diameter with OTP memories undergo testing. | Photo Credit: Ankit Bende and Kumar Priyadarshi, IIT Bombay

Correcting offsets

For instance, think of a chip that helps read off the temperature. Due to a manufacturing defect, the chip may read 100 degree Celsius as 101 degree Celsius. This “offset” of 1 degree may be corrected by storing the error correction parameter in the OTP memory. This is done uniquely for each chip and once stored, the memory corrects the chip’s output for its lifetime.

“OTP memories are also used for other purposes, mainly three: chip identity, secure information storage and chip calibration for error correction,” says Udayan Ganguly, professor at IIT Bombay, who holds the patents for the invention along with A. Lele, S. Sadana and P. Kumbhare.

Storing values

To store the correction value, the researchers used eight memory cells, each of which would store one “bit” (that is a value of zero or one). Each of the memory cells consist of an ultrathin silicon dioxide layer which is 10-15 atomic layers thick. This is deposited uniformly over a dinner plate-sized eight-inch silicon wafer to form millions of nanoscale capacitors. “The pristine silicon dioxide layer is insulating, passing a very low current [which in digital electronics is read as a “0”]. A nanoscale lightning is generated of 3.3 volts to blow the capacitor, leading to a short circuit that produced high current [this is a “1”],” says Prof. Ganguly. Thus, the OTP memory remembers either the “0” state or “1” state through its lifetime.

The group, in collaboration with the Semi-Conductor Laboratory, Mohali, Punjab (SCL), has successfully demonstrated CMOS 180-nanometre-based, production-ready, eight-bit memory technology, according to a press release from the office of the Principal Scientific Adviser to Government of India. Reiterating this, Prof Ganguly says, “We have shown that the memory cells and arrays pass all the specifications for the trimming application when manufactured in the SCL 180-nanometre CMOS line. These include successful operation between minus 40 degrees C to 125 degrees C and reliability to ensure excess of 95% yield on eight-bit memories.”

According to him, a large fraction of manufactured chips may need to be discarded for faults that can be corrected using this technology. This technology is the first indigenous semiconductor memory technology adoption to manufacturing at 180-nanometre node. Thus, this is a major national milestone for semiconductor innovation, says Prof Ganguly.

Better process

There exist other methods of achieving OTP memories than described above. However, these demand challenging engineering techniques and also require high voltage, which comes with a large area penalty.

“In contrast, we use a dedicated insulator material which is specially engineered silicon dioxide at 2.5-nanometre thickness to breakdown at 3.3 volt without any special structures along with a standard transistor. Thus, the transistor is not disturbed, and no special high voltage generation is needed,” says Prof. Ganguly, pointing out the attractive features of the technology.

First customer

Semi-Conductor Lab (SCL), Punjab, is the first customer to try and use this technology for internal purposes. Apart from collaborating with SCL, the team at IIT Bombay partnered with IIT Delhi, SETS Chennai and Defence Research and Development Organization for hardware encryption.

“The concept came out of a PhD Thesis in IIT Bombay... This is the first indigenous 180-nanometre memory technology to have successfully graduated from lab to fab in 2021. It has taken six years in the process of translating research to manufacturing,” says Prof. Ganguly.

<https://www.thehindu.com/sci-tech/science/indigenous-memory-technology-moves-from-lab-to-fab/article36670426.ece>



Mon, 27 Sept 2021

CDIIC to incubate four startups in the defence sector

Codissia Defence Innovation and Atal Incubation Centre (CDIIC), Defence Research Development Organisation - Technology Development Fund, Bharat Electronics, and Defence Innovation Organisation will work jointly to make Coimbatore a Defence Manufacturing Hub, according to a press release from the Centre.

The CDIIC organised a road show for Defence India Start up Challenge and exchanged MoUs with startups on Sunday.

At a virtual meeting held on Sunday, Nidhi Bansal, director of Technology Development Fund, Defence R&D Organisation, shared details of the funding opportunities for startups and MSMEs under the technology development fund. Sa. K. Vishnoo Prathap, Programme Executive of the Defence Innovation Organisation, said the Defence Secretary has instructed all defence PSUs to share the indigenisation list with the Centre in 10 days and finalise the products to be developed under the Defence Innovation Hub.

Four startups, Dataspire Technologies, Coimbatore, Edgeforce Solutions, Hyderabad, Mano Aircraft, Coimbatore, and Vellon Space, Madurai, signed incubation agreement with the CDIIC, according to the press release.

<https://www.thehindu.com/news/cities/Coimbatore/cdiic-to-incubate-four-startups-in-the-defence-sector/article36687279.ece>

India's submarine conundrum: nuclear or conventional?

A debate rages over whether the Indian Navy should be going in for conventional diesel-electric submarines, or AIP vessels or SSNs

By Ajai Shukla

Barely a month after the US troop withdrawal from Afghanistan, America is making a strategic course correction, partnering two other Anglophone countries – Australia and the UK – in launching a new defence alliance in the Asia-Pacific.

Appearing together on television on September 15, the three countries' leaders – Joe Biden, Boris Johnson and Scott Morrison – jointly announced an “enhanced trilateral security partnership” named AUKUS (Australia – UK – US).

Signalling that AUKUS meant business, the first announcement by the three leaders was that the UK and US would provide Australia with the classified technology and wherewithal needed to build and operate up to eight nuclear-powered attack submarines (SSNs).

Previously, the US has transferred nuclear submarine technology only to the UK in 1958; Australia will be the second recipient, making it the world's seventh operator of nuclear submarines after America, Britain, China, France, India and Russia.

This was a slap on the face to France, since Australia had already chosen Naval Group, the French shipbuilder, to supply 12 conventional, diesel-electric submarines for \$90 billion. Now that is cancelled and, instead, Australia will have a fleet of SSNs, based on American and British designs, that can patrol the faraway South China Sea, while remaining interoperable with its AUKUS alliance partners' submarines.

Adding insult to injury, the decision not to buy Naval Group's conventional Barracuda submarines came with the implicit conclusion that they lacked the range and capability needed to confront its People's Liberation Army (Navy), or PLA(N) adversaries.

Washington's role in forming AUKUS and in equipping the Royal Australian Navy (RAN) with SSNs is part of America's strategic attention shift from messy conflicts in West Asia to the growing confrontation with an assertive rival superpower – China.

No longer is US security policy driven by American thirst for West Asian oil supplies. According to data for the year 2020, from “International Energy Statistics,” the US is now the world's biggest oil producer with an output of 18.60 million barrels per day (mbpd) – 20 per cent of the world's total output. With an annual consumption of 20.51 mbpd, the US needs to import only a small quantity of oil.

Meanwhile, the UK too is eager to deepen its involvement in the Asia-Pacific. With Brexit, London has detached itself from the European strategic architecture and re-plugged into the Anglosphere. True, the UK has not been a heavyweight player in the Indo-Pacific for decades. However, US concern over China's growing clout and aggression in those waters causes it to welcome the support of its closest strategic partner.

Canberra too is plugging back into the Anglosphere. Australia's armed forces have always demonstrated commitment towards their treaty obligations with the US, even sending troops into combat in Afghanistan and Iraq to pay what is pithily termed “the blood sacrifice”. Australia's attitude towards China has been increasingly more belligerent, which is dangerous for Canberra, given its proximity to China, and its trade dependence on that country.



Alongside the outrage in Paris, there was consternation in New Delhi too over Washington's readiness to give an AUKUS alliance partner nuclear technology for submarines, while denying India – a designated “major defence partner” and a key ally in the Indian Ocean – similar access to nuclear reactor technology for its planned line of SSNs and an aircraft carrier.

India's submarine dilemma

Amidst this churning, New Delhi announced in June that it was tendering for the indigenous construction of six conventional submarines, powered by Air Independent Propulsion (AIP). Within India's strategic community, a debate rages over the question – echoing that currently being heard in Australia – of whether the Indian Navy should be going in for conventional diesel-electric submarines, or AIP vessels or SSNs.

In diesel-electric boats (as submariners incongruously refer to their submarines), large banks of batteries power electric motors that turn the submarine's propellers. But the batteries quickly get discharged and the boat must surface every day or two to run onboard diesel generators, which require atmospheric air, to recharge their batteries. During battery charging, the surfaced submarine is vulnerable to detection since enemy radars quickly detect submarine masts or snorkels protruding above the surface.

To avoid detection, the ideal solution is nuclear propulsion.

Nuclear reactors require no oxygen, which allows these submarines almost indefinite underwater endurance, limited only by human endurance and the amount of food that a submarine can carry. However, nuclear propulsion has serious technology challenges and India is still struggling to build a reactor small enough for an attack submarine.

AIP provides the next best solution, allowing submarines to remain underwater for up to two weeks, which provides the enemy with less opportunity to detect a surfaced boat.

The most common AIP systems use “fuel cell technology”, which generates power through the reverse electrolysis of oxygen and hydrogen, with the two elements chemically combining to generate electricity to charge the submarine's batteries. Another technology solution for an AIP system is the Phosphoric Acid Fuel Cell (PAFC) technology. This solution, which the DRDO is developing, is more rugged, tolerant of fuel impurities, and offers longer life and efficiency.

However, hydrography (underwater geography) prevents the Indian Navy for opting for an all-conventional, or all-nuclear submarine fleet. That is because the underwater gradient in the Arabian Sea is so restricted that large nuclear submarines cannot come in close to the shore without scraping against the seabed. 50 kilometres out of Karachi, the seabed is just 50 metres deep, which is too shallow for nuclear submarine operations. Hence, in the Arabian Sea, conventional submarines – which are significantly smaller than nuclear boats – are essential for submerged operations.

India's eastern coast, on the Bay of Bengal, however has a sharp gradient that allows even large nuclear SSNs to operate freely just a couple of kilometres out of harbour. Furthermore, conventional submarines cannot carry out the long transit submerged to patrol areas, such as the Malacca and Sunda Straits. They would need to recharge batteries en route, compromising operational secrecy. Therefore, India's eastern coast needs large, nuclear SSNs that have long underwater endurance.

The Indian submarine project, therefore continues on two tracks: small conventional submarines for the Arabian Sea and an SSN programme for the Bay of Bengal. India has made a breakthrough in nuclear-propelled, nuclear armed submarines (SSBN) and the first of them, INS Arihant, is already operationally deployed in deterrence patrols. More SSBNs are in the pipeline.

However the SSN programme is proceeding only slowly. An American offer of nuclear propulsion technology, such as the one made to Australia, would be welcomed in New Delhi. However that would carry the quid pro quo of alliance burdens, a price that India, unlike Australia, is unwilling to pay.

Arming across the Asia-Pacific

<u>Country</u>	<u>New Weaponry</u>	<u>Remarks</u>
Australia	8 nuclear powered submarines	From UK under AUKUS
	Tomahawk cruise missiles on warships	
	Long-Range Anti-Ship Missiles (LRASM) for F/A-18 and F-35A Lightning II fighters	Can hit targets at a range of 900 km
	Precision guided missiles that can destroy targets from over 400 km planned for its land forces.	
	Australia and US to collaborate to develop hypersonic missiles.	Under the trilateral AUKUS security deal.
	US has approved \$3.5 billion sale of 29 Boeing AH-64E Apache attack helicopters to Australia	
<u>Taiwan</u>	Announced expenditure of \$8.69 billion over the next five years to upgrade its weapons capabilities	This comes on top of planned military spending of \$17 billion for 2022.
	The programme will include a new, 1,200 km range, upgraded Hsiung Sheng cruise missile.	
	Taiwan has new "aircraft carrier killers" like the PLA's Dong Feng 21D and Dong Feng 26.	Also developing its own submarines
	Washington has approved sales of 100 Harpoon Coastal Defence Systems, three missile systems, artillery, and four aerial drones.	Worth about \$5 billion in total
	In August, Washington approved the sale to Taiwan of 40 x 155mm M109A6 self-propelled howitzers.	The deal is valued at up to \$750 million
<u>South Korea</u>	Tested a submarine-launched ballistic missile (SLBM) this month First non-nuclear country to develop	This is a variant of ground-based Hyunmoo-2B ballistic missile, with a range of

	such a system.	about 500 km.
	In 2020, South Korea proposed to build three submarines. Two of them, which displace 3,000 tons and 3,600 tonnes - will have diesel engines. However it is unclear how the third one, at 4,000 tonnes, would be powered.	Building a nuclear submarine has been among President Moon Jae-in election pledges, but he has never officially announced it after taking office in 2017.
	Seoul has unveiled new missiles, including a supersonic cruise missile to be deployed soon	
	South Korea has been striving to develop solid-fuel rocket engines. This is intended to launch a spy satellite by the late 2020s.	Has successfully carried out a test firing in July.
<u>China</u>	It is mass producing the DF-26, a multipurpose weapon that can be fitted with nuclear warheads and has a range of up to 4,000 km.	It also has the DF-41 intercontinental ballistic missiles, the backbone of China's nuclear deterrent.
	The hypersonic DF-17 missile is said to manoeuvre at many times the speed of sound, making it more difficult to counter.	
	In 2019, China unveiled new unmanned aerial vehicles (UAVs)	
<u>Japan</u>	It has spent millions of dollars on long-range air-launched weapons, and is developing a new truck-mounted anti-ship missile, the Type 12, with a 1,000 km range.	
	In 2020, Washington cleared the sale to Japan of 105 Lockheed F-35 fighters for about \$23 billion	

https://www.business-standard.com/article/current-affairs/india-s-submarine-conundrum-nuclear-or-conventional-121092401081_1.html

Prestigious IETE award bestowed on HAL engineer

Mr. Sharma shares the award with Prof (Dr) Janakarajan Ramkumar, IIT Kanpur

Bengaluru: A young engineer from HAL, Mr. Prikshat Sharma, has been bestowed with the prestigious IETE (The Institution of Electronics and Telecommunication Engineers) award for the year 2021 for his contribution to the development of Integrated Avionics System Testing Rig for avionics rotatable tables of LCA aircraft, the first-ever in-house facility established for an LCA production program.

Mr. Sharma works as Deputy General Manager at HAL's LCA Tejas Division and received the award from Prof Dr. J W Bakal, President, IETE at a digital event held today on the occasion of the 64th IETE Convention. The award consists of a citation, a medal, and a plaque.

Mr. Sharma shares the award with Prof (Dr) Janakarajan Ramkumar, IIT Kanpur.

Instituted by Dr. R K Tyagi, former Chairman of HAL in memory of his late father Devi Singh Tyagi in 2016, the award is presented to a technocrat or a scientist or an engineer or an academician for outstanding contribution in the field of avionics and defence electronics that results in strategic and commercial advantage towards meeting the national objective of 'Make in India'.

"LCA is a very important project for all of us and we are happy that one of our key executives received the award this year", says Mr R Madhavan, CMD, HAL.

The Automated Test Equipment (ATE), which Mr. Sharma was instrumental in developing, performs a complete functional test of LRUs (Line Replaceable Units) by simulating all the necessary communication interfaces available on an aircraft. With the commissioning of this ATE, the cycle-time and man-hour requirements for Pre-Installation (PI) checks come down drastically as it avoids multiple to and fro commutation to various agencies. This is a huge leap in self-sufficiency in the production activities of Tejas fighter.

<https://www.psuconnect.in/news/prestigious-iete-award-bestowed-on-hal-engineer/29494>



Defence technology key to the future of Atmanirbhar Bharat

These initiatives and more, visibly seen in the Defence Expos and in the recently concluded Aero India Show in Bengaluru epitomize that India has created the mark in the technology world

By Lt. Gen Anil Kapoor (Retd)

A resurgent India on the move can be said to have embarked on a two and a half front technology sojourn. The First Front is the Make in India, as a precursor to Made in India, the Second Front being Aatmanirbhar Bharat as a call for self-reliance and the Half Front is Start-up India to champion the agile ignited young minds into entrepreneur ventures. All these coming up concurrently has created an enormous technology and innovation bandwidth, and an excitement in India which has tech-reverberations world-wide. A Nation known for technical prowess comprising strategic thinkers and technology wizards, the white collared enabler professionals and skilled innovative tech workforce at the grass roots, has ushered an era in technology development by giving the world two major game changing concepts – “Jugaad” which means a resourceful approach to problem solving and “Atmanirbhar Bharat” which means self-reliance. These initiatives and more, visibly seen in the Defence Expos and in the recently concluded Aero India Show in Bengaluru epitomize that India has created the mark in the technology world.



Globally, India today stands as the second largest importer of Defence equipment.

The New Tech World Order is defined by Four Ds – Data, Digitisation, Digitalisation and Disruption. While these have fueled digital transformation globally giving rise to a large number of dual use technologies which are drivers of automation & autonomous applications, it is disruption which is not only transforming technologies at an unprecedented pace, but also transforming business concepts, models, processes and practices. While automated systems are rule based, the autonomous systems are designed and programmed to take decisions and act. Supported by AI, IoT, Augmented Reality (AR), Virtual Reality (VR), Big data analytics and BlockChain technology and interconnected by 5G networks, the cyber-based System of Systems have revolutionized dual use and military technologies. An apt example is Autonomous Unmanned Systems which have created systems for global air traffic controls, local traffic management, transformed precision manufacturing and many more, on the one hand, and automated weapon systems, on the other hand, as demonstrated in the Azerbaijan – Armenia War 2020 through swarms of drones. These systems typically comprise a land based autonomous pivot with computer based system’s application software for Command & Control info based decision support, tightly integrated with the mobile maneuver arm comprising actionable elements or combat elements in automated systems with man in the loop or fully autonomous systems with man out of the loop. Automated Unmanned Systems comprise a myriad of niche disruptive technologies, both at the hardware and software levels.

With a country of India’s size, endowments, geographical location, regional and global imperatives and perennial security challenges (both internal and external), self-reliance in defence technologies is inescapable and must be the edifice of the National agenda. A durable national security requires credible defence capability and capacity for dissuasion, deterrence and meeting the conventional threats. Development of industrial infrastructure, strategic technology management and establishment of a credible defence industrial base will be the future mainstay of

developing Nations like India. The task ahead of India is daunting given that India is the world's second largest arms importer and hence, the Defence Industrial Base in India is a compulsion, both for sustaining the military power and to emerge as a defence manufacturing hub.

Globally, India today stands as the second largest importer of Defence equipment. Defence Industrial Base focus has to be on increasing indigenous defence research, design, development, manufacturing, and, as a corollary, move the Country towards greater self-reliance and net exporter of defence equipment. The Make in India, Aatmanirbhar Bharat programmes and numerous policy initiatives like FDI policy, negative import list, Defence industrial corridor, review of defence procurement procedure and others, the long-term strategic partnerships have emerged as essential tools to solve the existing problems and promote self-reliance in defence industry. Three core elements, namely 'defence' (security necessity, policy formulation and implementation), 'industry' (providers of goods and services), resources (budget, technology, research and innovation) powered by competent and qualified human resource (defence technology, knowledge management and skills) are interdependent as they combine to create the Defence Industrial Base (DIB).

It is, therefore, an opportune moment to involve academia to synergise with industry, in general, and defence industry, in particular, to launch science, technology and engineering programs in defence technologies to create the turf of defence technology professionals. India has embarked on a journey to modernize the Armed Forces. It is encouraging that the Master of Technology Defence Technology Program conceived by DRDO and All India Council for Technical Education (AICTE) is indeed a defining moment among private and central Universities to participate in this Defence Technology Programme. Recently, Amity University at Noida and Gurugram campus have taken up the challenge to be the forerunners of this unique M Tech Def Tech Programme. The M Tech course comprises six verticals comprising combat vehicles, naval, aerospace and missiles, directed energies, high energy materials, communication and sensors and disruptive technologies. It is a considered view that preparing knowledgeable and skilled defence technology professionals will provide young budding engineers with great employment opportunities within the arena of defence start-ups, OEMs, Tier 1,2 and 3 private industry, DPSUs, Ordnance Factories and DRDO. Such professionals shall facilitate and catapult India into the league of formidable defence industry complex Nations both for indigenisation of defence equipment and be a stronger competitor in defence exports. High time India fights her wars with Indian Weapons and Military equipment.

The New World Order respects Nations with the strength to manage VUCAD (Volatility, Uncertainty, Complexity, Ambiguity and Disruption). Bewildered and worried by the struggle, a child opens the cocoon to let the butterfly fly off. Alas, the butterfly failed to fly and perished since the wings did not develop the intrinsic strength afforded by Nature in the struggle moments of de-cocooning. With a good intent but inadequate knowledge of 'how's and whys' of the child, a potential creation was terminated. Aatmanirbhar Bharat and Made-in-India hold a great strategic intent. In the backdrop of a strong technical base provided by ISRO, DRDO, Technology and Innovation Centres of industries and PSUs, Start-ups and Technology Hubs, the time is ripe to strengthen the cocoon through qualified Defence Technology professionals and fly out the technology butterfly globally. The tech sojourn must become an illustrious lasting tech journey. Let the youngsters join the exercise in Nation building through M Tech in Defence Technology – the future lies here and beckons.

(The author superannuated as Director General Electronics and Mechanical Engineering (DG EME) and is presently an Honorary Advisor, Amity University. Views expressed are personal and do not reflect the official position or policy of Financial Express Online)

<https://www.financialexpress.com/defence/defence-technology-key-to-the-future-of-atmanirbhar-bharat/2337983/>

Mumbai-based shipping companies on NIA radar over Karachi bound Chinese vessel

By Rahul Tripathi

Synopsis

A show-cause notice was initially issued by the customs department to Chinese vessel owners and the two shipping companies now under the NIA radar.

Two Mumbai-based shipping companies have come under the scanner of a NIA team probing the case of a Karachi bound Chinese vessel that allegedly carried equipment for making rocket motors for missiles. The Chinese merchant vessel Da Cui Yun was stopped from its onward journey by customs officials at Deendayal Port, formerly known as Kandla Port, in February 2020, after the dual use material was found during inspection.

It was later allowed to sail to Karachi after the suspected cargo was seized. Investigators have alleged that the Chinese vessel attempted to clandestinely ship the dual use cargo, Autoclave, from Shanghai to Pakistan's Qasim Port, via Kandla, by suppressing identity and critical information on the cargo.

NIA took over the probe last week after the issue was deliberated by officials of home, external affairs and defence ministries. The Defence Research and Development Organisation gave the opinion that Autoclave could be used to manufacture long-range missiles. Sources said Chinese nationals based in Hong Kong were identified during NIA probe. Indian security agencies allege China has been clandestinely helping Pakistan to enhance missile capabilities.

NIA estimated that the market value of cylindrical shell Autoclave was Rs 10.50 crore. An NIA spokesperson refused to comment on the status of the probe. It is probing the case under the Weapons of Mass Destruction and Delivery System (Prohibition of Unlawful Activities) Act. The 2005 law prescribes five years imprisonment minimum and life imprisonment maximum, for those violating the Act. A show-cause notice was initially issued by the customs department to Chinese vessel owners and the two shipping companies now under the NIA radar.

<https://economictimes.indiatimes.com/news/india/mumbai-based-shipping-companies-on-nia-radar-over-karachi-bound-chinese-vessel/articleshow/86499659.cms>



अमरउजाला

Sun, 26 Sept 2021

डीआरडीओ की टीम करेगी ऑक्सीजन प्लांट उत्पादन के मानकों की जांच

रामपुर: जिला अस्पताल में स्थापित किए गए ऑक्सीजन प्लांट से ऑक्सीजन उत्पादन के मानकों और गुणवत्ता की जांच डीआरडीओ (डिफेंस रिसर्च एंड डेवलपमेंट आर्गनाइजेशन) और टाटा कंपनी की टीम करेगी। टीम की जांच रिपोर्ट में सब कुछ सही पाए जाने पर प्लांट को चालू कर दिया जाएगा।

कोरोना संक्रमण की संभावित तीसरी लहर को देखते हुए जिले में उपचार को लेकर पर्याप्त संसाधन जुटाए जा रहे हैं। इसके तहत बच्चों के उपचार के लिए जहां एक ओर पीडियाट्रिक इंटेसिव केयर यूनिट (पीकू) वार्ड स्थापित किया गया है तो वहीं बिलासपुर सीएचसी और जिला अस्पताल में ऑक्सीजन प्लांट भी स्थापित किए गए हैं। बिलासपुर सीएचसी में स्थापित तीन सौ एलपीएम (लीटर प्रति मिनट) क्षमता के ऑक्सीजन प्लांट का उद्घाटन केंद्रीय अल्पसंख्यक कार्य मंत्री एवं राज्यसभा में उपनेता मुख्तार अब्बास नकवी कर चुके हैं। वहीं जिला अस्पताल में स्थापित एक हजार एलपीएम क्षमता के ऑक्सीजन प्लांट का संचालन शुरू होना है। इसके लिए प्लांट का टेस्ट रन किया जा रहा है। टेस्ट रन की प्रक्रिया पूरी होने के बाद डीआरडीओ और टाटा कंपनी की टीम जिला अस्पताल पहुंचेगी और ऑक्सीजन प्लांट से बनने वाली ऑक्सीजन की गुणवत्ता और मानकों की जांच करेगी। टीम की जांच में सब कुछ सही पाए जाने पर इसका संचालन शुरू किया जाएगा।

<https://www.amarujala.com/uttar-pradesh/rampur/probe-of-oxxygen-plant-rampur-news-mbd4039764116>

तेजस की तकनीक से ऑक्सीजन बनाएगा पीएसए प्लांट

ऋषिकेश: अखिल भारतीय आयुर्विज्ञान संस्थान (एम्स) ऋषिकेश में नवनिर्मित पीएसए ऑक्सीजन प्लांट में स्वदेशी फाइटर जेट एलसीए तेजस की ऑक्सीजन तकनीक का प्रयोग किया गया है। डीआरडीओ ने 24 घंटे में एक हजार लीटर प्रति मिनट ऑक्सीजन का उत्पादन करने वाले प्लांट को महज दो माह में तैयार किया है। इसके बाद एम्स की ऑक्सीजन आपूर्ति क्षमता दोगुनी हो गई है।

कोरोना की आशंकित तीसरी लहर के मद्देनजर पूरे देश में ऑक्सीजन पावर बैंक को बढ़ाया जा रहा है। देशभर में 548 पीएसए ऑक्सीजन प्लांट तैयार करने की जिम्मेदारी डीआरडीओ को दी गई है। प्लांट में प्रेशर स्विंग एडसोर्प्शन (पीएसए) मालिक्यूलर सीइव (जियोलाइट) तकनीक के प्रयोग से वातावरण में मौजूद तकनीक से ऑक्सीजन बनाई जाती है। इस तकनीक पर आधारित ऑक्सीजन प्लांट्स सबसे पहले लेह और उत्तर-पूर्व के राज्यों में लगाए थे। डीआरडीओ ने अब यह तकनीक टाटा कंपनी, कोयम्बटूर की ट्राईटेंड न्यूमैटिक प्राइवेट लिमिटेड, इंडियन इंस्टीट्यूट ऑफ पैट्रोलियम (आईपीपी) को सौंप दी है। तीनों कंपनियों देशभर में 548 पीएसए ऑक्सीजन प्लांट स्थापित कर रही हैं। इसमें 380 प्लांट टाटा, 120 प्लांट आईपीपी और 48 प्लांट ट्राईटेंड न्यूमैटिक प्राइवेट लिमिटेड तैयार कर रही है। एम्स ऋषिकेश में स्थापित नए पीएसए प्लांट का निर्माण टाटा कंपनी ने किया है।



एम्स में बने ऑक्सीजन गैस प्लांट का निरीक्षण करते जिलाधिकारी डॉ.आर राजेश कुमार, एसएसपी जन्मेजय खं - फोटो : RISHIKESH

190 मरीजों को मिलेगी ऑक्सीजन

पीएसए ऑक्सीजन प्लांट में हर मिनट एक हजार लीटर ऑक्सीजन का उत्पादन होता है। प्लांट से एक समय पर 190 मरीजों को पांच लीटर प्रति मिनट ऑक्सीजन की आपूर्ति की जा सकती है। वहीं 195 ऑक्सीजन सिलिंडर को रीफिल किया जा सकता है। ऑक्सीजन प्लांट से 64 वेण्टिलेटर को 15 लीटर ऑक्सीजन प्रति मिनट की ऑक्सीजन दी जा सकती है।

एम्स में दोगुनी हुई ऑक्सीजन उत्पादन क्षमता



एम्स के पहले से लिक्विड ऑक्सीजन स्टोरेज प्लांट बना हुआ है। प्लांट की आक्सीजन स्टोरेज क्षमता 30 हजार लीटर है। पीएसए ऑक्सीजन प्लांट से एक दिन में 24 हजार लीटर ऑक्सीजन का उत्पादन होगा। ऐसे में अब एम्स की ऑक्सीजन आपूर्ति क्षमता 54 हजार लीटर हो गई है। यह पहले के मुकाबले लगभग दोगुनी क्षमता है।

करीब एक सप्ताह पहले पीएसए ऑक्सीजन प्लांट तैयार हो गया था। प्लांट में 24 घंटे प्रति मिनट एक हजार लीटर ऑक्सीजन का उत्पादन होता है। प्लांट के निर्माण होने उत्तराखंड और अन्य राज्यों से आने मरीजों का इसका लाभ मिल पाएगा। कोविड संक्रमण के दृष्टिगत भी यह एक उल्लेखनीय कदम है।

-हरीश मोहन थपलियाल, पीआरओ, एम्स ऋषिकेश

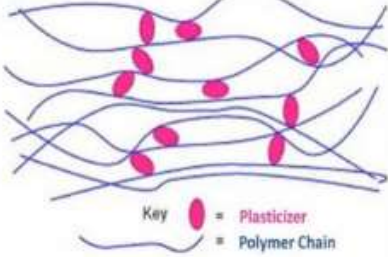
<https://www.amarujala.com/uttarakhand/rishikesh/psa-plant-will-make-oxygen-with-the-technology-of-tejas-rishikesh-news-drn3914426171>



DRDO on Twitter

 **NewsMeter**  @NewsMeter_In · Sep 24

UoH ACRHEM gets patent for inventing green method to develop energetic plasticizers #Hyderabad #UoH #Plasticizers

Plasticizers help in improving the flexibility and mechanical stability of the polymer-based materials.



Key  = Plasticizer
 = Polymer Chain

UoH ACRHEM gets patent for inventing green method to develop ener...
The invention is titled "Green Method for the Synthesis of Bis (Fluoroalkyl) Carbonate".
[newsmeter.in](https://www.newsmeter.in)



Press Information Bureau
Government of India

Ministry of Defence

Sun, 26 Sept 2021 2:44PM

Chief of the Naval Staff visit to Oman 27–29 Sep 21

Admiral Karambir Singh, Chief of the Naval Staff (CNS), arrived in Oman for a three-day official visit from 27 – 29 Sep 21. The visit aims to consolidate bilateral defence relations with Oman, as also to explore new avenues for defence cooperation.

The CNS is scheduled to hold bilateral discussions with his counterpart Rear Admiral Saif bin Nasser bin Mohsen Al-Rahbi, Commander of Royal Navy of Oman (RNO) in Muscat.

During the visit, the CNS would also be interacting with senior hierarchy of Oman including Vice Admiral Abdullah Khamis Abdullah Al Raisi (Chief of Staff Sultan's Armed Forces), Maj Gen Matar Bin Salim Bin Rashid Al Balushi (Commander of Royal Army of Oman), Air Vice Marshal Khamis Bin Hammad Bin Sultan Al Ghafri (Commander of Royal Air Force of Oman) and Dr. Mohammad Bin Nasser Bin Ali Al Zaabi (Secretary General, MoD). He would also be visiting key defence installations like Muaskar Al Murtafa (MAM) Camp, Maritime Security Centre (MSC), Said Bin Sultan Naval Base, Al Musanna Air Base and National Defence College, Oman.

The Indian Navy cooperates with Royal Navy of Oman on many fronts, which include operational interactions, training cooperation, and exchange of Subject Matter Experts in various fields. Both Navies have been participating in the biennial maritime exercise *Naseem Al Bahr* since 1993. This exercise was last conducted in 2020, off Goa and the next edition is scheduled in 2022.

This official visit of the CNS to Oman highlights the growing cooperation between Indian Navy and Royal Navy of Oman.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1758251>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Sun, 26 Sept 2021 2:44PM

दिनांक 27 से 29 सितंबर, 2021 तक नौसेना प्रमुख का ओमान दौरा

नौसेना प्रमुख एडमिरल करमबीर सिंह दिनांक 27 से 29 सितंबर 2021 तक तीन दिवसीय आधिकारिक यात्रा के लिए ओमान पहुंचे। इस यात्रा का उद्देश्य ओमान के साथ द्विपक्षीय रक्षा संबंधों को मजबूत करना है, साथ ही रक्षा सहयोग के लिए नए रास्तों की तलाश करना है।

नौसेना प्रमुख मस्कट में रॉयल नेवी ऑफ ओमान (आरएनओ) के कमांडर रियर एडमिरल सैफ बिन नासिर बिन मोहसेन अल-रहबी के साथ द्विपक्षीय चर्चा करने वाले हैं।

इस यात्रा के दौरान नौसेना प्रमुख वाइस एडमिरल अब्दुल्ला खमिस अब्दुल्ला अल रायसी (चीफ ऑफ स्टाफ), मेजर जनरल मटर बिन सलीम बिन राशिद अल बलुशी (ओमान की शाही सेना के कमांडर), एयर वाइस मार्शल खमिस बिन हम्माद बिन सुल्तान अल गफरी (ओमान की रॉयल एयर फोर्स के कमांडर) और डॉ मोहम्मद बिन नासिर बिन अली अल जाबी (महासचिव, रक्षा मंत्रालय) समेत ओमान में सुरक्षा अमले से जुड़े वरिष्ठ अधिकारियों के साथ भी बातचीत करेंगे। वह मुस्कर अल मुर्तफा (एमएएम) कैंप, मैरीटाइम सिक्योरिटी सेंटर (एमएससी), सैद बिन सुल्तान नेवल बेस, अल मुसाना एयर बेस और नेशनल डिफेंस कॉलेज, ओमान जैसे प्रमुख रक्षा प्रतिष्ठानों का भी दौरा करेंगे।

भारतीय नौसेना कई मोर्चों पर ओमान की रॉयल नेवी के साथ सहयोग करती है, जिसमें विभिन्न क्षेत्रों में अभियानगत बातचीत, प्रशिक्षण सहयोग एवं विषय के विशेषज्ञों का आदान-प्रदान शामिल है। दोनों नौसेनाएं 1993 से द्विवार्षिक समुद्री अभ्यास नसीम अल बहर में भाग ले रही हैं। यह अभ्यास आखिरी बार 2020 में गोवा में आयोजित किया गया था और अगला संस्करण 2022 में होना निर्धारित है।

नौसेना प्रमुख की ओमान की यह आधिकारिक यात्रा भारतीय नौसेना और ओमान की रॉयल नेवी के बीच बढ़ते सहयोग पर रौशनी डालती है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1758363>



MoD signs contract with Airbus Defence & Space, Spain for acquisition of 56 C-295MW transport aircraft for IAF

Key Highlights:

- *Big step towards modernisation of IAF transport fleet*
- *5-10 tonne capacity aircraft equipped with contemporary technology*
- *Airbus to also directly purchase eligible products & services from Indian Offset Partners*
- *Unique opportunity for domestic private sector to enter into technology intensive aviation industry*

Ministry of Defence (MoD) signed a contract with M/s Airbus Defence and Space, Spain for acquisition of 56 C-295MW transport aircraft for the Indian Air Force, on September 24, 2021. The MoD has also signed an Offset Contract with M/s Airbus Defence and Space through which M/s Airbus will discharge its offset obligations through direct purchase of eligible products and services from Indian Offset Partners. These contracts were signed following the approval accorded by the Cabinet Committee on Security earlier this month.

The induction of C-295MW will be a significant step towards modernisation of the transport fleet of the Indian Air Force (IAF). It is a transport aircraft of 5-10 tonne capacity with contemporary technology that will replace the ageing Avro transport aircraft of IAF. The aircraft is capable of operating from semi-prepared strips and has a rear ramp door for quick reaction and para dropping of troops & cargo. The aircraft will give a major boost to tactical airlift capability of IAF, especially in the Northern and North-Eastern sector and Andaman & Nicobar Islands.

The project will provide a major boost to the 'Atmanirbhar Bharat Abhiyan' of the Government that offers a unique opportunity for the Indian private sector to enter into technology intensive and highly competitive aviation industry. Out of 56, forty aircraft will be manufactured in India by TATA Consortium. All the deliveries will be completed within ten years of signing of the contract. All 56 aircraft will be installed with indigenous Electronic Warfare Suite. After completion of the delivery, the subsequent aircraft manufactured in India can be exported to countries which are cleared by the Government of India. The project will give a boost to aerospace ecosystem in India wherein several MSMEs spread over the country will be involved in manufacturing of parts of the aircraft. The program will also involve development of specialised infrastructure in the form of hangars, buildings, aprons and taxiway.

This programme is a unique initiative of the Government to strengthen the indigenous capabilities and boost 'Make in India'.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1757634>





रक्षा मंत्रालय ने भारतीय वायुसेना के लिए 56 सी-295 एमडब्ल्यू परिवहन विमान के अधिग्रहण के लिए एयरबस डिफेंस एंड स्पेस, स्पेन के साथ अनुबंध पर हस्ताक्षर किए

प्रमुख बातें:

- भारतीय वायुसेना के परिवहन बेड़े के आधुनिकीकरण की दिशा में बड़ा कदम
- समकालीन प्रौद्योगिकी से लैस 5-10 टन क्षमता के विमान
- एयरबस भी सीधे भारतीय ऑफसेट पार्टनर्स से समुचित उत्पादों और सेवाओं की खरीद करेगी
- घरेलू निजी क्षेत्र के लिए प्रौद्योगिकी गहन विमानन उद्योग में प्रवेश करने का अनूठा अवसर

रक्षा मंत्रालय ने दिनांक 24 सितंबर, 2021 को भारतीय वायु सेना के लिए 56 सी-295एमडब्ल्यू परिवहन विमान के अधिग्रहण के लिए मैसर्स एयरबस डिफेंस एंड स्पेस, स्पेन के साथ एक अनुबंध पर हस्ताक्षर किए। रक्षा मंत्रालय ने मैसर्स एयरबस डिफेंस एंड स्पेस के साथ एक ऑफसेट अनुबंध पर भी हस्ताक्षर किए हैं जिसके माध्यम से मैसर्स एयरबस भारतीय ऑफसेट भागीदारों से योग्य उत्पादों और सेवाओं की सीधी खरीद के माध्यम से अपने ऑफसेट दायित्वों का निर्वहन करेगा। इन अनुबंधों पर इस महीने की शुरुआत में कैबिनेट की सुरक्षा मामलों की कमेटी द्वारा दी गई मंजूरी के बाद हस्ताक्षर किए गए थे।



सी-295एमडब्ल्यू को शामिल करना भारतीय वायु सेना के परिवहन बेड़े के आधुनिकीकरण की दिशा में एक महत्वपूर्ण कदम होगा। यह समकालीन तकनीक के साथ 5-10 टन क्षमता का परिवहन विमान है जो भारतीय वायुसेना के पुराने एवरो परिवहन विमान की जगह लेगा। विमान आधी तैयार की गई एयर स्ट्रिप्स से संचालन करने में सक्षम है और इसमें तेज़ प्रतिक्रिया और सैनिकों तथा कार्गो के पैरा ड्रॉपिंग के लिए एक रियर रैंप दरवाजा है। विमान विशेष रूप से उत्तरी और उत्तर-पूर्वी क्षेत्र और अंडमान तथा निकोबार द्वीप समूह में भारतीय वायुसेना की सामरिक एयरलिफ्ट क्षमता को बढ़ावा देगा।

यह परियोजना सरकार के 'आत्मनिर्भर भारत अभियान' को बढ़ावा देगी जो भारतीय निजी क्षेत्र को प्रौद्योगिकी गहन और अत्यधिक प्रतिस्पर्धी विमानन उद्योग में प्रवेश करने का एक अनूठा अवसर प्रदान करती है। 56 में से 40 विमान भारत में टाटा कंसोर्टियम द्वारा निर्मित किए जाएंगे। अनुबंध पर हस्ताक्षर करने के 10 साल के भीतर सभी डिलीवरी पूरी कर ली जाएंगी। सभी 56 विमानों को स्वदेशी इलेक्ट्रॉनिक वारफेयर सूट के साथ स्थापित किया जाएगा। डिलीवरी के पूरा होने के बाद भारत में निर्मित बाद के विमानों को उन देशों को निर्यात किया जा सकता है जिन्हें भारत सरकार द्वारा मंजूरी दी गई है। यह परियोजना भारत में एयरोस्पेस संबंधी पारिस्थितिकी तंत्र को बढ़ावा देगी जिसमें देश भर में फैले कई एमएसएमई उद्योग विमान के कुछ हिस्सों के निर्माण में शामिल होंगे। इस कार्यक्रम में हैंगर, भवन, एप्रन और टैक्सीवे के रूप में विशेष बुनियादी ढांचे का विकास भी शामिल होगा।

यह कार्यक्रम स्वदेशी क्षमताओं को मजबूत करने और 'मेक इन इंडिया' को बढ़ावा देने के लिए सरकार की एक अनूठी पहल है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1757803>



Press Information Bureau
Government of India

Ministry of Defence

Fri, 24 Sept 2021 5:26PM

Joint Military training exercise with Shanghai Cooperation Organisation (SCO) member states culminates at Orenburg, Russia

The 6th Edition of Exercise PEACEFUL MISSION: 2021 of SCO Member States hosted by Russia at the Orenburg Region of South West Russia culminated on 24 September 2021. The twelve days long joint training involving Armed Forces of all Shanghai Cooperation Organisation (SCO) member states was organised with an aim to foster close relations between SCO member states and to enhance abilities of the military leaders to command multinational military contingents.

In this joint multinational exercise which began on 14 September 2021, SCO member nations conducted joint training focusing on combating terrorism. All military contingents took part in the final joint exercise where-in multinational forces exhibited their tactical prowess, combat power and overwhelming dominance over terrorist groups. The validation phase of the Exercise was witnessed by all Chiefs' of the General Staff of the SCO member states. Gen Bipin Rawat, Chief of Defence Staff (CDS) who is currently on a visit to Russia witnessed the validation exercise on 23 September 2021 and expressed great satisfaction on the high standards of synergy and close ties achieved among member states during the exercise.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1757747>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Fri, 24 Sept 2021 5:26PM

शंघाई सहयोग संगठन (एससीओ) के सदस्य देशों के साथ संयुक्त सैन्य प्रशिक्षण अभ्यास का ओरेनबर्ग, रूस में समापन

रूस द्वारा आयोजित एससीओ सदस्य देशों के संयुक्त युद्धाभ्यास पीसफुल मिशन 2021 के छठे संस्करण का समापन दक्षिण पश्चिम रूस के ओरेनबर्ग क्षेत्र में दिनांक 24 सितंबर 2021 को हुआ। शंघाई सहयोग संगठन (एससीओ) के सभी सदस्य देशों के सशस्त्र बलों को शामिल कर 12 दिनों का यह संयुक्त प्रशिक्षण एससीओ सदस्य देशों के बीच घनिष्ठ संबंधों को बढ़ावा देने और बहुराष्ट्रीय सैन्य टुकड़ियों को कमांड करने की सैन्य लीडरान की क्षमताओं को बढ़ाने के उद्देश्य से आयोजित किया गया था।

दिनांक 14 सितंबर 2021 को शुरू हुए इस संयुक्त बहुराष्ट्रीय अभ्यास में, एससीओ सदस्य देशों ने आतंकवाद का मुकाबला करने पर ध्यान केंद्रित करते हुए संयुक्त प्रशिक्षण अभ्यास आयोजित किया। सभी सैन्य टुकड़ियों ने अंतिम संयुक्त अभ्यास में भाग लिया, जिसमें बहुराष्ट्रीय बलों ने अपने सामरिक कौशल, युद्ध शक्ति और आतंकवादी समूहों पर हावी होने वाली क्षमताओं का प्रदर्शन किया। अभ्यास के सत्यापन चरण को एससीओ सदस्य देशों के जनरल स्टाफ के सभी प्रमुखों ने देखा। चीफ ऑफ डिफेंस स्टाफ (सीडीएस) जनरल बिपिन रावत, जो वर्तमान में रूस की यात्रा पर हैं, ने दिनांक 23 सितंबर 2021 को सत्यापन अभ्यास देखा और अभ्यास के दौरान सदस्य देशों के बीच तालमेल तथा घनिष्ठ संबंधों के उच्च मानकों पर संतोष व्यक्त किया।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1757806>

Air Marshal Sandeep Singh to be next IAF Vice Chief

Air Marshal Sandeep Singh has been appointed as the next Vice Chief of the Indian Air Force. He will succeed Air Marshal VR Chaudhari, who will take over as the next Chief of Air Staff by the end of the month.

By Manjeet Negi

New Delhi: Air Marshal Sandeep Singh has been appointed as the next Vice Chief of the Indian Air Force. He will succeed Air Marshal VR Chaudhari, who will take over as the Chief of Air Staff on September 30.

Air Marshal Sandeep Singh was commissioned into the Indian Air Force as a fighter pilot on December 22, 1983. He has experience of flying for over 4,150 hours and is qualified to fly on Su-30 MkI, Mig-29 and Mig-21 aircraft.

Air Marshal Sandeep Singh is a qualified flying instructor in the A2 category and an exceptional test pilot. He has been the flight commander of a Mig-21 Squadron and an instructor at the Air Force Test Pilots School.

Air Marshal Sandeep Singh has also been the project test pilot with the IAF Su-30 project team in Russia and is presently the commanding officer of a Su-30 Mk-1 Squadron.

As a test pilot with the Su-30 project team in Russia, he was instrumental in evolving the navigation, display and weapon employment logic of Su-30 Mk I aircraft.

The Su 30 Mk 1 is being hailed as a 'first of its kind' project in which the best of Russian and western technologies have been synergised to produce one of the most potent fighter aircraft in the world.

With his operational flying experience, professional knowledge and analytical approach, Air Marshal Sandeep Singh also spearheaded the integration team of Indian, Russian and Western specialists to ensure the success of the Su-30 Mk 1 project.

Air Marshal Sandeep Singh is also a recipient of the Sword of Honour -- for standing first in the overall order of merit in his course.

<https://www.indiatoday.in/india/story/air-marshal-sandeep-singh-next-iaf-vice-chief-1856688-2021-09-24>



Air Marshal Sandeep Singh will take over as the next IAF Vice Chief.

Lt Gen Nav K Khanduri appointed as next Chief of Army's Western Command

Lieutenant General Nav K Khanduri has been appointed as the next chief of Indian Army's Western Command in Chandimandir. This is the first time that the government has appointed an Army Air Defence Corps officer to the post

By Manjeet Negi

In a first, the Centre has appointed an Army Air Defence Corps officer Lieutenant General Nav K Khanduri as the next chief of Indian Army's Western Command in Chandimandir.

The command is responsible for looking after the Indian boundary with Pakistan from some part of Jammu sector to Punjab.

General Nav K Khanduri would be replacing Lt Gen RP Singh who is superannuating on October 31. He was earlier the commander of Sukna-based Trishakti Corps.

General Khanduri has also served as the Director-General of Operational Logistics and Strategic Management.

General Khanduri is an alumnus of the Rashtriya Indian Military College in Dehradun and the National Defence Academy, Pune. After his graduation from the Indian Military Academy in Dehradun, he was commissioned in the Army's Air Defence wing in December 1983.

Outgoing commander Mohanty complimented all ranks of the Corps for their unflinching commitment, dedication and devotion in accomplishing assigned tasks in extremely challenging operational environments.

<https://www.indiatoday.in/india/story/lt-gen-nav-k-khanduri-appointed-next-chief-army-western-command-1857012-2021-09-25>



General Khanduri has served as the Director-General of Operational Logistics and Strategic Management.

ISRO's NETRA in Bengaluru to soon receive information from US agency about threats to space assets

India and the United States will sign a Memorandum of Understanding on Space Situational Awareness

By Anirban Bhaumik

New Delhi: The 'NETRA' in Bengaluru will soon start collaborating with the Combined Space Operation Center (CSpOC) located at the Vandenberg Air Force Base in California to protect satellites of India and the United States from natural and man-made threats.

India and the United States will sign a Memorandum of Understanding on Space Situational Awareness by the end of this year, creating a framework for sharing data and services to ensure the long-term sustainability of outer space activities, according according to a joint statement issued after Prime Minister Narendra Modi's meeting with President Joe Biden at the White House in Washington D.C.

The agreement will help the Indian Space Research Organization's 'NETRA' in Bengaluru to receive from the CSpOC in the US data about space debris and other objects in the space and potential threat they could pose to the safety and security of the new launches as well as the existing satellites and other space assets.

The ISRO opened its NETRA – Network for Space Object Tracking and Analysis – within the ISTRAC campus at Peenya in Bengaluru on December 14 last year.

The US Joint Space Operation Command Center (JSpOC) transitioned into the CSpOC – a US-led multinational initiative involving the UK, Australia, Canada, France, Germany and New Zealand. It receives inputs from the Space Surveillance Network and share data with the nations having Space Situational Awareness agreement with the US.

A source in New Delhi said that the Space Situational Awareness data sharing pact between India and the US would help the exchange of data about the threat posed to the satellites and other assets of the two nations – not only by the countless debris in the increasingly overcrowded space but also from hostile anti-satellite capabilities.

According to a fact-sheet issued by the White House after Modi-Biden talks, the US welcomed India's "consideration of potential cooperation in Artemis and the Artemis Accords, a set of principles to support the safe and transparent exploration of space to the moon and beyond".

Modi also discussed India-US bilateral cooperation in the space sector with Biden's Vice President Kamala Harris, who heads the National Space Council of America.

<https://www.deccanherald.com/science-and-environment/isros-netra-in-bengaluru-to-soon-receive-information-from-us-agency-about-threats-to-space-assets-1034073.html>

IAF modernisation: Govt signs deal for 56 Airbus C295. All you need to know about the transport aircraft

The aircraft will give a major boost to tactical airlift capability of IAF, especially in the Northern and North-Eastern sector and Andaman and Nicobar Islands

The Ministry of Defence today signed a contract with Airbus Defence and Space, Spain for acquisition of 56 C-295MW transport aircraft for the Indian Air Force (IAF). It also inked an offset contract with Airbus through which the aerospace company will discharge its offset obligations through direct purchase of eligible products and services from Indian Offset Partners. The induction of C-295MW will be a significant step towards modernisation of the transport fleet of the Air Force, the ministry said.



The induction of C-295MW will be a significant step towards modernisation of the transport fleet of the Air Force.

What is Airbus C295

Airbus C295 is a transport aircraft of 5-10 tonne capacity with contemporary technology that will replace the ageing Avro transport aircraft of the Indian Air Force. The aircraft is capable of operating from semi-prepared strips and has a rear ramp door for quick reaction and para dropping of troops and cargo.

The aircraft will give a major boost to tactical airlift capability of IAF, especially in the Northern and North-Eastern sector and Andaman and Nicobar Islands.

Major boost to Atmanirbhar Bharat Abhiyan

The ministry said the project will provide a major boost to the 'Atmanirbhar Bharat Abhiyan' that offers a unique opportunity for the Indian private sector to enter into technology intensive and highly competitive aviation industry.

Out of 56, forty aircraft will be manufactured in India by TATA Consortium. All the deliveries will be completed within ten years of signing of the contract. All 56 aircraft will be installed with indigenous Electronic Warfare Suite.

After completion of the delivery, the subsequent aircraft manufactured in India can be exported to countries which are cleared by the Government of India.

The project will give a boost to aerospace ecosystem in India wherein several MSMEs spread over the country will be involved in manufacturing of parts of the aircraft.

The program will also involve development of specialised infrastructure in the form of hangars, buildings, aprons and taxiway. This programme is a unique initiative of the Government to strengthen the indigenous capabilities and boost 'Make in India'.

<https://www.livemint.com/news/india/indian-air-force-iaf-transport-fleet-to-add-56-airbus-c295-all-you-need-to-know-about-the-aircraft-11632488363739.html>



Press Information Bureau
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Ministry of Science & Technology

Fri, 24 Sept 2021 12:57PM

Electronic polymer based low-cost sensor developed to detect explosives rapidly

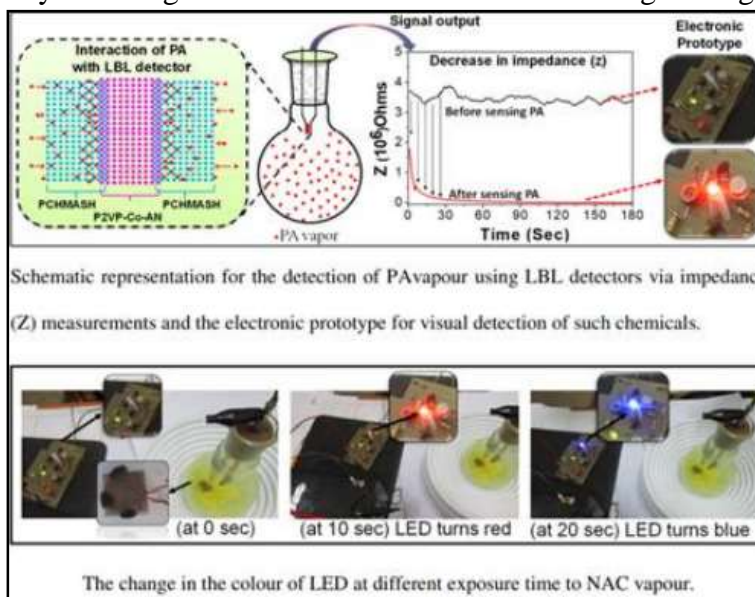
Indian Scientists, for the first time, have developed a thermally stable and cost-effective electronic polymer-based sensor for rapidly detecting nitro-aromatic chemicals used in high-energy explosives. The detection of explosives without destroying them is essential for protection, and criminal investigations, minefield remediation, military applications, ammunition remediation sites, security applications, and chemical sensors play a vital role in such cases.

Though explosive poly-nitroaromatic compounds can be analyzed usually by sophisticated instrumental techniques, the requirements for quick decision making in criminology laboratories or reclaimed military sites or to detect explosives in possession of extremists often require simple, cheap, and selective field techniques which will be non-destructive in nature. Non-destructive sensing of nitroaromatic chemicals (NACs) is difficult. While earlier studies are based mostly on photo-luminescent property, detection of the basis of conducting property has not been explored so far. Detection on the basis of conducting property helps in making a handy detection device where results can be seen with the help of a LED.

To overcome such disadvantages, a team of scientists led by Dr Neelotpal Sen Sarma from the Institute of Advanced Study in Science and Technology, Guwahati, an autonomous institute of the Department of Science & Technology, Government of India, has developed a layer by layer (LBL) polymer detector consisting of two organic polymers -- poly-2-vinyl pyridine with acrylonitrile (P2VP-Co-AN) and copolysulfone of cholesterol methacrylate with hexane (PCHMASH), which undergoes a drastic change in impedance (resistance in an ac circuit) in the presence of very low concentration of NACs vapour within few seconds. Here, picric acid (PA) was chosen as the model NAC, and a simple and cost-effective electronic prototype was developed for visual detection of PA. The team has filed a patent for the novel technology funded by DeitY, GoI.

“An electronic sensing device build around a polymer gas sensor can quickly detect the explosive on-site,” said Dr Neelotpal Sen Sarma.

The sensor device comprises of three layers--polymers copolysulfone of cholesteryl methacrylate along with 1-hexene (PCHMASH), and copolymer of poly-2-vinyl pyridine with acrylonitrile by sandwiching PCHMASH in between two P2VP-Co-AN outer layers by stainless



steel (SS) mesh. The sensitivity of the system is determined by monitoring the change in the impedance response with time (sec) in the presence of the vapour of the analyte (picric acid).

The tri-layer polymer matrix was found to be very efficient molecular sensor for nitroaromatic chemicals. The sensor device is quite simple and reversible in nature, and its response does not alter with varying operating temperature in presence of other common chemicals and humidity.

The device can be operated at room temperature, has a low response time and negligible interference from other chemicals. The fabrication is a very simple, is negligibly affected by humidity, and the cholesterol-based polymers used are biodegradable.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1757636>



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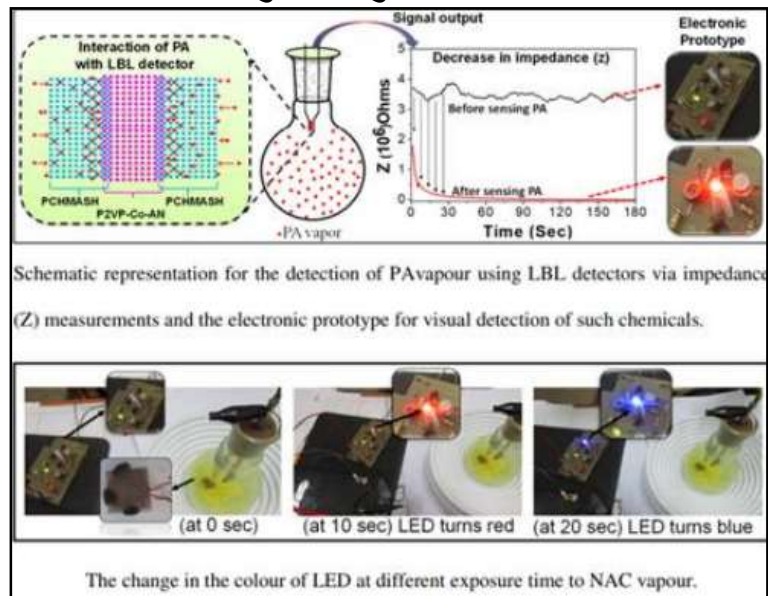
विज्ञान एवं प्रौद्योगिकी मंत्रालय

Fri, 24 Sept 2021 12:57PM

विस्फोटकों का तेजी से पता लगाने के लिए कम लागत वाला इलेक्ट्रॉनिक पॉलीमर आधारित सेंसर विकसित किया गया

भारतीय वैज्ञानिकों ने पहली बार उच्च-ऊर्जा विस्फोटकों में प्रयुक्त नाइट्रो-एरोमैटिक रसायनों का तेजी से पता लगाने के लिए तापीय रूप से स्थिर (थर्मली स्टेबल) और कम लागत लागत वाला इलेक्ट्रॉनिक पॉलीमर-आधारित सेंसर विकसित किया है। विस्फोटकों को नष्ट किए बिना उनका पता लगाना सुरक्षा के लिए आवश्यक है और ऐसे मामलों में आपराधिक जांच, बारूदी सुरंग वाले क्षेत्र में ही उपचार (माइनफील्ड रिमोडिशन), सैन्य अनुप्रयोगों, गोला-बारूद उपचार स्थल, सुरक्षा अनुप्रयोगों और रासायनिक सेंसर महत्वपूर्ण भूमिका निभाते हैं।

हालांकि विस्फोटक पॉली-नाइट्रोएरोमैटिक यौगिकों का विश्लेषण आमतौर पर परिष्कृत उपकरणों में प्रयुक्त तकनीकों द्वारा किया जा सकता है लेकिन अपराध विज्ञान प्रयोगशालाओं या कब्जे से मुक्त कराए गए सैन्य स्थलों में त्वरित निर्णय लेने अथवा उग्रवादियों के पास विद्यमान विस्फोटकों का पता लगाने के लिए अक्सर सरल, कम लागत वाली और ऐसी चयनात्मक क्षेत्र तकनीकों की आवश्यकता होती है जिनकी प्रकृति गैर-विनाशकारी हो। नाइट्रोएरोमैटिक रसायनों (एनएसी) की गैर-विनाशकारी पहचान करना एक कठिन कार्य है। जबकि पहले के अध्ययन ज्यादातर फोटो-ल्यूमिनसेंट गुणधर्म पर आधारित होते हैं, फिर भी अब तक इन गुणों की प्रविधि के आधार का पता नहीं लगाया गया है। गुणों के आधार पर पता लगाने से विस्फोटकों को ढूँढ़ निकालने में सक्षम सरल कहीं भी ले जाए



जा सकने योग्य ऐसा उपकरण बनाने में सहायता मिलती है जिसमें एक एलईडी की मदद से परिणाम देखे जा सकते हैं।

इस तरह की कमियों को दूर करने के लिए, विज्ञान और प्रौद्योगिकी विभाग, भारत सरकार के एक स्वायत्त संस्थान, विज्ञान और प्रौद्योगिकी उच्च अध्ययन संस्थान (इंस्टीट्यूट ऑफ़ एडवांस्ड, स्टडी इन साइंस एंड टेक्नॉलॉजी), गुवाहाटी के डॉ नीलोत्पल सेन सरमा के नेतृत्व में वैज्ञानिकों की एक टीम ने परत दर परत विकसित की है (एलबीएल) पॉलीमर डिटेक्टर विकसित किया है जिसमें दो कार्बनिक पॉलिमर होते हैं - पहला, पॉली-2-विनाइल पाइरीडीन जिसमें एक्रिलोनिट्राइल (पी2वीपी -सीओ- एएन) होता है और दूसरा, हेक्सेन (पीसीएचएमएएसएच) के साथ कोलेस्ट्रॉल मेथाक्राइलेट का को-पॉलीसल्फोन होता है जो कुछ सेकंड के भीतर एनएसी वाष्प की बहुत कम सांद्रता की उपस्थिति में अवरोध (किसी एसी सर्किट में प्रतिरोध) आने से पर भारी परिवर्तन से गुजरता है। यहां पिक्रिक एसिड (पीए) को मॉडल एनएसी के रूप में चुना गया था, और पीए की दृश्य पहचान के लिए एक सरल और लागत प्रभावी इलेक्ट्रॉनिक प्रोटोटाइप विकसित किया गया था। इस टीम ने इलेक्ट्रॉनिक्स और सूचना प्रौद्योगिकी विभाग (डीईआईटीवाई) , भारत सरकार द्वारा वित्त पोषित इस नई प्रौद्योगिकी के लिए एक पेटेंट के लिए भी आवेदन किया है।

डॉ नीलोत्पल सेन सरमा ने कहा, "पॉलीमर गैस सेंसर से युक्त इस प्रकार निर्मित एक इलेक्ट्रॉनिक सेंसिंग उपकरण (डिवाइस) विस्फोटक का तुरंत पता लगा सकती है।"

इस सेंसर उपकरण (डिवाइस) में तीन परतें शामिल हैं - 1- हेक्सेन (पीसीएचएमएएसएच) के साथ कोलेस्ट्रॉल मेथाक्राइलेट का को-पॉलीसल्फोन , और पी2वीपी -सीओ- एएन युक्त स्टेनलेस स्टील की दो जालियों वाली बाहरी परतों के बीच में पीसीएचएमएएसएच को रखकर करके एक्रिलोनिट्राइल के साथ पॉली-2-विनाइल पाइरीडीन का कोपॉलीमर। इस प्रणाली की संवेदनशीलता विश्लेषक अर्थात पिक्रिक एसिड की वाष्प की उपस्थिति में समय (सेकंड) के साथ आए अवरोध की प्रतिक्रिया में परिवर्तन की निगरानी के द्वारा निर्धारित की जाती है।

त्रि-स्तरीय बहुलक मैट्रिक्स (ट्राई-लेयर पॉलीमर मैट्रिक्स) नाइट्रोएरोमैटिक रसायनों के लिए बहुत कुशल एवं प्रभावी आणविक सेंसर पाया गया। यह सेंसर उपकरण (डिवाइस) प्रकृति में काफी सरल और प्रतिवर्ती (रिवर्सिबल) है और इसकी प्रतिक्रिया अन्य सामान्य रसायनों और आर्द्रता की उपस्थिति में अलग-अलग संचालनीय (ऑपरेटिंग) तापमान के साथ नहीं बदलती है।

इस उपकरण (डिवाइस) को कमरे के सामान्य तापमान पर संचालित किया जा सकता है, इसमें कम प्रतिक्रिया समय होता है और अन्य रसायनों से नगण्य हस्तक्षेप होता है। इसका निर्माण बहुत ही सरल है और नमी से नगण्य रूप से प्रभावित होता है तथा इसमें उपयोग किए जाने वाले कोलेस्ट्रॉल-आधारित पॉलिमर प्रकृति में स्वतः ही विनष्ट हो जाते हैं ।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1757711>

Made for mission life of 6 months, India's Mars probe completes 7 years in orbit

The lessons learnt have raised the confidence of ISRO Scientists for taking up future interplanetary missions

Bengaluru: India's Mars Orbiter spacecraft has completed seven years in its orbit, well beyond its designed mission life of six months.

"Indeed, a satisfying feeling," K Radhakrishnan who as the then Chairman of Indian Space Research Organisation (ISRO) led the Mars Orbiter Mission (Mangalyaan) team told PTI on the milestone.

MOM is the maiden interplanetary mission of ISRO. Launched on November 5, 2013, the probe was successfully inserted into Martian orbit on September 24, 2014 in its first attempt.

MOM is primarily a technology demonstration venture and all the mission objectives were successfully met, according to officials of Bengaluru-headquartered India's national space agency.

The main lessons learnt were in the field of design and realisation of systems and subsystems, launch for interplanetary mission, insertion into other planet's orbit, operation of the spacecraft and scientific instruments around Mars orbit, they said.

The lessons learnt have raised the confidence of ISRO scientists for taking up future interplanetary missions.

ISRO has been continuously monitoring the spacecraft and its five scientific instruments, and officials said scientific analysis of the data being received from MOM spacecraft is in progress.

On the health of the spacecraft, M Annadurai, who was the Programme Director of MOM, said the spacecraft's "moving elements are facing some issues and some of the redundancies we have to switch over." "The spacecraft's health is reasonably good considering that we are in the seventh year," Annadurai told PTI.

He expects the spacecraft to have a mission life of probably another one year.

On the reasons for the long mission life, Annadurai said ISRO had done corrections after learning lessons from the Chandrayaan-1 venture, in terms of reconfiguring the spacecraft and optimisation of fuel management, among others.

Noting that Earth remote-sensing satellites typically have a mission life of seven to nine years, he said it was a very satisfying moment that India could establish that around Mars also, a spacecraft can be in operation for such a long period.

On some criticism in some quarters that scientific output of the MOM was "low", Annadurai said it was more of a technology-demonstration mission.

He pointed out that the spacecraft was launched by PSLV as GSLV was not in operational condition then. ISRO could apportion only about 15 kg for scientific instruments, and the time available for scientists to develop them was only 18-19 months.

"I don't think we could have done better than what we have done," Annadurai said.

ISRO officials said the spacecraft has already covered three Martian years (one Martian year is about two earth years).

"We have seen how changes happen on the Mars from one season to another, one Martian year to another Martian year," they said.

Annadurai said: "We have good inputs on seasonal affects on Mars atmosphere...surface. The mission has provided meaningful data also".

<https://www.thehindu.com/sci-tech/technology/indias-mars-probe-completes-7-years-in-orbit/article36679383.ece>

सात साल बाद भी सक्रिय है छह माह के मिशन पर गया मंगलयान, जानें और कितने वर्षों तक करता रहेगा काम

मंगलयान ने अपनी कक्षा में सात साल पूरे कर लिए हैं। बड़ी बात यह कि मंगलयान को केवल छह महीने के मिशन पर भेजा गया था। मालूम हो कि मंगलयान दूसरे ग्रह पर भेजा जाने वाला इसरो का पहला अभियान था।

By Krishna Bihari Singh

बेंगलुरु: मंगलयान ने अपनी कक्षा में सात साल पूरे कर लिए हैं, जबकि उसे सिर्फ छह महीने के मिशन पर भेजा गया था। भारतीय अंतरिक्ष अनुसंधान संगठन (इसरो) के तत्कालीन अध्यक्ष के रूप में मंगलयान अभियान का नेतृत्व करने वाले के. राधाकृष्णन ने इस उपलब्धि पर खास बातचीत में कहा, 'निश्चित रूप से यह संतोषजनक है।' मंगलयान दूसरे ग्रह पर भेजा जाने वाला इसरो का पहला अभियान था। उसे पांच नवंबर, 2013 को आरंभ किया गया था।

मंगलयान 24 सितंबर, 2014 को अपनी कक्षा में पहले ही प्रयास में सफलतापूर्वक पहुंचा था। इसरो के अधिकारियों ने बताया कि इस अभियान के सभी लक्ष्यों को सफलतापूर्वक प्राप्त किया गया। इससे जो कुछ भी सीखने को मिला, उससे संगठन के विज्ञानियों के आत्मविश्वास में काफी इजाफा हुआ है। अधिकारियों ने कहा कि मंगलयान से जो भी जानकारी मिली, उनके वैज्ञानिक विश्लेषण की प्रक्रिया चल रही है।

मिशन के कार्यक्रम निदेशक रहे एम. अन्नादुराई ने कहा, 'मंगलयान का यह सातवां वर्ष है। यान अब भी काफी बेहतर स्थिति में है।' उन्होंने उम्मीद जताई कि अंतरिक्ष यान कम से कम एक और वर्ष काम करेगा। मिशन की लंबी आयु के कारणों के बारे में अन्नादुराई ने कहा कि चंद्रयान-1 से सीख लेते हुए इसरो ने मंगलयान में कई सुधार किए थे। विमान में किए गए बदलाव व ईंधन प्रबंधन को अनुकूल बनाने जैसे पहलू विशेष रूप से उल्लेखनीय हैं।

इसरो के अधिकारियों ने कहा कि यान मंगल ग्रह पर वहां के तीन वर्ष का समय बीता चुका है। उन्होंने कहा, 'हमने देखा कि मंगल पर एक मौसम से दूसरे मौसम में बदलाव किस तरह होते हैं। हमने साल दर साल बदलाव भी देखे।' मंगल ग्रह का एक वर्ष धरती के लगभग दो साल के बराबर होता है।

<https://www.jagran.com/news/national-isro-mangalyaan-india-mars-probe-completes-seven-years-in-orbit-22058041.html>



Quasi-particles with tunable interactions

The laws of quantum mechanics allow for the existence of 'quasi-particles': excitations in materials that behave exactly like ordinary particles. A major advantage of quasi-particles over ordinary particles is that their properties can be engineered. In a *Nature Materials* News & Views article this week, IoP physicist Erik van Heumen describes recent experiments where even the interactions between quasi-particles can be tuned.

In recent years, the mathematical branch of topology, studying the shapes of things, and the physical branch of condensed matter physics, studying the behaviour of solids and fluids, have merged into an exciting new research field: that of topological materials. One of the most exciting aspects of this combined field is the emergence of exotic quasi-particles: local disturbances in materials that behave exactly like particles. That such quasi-particles can exist, was already known from the quantum description of simple materials. What the combination with topology offers is a whole new set of such particles, known for example as Dirac and Weyl fermions, axions and magnetic monopoles.



Water waves are localized excitations in the water, that in many aspects behave like particles, having velocities and energy, interacting, and so on. In materials, certain excitations can behave even more like particles, with all sorts of tunable properties: quasi-particles. Credit: Pixabay/CC0 Public Domain

Engineering interactions

Freeing themselves from the strict rules for ordinary particles dictated by nature, researchers gain control over the properties of quasi-particles by a careful choice of the materials used to generate them. One wish that has been high on the list has been to find materials in which the type and strength of interactions between quasi-particles can be tuned.

Recently, a family of materials was discovered that feature atoms arranged in a so-called kagome lattice. In his 'News & Views' article, Erik van Heumen describes experiments, reported on in the latest edition of *Nature Materials*, that suggest the formation in these materials of a so-called 'flux-density wave', an excitation that provides the first confirmation of the theoretical predictions that these materials could host exotically interacting quasi-particles. The fact that such tunable interactions between quasi-particles in materials can now be created in the laboratory holds great promise for future studies of topological materials.

More information: Kagome lattices with chiral charge density, *Nature Materials* (2021). [DOI: 10.1038/s41563-021-01095-z](https://doi.org/10.1038/s41563-021-01095-z)

Journal information: *Nature Materials*
<https://phys.org/news/2021-09-quasi-particles-tunable-interactions.html>

New technique speeds measurement of ultrafast pulses

When we look at an object with our eyes, or with a camera, we can automatically gather enough pixels of light at visible wavelengths to have a clear image of what we see.

However, to visualize a quantum object or phenomenon where the illumination is weak, or emanating from nonvisible infrared or far infrared wavelengths, scientists need far more sensitive tools. For example, they have developed single-pixel imaging in the spatial domain as a way to pack and spatially structure as many photons as possible onto a single pixel detector and then create an image using computational algorithms.

Similarly, in the time domain, when an unknown ultrafast signal is either weak, or in the infrared or far infrared wavelengths, the ability of single-pixel imaging to visualize it is reduced. Based on the spatio-temporal duality of light pulses, University of Rochester researchers have developed a time-domain single-pixel imaging technique, described in *Optica*, that solves this problem, detecting 5 femtojoule ultrafast light pulses with a temporal sampling size down to 16 femtoseconds. This time-domain analogy of the single-pixel imaging shows similar advantages to its spatial counterparts: a good measurement efficiency, a high sensitivity, robustness against temporal distortions and the compatibility at multiple wavelengths.

Lead author Jiapeng Zhao, a Ph.D. student in optics at the University of Rochester, says possible applications include a highly accurate spectrographic tool, demonstrated to achieve 97.5 percent accuracy in identifying samples using a convolutional neural network with this technique.

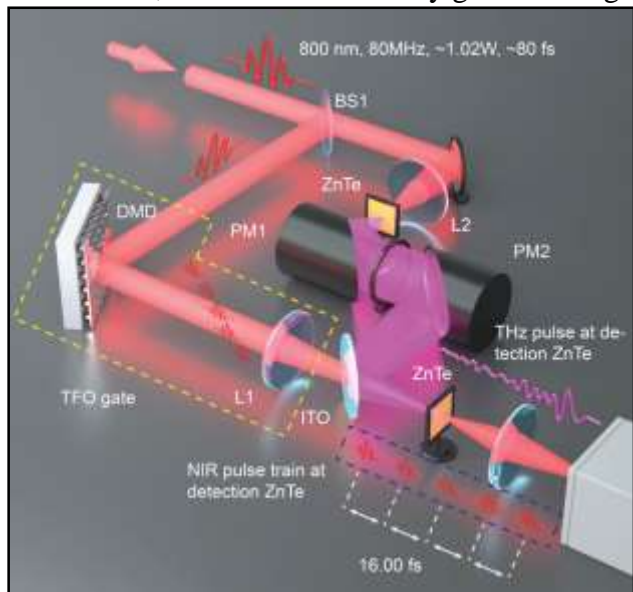
The technique can also be combined with single-pixel imaging to create a computational hyperspectral imaging system, says Zhao, who works in the Rochester research group of Robert Boyd, professor of optics. The system can greatly speed up the detection and analysis of images at broad frequency bands. This could be especially useful for medical applications, where detection of nonvisible light emanating from human tissue at different wavelengths can indicate disorders such as high blood pressure.

"By coupling our technique with single pixel imaging in the spatial domain, we can have good hyperspectral image within a few seconds. That's much faster than what people have done before," Zhao says.

More information: Jiapeng Zhao et al, Compressive ultrafast pulse measurement via time-domain single-pixel imaging, *Optica* (2021). DOI: [10.1364/OPTICA.431455](https://doi.org/10.1364/OPTICA.431455)

Journal information: [Optica](https://doi.org/10.1364/OPTICA.431455)

<https://phys.org/news/2021-09-technique-ultrafast-pulses.html>

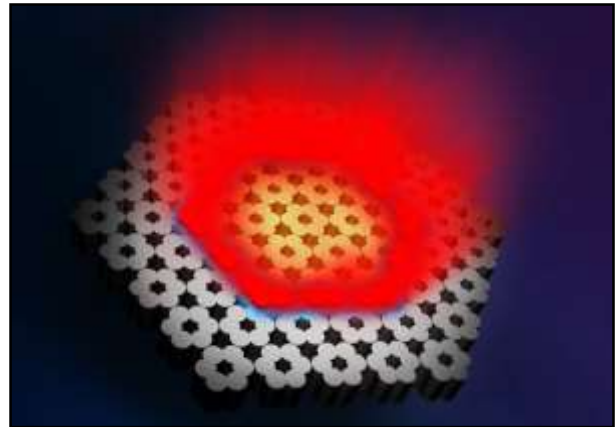


Schematics of the experimental setup showing a temporal fan out (TFO) gate represented by the yellow dashed box, which includes a digital micromirror device. The propagation direction of prepared input ultrafast pulse, originating in blue dashed box, is shown in pink. Dark red lines represent the corresponding pulse front. Credit: Jiapeng Zhao

Tiny lasers acting together as one: Topological vertical cavity laser arrays

Israeli and German researchers have developed a way to force an array of vertical cavity lasers to act together as a single laser—a highly effective laser network the size of a grain of sand. The findings are presented in a new joint research paper published online by the prestigious journal *Science* on Friday, September 24.

Cell phones, car sensors or data transmission in fiber optic networks are all using so called Vertical-Cavity Surface-Emitting Lasers (VCSELs)—semiconductor lasers that are firmly anchored in our everyday technology. Though widely used, the VCSEL device has miniscule size of only a few microns, which sets a stringent limit on the output power it can generate. For years, scientists have sought to enhance the power emitted by such devices through combining many tiny VCSELs and forcing them to act as a single coherent laser, but had limited success. The current breakthrough uses a different scheme: it employs a unique geometrical arrangement of VCSELs on the chip that forces the flight to flow in a specific path—a photonic topological insulator platform.



Artistic rendition of a topological array of vertically emitting lasers. All 30 microlasers along a topological interface (blue) act as one, collectively emitting coherent laser light (red). Credit: Pixelwg, Christian Kroneck

topological insulator platform.

From topological insulators to topological lasers

Topological insulators are revolutionary quantum materials that insulate on the inside but conduct electricity on their surface—without loss. Several years ago, the Technion group led by Prof. Mordechai Segev has introduced these innovative ideas into photonics, and demonstrated the first Photonic Topological Insulator, where light travels around the edges of a two-dimensional array of waveguides without being affected by defects or disorder.

This opened a new field, now known as "Topological Photonics," where hundreds of groups currently have active research. In 2018, the same group also found a way to use the properties of photonic topological insulators to force many micro-ring lasers to lock together and act as a single laser.

But that system still had a major bottleneck: the light was circulating in the photonic chip confined to the same plane used for extracting the light out. That meant that the whole system was again subject to a power limit, imposed by the device used to get the light out, similar to having a single socket for a whole power plant.

The current breakthrough uses a different scheme: the lasers are forced to lock within the planar chip, but the light is now emitted through the surface of the chip from each tiny laser and can be easily collected.

Circumstances and participants

This German-Israeli research project originated primarily during the Corona pandemic. Without the enormous commitment of the researchers involved, this scientific milestone would not have been possible.

The research was conducted by Ph.D. student Alex Dikopoltsev from the team of Distinguished Professor Mordechai Segev, of the Physics Department and the Electrical & Computer Engineering Department at the Technion—Israel Institute of Technology, and Ph.D. student Tristan H. Harder

from the team of Prof. Sebastian Klembt and Prof. Sven Höfling at the Chair of Applied Physics at the University of Würzburg, and the Cluster of Excellence ct.qmat—Complexity and Topology in Quantum Matter, in collaboration with researchers from Jena and Oldenburg. The device fabrication took advantage of the excellent clean room facilities at the University of Würzburg.

The long road to new topological lasers

"It is fascinating to see how science evolves," said Prof. Segev of the Technion. "We went from fundamental physics concepts to foundational changes therein, and now to real technology that is now being pursued by companies. Back in 2015, when we started to work on topological insulator lasers, nobody believed it's possible, because the topological concepts known at that time were limited to systems that do not, in fact—cannot—have gain. But all lasers require gain. So topological insulator lasers stood against everything known at that time. We were like a bunch of lunatics searching for something that was considered impossible. And now we have made a large step towards real technology that has many applications."

The Israeli and German team utilized the concepts of topological photonics with VCSELs that emit the light vertically, while the topological process responsible for the mutual coherence and locking of the VCSELs occurs in the plane of the chip. The end result is a powerful but very compact and efficient laser, not limited by a number of VCSEL emitters, and undisturbed by defects or altering temperatures.

"The topological principle of this laser can generally work for all wavelengths and thus a range of materials," explains German project leader Prof. Sebastian Klembt of the University of Würzburg, working on light-matter interaction and topological photonics within the ct.qmat Cluster of Excellence. "Exactly how many microlasers need to be arranged and connected would always depend entirely on the application. We can expand the size of the laser network to a very large size, and in principle it will remain coherent also for large numbers. It is great to see that topology, originally a branch of mathematics, has emerged as a revolutionary new toolbox for controlling, steering and improving laser properties."

The groundbreaking research has demonstrated that it is in fact theoretically and experimentally possible to combine VCSELs to achieve a more robust and highly efficient laser. As such, the results of the study pave the way towards applications of numerous future technologies such as medical devices, communications, and a variety of real-world applications.

More information: Alex Dikopoltsev et al, Topological insulator vertical-cavity laser array, *Science* (2021). DOI: [10.1126/science.abj2232](https://doi.org/10.1126/science.abj2232)

Journal information: [Science](https://www.science.org)

<https://phys.org/news/2021-09-tiny-lasers-topological-vertical-cavity.html>

Study claims you can dodge COVID-19 with diet

Nearly one-third of coronavirus cases could have been avoided if people had a healthy diet that includes lots of fruit and vegetables, claims a new study

Key Highlights

- **Getting vaccinated and wearing a mask indoors and in crowded spaces is paramount**
- **People who had a healthier diet had a 9 per cent lower risk of contracting the virus compared to people who ate a poorer diet**
- **Metabolic conditions including obesity and type-2 diabetes can cause severe coronavirus complications**

Washington: Nearly one-third of coronavirus cases could have been avoided if people had a healthy diet that includes lots of fruit and vegetables, claims a new study.

While getting vaccinated and wearing a mask indoors and in crowded spaces is paramount, the research, published in the journal Gut, suggests that eating properly may reduce the risk of contracting Covid-19, the Jerusalem Post reported.

The study, led by researchers from Massachusetts General Hospital in Boston, showed that people who had a healthier diet had a 9 per cent lower risk of contracting the virus compared to people who ate a poorer diet.

Those who ate healthier were 41 per cent less likely to develop severe symptoms.

Although doctors have stated that metabolic conditions including obesity and Type 2 diabetes can cause severe coronavirus complications, this study is among the first to add nutrition to the equation, the report said.

Previous studies have suggested that poor nutrition is a widespread trait among groups disproportionately affected by the epidemic, but data on the link between diet and the risk of getting the virus and then developing severe symptoms is lacking, said study editor Jordi Marino, a doctoral student and instructor at Harvard Medical School.

The team analysed data collected on 592,571 people from the US and the UK between March and December 2020. Each participant completed a survey of their dietary habits, with study authors scoring people's "diet quality," with an emphasis on fruit and vegetable consumption.

During the follow-up period, 31,831 participants developed Covid-19.

The researchers also observed a cumulative link between poor nutrition, increased socioeconomic deprivation and Covid-19 risk. People who live in poor neighbourhoods and who rely heavily on fast food are much more susceptible to the virus. Models estimate that nearly a third of virus cases would have been avoided if one of these two conditions didn't exist, explained Marino. The researchers called for making healthy, plant-based foods more available and affordable to help advance the end of the epidemic.

"Our findings are a call for governments and those who develop protocols to prioritize healthy eating and welfare with influential policies," Marino said.

<https://www.timesnownews.com/health/article/study-claims-you-can-you-dodge-covid-19-with-diet/816796>

