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समाचार पत्रों से चयित अंश Newspapers Clippings

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

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DRDO Technology News

Press Information Bureau
Government of India

Ministry of Defence

Sat, 09 Oct 2021 9:49PM

Astronautical Society of India confers Aryabhata Award to Secretary DDR&D and Chairman DRDO, Dr G Satheesh Reddy

Key Highlights:

- *Dr G Satheesh Reddy is a pioneer in the area of R&D of advanced avionics, navigation and missile technologies*
- *Dr Reddy is an institution builder and has set up mechanisms to establish robust defence development and production ecosystem*

Secretary DDR&D and Chairman DRDO Dr G Satheesh Reddy has been conferred the prestigious Aryabhata Award by Astronautical Society of India (ASI) for his outstanding life-time contribution to the promotion of astronautics in India. The award function was held on October 09, 2021 at UR Rao Satellite Centre Bangalore with participants joining virtually from across the ISRO, DRDO and other academic institutions.

Dr G Satheesh Reddy is a pioneer in the area of R&D of advanced avionics, navigation and missile technologies. He has contributed immensely to strategic and tactical missile systems and helped the country become self-reliant in critical defence technologies. He is an institution builder and has set up mechanisms to establish robust defence development and production ecosystem. Due to his persistent effort, defence research in academic institutes is accelerating towards higher technology readiness level.

The ASI is engaged in the dissemination of technical and other information related to astronautics by conducting technical meetings, bringing out technical publications and organising exhibitions.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762578>



पत्र सूचना कार्यालय

भारत सरकार

रक्षा मंत्रालय

Sat, 09 Oct 2021 9:49PM

एस्ट्रोनॉटिकल सोसाइटी ऑफ इंडिया ने डीडीआर एंड डी के सचिव और डीआरडीओ के अध्यक्ष डॉ जी सतीश रेड्डी को आर्यभट्ट पुरस्कार से सम्मानित किया

मुख्य बिंदु:

1. डॉ जी सतीश रेड्डी उन्नत वैमानिकी, नेविगेशन और मिसाइल प्रौद्योगिकियों के अनुसंधान एवं विकास के क्षेत्र में पथ प्रदर्शक हैं।
2. डॉ रेड्डी एक संस्था निर्माता हैं और उन्होंने मजबूत रक्षा विकास तथा उत्पादन पारिस्थितिकी तंत्र तैयार करने के लिए यांत्रिक क्रियाविधि स्थापित की है।

रक्षा अनुसंधान एवं विकास विभाग (डीडीआर एंड डी) के सचिव और रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) के अध्यक्ष डॉ जी सतीश रेड्डी को एस्ट्रोनॉटिकल सोसाइटी ऑफ इंडिया (एसआई) द्वारा प्रतिष्ठित आर्यभट्ट पुरस्कार से सम्मानित किया गया है, जो भारत में एस्ट्रोनॉटिक्स को बढ़ावा देने में उनके उत्कृष्ट आजीवन योगदान के लिए दिया गया है। पुरस्कार समारोह 09 अक्टूबर 2021 को यू आर राव सैटेलाइट केंद्र बेंगलूर में आयोजित किया गया था, जिसमें इसरो, डीआरडीओ और अन्य शैक्षणिक संस्थानों से प्रतिभागियों ने वर्चुअल माध्यम से हिस्सा लिया।

डॉ जी सतीश रेड्डी उन्नत वैमानिकी, नेविगेशन और मिसाइल प्रौद्योगिकियों के अनुसंधान एवं विकास के क्षेत्र में पथ प्रदर्शक हैं। उन्होंने सामरिक तथा रणनीतिक महत्व की मिसाइल प्रणालियों में बहुत योगदान दिया है और देश को महत्वपूर्ण रक्षा प्रौद्योगिकियों में आत्मनिर्भर बनने में मदद की है। वह एक संस्था निर्माता हैं और उन्होंने मजबूत रक्षा विकास तथा उत्पादन पारिस्थितिकी तंत्र तैयार करने के लिए यांत्रिक क्रियाविधि स्थापित की है। उनके निरंतर प्रयास के कारण, शैक्षणिक संस्थानों में रक्षा अनुसंधान उच्च प्रौद्योगिकी तत्परता स्तर की ओर तेजी से बढ़ रही है।

एसआई तकनीकी बैठकें आयोजित करके, तकनीकी प्रकाशन निकालकर और एक प्रदर्शनी आयोजित करके एस्ट्रोनॉटिक्स से संबंधित तकनीकी और अन्य सूचनाओं के प्रसार में लगा हुआ है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762650>



Raksha Rajya Mantri Shri Ajay Bhatt visits Defence Electronics Applications Laboratory

Key Highlights:

- *Appreciated efforts of the lab in developing state-of-the-art communication and surveillance systems and technologies*
- *Lauded efforts of DEAL towards the social responsibilities including setup of COVID-19 related support*

Raksha Rajya Mantri Shri Ajay Bhatt visited Defence Research and Development Organisation (DRDO) premier lab, Defence Electronics Applications Laboratory (DEAL) in Dehradun on October 08, 2021.

Director of DEAL Shri P K Sharma briefed the Raksha Rajya Mantri about various ongoing and planned projects and the production status of the products developed by the laboratory and users' satisfaction.

During the visit, Shri Ajay Bhatt discussed the activities of DEAL at length and made several suggestions towards encouraging private production units in Uttarakhand to boost local defence manufacturing and also on induction policy of products developed by the DRDO.

The Raksha Rajya Mantri was demonstrated the products and technologies developed by the DEAL for the Armed Forces. This included SDR, GSAT-6 terminals, Troposcatter Modem, HD-VLF communication system and Data Links for RUSTOM-II MALE UAV and AEW&CS.

Shri Ajay Bhatt appreciated the efforts of laboratory in developing state-of-the-art communication and surveillance systems and technologies. He also lauded the efforts of the DEAL towards the social responsibilities including setup of COVID-19 related support, communication support during natural calamities, providing internship to engineering graduates and post graduates, organising webinars with universities, and showcasing of products developed by the laboratory for general public at various occasions. He also planted a sapling on the campus of the laboratory.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1762410>



पत्र सूचना कार्यालय

भारत सरकार

रक्षा मंत्रालय

Sat, 09 Oct 2021 3:07PM

रक्षा राज्य मंत्री श्री अजय भट्ट ने रक्षा इलेक्ट्रॉनिक्स एप्लीकेशन प्रयोगशाला का दौरा किया

प्रमुख बातें:

- अत्याधुनिक संचार एवं निगरानी प्रणालियों तथा प्रौद्योगिकियों के विकास में प्रयोगशाला के प्रयासों की सराहना की
 - कोविड-19 संबंधित सेटअप सहित सामाजिक जिम्मेदारियों के प्रति डील के प्रयासों की सराहना की
- रक्षा राज्य मंत्री श्री अजय भट्ट ने दिनांक 08 अक्टूबर, 2021 को देहरादून में रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) की प्रमुख प्रयोगशाला, डिफेंस इलेक्ट्रॉनिक्स एप्लीकेशन्स लैबोरेट्री (डीईएएल) का दौरा किया।

डिफेंस इलेक्ट्रॉनिक्स एप्लीकेशन्स लैबोरेट्री (डीईएएल) के निदेशक श्री पी के शर्मा ने रक्षा राज्य मंत्री को जारी विभिन्न परियोजनाओं और नियोजित परियोजनाओं के साथ ही प्रयोगशाला द्वारा विकसित उत्पादों की उत्पादन स्थिति तथा उपयोगकर्ताओं की संतुष्टि के बारे में जानकारी दी।

इस यात्रा के दौरान श्री अजय भट्ट ने डिफेंस इलेक्ट्रॉनिक्स एप्लीकेशन्स लैबोरेट्री (डीईएएल) की गतिविधियों पर विस्तार से चर्चा की और स्थानीय रक्षा विनिर्माण को बढ़ावा देने के लिए उत्तराखंड में निजी उत्पादन इकाइयों को प्रोत्साहित करने तथा डीआरडीओ द्वारा विकसित उत्पादों की इंडक्शन नीति पर भी कई सुझाव दिए।

रक्षा राज्य मंत्री को सशस्त्र बलों के लिए डिफेंस इलेक्ट्रॉनिक्स एप्लीकेशन्स लैबोरेट्री (डीईएएल) द्वारा विकसित उत्पादों और प्रौद्योगिकियों का प्रदर्शन भी दिखाया गया। इसमें एसडीआर, जी-सैट-6 टर्मिनल, ट्रोपोस्केटर मॉडेम, एचडी-वीएलएफ संचार प्रणाली और रुस्तम-11 मेल यूएवी और एईडब्ल्यू एंड सीएस के लिए डेटा लिंक शामिल थे।

श्री अजय भट्ट ने अत्याधुनिक संचार और निगरानी प्रणाली तथा प्रौद्योगिकियों के विकास में प्रयोगशाला के प्रयासों की सराहना की। उन्होंने कोविड-19 संबंधित सहायता, प्राकृतिक आपदाओं के दौरान संचार सहायता, इंजीनियरिंग स्नातकों और स्नातकोत्तरों को इंटर्नशिप प्रदान करने, विश्वविद्यालयों के साथ वेबिनार आयोजित करने और प्रयोगशाला द्वारा विकसित उत्पादों के प्रदर्शन सहित विभिन्न अवसरों पर आम जनता के लिए प्रदर्शन समेत सामाजिक जिम्मेदारियों के लिए डिफेंस इलेक्ट्रॉनिक्स एप्लीकेशन्स लैबोरेट्री (डीईएएल) के प्रयासों की भी सराहना की। उन्होंने प्रयोगशाला परिसर में एक पौधा भी लगाया।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1762562>



DRDO conducts All India official language, Scientific and technical seminar

Key Highlights:

- *Objective to promote use of Hindi in official activities including scientific and technical works.*
- *'Test and Evaluation of Defence Products: The Necessity and Achievements' was the theme of the seminar*
- *Role of Missile Technology in Indian Defence Scenario, Role of Science & Technology in Nation Building and Effect of COVID-19 on mankind among subjects discussed*

Integrated Test Range (ITR) Chandipur, a premier laboratory of Defence Research and Development Organisation (DRDO) organised All India Official Language, Scientific and Technical Seminar on October 06-07, 2021. The seminar was formally inaugurated by Member of Parliament and Chairman, Standing Committee on Defence Shri Jual Oram.

Every year, a DRDO laboratory is entrusted with the responsibility of hosting this seminar on Rajbhasha with an objective of promoting use of Hindi in official activities including scientific and technical works. This year, the seminar was hosted by ITR with the theme 'Test and Evaluation of Defence Products: The Necessity and Achievements'. A number of relevant subjects like Role of Missile Technology in Indian Defence Scenario, Role of Science and Technology in Nation Building, Hindi and us, Natural resources, Healing with Yoga and Effect of COVID-19 on mankind were covered during the seminar. Articles in Hindi on the above subjects have been contributed by DRDO employees from different laboratories.

In his address, Shri Jual Oram lauded the effort of DRDO in promoting Hindi in official activities. He stressed on preserving the cultural heritage through promoting use of regional languages. Officers and staff of DRDO laboratories across the country participated in the seminar.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762132>





डीआरडीओ ने अखिल भारतीय राजभाषा, वैज्ञानिक एवं तकनीकी संगोष्ठी का आयोजन किया

प्रमुख बातें:

- इसका उद्देश्य वैज्ञानिक और तकनीकी कार्यों सहित शासकीय गतिविधियों में हिंदी के उपयोग को बढ़ावा देना है
- संगोष्ठी का विषय 'रक्षा उत्पादों का परीक्षण और मूल्यांकन: आवश्यकता और उपलब्धियां' था
- भारतीय रक्षा परिदृश्य में मिसाइल प्रौद्योगिकी की भूमिका, राष्ट्र निर्माण में विज्ञान और प्रौद्योगिकी की भूमिका एवं कोविड 19 का मानव जाति पर प्रभाव चर्चा के विषय थे

रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) की एक प्रमुख प्रयोगशाला एकीकृत परीक्षण रेंज (आईटीआर) चांदीपुर ने 06 और 07 अक्टूबर, 2021 को अखिल भारतीय राजभाषा, वैज्ञानिक और तकनीकी संगोष्ठी का आयोजन किया। संगोष्ठी का औपचारिक उद्घाटन संसद सदस्य और रक्षा पर स्थायी समिति के अध्यक्ष श्री जुएल ओराम द्वारा किया गया।

वैज्ञानिक और तकनीकी कार्यों सहित आधिकारिक गतिविधियों में हिंदी के उपयोग को बढ़ावा देने के उद्देश्य से राजभाषा पर इस संगोष्ठी की मेजबानी करने की जिम्मेदारी हर साल एक डीआरडीओ प्रयोगशाला को सौंपी जाती है। इस वर्ष इस संगोष्ठी का आयोजन आईटीआर द्वारा 'रक्षा उत्पादों का परीक्षण और मूल्यांकन: आवश्यकता और उपलब्धियां' विषय के साथ किया गया था। संगोष्ठी के दौरान भारतीय रक्षा परिदृश्य में मिसाइल प्रौद्योगिकी की भूमिका, राष्ट्र निर्माण में विज्ञान और प्रौद्योगिकी की भूमिका, हिंदी और हम, प्राकृतिक संसाधन, योग के साथ उपचार और मानव जाति पर कोविड-19 के प्रभाव जैसे अनेक प्रासंगिक विषयों को शामिल किया गया। उपरोक्त विषयों पर हिंदी में लेखों का योगदान विभिन्न प्रयोगशालाओं के डीआरडीओ कर्मचारियों द्वारा किया गया है।



श्री जुएल ओराम ने अपने संबोधन में आधिकारिक गतिविधियों में हिंदी को बढ़ावा देने के लिए डीआरडीओ के प्रयासों की सराहना की। उन्होंने क्षेत्रीय भाषाओं के उपयोग को बढ़ावा देकर सांस्कृतिक विरासत के संरक्षण पर जोर दिया। संगोष्ठी में देश भर की डीआरडीओ प्रयोगशालाओं के अधिकारियों और कर्मचारियों ने भाग लिया।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762252>

From HAL to Tatas, how Indian domestic defence industry is wind beneath IAF's wings

Companies have been developing new aircraft and technology in an attempt to make the Indian Air Force more 'aatmanirbhar'

On 8 October 1932, the Indian Air Force was launched with six officers and 19 soldiers trained by Britain's Royal Air Force.

Today, 89 years later, the Indian Air Force is celebrating its foundation day.

The IAF has come a really long way since 1932, from having just four Westland Wapiti IIA aircraft initially to having a total of 1,262 aircraft as recorded in January 2020.

And that's not where it ends. Former IAF Chief Air Marshal RKS Bhaduria in early September had said that the air force was looking at procuring 350 more aircraft over the next two decades.

But it's taken a lot for the IAF to soar — with massive imports of aircraft and related-technology to now putting emphasis on 'aatmanirbhar' Bharat, or self-reliant India.

A major importer

India is known to be a huge defence importer and according to the data on international arms transfers released by the Stockholm International Peace Research Institute (SIPRI) it is the world's second-largest arms importer, only topped by Saudi Arabia.

From 2016-2020, India accounted for 9.5 percent of the total global arms imports, the SIPRI data revealed, adding that it had however, fallen by 33 percent between 2011-2015 and 2016-2020.

Reporting on the drop in imports, Air Marshal Anil Chopra (retired) had said that the data clearly showed the country's drive towards Atmanirbharta is showing results. "India is finally at an inflection point and the Indian defence industry is coming of age," the director general, Centre for Air Power Studies, was quoted as saying by the *Hindustan Times*.

Domestic industry

India has a domestic defence industry of which 80 percent is government-owned. The public sector includes Defence Research and Development Organisation and its 50 labs, four defence shipyards, five defence Public Sector Undertakings and 41 ordnance factories.

Despite these, India's target of 70 percent self-reliance in defence procurement is still to be achieved. At present, India's self-reliance is hovering at around 35-40 percent.

• DRDO

The DRDO has contributed greatly to the Indian Air Force and is undoubtedly one of the top defence equipment manufacturing companies in India.

Recently, the IAF was handed over the first deliverable Firing Unit of Medium Range Surface to Air Missile (MRSAM) System. Developed jointly by DRDO and Israel Aerospace Industries (IAI) in collaboration with the Indian industry, the MRSAM (IAF) is an advanced network-centric combat Air Defence System.

Terming the MRSAM, one of the best state-of-the-art missiles in the world, Defence Minister Rajnath Singh said the weapon will prove to be a game-changer in the air-defence system.



The Tejas light combat aircraft built by Hindustan Aeronautics Ltd. Image Courtesy: HAL

The DRDO is also developing a new airborne early warning and control aircraft using the Airbus jets. The project is estimated to be worth Rs 11,000 crore, as per sources.

• **Hindustan Aeronautics Ltd (HAL)**

HAL, the state-owned company, is known for manufacturing some very competitive aircraft and helicopters, including 'Light Combat Aircraft', 'Chetak', and 'Cheetah'.

In February, the government sealed a Rs 48,000 crore deal to procure 83 Tejas light combat aircraft from HAL, in the biggest ever indigenous defence procurement programme.

It also announced that it would be developing a 10-12 tonne attack helicopter by 2027, which would be India's answer to America's Apache chopper.

• **Bharat Electronics Ltd**

Established in 1954, BEL has core competencies in the area of radars and weapons systems, sonars and Electro-Optics.

The company is responsible for developing the Surface-to-Air-Akash Missile System, which was inducted into the IAF in July 2015.

• **Bharat Dynamics Limited**

Started in 1970, Bharat Dynamics Limited is another defence PSU spearheading the government's 'Aatmanirbhar' objective. The Akash Weapons System is produced by them in collaboration with BDL and DRDO.

Moreover, there are several private-run companies that have been extending support to the Indian Air Force.

Just recently, India announced that it would be purchasing 56 C-295 medium transport aircraft, replacing the ageing fleet of Avro-748 planes.

Tata Advanced Systems Limited would jointly execute this project with Airbus Defence and Space under which 40 of the 56 planes would be assembled in India by TASL.

Kalyani Rafael Advanced Systems Ltd, a joint venture between Pune-based business giant Kalyani Group and Israel-based Rafael Advanced Defence Systems Ltd, made big news when it bagged its first order worth \$100 million for manufacturing 1000 Barak-8MRSAM missile kits for the Indian Air Force.

Infrastructure giant Larsen & Toubro also contributes to the Indian Air Force. It supplies various Ground Systems such as Platforms for Radar systems, SatCom equipment for C4I and multiple weapon systems. Moreover, it has also been chosen to manage the armed forces' communications network, ensuring bases across the country talk and exchange dates securely.

With inputs from agencies

<https://www.firstpost.com/india/from-hal-to-tatas-how-indian-domestic-defence-industry-is-wind-beneath-iafs-wings-10036781.html>

IAF Day 2021: from 83 Tejas aircraft to Akash missiles, here's what the IAF is set to acquire

These recent defence deals will aid in protecting our India's airspace and strengthen the IAF's capabilities

Every year, Indian Air Force (IAF) Day is celebrated on 8 October to commemorate the establishment of the IAF as well as honour its contributions in strengthening the national security of the country. The IAF came into existence as a supporting wing of the UK's Royal Air Force in 1932 and will celebrate its 89th Foundation Day this year. As the country celebrates the achievements of the IAF, here is a look at the recent defence deals that will benefit the organisation in protecting our country's airspace:



The IAF is set to acquire Akash missiles as per a Rs 499 crore contract signed with Bharat Dynamics Limited. Image Courtesy: Wikimedia Commons

24 Mirage 2000 aircraft:

The Indian government recently inked a deal to buy phased out Mirage 2000 aircraft from the French Air Force. The deal was signed "to improve the spares and airframe capability to help improve the serviceability of the around 50 Mirage-2000s in the Indian fleet," according to a report in *Business Standard*. The contract has been signed for the force to acquire 24 Mirage aircraft.

BDL Akash missiles:

The IAF is set to acquire Akash missiles, manufactured by Bharat Dynamics Limited (BDL), as per a Rs 499 crore contract signed by the two in July this year. The missile, which has been test-fired on several occasions, is capable of engaging aerial threats up to the maximum range of 25 kilometer and up to an altitude of 20 kilometre. The missile operates at a speed range of 1.8 to 2.5 Mach and is being manufactured for both the IAF and the Indian Army. BDL is considered the prime production company under the country's Integrated Guided Missile Development Programme (IGMDP) and Akash Missile is considered to be one of the best missiles in its category.

83 Tejas LCA:

The Union government signed a Rs 38,000 crore deal with state-run company Hindustan Aeronautics Ltd to procure 83 Tejas Light Combat Aircraft (LCA) for the IAF in February this year. The Tejas aircraft is a highly agile multi-role supersonic fighter aircraft. The single-engine aircraft is capable of operating in high-threat air environments.

56 C-295 Airbus

The IAF is set to gain 56 C-295 medium transport aircraft as the government signed a deal with Airbus Defence and Space, Spain, in September. The IAF fleet will receive 16 aircraft in flyaway condition within 48 months, while a consortium of the Airbus Defence and Space and Tata Advanced Systems Limited (TASL) will manufacture 40 planes in India within 10 years of signing the contract. The C-295 transport plane will replace the IAF's ageing fleet of Avro-748 planes. It can also be used for tactical transport of up to 51 paratroopers or 71 troops.

Anti-drone technology:

The IAF signed a contract of Rs 155 crore for Counter Unmanned Aircraft Systems (CUAS) with Hyderabad-based Zen Technologies in September this year. This will be carried out in a 12-month time frame, according to the company and is aimed at improving the IAF's capabilities in the anti-drone space.

<https://www.firstpost.com/india/iaf-day-2021-from-83-tejas-aircraft-to-akash-missiles-heres-what-the-iaf-is-set-to-acquire-10036961.html>

From 83 Tejas to 56 C-295 Airbus, here's how air arsenal is being bolstered by IAF

With countries around the globe ramping up the air defence ecosystem in order to get strategic advances over their enemy, the Indian Air Force (IAF) recent defence details are the same shot towards making India foolproof.

83 Tejas fighter jets

In a whopping ₹48,000 crore deal with state-run aerospace & defence company Hindustan Aeronautics Ltd (HAL), the Indian government ordered 83 Light Combat Aircraft (LCA) Tejas for the Indian Air Force in February this year.

Tejas is a single-engine, highly agile multi-role supersonic fighter aircraft. The fighter jet has a quadruplex digital fly-by-wire Flight Control System (FCS) along with associated advanced flight control laws.

The aircraft's delta wing is designed for 'air combat' and 'offensive air support' with 'reconnaissance' and 'anti-ship' as its secondary roles, which allows the aircraft to operate in the high-threat air environment. Further, extensive use of advanced composites in the airframe provides a high strength to weight ratio, long fatigue life, and low radar signatures to the aircraft.



56 C-295 Airbus

In a landmark ₹22,000 deal, the Indian Air Force is set to welcome Fifty Six (56) C-295 transport aircraft. Under the deal, which was recently inked by the Indian government with Airbus Defence, Spain, the IAF fleet will receive 16 aircraft in flyaway condition within the span of 48 months, while a consortium of the Airbus Defence and Space and Tata Advanced Systems Limited (TASL) will manufacture 40 planes in domestically within 10 years of signing the contract.

Notably, the C-295 transport plane will replace the IAF's aging fleet of Avro-748 planes and transport will also be used for tactical transport of up to 51 paratroopers or 71 troops.

The Airbus C295 is a new-generation tactical aircraft in the light and medium segment. With its robust and reliable versatility, the aircraft can be used for different missions in different circumstances.

The multi-role C295 aircraft can operate worldwide under all weather conditions from desert to maritime environments, from extremely hot to extremely cold temperatures.

24 Mirage 2000 aircraft

The Indian Air Force (IAF) is set to acquire 24 second-hand Mirage 2000 fighters, made by French manufacturer Dassault Aviation. The Indian government recently inked a deal to buy phased-out Mirage 2000 aircraft from the French Air Force.

The deal aims "to improve the spares and airframe capability to help improve the serviceability of the around 50 Mirage-2000s in the Indian fleet."

Akash missiles

Apart from fighter aircraft, the IAF is also set to acquire Akash missiles, manufactured by India's manufacturers of ammunitions and missile systems Bharat Dynamics Limited (BDL). The ₹499 crore contract was signed by the two in July 2021.

The Akash missile has been test-fired on several occasions and is capable of engaging aerial threats up to the maximum range of 25 kilometers and up to an altitude of 20 kilometers.

With the speed range of 1.8 to 2.5 Mach, the missile will be manufactured for both the IAF and the Indian Army.

BDL is considered the prime production company under the country's Integrated Guided Missile Development Programme (IGMDP) and Akash Missile is considered to be one of the best missiles in its category.

Anti-drone technology

Under the ₹155 crore pact, the Indian Air Force is also scheduled to induct Counter Unmanned Aircraft Systems (CUAS) manufactured by Hyderabad-based Zen Technologies. This will be carried out in a 12-month time frame, and the technology will improve the IAF's capabilities in the anti-drone space.

<https://www.apnnews.com/from-83-tejas-to-56-c-295-airbus-heres-how-air-arsenal-is-being-bolstered-by-iaf/>



Sat, 09 Oct 2021

रक्षा राज्य मंत्री ने की डीआरडीओ के कार्यों की प्रशंसा

देहरादून, 09 अक्टूबर (हि.स.)। रक्षा राज्य मंत्री अजय भट्ट ने रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) की प्रमुख प्रयोगशाला, रक्षा इलेक्ट्रॉनिक्स अनुप्रयोग प्रयोगशाला (डील) का दौरा किया। इस दौरान मंत्री ने अत्याधुनिक संचार और निगरानी प्रणाली और प्रौद्योगिकियों को विकसित करने में प्रयोगशाला के प्रयासों की सराहना की।

इस मौके पर अजय भट्ट ने डील की गतिविधियों पर विस्तार से चर्चा की। साथ ही स्थानीय रक्षा विनिर्माण को बढ़ावा और उत्तराखंड में निजी उत्पादन इकाइयों को प्रोत्साहित करने को कहा। उन्होंने डीआरडीओ की ओर से विकसित उत्पादों के लिए कई सुझाव दिए। इस मौके पर डील के निदेशक ने विकसित उत्पादों की उत्पादन और उपयोग की जानकारी दी।

रक्षा राज्य मंत्री को सशस्त्र बलों के लिए डील की ओर से विकसित उत्पादों और प्रौद्योगिकियों का प्रदर्शन किया गया। इसमें एसडीआर, जीसैट-टी-6 टर्मिनल, ट्रोपोस्फैटर मोडेम, एचडी-वीएलएफ संचार प्रणाली और रुस्तम-द्वितीय पुरुष यूएवी और और आईडब्लू सीएस के लिए डेटा लिंक शामिल थे। मंत्री अजय भट्ट ने अत्याधुनिक संचार और निगरानी प्रणाली और प्रौद्योगिकियों के विकास में प्रयोगशाला के प्रयासों और कोरोना से बचाव में सहयोग की प्रशंसा की।

<https://doonhorizon.in/states/minister-of-state-for-defense-praises-drdo-worksph/cid5439688.htm>

Air Force Day: वायुसेना होगी और शक्तिशाली, 'दुर्गा' और 'काली' करेंगी दुश्मनों से रखवाली

By आनंद मणि त्रिपाठी

- वायुसेना दिवस पर विशेष : डीआरडीओ ने तैयार किये ऊर्जा निर्देशित हथियार, जल-थल-नभ से मार करने में सक्षम।
- 'दुर्गा' और 'काली' के सिस्टम से निकलने वाली एक्सरे और माइक्रोवेव ऊर्जा दुश्मन को भस्म कर देगी।

जयपुर । रक्षा अनुसंधान और विकास संगठन ने ऊर्जा निर्देशित ऐसे हथियार तैयार किए हैं, जो अंतरराष्ट्रीय सीमा पर दुश्मन के किसी भी उपकरण, वस्तु और आदमी पर कहर बनकर टूटेंगे। इनमें से एक 'दुर्गा' (डायरेक्शनली अनरेस्ट्रिक्टेड रे गन एरे) हवा, समुद्र और सतह से मार करने में सक्षम है। दूसरी 'काली' (किलो एम्पेरे लाइनर इंजेक्टर) दो अलग आवृत्तियों एक्स-रे व माइक्रोवेव पर काम करता है। इसकी माइक्रोवेव आवृत्ति विमान के उपकरण नष्ट करने में सक्षम है। ऐसे ही एक उपकरण का परीक्षण 2017 में तत्कालीन रक्षामंत्री अरुण जेटली के सामने चित्रदुर्गा में किया गया था। यह 250 मीटर की दूरी तक लक्ष्य भेदने में कामयाब रहा था।

ताकत में बहुआयामी बढ़ोतरी... दुश्मनों की चुनौतियों के निपटने के लिए वायुसेना लगातार अपनी ताकत में बहुआयामी बढ़ोतरी कर रही है। वायुसेना प्रमुख के मुताबिक बहुप्रतीक्षित रूस निर्मित एस-400 (जमीन से हवा में मार करने वाली मिसाइल) एक साल के भीतर वायुसेना में शामिल कर ली जाएगी। वायुसेना 114 मल्टी-रोल फाइटर एयरक्राफ्ट की प्रस्तावित खरीद को भी आगे बढ़ा रही है। इसे मेक इन इंडिया के तहत तैयार किया जाएगा।

अब गुब्बारों पर खर्च नहीं होगी मिसाइल -

अंतरराष्ट्रीय सीमा या निषिद्ध क्षेत्र में दुश्मन के ड्रोन, बैलून या अन्य उड़ते उपकरण मार गिराने के लिए अब मिसाइल खर्च नहीं करनी पड़ेगी। उन्हें ऊर्जा निर्देशित हथियार से ही नष्ट किया जा सकेगा। राजस्थान बॉर्डर पर 2019 में बैलून मार गिराने के लिए सुखोई से मिसाइल दागी गई थी। राजस्थान में ही 2016 में एक पाकिस्तानी बैलून पर 97 गोलियां चलाई गई थीं।

नए वायुसेना प्रमुख ने भी दिखाई रुचि... भारतीय वायुसेना प्रमुख वीआर चौधरी ने हाल ही ऊर्जा निर्देशित हथियारों को लेकर कहा, जो नया उपकरण आएगा, वायुसेना अपनी परिचालन तैयारियों को बढ़ाने के लिए उसे तुरंत तैनात करेगी। स्वदेशी एस्ट्रा, आकाश एडिशनल, 83 एलसीए, डीआरडीओ की एमआरएसएएम को जल्द तैनात किया जाएगा।

<https://www.patrika.com/national-news/air-force-day-drdo-prepared-energy-guided-weapons-durga-and-kali-7110703/>

Air warriors demonstrate formations to commemorate 1971 Indo-Pak war victory

Six Hawk aircraft flew in an L-shape over the Hindon airbase to demonstrate the 'Vinaash' (destroyer) formation, signifying the Indian Air Force's (IAF) significant victory during the battle of Longewala in the 1971 war with Pakistan

By Peeyush Khandelwal

Six Hawk aircraft flew in an L-shape over the Hindon airbase to demonstrate the 'Vinaash' (destroyer) formation, signifying the Indian Air Force's (IAF) significant victory during the battle of Longewala in the 1971 war with Pakistan.

The IAF's power packed air show, on the occasion of the 89th Air Force Day, showcased a range of aircraft which flew in different formations to commemorate the 50th year of India's victory over Pakistan during the 1971 war. The participating Hawks were from the operational conversion unit 'Alpha', which is the same squadron which flew the Hunter aircraft during the 1971 war.



A Globemaster heavy lift aircraft followed by a team of nine aircraft from the 'Suryakiran' aerobatic team demonstrated the 'Tiranga' formation, celebrating 75 years of India's independence. (Sakib Ali/HT Photo)

The different formations showcased on Friday, that were named after war heroes and operations carried out during the 1971 war, enthralled spectators at the Hindon airbase. People also got a glimpse of a single seat interceptor and air defence/ground attack Gnat aircraft.

The event started with a team of the 'Akash Ganga' paratroopers taking a plunge from an AN-32 transport aircraft, which flew at a height of 8,000 metres above the Hindon airbase.

Three paratroopers, including one from the Indian Army, were seen parachuting from a height of 6,000 ft from a vintage Dakota aircraft while carrying the Indian Tricolour along with IAF flag. IAF officials said the paratroop depicted the Tangail airdrop operation it carried out during the 1971 war.

"There were 75 aircraft which participated in the air show at the Hindon airbase. Different formations, such as Tangail, Meghna, Longewala, Sekhon and others, were demonstrated. In the Sekhon formation, there was a mixed use of different aircraft like LCA Tejas, Jaguars, Rafales and Mirage-2000s. The formations were either named after war heroes or operations carried out during the 1971 war," said a spokesperson from IAF.

The tandem rotor Chinook helicopters, procured from the US in 2019, demonstrated a formation--ferrying 155mm artillery guns suspended by cables-- depicting the operation that the IAF carried out near Meghna river during the 1971 war. Back then, the operation was codenamed 'Cactus Lily.'

The five MiG-29 air superiority aircraft of the 47 squadron flew in the 'Vijay' formation over the Hindon airbase. Officials said the squadron undertook various missions like strikes, escorts and combat air patrolling during the 1971 war.

Likewise, a group of Jaguar deep penetration strike aircraft flew in 'Shamsher' formation and belonged to the 14 squadron, which played a vital role during the 1971 war.

The 'Pratap' formation, demonstrated by a Dakota flanked by two Dornier aircraft, paid tributes to the legends who operated such aircraft.

A Globemaster heavy lift aircraft followed by a team of nine aircraft from the ‘Suryakiran’ aerobatic team demonstrated the ‘Tiranga’ formation, celebrating 75 years of India’s independence.

The Suryakirans flew in different formations and even demonstrated the shape of a Gnat aircraft, which fought the battle of Boyra on November 22, 1971. It was an aerial interception battle that was fought between IAF and Pakistani Air Force jets, which intruded into Indian air space.

“The first aerial engagement between IAF & PAF in the buildup to the 1971 war took place on November 22, when IAF Gnats intercepted PAF Sabres over Boyra. In the ensuing dogfight, three PAF Sabres were claimed by the IAF Gnats, with two crashing in the Indian territory,” the IAF said in a tweet in November 2020.

The Suryakiran team also demonstrated the shape of India’s light combat aircraft ‘Tejas’ and depicted the different delta wing aircraft--Mig-21s, Mirage-2000s, LCA Tejas and Sukhoi, which IAF operates. The four aircraft were also at static display at the Hindon airbase.

Air chief Marshal V R Chaudhary thanked and congratulated the air warriors on Air Force Day.

“As the IAF enters its 90th year, the men and women in Blue who serve the nation today are proud custodians of a legacy of valour, sacrifice and pioneering spirit. It is a great honour for me to stand before you as the successor to a great lineage of commanders who charted a course of a service and brought us to where we stand today,” he said.

The Rafale, Sukhoi-30 and Tejas also performed different manoeuvres, during which they also deployed flares over the airbase.

<https://www.hindustantimes.com/cities/noida-news/air-warriors-demonstrate-formations-to-commemorate-1971-indo-pak-war-victory-101633717646886.html>



Sat, 09 Oct 2021

SASTRA faculty bags DRDO’s innovation award

An innovative idea on the design of intercept receiver for electronic support system conceived by James A Baskaradas, senior assistant professor, School of Electrical and Electronics Engineering, SASTRA, a Deemed to be University, has won the Defence Research and Development Organisation’s Innovation Award contest - Dare to Dream 2.0.

The idea conceived by Mr. James will be of much use to the armed forces in surveillance support. He said a University release that his innovation was under active consideration of the Technological Development Fund Scheme for transforming the idea into a prototype.



James A Baska

<https://www.thehindu.com/news/cities/Tiruchirapalli/sastra-faculty-bags-drdos-innovation-award/article36899104.ece>

PTC Industries Limited, Lucknow gets clearance certificate for Critical Defence Components

PTC Industries Limited., Lucknow is a multi-faceted company, engaged in various engineering activities since 1960s. In the past few years M/s PTC Industries Limited has taken a leap towards development and manufacturing of strategic components and sub systems for various Defence & Aerospace applications.

Today M/s PTC Industries Limited, Lucknow added another feather in their cap by receiving the 'CLEARANCE CERTIFICATE' for critical ON-LINE FITTINGS (OLFs) for Defence applications, made out of expensive Titanium alloys and using a unique In-House Capability comprising of Investment Casting + HIP (Hot Isostatic Pressing) processing techniques, available only with very few companies worldwide.

These critical "OLFs" till date were being imported, but presently with this CLEARANCE CERTIFICATE received by Shri Sachin Agarwal, CMD, PTC Industries Limited, from CHIEF EXECUTIVE (AIR WORTHINESS), Shri A P V S PRASAD, Outstanding Scientist, CEMILAC-The Military Airworthiness Regulatory Body, under DRDO, Ministry of Defence, will reduce imports and help to start production within the country by M/s PTC Industries Limited, under the MAKE IN INDIA & ATMANIRBHAR BHARAT programs of Government of India.

The spin off from this important technology at M/s PTC Industries Limited, has already resulted in Development & Type Certification Activities of various critical and strategic components required for Defence applications viz., thin-walled oil tank parts and intermediate Casings of an Indigenized Aeroengine, highly Complicated Components like High Pressure Air Bottles and many such more critical components of indigenous equipment for various Air, Sea and Land Platforms.

M/s PTC Industries Limited, with its Advanced Technological Capabilities and State of Art facilities for manufacture of Aerospace components & Sub Systems, will play an important role in enhancing India's Defence Capabilities in near future.

Shares of PTC Industries Ltd was last trading in BSE at Rs. 3010.65 as compared to the previous close of Rs. 3040.30. The total number of shares traded during the day was 976 in over 51 trades.

The stock hit an intraday high of Rs. 3099.00 and intraday low of 2955.10. The net turnover during the day was Rs. 2970750.00.

https://www.equitybulls.com/admin/news2006/news_det.asp?id=299331

PM dedicates three PSA oxygen plants to people in Kashi

The PM inaugurated 35 such PSA oxygen plants across 35 states and Union Territories (UTs). He also addressed doctors, staff and public present near the oxygen plant located in the trauma centre complex in Varanasi

Varanasi: Prime Minister Narendra Modi on Thursday dedicated three pressure swing adsorption (PSA) oxygen plants established under PM CARES at Sir Sunderlal Hospital, Trauma Centre (IMS-BHU) and District Women's Hospital to the people of Varanasi via video conferencing from AIIMS, Rishikesh.

The PM inaugurated 35 such PSA oxygen plants across 35 states and Union Territories (UTs). He also addressed doctors, staff and public present near the oxygen plant located in the trauma centre complex in Varanasi.

According to Prime Minister's Office (PMO), with the inception of these 35 PSA oxygen plants, all districts of the country will now have commissioned PSA oxygen plants.

Till now, a total of 1,224 PSA oxygen plants have been funded under PM CARES all across the country, out of which more than 1,100 plants have been commissioned, providing an output of over 1,750 MT oxygen per day.

Additional director/chief medical officer, Dr VB Singh, informed that the oxygen plants at Sir Sunderlal Hospital and Trauma Centre had a capacity of 960 LPM each. These two were jointly constructed by the National Highways Authority of India (NHAI) and the Defence Research and Development Organisation (DRDO) under PM CARES. The 1000 LPM oxygen plant at Women's Hospital was jointly set up by DRDO and Tata group.

Medical superintendent of Sir Sunderlal Hospital Prof KK Gupta, trauma centre in-charge Prof Saurabh Singh Acharya and superintendent in-charge of divisional government hospital Dr Prasanna Kumar among others were present on the occasion. Inputs from agency.

<https://www.hindustantimes.com/cities/lucknow-news/pm-dedicates-two-psa-oxygen-plants-to-people-in-varanasi-101633608663202.html>



Prime Minister Narendra Modi's address during dedication of Pressure Swing Adsorption (PSA) oxygen plants, established under PM CARES, to the nation, at AIIMS Rishikesh. (PTI Photo)

Chandigarh prepares for Covid-19 third wave; four oxygen plants inaugurated

Four oxygen generation plants were inaugurated at government health institutes in Chandigarh amid the possibility of the third wave of the Covid-19 pandemic

Chandigarh: Amid the possibility of the third wave of the pandemic and to give a boost to the existing healthcare sector, four pressure swing adsorption (PSA) oxygen generation plants were inaugurated at various government health centres in Chandigarh on Thursday. According to a report published in The Tribune, the UT administration has readied four oxygen plants for 3,600 hospital beds in the city.

The demand for oxygen went up during the second wave of the pandemic as the number of patients requiring respiratory support saw an upward trend. The city had a tough time dealing with the oxygen crisis as the requirement of the UT was hardly met with the quota sanctioned by the Centre. When the second wave gripped the city, two oxygen plants were set up at city hospitals but they were only able to fulfill 25 per cent of the oxygen requirement.



Oxygen plants to generate 3,600 LPM

The four oxygen plants inaugurated at Chandigarh's government healthcare institutes have a cumulative capacity to generate 3,600 litres of medical oxygen per minute.

One among such plants was the 500-litre oxygen per minute (LPM) capacity plant at Government Multi-Specialty Hospital (GMSH) in Sector 16 which was virtually inaugurated by Prime Minister Narendra Modi under the PM Cares Fund. On the other hand, UT Administrator Banwarilal Purohit virtually inaugurated an oxygen plant at Nehru Hospital Extension, PGI. BJP leader Kirron Kher also inaugurated an oxygen plant at GMCH-32 and its South Campus in Sector 48, stated reports.

Purohit was quoted by The Tribune as saying that with the help of a DRDO-developed PSA oxygen plant designed for capacity of 1,000 LPM can be catered to 190 patients at a flow rate of 5 LPM. The hospital can now generate medical oxygen in a cost-effective manner.

Yashpal Garg, Secretary, Health Department told The Tribune that Chandigarh was the first city in India to make PSA oxygen plants operational in major hospitals. Garg also said that now the city has sufficient stock of oxygen to deal with the crisis in future and two more plants will be installed at the PGI. These plants are likely to be equipped with PSA techniques and molecular sieve (zeolite) technology which will generate oxygen directly from the atmospheric air.

<https://www.indiatoday.in/cities/chandigarh/story/chandigarh-prepares-for-covid-19-third-wave-four-oxygen-plants-inaugurated-1862460-2021-10-08>

महर्षि देवरहा बाबा मेडिकल कॉलेज में ऑक्सीजन प्लांट चालू

देवरिया। प्रधानमंत्री नरेंद्र मोदी ने वर्चुअल माध्यम से महर्षि देवरहा बाबा मेडिकल कॉलेज स्थित ऑक्सीजन प्लांट का उद्घाटन शुक्रवार को किया। प्लांट की स्थापना पीएम केयर्स फंड से हुई है। इसमें डीआरडीओ की तकनीकी का इस्तेमाल हुआ है। यह प्लांट एक हजार एलपीएम ऑक्सीजन उत्पादन करने में सक्षम है। इंटरनेट ऑफ थिंग्स के माध्यम से इस प्लांट में उत्पादित ऑक्सीजन की गुणवत्ता सुनिश्चित की जाएगी।

मेडिकल कॉलेज से संबद्ध जिला अस्पताल के एमसीएच विंग परिसर में आयोजित कार्यक्रम में सांसद डॉ. रमापति राम त्रिपाठी ने फीता काटकर ऑक्सीजन प्लांट का शुभारंभ किया। उन्होंने कहा कि प्रधानमंत्री ने देशभर में 35 ऑक्सीजन प्लांट का शुभारंभ किया है, जिनमें देवरिया का प्लांट भी शामिल हैं। इस प्लांट की स्थापना से जनपद में स्वास्थ्य सुविधाओं का विस्तार होगा और मरीजों में आत्मविश्वास का विकास होगा। यह ऑक्सीजन प्लांट जनपद में स्वास्थ्य सुविधाओं के विस्तार में मील का पत्थर साबित होगा। विधायक डॉ. सत्यप्रकाश मणि त्रिपाठी ने कहा कि ऑक्सीजन प्लांट की स्थापना से मेडिकल कॉलेज और जिला अस्पताल में ऑक्सीजन की आपूर्ति निर्बाध रूप से हो सकेगी। डीएम आशुतोष निरंजन ने कहा कि ऑक्सीजन प्लांट से मेडिकल कॉलेज को काफी फायदा होगा। यह एक स्थायी उत्पादन संरचना है, जिससे मेडिकल कॉलेज में ऑक्सीजन की कमी कभी नहीं होगी। इसमें उच्च तकनीकी का प्रयोग है, जिससे उत्पादित ऑक्सीजन की गुणवत्ता की नियमित मॉनीटरिंग की जाएगी। संचालन डॉ. अखिलेश त्रिपाठी ने किया। इस दौरान एडीएम प्रशासन कुंवर पंकज, मेडिकल कॉलेज के प्राचार्य डॉ. आनंद मोहन वर्मा, पूर्व विधायक रविंद्र प्रताप मल्ल, श्रीनिवास मणि, अजय उपाध्याय, अंबिकेश पांडेय, सीपी सिंह, संजय पांडेय, प्रवीण निखर, राधेश्याम शुक्ला, एसीएमओ राजेंद्र प्रसाद, डॉ. संजय चंद, डॉ. आरके श्रीवास्तव, डॉ. एचके मिश्रा आदि मौजूद रहे।

<https://www.amarujala.com/uttar-pradesh/deoria/oxygen-plant-of-deoria-medical-college-start-deoria-news-gkp4121093123>

कानपुर में अब नहीं होगी ऑक्सीजन की कमी:डफरिन और हैलट अस्पताल में शुरू हुए दो प्लांट, ऑक्सीजन बेड की संख्या भी बढ़ी

कोरोना महामारी की दूसरी लहर के हालात से सबक लेकर शहर के डफरिन और हैलट अस्पताल में पीएम केयर फंड से स्थापित ऑक्सीजन प्लांट का लोकार्पण किया गया। इस दौरान हैलट अस्पताल में प्रदेश की उच्च शिक्षा मंत्री नीलिमा कटियार एवं सांसद देवेन्द्र सिंह भोले तो डफरिन अस्पताल में सांसद सत्यदेव पचौरी ने फीता काटकर प्लांट का लोकार्पण किया।

डफरिन में भी शुरू हुआ प्लांट...

शहर के डफरिन अस्पताल में भी पीएम केयर फंड से स्थापित ऑक्सीजन जनरेशन प्लांट का लोकार्पण सांसद सत्यदेव पचौरी ने किया। उनके साथ विधान परिषद सदस्य सलिल विश्नोई ने बटन दबाकर प्लांट को स्टार्ट किया। इस मौके पर उन्होंने कहा कि, अब यहां के अस्पताल में मरीजों को



मंडलायुक्त डा राजशेखर, विधान परिषद सदस्य सलिल विश्नोई और सांसद सत्यदेव पचौरी

ऑक्सीजन सिलिंडर से नहीं बल्कि डायरेक्ट पाइपलाइन से दी जाएगी। इस दौरान मंडलायुक्त डा राजशेखर ने ऑक्सीजन जनरेशन प्लांट की खासियत बताते हुए कहा कि, अब ऑक्सीजन के लिए अस्पताल आत्मनिर्भर हो गए हैं। इस प्लांट की क्षमता एक हजार लीटर प्रति मिनट जनरेशन की है। इस दौरान मुख्य विकास अधिकारी डा. महेंद्र कुमार और एसीएमओ डा. अरविंद यादव मौजूद रहे।

हैलट में भी शुरू हुआ प्लांट...

जीएसवीएम मेडिकल कॉलेज के हैलट अस्पताल के इमरजेंसी ब्लॉक में पीएम केयर फंड से डीआरडीओ की तकनीक, जो तेजस विमान में इस्तेमाल की गई है से निर्मित ऑक्सीजन जनरेशन प्लांट की स्थापना की गई है। उच्च शिक्षा राज्य मंत्री नीलिमा कटियार ने पूजन किया। उसके बाद सांसद देवेन्द्र सिंह भोले ने प्लांट का फीता काटा और उसके बाद अंदर जाकर बटन दबाकर प्लांट का लोकार्पण किया। इसके साथ ही ऑक्सीजन जनरेशन प्लांट से ऑक्सीजन की आपूर्ति शुरू हो गई।

<https://www.bhaskar.com/local/uttar-pradesh/kanpur/news/now-there-will-be-no-problem-of-oxygen-for-patients-in-kanpur-the-number-of-oxygen-beds-has-increased-kanpur-129000130.html>

चंडीगढ़ ने 3,600 अस्पताल के बिस्तरों के लिए 4 ऑक्सीजन प्लांट तैयार किए

चंडीगढ़: कोविड -19 महामारी की संभावित तीसरी लहर के बीच सबसे खराब तैयारी के लिए, यूटी प्रशासन ने शहर में 3,600 अस्पताल के बिस्तरों को पूरा करने के लिए चार दबाव स्विंग अवशोषण (पीएसए) ऑक्सीजन संयंत्र तैयार किए हैं। चूंकि महामारी की दूसरी लहर के दौरान श्वसन सहायता की आवश्यकता वाले रोगियों में वृद्धि जारी रही, चंडीगढ़ ने ऑक्सीजन संकट को देखा क्योंकि इस क्षेत्र की आवश्यकता केंद्र द्वारा स्वीकृत कोटा से मुश्किल से पूरी हो रही थी। शहर के अस्पतालों में स्थापित दो ऑक्सीजन संयंत्र दूसरी लहर के दौरान केवल 25 प्रतिशत ऑक्सीजन आवश्यकताओं को पूरा करने में सक्षम थे। चार पीएसए ऑक्सीजन संयंत्र आज औपचारिक रूप से शहर के लोगों को समर्पित किए गए।

प्रधान मंत्री नरेंद्र मोदी ने आज GMSH-16 में 500 लीटर प्रति मिनट (LPM) की क्षमता वाले PSA ऑक्सीजन संयंत्र का वस्तुतः उद्घाटन किया। यूटी प्रशासक बनवारीलाल पुरोहित ने नेहरू अस्पताल एक्सटेंशन, पीजीआई में एक पीएसए मेडिकल ऑक्सीजन प्लांट का उद्घाटन किया, जबकि सांसद किरण खेर ने जीएमसीएच -32 और सेक्टर 48 में इसके साथ कैंपस में एक-एक प्लांट का उद्घाटन किया। इस अवसर पर बोलते हुए, प्रशासक ने कहा, "इस डीआरडीओ द्वारा विकसित पीएसए ऑक्सीजन प्लांट की स्थापना के साथ, 1,000 एलपीएम की क्षमता के लिए डिज़ाइन किया गया है, जो 5 एलपीएम की प्रवाह दर पर 190 रोगियों को पूरा करता है, पीजीआई के पास अब विकल्प होगा। अत्यधिक लागत प्रभावी तरीके से साइट पर चिकित्सा ऑक्सीजन उत्पन्न करना।"

उन्होंने कहा, "प्रधानमंत्री नागरिक सहायता और आपातकालीन स्थिति में राहत (पीएम केयर्स) फंड के तत्वावधान में पीएसए ऑक्सीजन उत्पादन संयंत्र स्थापित करने के पीछे का उद्देश्य पीजीआई में कैप्टिव ऑक्सीजन उत्पादन सुविधा सुनिश्चित करना है ताकि संस्थान को अचानक व्यवधान का सामना न करना पड़े। ऑक्सीजन की आपूर्ति।"

देश के लिए पीएम के विजन को दोहराते हुए किरण ने कहा, 'दूसरी लहर ने हमें बहुत कुछ सिखाया है। जहां तक ऑक्सीजन की आपूर्ति, अस्पताल के बिस्तर और दवाओं का संबंध है, हम पूरी तरह से तैयार रहना चाहते हैं और हर अस्पताल को महत्वपूर्ण देखभाल चिकित्सा आवश्यकताओं को पूरा करने के लिए पर्याप्त धन सुनिश्चित किया है।'

आगे ऑक्सीजन संकट से निपटने के लिए, यूटी प्रशासन ने पहले ही जीएमएसएच -16 और जीएमसीएच -32 को 800 एलपीएम की क्षमता वाले दो पीएसए संयंत्रों को मंजूरी दे दी है। यूटी ने जीएमसीएच (साउथ कैंपस), सेक्टर 48, मणि माजरा के सिविल अस्पताल में दो 400 एलपीएम क्षमता वाले प्लांट और सेक्टर 45 और सेक्टर 22 और ईएसआई के सिविल अस्पतालों में 300 एलपीएम क्षमता वाले तीन प्लांट स्थापित करने का भी प्रस्ताव रखा है। राम दरबार में अस्पताल।

स्वास्थ्य विभाग के सचिव यशपाल गर्ग ने कहा कि चंडीगढ़ देश में सभी प्रमुख अस्पतालों में पीएसए ऑक्सीजन प्लांट लगाने और चालू करने वाला देश का पहला शहर है।

पीजीआई के निदेशक प्रो जगत राम ने कहा, "पीजीआई में दो और पीएसए ऑक्सीजन प्लांट लगाए जाएंगे और ये वायुमंडलीय हवा से सीधे ऑक्सीजन उत्पन्न करने के लिए पीएसए तकनीक और आणविक चलनी (जियोलाइट) तकनीक का उपयोग करेंगे

<https://samacharnama.com/city/chandigarh/chandigarh-builds-4-oxygen-plants-for-3600-hospital-beds/cid5434091.htm>



Fri, 08 Oct 2021

Churu: एक करोड़ की लागत का हैं प्रत्येक प्लांट, क्षमता इतनी कि प्रतिदिन 180 बड़े सिलेंडर भर सकते

डीआरडीओ की ओर से राजकीय डेडराज भरतिया अस्पताल में लगाए गए दो ऑक्सीजन प्लांट का वर्चुअल उद्घाटन गुरुवार दोपहर प्रधानमंत्री नरेन्द्र मोदी ने किया। मरीज ऑक्सीजन सिलेंडर के लिए जगह-जगह भटकते रहे थे।

अस्पताल के कार्यवाहक अधीक्षक डॉ. हनुमान जयपाल ने कहा कि डीआरडीओ की ओर से दो ऑक्सीजन प्लांट लगाए गए हैं। प्रत्येक प्लांट से एक हजार लीटर प्रति मिनट ऑक्सीजन सप्लाई होती है। इस प्लांट की क्षमता इतनी है कि प्रतिदिन ऑक्सीजन के 180 बड़े सिलेंडर भर सकते हैं। अब हमारा दायित्व बनता है कि सरकार की ओर से बनाए गए इस प्लांट के रख-रखाव सही ढंग से करें। इसके चलते अस्पताल में आने वाले मरीजों को किसी प्रकार की कोई परेशानी नहीं हो।

इन दो प्लांट से अस्पताल के चार सौ बेडों पर सीधी ऑक्सीजन की सप्लाई होगी। समय-समय पर प्लांट का रख-रखाव आदि करना होगा। मौक पर वरिष्ठ फिजीशियन डॉ. एफएच गौरी, रेडियोलॉजी विभाग के एचओडी डॉ. बीएल, डॉ. जेपी महायच आदि मौजूद थे।

<https://samacharnama.com/states/rajasthan-news/churu-is-costing-one-crore-each-plant-the-capacity-is-such/cid5427259.htm>

टोंक सआदत अस्पताल में प्रभारी मंत्री ने ऑक्सीजन प्लांट का वर्चुअल उद्घाटन किया

By Pawan Sharma

टोंक. सआदत अस्पताल में पीएम केयर फंड के तहत स्थापित किए गए नए ऑक्सीजन प्लांट का गुरुवार को चिकित्सा मंत्री द्वारा वर्चुअल उद्घाटन किया गया। उप नियंत्रक डॉ बीएल मीणा ने बताया कि प्रधानमंत्री नरेन्द्र मोदी ने प्रदेश में जयपुर स्थित एक ऑक्सीजन प्लांट का वर्चुअल उद्घाटन किया है। उसके बाद कार्यक्रम के तहत टोंक में भी चिकित्सा एवं स्वास्थ्य मंत्री व जिला प्रभारी मंत्री डॉ रघु शर्मा ने पीएम केयर फंड से स्थापित किए गए ऑक्सीजन जनरेशन प्लांट का वर्चुअल उद्घाटन किया है।

मीणा ने बताया कि इस ऑक्सीजन प्लांट से प्रतिदिन 275 सिलेण्डर (1000 लीटर) ऑक्सीजन का प्रति मिनट उत्पादन होगा। प्लांट से पाइप लाइन के जरिए सीधे अस्पताल में मरीजों के बेड तक ऑक्सीजन मिल सकेगी। मीणा ने बताया कि इस ऑक्सीजन जनरेशन प्लांट के लिए सिविल निर्माण कार्य एनएचएआई की ओर से कराया गया है।

प्लांट के लिए स्वास्थ्य एवं परिवार कल्याण मंत्रालय के अंतर्गत ऑक्सीजन प्लांट की मशीनरी सहित अन्य संसाधन डिफेंस रिसर्च एंड डवलपमेंट ऑर्गेनाइजेशन (डीआरडीओ) की ओर से उपलब्ध कराए गए हैं। मीणा ने बताया इस प्लांट सहित सआदत अस्पताल में ऑक्सीजन जनरेशन प्लांट की संख्या तीन गई है, जिनसे आवश्यकता पड़ने पर प्रतिदिन 375 ऑक्सीजन सिलेण्डर की आपूर्ति हो सकेगी, जिसमें एक की 35 व दूसरे प्लांट की 65 सिलेण्डर प्रतिदिन ऑक्सीजन उत्पादन की क्षमता है।

वर्चुअल लोकार्पण के दौरान एडीएम मुरारी लाल शर्मा, पीएमओ खेमराज बंशीवाल, डिप्टी सीएमएचओ महबूब अंसारी, ऑक्सीजन प्लांट के नॉडल अधिकारी डॉ हिमांशू मित्तल, पीएसए हैड डॉ हेमन्त शाक्य सहित अन्य कर्मचारी मौजूद थे।



टोंक सआदत अस्पताल में प्रभारी मंत्री ने ऑक्सीजन प्लांट का वर्चुअल उद्घाटन किया

DRDO on Twitter

 **Prasar Bharati News Services पी.बी.एन.एस.** ✓
@PBNS_India

Astronautical Society of India has conferred Aryabhata Award to Secretary DDR&D & Chairman DRDO, Dr G Satheesh Reddy.

Dr Reddy is an institution builder & has set up mechanisms to establish robust defence development & production ecosystem in India.

[@DRDO_India](#)

10:17 AM · Oct 10, 2021

 **DRDO** ✓ @DRDO_India · Oct 8

Hon'ble RRM Shri Ajay Bhatt visited Defence Electronics Applications Laboratory (DEAL), DRDO today. He was briefed about ongoing & planned projects of the laboratory and was also demonstrated the various products & technologies developed for [#IndianArmedForces](#).



 **DRDO** ✓ @DRDO_India · 13h

Astronautical Society of India Confers Aryabhata Award to Secretary DDR&D and Chairman DRDO
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Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Sat, 09 Oct 2021 9:47PM

India-US Defence Policy Group meeting in Washington DC

Defence Secretary of India Dr Ajay Kumar and the US Under Secretary of Defense for Policy, Dr Colin Kahl co-chaired the 16th meeting of the India-US Defence Policy Group (DPG) on 08 October 2021 in Washington DC. The DPG is the apex official-level mechanism between the Ministry of Defence of India and the US Department of Defense to comprehensively review and guide all aspects of bilateral defence cooperation.

The two sides reviewed the progress in operationalising India-US Major Defence Partnership, mil-to-mil engagements, implementation of foundational defence agreements, defence exercises, strengthening technology cooperation and defence trade. Both sides shared regional security perspectives and cooperation, and to work together to promote shared interests in the Indo Pacific region.

The co-chairs were apprised of the progress made by various bilateral defense initiatives and mechanisms. They took stock of the joint project to co-develop air-launched unmanned aerial vehicles (UAVs) under the Defence Technology and Trade Initiative. The two sides also welcomed the holding of inaugural Industrial Security Agreement meeting in India to facilitate high-end defence industrial collaboration. They agreed to encourage both the private and government stakeholders to utilise the existing innovation ecosystems in defence industries for co-development and co-production. Both sides welcomed the cooperation in new domains such as space, Artificial Intelligence, cyber and counter Unmanned Aerial Vehicle technologies.

The two sides reviewed preparation for the forthcoming 2+2 Ministerial Dialogue. It was agreed to hold the next DPG meeting in India on mutually convenient dates.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762577>



पत्र सूचना कार्यालय

भारत सरकार

रक्षा मंत्रालय

Sat, 09 Oct 2021 9:47PM

वाशिंगटन डीसी में भारत-अमेरिका रक्षा नीति समूह की बैठक

भारत के रक्षा सचिव डॉ अजय कुमार और रक्षा क्षेत्र में नीति निर्माण हेतु अमेरिका के अवर रक्षा सचिव डॉ कॉलिन कहल ने दिनांक 08 अक्टूबर 2021 को वाशिंगटन डीसी में भारत-अमेरिका रक्षा नीति समूह (डीपीजी) की 16वीं बैठक की सह-अध्यक्षता की। डीपीजी द्विपक्षीय रक्षा सहयोग के सभी पहलुओं की व्यापक समीक्षा और मार्गदर्शन करने के लिए भारत के रक्षा मंत्रालय और अमेरिकी रक्षा विभाग के बीच शीर्ष आधिकारिक स्तर का तंत्र है।

दोनों पक्षों ने भारत-अमेरिका प्रमुख रक्षा साझेदारी, सैन्य जुड़ाव, मूलभूत रक्षा समझौतों के कार्यान्वयन, रक्षा अभ्यास, प्रौद्योगिकी सहयोग और रक्षा व्यापार को मजबूत करने में प्रगति की समीक्षा की। दोनों पक्षों ने क्षेत्रीय सुरक्षा दृष्टिकोण और सहयोग साझा किया और हिंद-प्रशांत क्षेत्र में साझा हितों को बढ़ावा देने के लिए साथ मिलकर काम करने की इच्छा जताई।

सह-अध्यक्षों को विभिन्न द्विपक्षीय रक्षा पहल और तंत्रों द्वारा की गई प्रगति से अवगत कराया गया। उन्होंने रक्षा प्रौद्योगिकी और व्यापार पहल के तहत हवाई-लॉन्च किए गए मानव रहित हवाई वाहनों (यूएवी) के सह-विकास के लिए संयुक्त परियोजना का जायजा लिया। दोनों पक्षों ने उच्च स्तरीय रक्षा औद्योगिक सहयोग की सुविधा के लिए भारत में आरंभिक औद्योगिक सुरक्षा समझौते की बैठक आयोजित करने का भी स्वागत किया। वे निजी और सरकारी दोनों हितधारकों को सह-विकास और सह-उत्पादन के लिए रक्षा उद्योगों में मौजूदा नवाचार इको सिस्टम का उपयोग करने के लिए प्रोत्साहित करने पर सहमत हुए। दोनों पक्षों ने अंतरिक्ष, आर्टिफिशियल इंटेलिजेंस, साइबर और मानव रहित हवाई वाहन रोधी प्रौद्योगिकियों जैसे नए डोमेन में सहयोग का स्वागत किया।

दोनों पक्षों ने आगामी 2+2 मंत्रिस्तरीय वार्ता की तैयारी की समीक्षा की। पारस्परिक रूप से सुविधाजनक तिथियों पर भारत में अगली डीपीजी बैठक आयोजित करने पर सहमति बनी।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762684>



Press Information Bureau

Government of India

Ministry of Defence

Fri, 08 Oct 2021 4:56PM

Fifth edition of Japan-India bilateral maritime exercise 'JIMEX'

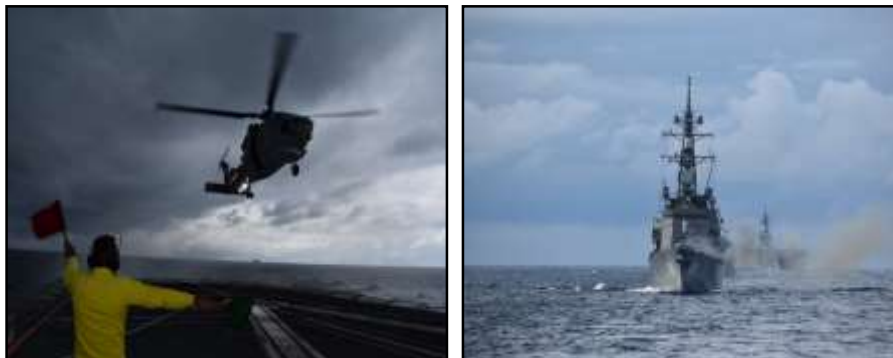
The 5th edition of the bilateral maritime exercise JIMEX, between Japan and India, was conducted in the Arabian Sea from 06 – 08 October 2021. The exercise saw the ships and aircraft of Japan Maritime Self Defence Force (JMSDF) and Indian Navy (*IN*) engaging in a high tempo of operations focused on air, surface and sub-surface dimensions of maritime operations as well as the air domain.

The *IN*, under the command of RAdm Ajay Kochhar, Flag Officer Commanding Western Fleet, is participating with indigenous Guided Missile Destroyer, INS Kochi (with Sea King MK 42B helicopter) and the Guided Missile Frigate INS Teg (with SAR capable Chetak helicopter). The *IN* is also fielding a P8I, a shore-based maritime reconnaissance aircraft, and MiG 29K fighters. The JMSDF is led by RAdm Ikeuchi Izuru, Commander, Escort Flotilla Three comprising of the Izumo Class Helicopter Carrier *Kaga* and the Guided Missile Destroyer *Murasame*. Both ships are participating with integral SH60K helicopters.

Setting the operational tempo from the start, the units exercised War at Sea scenario with P8I (*IN*) providing maritime reconnaissance support to both navies. The units practiced Replenishment at Sea approaches and undertook fuel rig connect-up between *Kaga* and *Kochi*. The exercise also involved complex Over the Horizon Targeting exercises and surface gun shoots on an expendable target. An advanced coordinated anti-submarine exercise involving an underwater target deployed by JMSDF saw surface units and *IN*'s P8I aircraft exercising with seamless coordination. Flag Officers of the two forces also met on the Flight Decks of *Kochi* and *Kaga* during flying operations, in keeping with the true spirit of military friendship.

The Air Domain operations included advanced anti-aircraft firing exercises on Expendable Aerial Target launched from the deck of INS Kochi and ship controlled Beyond Visual Range (BVR) combat drills by *IN*'s MiG 29K fighters. The exercise involved a high tempo of flying operations with MiG 29K fighters coming in for multiple simulated air strike on surface units, shepherded by the *IN*'s Maritime Patrol Aircraft, Dornier. The inclement weather could do little to hold back *IN* and JMSDF helicopters from undertaking cross-deck landings, showcasing a high level of interoperability.

The precision, coordination and the high level of interoperability reflected not only the high standards of professionalism and preparedness the two navies maintain to counter threats at sea, but also the high level of trust and understanding that they have built over the years. The complex maritime exercises undertaken will enable the two navies to further strengthen their already wide-ranging strategic partnership and, when required, to jointly safeguard their maritime interests and ensure peace, security and stability in the region.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1762148>

If China continues presence along LAC, so will we: Army Chief General Naravane

India and China have been locked in a border standoff for 17 months. Despite two rounds of disengagement at friction points this year, the two nations still have 50,000 to 60,000 troops each deployed in Ladakh

By Rahul Singh

New Delhi: If the Chinese army is to stay in eastern Ladakh, so is the Indian Army, army chief General Manoj Mukund Naravane said on Saturday, referring to the military buildup and infrastructure development by the People's Liberation Army across the contested Line of Actual Control (LAC).

"It is a matter of concern that the large-scale buildup that occurred last year (when the border row erupted) continues to be in place," the army chief said.

"To sustain that kind of buildup, there has been an equal amount of infrastructure development on the Chinese side. It means that they are there to stay. We are keeping a close watch on the developments. But if they are there to stay, we are there to stay too," he said at a public event in New Delhi.



Chief of the Army Staff General Manoj Mukund Naravane.

India has taken countermeasures and matched Chinese moves, Naravane said. His comments come at a time when the rivals are planning to hold the next round of military talks to cool tensions in eastern Ladakh. The 13th round of talks to take disengagement at friction points on LAC forward is expected to take place next week.

India and China have been locked in a border standoff for 17 months. Despite two rounds of disengagement at friction points this year, the two nations still have 50,000 to 60,000 troops each deployed in Ladakh.

"If they continue to stay there for the second winter, it will definitely mean we will be in Line of Control (LoC) kind of situation (referring to the Indian and Pakistani deployments on the LoC), though not an active LoC as is there on the western front. We will have to keep a close eye on PLA troop buildup and deployments to ensure they don't get into any misadventure once again," Naravane said.

Asked to comment on PLA's intentions, given its aggressive moves in the northern sector, he said: "I wish I knew. The most difficult thing is to get into your adversary's mind. This is the question we have been asking not just within the army, but also at other forums. But whatever those reasons may have been, I don't think they have been able to achieve their aims because of the rapid response by the Indian armed forces."

The army chief said renewed infiltration attempts by Pakistani terrorists were being witnessed along LoC in Kashmir after a four-month lull, following the renewal of a ceasefire pact with Pakistan in February 2021. The two countries first agreed in 2003 to observe truce along their de facto border in Jammu and Kashmir.

"The ceasefire held in totality till July. Incidents have started taking place again. There have been three incidents of ceasefire violation in north Kashmir. It seems to be a repeat of the 2003 pattern when it started with one odd incident and then rising to...as good as not having a ceasefire," he said.

On the Afghanistan situation and its impact on Kashmir, Naravane said when the previous Taliban regime was in power 20 years ago, Afghan-origin terrorists were operating in the valley. "There is reason to believe that the same thing might happen once again. We are prepared for any

such eventuality. Just as we dealt with them in early 2000s, we will deal with them now should they venture anywhere near us.”

Naravane flagged concerns about the recent targeted killings in Kashmir, saying the acts were unacceptable and a last-ditch attempt by terrorists to stay “a little relevant.”

On the possibility of women being assigned front-line combat roles given that the doors of the National Defence Academy have been opened to them, he said, “We have opened 10 branches of the army to women, except infantry, armoured corps and mechanised infantry. I think for the foreseeable future that will remain the same. I will not make any false promises. We will have to see how it goes along. None of our neighbouring countries have opened up their combat arms to women officers. Things could change in future. We have to move slowly... Change will happen but at its own pace.”

<https://www.hindustantimes.com/india-news/if-china-continues-presence-along-lac-so-will-we-says-army-chief-general-naravane-101633803883938.html>

THEWEEK

Mon, 11 Oct 2021

'Right choice for IAF': Pratt & Whitney touts engines for F-15EX fighter

All countries operating F-15, F-16 use engines made by either GE or Pratt & Whitney

Last week, during an annual press conference ahead of Air Force Day, the chief of the Indian Air Force emphasised the importance of a project to procure 114 'multirole fighter aircraft' (MRFA).

Air Chief Marshal V.R. Chaudhari said the project for 114 fighter jets would be "under the Make In India initiative" and the Indian Air Force was moving the "case forward". Announced in April 2019, the estimated acquisition cost of 114 fighter jets is \$18 billion.

Companies from the US, France, Sweden and Russia and a European consortium have offered their aircraft for the project. The MRFA competition had been touted as a 're-run' of an aborted competition to buy 126 fighter aircraft for the IAF that was called the Medium Multi-Role Combat Aircraft' (MMRCA), which was first launched in the first decade of this millennium. The Dassault Rafale was announced as the winner of the MMRCA tender in 2012, but the tender was cancelled in 2015 as negotiations with the French manufacturer got bogged down. That year, the Narendra Modi government announced India would buy 36 Rafale jets off the shelf.

However, in February 2020, news emerged that the US government, under then president Donald Trump, wanted to 'disrupt' the Indian Air Force competition by offering a heavyweight fighter, the F-15EX.

The F-15EX is the newest version of the F-15 air superiority fighter, which first flew in 1972. While nearly identical to a standard F-15 externally, the F-15EX has a new fly-by-wire system, more powerful processor and advanced electronic warfare suite.

Earlier this year, Boeing confirmed the F-15EX had been offered to the Indian Air Force. The F-15EX is significantly heavier than all the other aircraft on offer to the Indian Air Force and can carry a payload of nearly 13 tonnes of air-to-air and air-to-surface weapons and fuel tanks, significantly more than the Dassault Rafale.



Representational image of an F-15EX | Boeing

In February, the F-15EX made its first flight, prior to delivery to the US Air Force. The US Air Force intends to buy 76 F-15EX fighters by 2025 and could eventually have a fleet of 144 jets.

On October 8, to mark Air Force Day, US Engine manufacturer Pratt & Whitney tweeted its wishes to the Indian Air Force with a video of the F-15EX. Pratt & Whitney tweeted, "We're proud to power many IAF aircraft and are excited for the opportunity to power the F-15EX with our F100 engine."

While the first batch of F-15EX fighters being bought by the US Air Force use F110 engines built by GE, Pratt & Whitney has been offering the latest variant of the F100 engine that powered the first F-15 jet that flew in 1972.

In a post on the company website, Thomas Prete, vice president, Military Engineering, Pratt & Whitney, declares the "The F100-PW-229 is the most capable, most reliable 4th generation fighter engine ever developed". All countries operating the F-15 and F-16 use either the F100 or F110 engines, which have similar dimensions and thrust settings.

<https://www.theweek.in/news/india/2021/10/10/right-choice-for-iaf-pratt-and-whitney-touts-engines-for-f-15-ex-fighter.html>

THE TIMES OF INDIA

Mon, 11 Oct 2021

Thales looking at providing cyber security solutions for Indian armed forces

New Delhi: Leading French defence major Thales Group is planning to focus significantly on addressing requirements of the Indian armed forces for new-age cyber security solutions, artificial intelligence and advanced capabilities in big data analytics.

Chairman and CEO of Thales Group Patrice Caine said the company has been looking at expanding its overall footprint in India, particularly in the areas of emerging technologies that will be crucial for the armed forces.

The Indian Army, the Navy and the Indian Air Force have been focusing on acquiring futuristic technologies like nanotechnology, quantum computing, artificial intelligence, swarm drones and robotic technologies to deal with future security challenges.



Caine said Thales Group is aiming at expanding its overall footprint in India in a number of segments, including in areas of cyber security, artificial intelligence and digital solutions.

"We are also looking at bringing some key pieces of equipment and systems to contribute to raise our level of involvement in sharing defence technologies with India's defence sector in the field of sonar, radars and other platforms," he told PTI.

However, he refused to share the details. Caine said that India's defence manufacturing sector is moving in the right direction riding on a series of policy initiatives by the government and Thales would like to be a key partner of the country in its quest to become a key producer of military platforms and solutions.

"We are totally committed to help India expand its defence production under the 'Make in India Initiative' by producing equipment either on our own or with our partners. India has a good talent pool to develop cyber-security solutions, AI applications and big data analytics," he said.

India is expected to spend close to USD 300 billion in the next five years in procuring defence equipment and almost all major global defence firms are eyeing a slice of it.

The Thales Chairman and CEO also indicated that the company is looking at having joint ventures with a number of Indian companies for a range of products and military solutions but refused to share details.

He said India is now considered as a key country for sourcing various raw materials for the company's global production line and it is going to double procurement from the country in the next five years.

"India is now a key and reliable country in our global supply chain," he said.

Thales is part of the French firms that provided key components for the Rafale jets procured by India.

As part of Thales' offsets commitments under the Rafale deal, the company helped Bharat Electronics Ltd (BEL) in producing modules for the RBE2 radar.

Thales has been providing avionics and other equipment to the state-run aerospace behemoth Hindustan Aeronautics Limited for over four decades and is involved in supplying equipment for various other key military projects.

Present in India since 1953, Thales has offices in New Delhi, Gurgaon, Hyderabad, Bengaluru, Chennai and Mumbai, among others. Over 600 employees are working with Thales and its joint ventures in India.

Caine also complimented India's reform measures aimed at boosting defence manufacturing.

The government has initiated a series of measures in the last couple of years to encourage the domestic defence industry.

In August last year, it was announced that India will stop the import of 101 weapons and military platforms like transport aircraft, light combat helicopters, conventional submarines, cruise missiles and sonar systems by 2024.

A second negative list, putting import restrictions on 108 military weapons and systems such as next-generation corvettes, airborne early warning systems, tank engines and radars, was issued recently.

In May last year, the government announced increasing the FDI limit from 49 per cent to 74 per cent under the automatic route in the defence sector.

The government has been focusing on reducing dependence on imported military platforms and has decided to support domestic defence manufacturing.

The Defence Ministry has set a goal of a turnover of USD 25 billion (Rs 1.75 lakh crore) in defence manufacturing by 2025 that included an export target of USD 5 billion (Rs 35,000 crore) worth of military hardware.

<https://timesofindia.indiatimes.com/india/thales-looking-at-providing-cyber-security-solutions-for-indian-armed-forces/articleshow/86914100.cms>

Will Pakistan's new Sea Sultan Sub-Hunter be used to guide anti-ship ballistic missiles?

Pakistan's Navy is focused on denying India's larger fleet access to its littoral waters. Here's how they'll do it

By Sebastien Roblin

In a ceremony on September 2, the Pakistani Navy inducted into service its first Sea Sultan maritime-patrol/anti-submarine jet—a Brazilian regional airliner refitted with Italian sensors and avionics.

The conversion was achieved unusually rapidly given the order was announced less than a year earlier in October 2020, and there are rumors the lead aircraft still lacks key systems. Nonetheless, two more of the new jets are being converted for the \$190 million contract, building towards an expected total procurement of ten aircraft for Pakistan's Naval Air Arm.



The Indian Ocean is becoming a second front in the maritime competition between Beijing and Washington, one which happens to be shaped around the longer-running conflict between India and Pakistan. Fifty years ago in December 1971 that regional rivalry flared into one of the last major naval conflicts since World War II, with deadly engagements involving submarines, guided-missile boats, and carrier-based aircraft.

Though Richard Nixon unsuccessfully tried to intervene on Pakistan's behalf in 1971, today Washington is aligning itself with New Delhi and is furnishing the Indian Navy with MQ-9 Predator maritime surveillance drones and versatile P-8 Neptune maritime patrol jets. As its relationship with the United States remains contentious, Islamabad, in turn, is leaning more on its longstanding alliance with China and arms manufacturers in Europe and beyond.

Sea Sultan and Orion

The Sea Sultans will eventually replace the Pakistani Navy's nine remaining turboprop-powered P-3 Orion maritime patrol planes of 28 Squadron, based in PNS Mehran in Karachi. After years of delay due to an embargo, between 1996 and 2012 Pakistan imported over a dozen P-3s from the United States. These were mostly P-3C anti-submarine models, though a few P-3B Airborne Early Warning (AEW) aircraft using Hawkeye 2000 radars were also procured.

Today, Pakistan's Naval Air Arm also operates three shorter-range Franco-Italian ATR-72 twin-turboprop maritime patrol planes, and sixteen Mi-14, Sea King, and Z-9EC anti-submarine capable helicopters. However, the Orions and forthcoming Sea Sultan have significantly greater range, payload, and endurance than these other platforms.

Pakistan's Orions have had an eventful service life, employed in combat against Taliban insurgents in Swat Valley, performing signals-intelligence gathering, surveillance, and bombing missions. But in 2011, insurgents raided Mehran and destroyed two P-3s based there, though the United States replaced the aircraft. A third P-3C was lost off the coast of Balochistan in 1999 in an accident that killed all twenty-one onboard.

As the future of U.S.-Pakistan relations remains murky, Islamabad explicitly sought a P-3 replacement that wouldn't be subject to U.S. International Traffic in Arms Regulations (ITAR). Thus the Sea Sultan is based on Brazilian Lineage 1000E regional jetliners purchased second-hand rather than directly from manufacturer Embraer. South African company Paramount Group is installing torpedo launchers and SeaSpray radars made by Italian firm Leonardo into the four-engine regional airliners.

The basic Lineage 1000 airliner has a comparable maximum range to a P-3C but is roughly fifty percent faster at cruising and maximum speed (629 and 543 miles per hour) and has a much higher maximum altitude too. Although the performance of a fully-equipped Sea Sultan is unknown, Pakistan's tender specified a range of 4,600 miles and a maximum takeoff weight of sixty to seventy tons.

The SeaSpray AESA X-Band multi-mode radar may represent the most important change from the Orion. The 360-degree radar incorporates a Moving Target Indicator for tracking vehicles and synthetic-aperture mode which can provide detailed scans of ships or other surface targets. The SeaSpray 7500V2 model has a maximum range of 368 miles, but the somewhat shorter-range 7300E model, already in use on Pakistani ATR-72 patrol planes and Sea King helicopters, may be installed instead.

Even the 7300E, however, reportedly has high enough resolution to detect life rafts and shipwrecked humans in inclement weather at a significant distance. Such resolution might also suffice to detect the protruding snorkel of a diesel-electric submarine sucking in air to recharge its batteries.

Like the Orion, Sea Sultans are planned to have electromagnetic and signals intelligence sensors (ESM and ELINT), sonar buoys, and an acoustic analysis station for submarine hunting, a satellite communications link, and flare/chaff dispensers to decoy missiles. They will also carry homing torpedoes for sub-hunting, and likely anti-ship missiles for surface warfare.

Pakistan's Navy is focused on denying India's larger fleet access to its littoral waters. Maritime patrol planes thus improve the Pakistani Navy's awareness of ships and submarines approaching said waters, limiting the risk of surprise attack (like the Indian Navy's successful missile attack on Karachi in 1971) and enabling coordinating response by other assets. Furthermore, they can attack maritime targets, conduct search and rescue missions, and scoop up electronic intelligence data on other militaries operating in the region.

One might also assume the new jets may be used to search for India's small but growing fleet of nuclear-armed ballistic missile submarines. However, once armed with 2,100-mile range K4 missiles, India's SSBN submarines will likely patrol in the relatively secure waters of the Bay of Bengal, beyond the practical reach of Pakistani aviation in wartime.

Spotter for Ship-Hunting Missiles?

In a speech in October 2020, former Chief of Naval Staff Admiral Zafar Mahmood Abbasi stated that Pakistan was developing "...in the hypersonic domain, the ship-based, long-range, anti-ship and land-attack P282 ballistic missile." He described it as an effort to "leapfrog" Pakistan to capabilities similar to India's supersonic Brahmos cruise missile.

Hypersonic weapons, which by definition attain speeds exceeding Mach 5, are a buzzword these days, and several analysts have wondered whether the admiral actually was referring to a hi-tech surface-skimming cruise missile—unlikely due to the difficulty of developing air-breathing hypersonic weapons—or a missile that deploys a hypersonic glide vehicle that skips just above the atmosphere.

But as many traditional ballistic missiles travel at hypersonic speeds, it seems unnecessary to theorize Abbasi meant such exotic technologies. After all, consider that Pakistan's ally China has developed a family of anti-ship ballistic missiles (ASBMs) across the short to medium range spectrum (the DF-21D, DF-26, and export-oriented CM-401). That obviously creates a practical vector by which Pakistan might develop this technology, just as India cooperated with Russia to develop its Brahmos missile.

The P-282 has also been described as an Anti-Access/Area-Denial (A2/AD) system designed to impose risks on shipping across large swathes of the ocean—a concept popularized mostly due to China's ASBM technology, though today the term has many critics.

Admittedly, China's ASBMs are deployed on land, not ships. But then the Indian Navy does deploy Dhanush ship-launched ballistic missiles capable against both land and maritime targets, albeit only out to a range of 200 to 466 miles depending on payload.

However, the big limitation of ASBMs is that despite projecting a threat across many hundreds of miles, they require a separate surveillance platform to detect potential targets and promptly relay targeting data—not easy when you consider ships are moving targets and the infrared-sensor used by ASBMs for terminal guidance only covers a relatively narrow cone.

In theory, the new Sea Sultans could serve as especially mobile enablers for an ASBM thanks to its sensors, communication systems, and long-range, long-endurance characteristics. They could rove ahead, locate ships, call in a missile attack, and possibly even transmit mid-course corrections to the missile.

That said, in wartime maritime patrol planes would be vulnerable to hostile fighters—even more so than usual because India might stage fighters at Jamnagar airport with range enough to interdict aircraft operating over the Arabian Sea.

Maritime patrol planes would have to remain outside the engagement range of surface-to-air missiles on Indian warships, which may extend to ninety-three miles with Barak-8ER missiles built by Israel for the Indian Navy. The Barak-8 also might vex ASBMs, as it is designed for short-range ballistic missile defense capability, and is alleged to have shot such a missile down in the 2020 Nagorno-Karabakh war.

Finally, it's worth noting the P-282 has not been characterized as nuclear-capable despite Pakistan's extensive inventory of tactical nuclear weapons. However, the development of ship-launched ballistic missiles could serve as a stepping stone to developing a submarine-launched nuclear missile, giving Pakistan a more flexible and survivable sea-based nuclear deterrence than its short-range submarine-launched Babar cruise missile.

<https://nationalinterest.org/blog/buzz/will-pakistan%E2%80%99s-new-sea-sultan-sub-hunter-be-used-guide-anti-ship-ballistic-missiles>



Press Information Bureau
Government of India

Ministry of Communications

Sun, 10 Oct 2021 9:19AM

Secretary Telecom Shri K. Rajaraman visits C-DOT; Inaugurates futuristic Quantum Communication Lab

Indigenously developed Quantum Key Distribution (QKD) solution by C-DOT unveiled

QKD solution can support a distance of more than 100 kilometers on standard optical fiber

Development of indigenous QKD solution is essential to address security threats of data posed by rapid advancement in Quantum Computing

Sh. K. Rajaraman, Secretary (T) and Chairman – Digital Communications Commission, Department of Telecommunications, Government of India, visited Centre for Development of Telematics (C-DOT) Delhi Campus yesterday. C-DOT is the premier Telecom R&D centre of the Department of Telecommunications, Ministry of Communications, Government of India. He interacted with senior officials of C-DOT and reviewed the R&D projects being developed by CDOT. He was given a detailed presentation about the telecom R & D activities undertaken by C-DOT by Dr. Rajkumar Upadhyay, Executive Director, C-DOT. Subsequently he visited various C-DOT labs including labs of 4G/5G, GPON, Encryptors, Routers, WiFi, Cyber Security etc. He encouraged the researchers working in various R&D projects and later addressed C-DOT officers. Officers from CDOT Bangalore campus joined the address through video conferencing tool developed in-house by C-DOT.

Shri Rajaraman asked C-DOT engineers to work with full dedication towards realizing the goal of “Atmanirbhar Bharat” in field of telecom. He also appreciated the contribution of C-DOT in achieving self-reliance in the field of telecom and assured full support of DoT in all endeavors of C-DOT. He complimented C-DOT for its critical role in developing indigenous 4G technology and ongoing 5G development project. (4G technology from CDOT is already under Proof of Concept (POC) Trial in BSNL network at Chandigarh and Ambala). He stressed upon CDOT to keep track of emerging technologies, align with the technology life cycle and asked CDOT to start working on 6G and other futuristic technologies in order to catch up with the market in time. He also advised C-DOT to focus on commercialization of technology and consider setting up incubators in C-DOT for faster technology commercialization. C-DOT was also asked to focus on contributing in national as well as international standards as well as creating more IPR.

Sh. K. Rajaraman also inaugurated the Quantum Communication Lab at C-DOT, Delhi and unveiled the indigenously developed Quantum Key Distribution (QKD) solution by C-DOT which can support a distance of more than 100 kilometers on standard optical fiber. Development of indigenous QKD solution is essential to address the threat that rapid advancement in Quantum Computing poses to the security of the data being transported by various critical sectors through the current communication networks. With the development of QKD solution and the existing suite of wide range of products in Optical Access, Core, Switching & Routing, Wireless, Post Quantum Cryptography Encryptors (PQCE) etc, C-DOT has become the first organization in India to offer complete portfolio of indigenous Quantum Secure telecom products & solutions to

comprehensively address the requirements of Telecom Service Providers as well as Strategic and Defense sector in India.

A brief about Quantum Technologies and QKD:

Quantum Technologies are one of the most researched area at present and are attracting huge investments by Governments all across the globe as well as by private players ranging from multinational giants to start ups. Almost all countries have dedicated programs for furthering research in this area, which has immense potential, impact of which can probably be compared with that of semiconductor technology in the last few decades or the impact that the laser had since its invention in 1960s.

Quantum Technologies can broadly be divided into four verticals viz. Quantum Computing, Quantum Communications, Quantum Sensors and Quantum Materials. To comprehensively address all these verticals and leapfrog India in this crucial & niche area, India has launched National Mission on Quantum Technologies & Applications (NM-QTA). This was announced by Hon'ble Finance Minister in her budget speech delivered in February 2020. This initiative, with a budget of more than USD 1 Billion spanning over eight years, will be led by Department of Science and Technology (DST) and will have active participation from various other ministries e.g. Department of Telecommunications, Department of Space, Department of Atomic Energy etc.

Quantum Technologies are based upon phenomena exhibited by microscopic particles (like photons, electrons, atoms etc.) which are quite distinct from the way normal macroscopic objects behave. Behavior of these microscopic particles can't be described by Classical (or Conventional) Physics based on Newtonian Mechanics, and consequently Quantum Mechanics came into picture, around 100 years back, to formulate theory to describe such behavior. One of the most quoted such phenomena is the "Photoelectric effect" for which Einstein was awarded the Noble Prize in Physics in the Year 1921. Quantum Mechanics is probabilistic in contrast to Classical Mechanics which is deterministic. Besides this, Quantum Mechanics is counterintuitive as the phenomena of Superposition, Entanglement, Teleportation & Tunneling etc. exhibited by microscopic particles appears weird and have no equivalence in everyday life. These aspects of Quantum Mechanics have, however, led to number of interesting applications such as exponential increase in computing power, inherently secure communication (teleportation of information), interaction free measurements, extremely precise & sensitive sensors etc.

Centre for Development of Telematics (C-DOT), a premier telecom research & development organization under Department of Telecommunications, Government of India, is leading the effort in the Quantum Communications vertical of NM-QTA. C-DOT has developed Product in one of the most promising applications of Quantum Communications viz. Quantum Key Distribution (QKD) and is continuing to pursue research in this area. Development of QKD solution will address the threat that rapid advancement in Quantum Computing poses to the security of the data being transported by the current communication infrastructure.

C-DOT is actively looking to collaborate with other national & international institutes and organizations working in the area of Quantum Communications to synergize efforts in this nascent field.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1762590>



New toxic-free, superior multilayer technology that packages together electronic components can help country's strategic sectors

Indian Scientists have indigenously developed toxic-free and superior multilayer technology that packages together electronic components like resistors, capacitors to produce multilayer circuits. These technologies, known as Low-Temperature Cofired Ceramic (LTCC) and High-Temperature Cofired Ceramic HTCC substrates with applications as satellite communication components, are currently being imported in India. The indigenous development can plug the money drain through import substitution and support the country's strategic sectors.

Low orbit satellites satellite systems which are in demand today need a sustainable technology supporting reduced satellite volume and mass, besides reduced production time and affordable cost. Hybrid microsystems based on LTCC technology (integration of passive components, such as a capacitor, resistor, inductor, resonator and filter, etc., into a multilayered ceramic module) is an interesting solution in future communication satellites due to their outstanding performance and moderate cost. Currently, the LTCC products are being imported from vendors like DuPont, Ferro etc., and hence country's revenue is getting drained owing to the exorbitant price of these products.

Hence, Dr K.P. Surendran, Principal Scientist, Materials Science & Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology NIIST, under the purview of Advanced Manufacturing Techniques scheme of Department of Science & Technology (DST), Govt. of India, developed a series of LTCC tapes and HTCC substrates which are on par with international standards. They have dielectric properties or the ability of storing electric energy in an electric field that are comparable to the commercial tapes, whereas thermal conductivity is better than them. A patent has already been filed on tape casting of HTCC substrate based on zircon.

An aqueous tape casting technique has been developed, which is relatively health hazard free since it does not employ volatile organic components like xylene and methyl ethyl ketone. The technology developed is a glass-free LTCC tape casting composition, which can address the brutality issues of tapes.

These tapes find application in various satellite communication components at the Space Application Centre, Ahmedabad (ISRO), which require thousands of microwave substrates every year as also in Defence Research laboratories and BHEL

The technology is in the 5th stage of the Technology Readiness level, and Dr K.P. Surendran has signed an MoU with Ants Ceramics, Vasai, Maharashtra on LTCC tapes. These LTCC tapes and conductive pastes can be supplied to Space Application Centre (SAC), Ahmedabad, to be tested as a cost-effective replacement to the commercial LTCC tapes which they are currently importing. If the testing is successful, NIIST tapes can be employed in ISRO's several microwave components like S- and C- band receivers for their satellite transponders.

The knowledge generated in the AMT project has given NIIST confidence for developing an all gold system as a substitute for the imported commercial LTCC tape system currently being used in

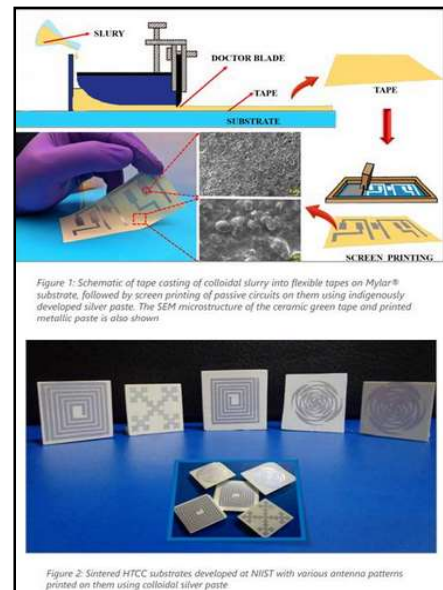


Figure 2: Sintered HTCC substrates developed at NIIST with various antenna patterns printed on them using colloidal silver paste

Space Application Centre ISRO for satellite applications. A project in this direction has been proposed under the ISRO Respond programme. Commercial exploration and mass production of this product is also being planned after testing the gold paste based LTCC tapes at SAC.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762144>



पत्र सूचना कार्यालय
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Fri, 08 Oct 2021 4:48PM

इलेक्ट्रॉनिक घटकों को एक साथ रखने वाली नई विषाक्तता-मुक्त, उत्तम कोटि की बहुस्तरीय तकनीक देश के रणनीतिक क्षेत्रों में सहायता कर सकती है

भारतीय वैज्ञानिकों ने स्वदेशी रूप से विषाक्तता-मुक्त और उत्तम कोटि की बहुस्तरीय तकनीक विकसित की है जो बहुस्तरीय सर्किट बनाने के लिए प्रतिरोधकों (रेजिस्टर्स), कैपेसिटर्स जैसे इलेक्ट्रॉनिक घटकों को एक साथ रखती है। उपग्रह संचार के घटकों के रूप में अनुप्रयोगों के लिए निम्न-तापमान कोफ़ायर सिरेमिक (एलटीसीसी) और उच्च-तापमान कोफ़ायर सिरेमिक (एचटीसीसी) सबस्ट्रेट्स के रूप में जानी जाने वाली इन प्रौद्योगिकियों को वर्तमान में भारत में आयात किया जा रहा है। इनको देश में विकसित करके आयात के रूप में देश की पूंजी को बाहर जाने से रोक सकता है, जिससे देश के रणनीतिक क्षेत्रों को सहायता मिल सकती है।

लो ऑर्बिट उपग्रह प्रणाली जिसकी आजकल अधिक मांग है, के लिए कम उत्पादन समय और सस्ती लागत के अलावा कम भार एवं द्रव्यमान वाले उपग्रह का समर्थन करने वाली एक स्थायी तकनीक की इस समय आवश्यकता है। एलटीसीसी प्रौद्योगिकी पर आधारित मिश्रित सूक्ष्म प्रणालियाँ (हाइब्रिड माइक्रोसिस्टम्स) अर्थात एक बहुस्तरीय सिरेमिक माँड्यूल में एक कैपेसिटर, रेजिस्टर, प्रारंभ करने वाला इन्डक्टर, रेजोनेटर यंत्र और फिल्टर आदि जैसे निष्क्रिय घटकों का एकीकरण किया जाता है। यह उनके उत्कृष्ट प्रदर्शन तथा उचित लागत के कारण भविष्य के संचार उपग्रहों में एक रोचक समाधान है। वर्तमान में, एलटीसीसी उत्पादों को इयूपॉन्ट फेरो सदृश विक्रेताओं से आयात किया जा रहा है। इन उत्पादों की अत्यधिक कीमत के कारण देश के राजस्व की भी हानि हो रही है।

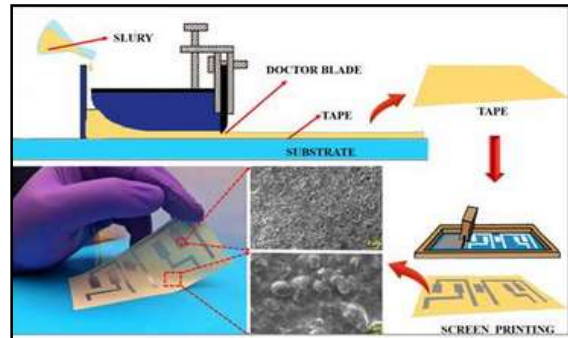


Figure 1: Schematic of tape casting of colloidal slurry into flexible tapes on Mylar® substrate, followed by screen printing of passive circuits on them using indigenously developed silver paste. The SEM microstructure of the ceramic green tape and printed metallic paste is also shown

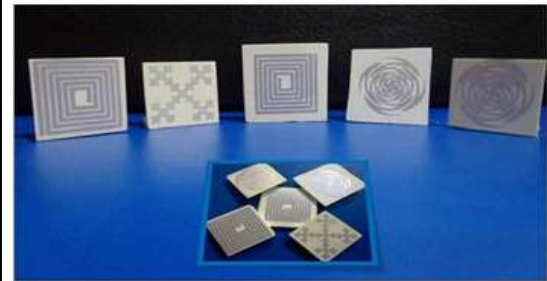


Figure 2: Sintered HTCC substrates developed at NIIST with various antenna patterns printed on them using colloidal silver paste

इसलिए, वैज्ञानिक और प्रौद्योगिक अनुसंधान परिषद (सीएसआईआर) के अंतर्गत सामग्री विज्ञान और प्रौद्योगिकी प्रभाग के प्रधान वैज्ञानिक डॉ. के.पी. सुरेंद्रन एवं राष्ट्रीय अंतर्विषयी विज्ञान तथा प्रौद्योगिकी संस्थान (एनआईआईएसीटी) ने भारत सरकार के विज्ञान और प्रौद्योगिकी विभाग (डीएसटीकी) की उन्नत

विनिर्माण तकनीक योजना के कार्यक्षेत्र में एलटीसीसी टेप और एचटीसीसी सबस्ट्रेट्स की एक ऐसी श्रृंखला विकसित की है, जो अंतर्राष्ट्रीय मानकों के अनुरूप है। इनके परावैद्युत गुणों अर्थात विद्युत प्रवाह को रोककर (डाईइलेक्ट्रिक) उस विद्युत ऊर्जा को एक विद्युत क्षेत्र में संग्रहीत करने की क्षमता के कारण इन्हें किसी भी वाणिज्यिक टेप के समकक्ष माना जाता है, जबकि इनकी तापीय चालकता उनसे बेहतर है। जिरकोन पर आधारित एचटीसीसी सबस्ट्रेट की टेप कास्टिंग पर एक पेटेंट पहले ही दायर किया जा चुका है।

एक जलीय टेप कास्टिंग तकनीक भी विकसित की गई है, जिसमें स्वास्थ्य के लिए अपेक्षाकृत कम जोखिम है, क्योंकि इसमें जाइलीन और मिथाइल एथिल कीटोन जैसे वाष्पशील कार्बनिक घटकों का प्रयोग नहीं किया जाता है। विकसित तकनीक एक ग्लास मुक्त एलटीसीसी टेप कास्टिंग संरचना है, जो टेप की प्रतिरोधिता (बूटैलिटी) के मुद्दों को हल कर सकती है।

इन टेपों का उपयोग अंतरिक्ष अनुप्रयोग केंद्र, अहमदाबाद (इसरो) में विभिन्न उपग्रह संचार घटकों में प्रयोग होने के अलावा रक्षा अनुसंधान प्रयोगशालाओं और भारत हेवी इलेक्ट्रिकल्स लि. (बीएचईएल) में किया जाता है और जिसके लिए हर साल हजारों की संख्या में माइक्रोवेव सबस्ट्रेट की आवश्यकता पड़ती है।

यह प्रौद्योगिकी अपनी तैयारी के 5वें चरण में है और डॉ. के.पी. सुरेंद्रन ने एलटीसीसी टेप पर एंट्स सेरामिक्स, वसई, महाराष्ट्र के साथ एक समझौता जापन पर हस्ताक्षर किए हैं। इन एलटीसीसी टेपों और प्रवाहकीय (कन्डक्टिव) लेपों (पेस्ट्स) की आपूर्ति अंतरिक्ष अनुप्रयोग केंद्र (एसएसी), अहमदाबाद को की जा सकती है और इनका परीक्षण उन वाणिज्यिक एलटीसीसी टेपों के लागत प्रभावी विकल्प (प्रतिस्थापन) के रूप में किया जा सकता है जिनका वे वर्तमान में आयात कर रहे हैं। यदि यह परीक्षण सफल होता है, तो भारतीय अंतरिक्ष अनुसंधान संस्थान (इसरो) के कई माइक्रोवेव घटकों जैसे एस- और सी-बैंड रिसीवर में उनके उपग्रह ट्रांसपोंडर के लिए एनआईआईएसटी टेपों का प्रयोग किया जा सकता है।

एएमटी परियोजना के अनुभव और जानकारी ने एनआईआईएसटी को उपग्रह में अनुप्रयोगों के लिए अंतरिक्ष अनुप्रयोग केंद्र इसरो द्वारा वर्तमान में उपयोग किए जा रहे आयातित वाणिज्यिक एलटीसीसी टेप सिस्टम के विकल्प के रूप में एक संपूर्ण स्वर्ण प्रणाली विकसित करने का भरोसा जगाया है। इसरो की प्रतिक्रिया कार्यक्रम के तहत इस दिशा में एक परियोजना प्रस्तावित की गई है। अंतरिक्ष अनुप्रयोग केंद्र (एसएसी) में सोने के लेप (पेस्ट) आधारित एलटीसीसी टेपों के परीक्षण के बाद इस उत्पाद की वाणिज्यिक संभावनाओं के साथ बड़े पैमाने पर उत्पादन की भी योजना बनाई जा रही है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762220>



Novel composite materials developed for high-temperature battery and supercapacitors

Indian researchers have developed a thermally stable solid electrolyte for lithium-ion batteries for energy storage that promise application for a wide range of temperatures from 30-500 degrees Celsius.

Energy generation and storage is the need of the hour, and worldwide efforts are being invested for developing cost-effective, efficient options. The current state of art indicates a possible replacement of conventional low energy density, low shelf life batteries with Lithium-ion and Sodium-ion batteries. However, there are several scientific and technical limitations in the present technology, for example, dependence of liquid electrolytes and narrow range of operating temperatures. Therefore, efforts are required to develop solid-state energy storage devices.

In this direction, a group of researchers led by Dr. Anshuman Dalvi of Department of Physics, BITS Pilani, Pilani Campus has developed solid-state energy storage devices in the form of thermally stable solid electrolytes for Li⁺ ion batteries and supercapacitors and tested their stability and efficiency using state of the art facilities. The establishment of the FIST program of the Department of Science & Technology (DST), Govt. of India supported XRD facility has given a new dimension to the ongoing research by providing them infrastructural support to investigate composite materials at high temperature with great resolution. This work has been published in the journal *'Materials Research Bulletin in 2021'*.

The team has used DST FIST-supported High-temperature X-ray diffraction (HTXRD) facility Rigaku SmartLab, particularly useful for the thermal stability assessment of novel solid electrolytes. The XRD patterns were obtained in situ up to 500 °C. Now, the batteries and supercapacitors to operate at high temperatures are being developed.

The results from HTXRD patterns (technique used to study the structural changes in the material as a function of temperature) for the range 30-500 °C for the ionic liquid (IL) dispersed sol-gel derived NASICON (superionic sodium conductors) structured LiTi₂(PO₄)₃ (LTP) composites indicated that IL does not react with LTP at higher temperatures to form unwanted compound. The composite was used in Lithium button cells. Excellent stability has been achieved under battery conditions. The composite promises battery application for a wide range of temperature.

Further, the samples are being used as electrolytes for electric double-layer (EDLC) supercapacitors. A high capacity of around 200 F/g and thermal stability at least up to 100 °C has been achieved for 10000 cycles. The EDLCs was used to power LEDs successfully. Efforts are on to fabricate EDLCs operating at 200 °C.

Dr Dalvi further elaborated, "Ionic liquid composites with NASICONs, Garnets, and some other fast ionic solids have been found to be promising for high-temperature energy storage devices. These devices are strategically important for military and space applications."





उच्च तापमान बैटरी और सुपर कैपैसिटर के लिए नयी तरह का मिश्र पदार्थ विकसित

भारतीय शोधकर्ताओं ने ऊर्जा भंडारण में लिथियम आयन बैटरी के लिए एक तापीय स्थिर ठोस इलेक्ट्रोलाइट विकसित किया है जो 30 से 500 डिग्री सेल्सियस तापमान के एक विस्तृत दायरे में उपयोग के लिये संभावनायें प्रकट करता है।

ऊर्जा उत्पादन और भंडारण समय की मांग है, और दुनिया भर में लागत प्रभावी, कुशल विकल्प विकसित करने के लिये प्रयास किये जा रहे हैं।



फिलहाल मौजूद सबसे उन्नत तकनीक पारंपरिक रूप से इस्तेमाल हो रही कम ऊर्जा घनत्व और कम समय के लिये इस्तेमाल योग्य बैटरी के लिथियम-आयन और सोडियम-आयन बैटरी के साथ संभावित बदलाव की ओर संकेत करती हैं। हालांकि, वर्तमान तकनीक में कई वैज्ञानिक और तकनीकी सीमाएं हैं, उदाहरण के लिए, तरल इलेक्ट्रोलाइट्स की निर्भरता और परिचालन तापमान का बेहद छोटा दायरा। इसलिए, ठोस-अवस्था के भंडारण उपकरणों को विकसित करने के प्रयासों की आवश्यकता है।

इस दिशा में, भौतिकी विभाग, बिट्स पिलानी, पिलानी कैंपस के डॉ॰ अंशुमान दलवी के नेतृत्व में शोधकर्ताओं के एक समूह ने लिथियम प्लस आयन बैटरी और सुपर कैपैसिटर के लिए तापीय स्थिर ठोस इलेक्ट्रोलाइट्स के रूप में ठोस-अवस्था में ऊर्जा भंडारण उपकरणों को विकसित किया है, और अत्याधुनिक सुविधाओं का उपयोग करके उनकी दक्षता और उनकी स्थिरता का परीक्षण किया है। विज्ञान और प्रौद्योगिकी विभाग (डीएसटी), भारत सरकार के द्वारा स्थापित एफआईएसटी कार्यक्रम द्वारा समर्थित एक्सआरडी फैसिलिटी ने चल रहे शोध कार्य को मिश्र पदार्थ की उच्च तापमान पर उच्च रेजोल्यूशन के साथ जांच के लिये बुनियादी ढांचागत सहायता प्रदान करके एक नया आयाम दिया है। यह काम 'मैटेरियल्स रिसर्च बुलेटिन इन 2021' पत्रिका में प्रकाशित हुआ है।

टीम ने डीएसटी एफआईएसटी-समर्थित हाई टेंपरेचर एक्स-रे डिफ्रेक्शन (एचटीएक्सआरडी) फैसिलिटी रिगाकू स्मार्टलैब का उपयोग किया है, जो विशेष रूप से नये ठोस इलेक्ट्रोलाइट्स की तापीय स्थिरता के मूल्यांकन के लिए उपयोगी है। एक्सआरडी पैटर्न मूल स्थिति में 500 डिग्री सेल्सियस तक प्राप्त किये गये थे। अब, उच्च तापमान पर काम करने के लिए बैटरी और सुपरकैपैसिटर विकसित किये जा रहे हैं।

आयनिक लिक्विड (आईएल) डिस्पर्ड सोल्यूशन-जेल प्रक्रिया से गुजारे गये नासिकॉन (सुपरआयोनिक सोडियम कंडक्टर) संरचित $\text{LiTi}_2(\text{PO}_4)_3$ (एलटीपी) कंपोजिट के लिये 30 से 500 डिग्री सेल्सियस की सीमा के लिये एचटीएक्सआरडी पैटर्न से परिणाम (तकनीक का इस्तेमाल तापमान की वजह से पदार्थ में संरचनात्मक परिवर्तनों का अध्ययन में किया जाता है) दर्शाते हैं कि ऊंचे तापमान पर आईएल एलटीपी के साथ अवांछित यौगिक बनाने के लिए प्रतिक्रिया नहीं करता है। कंपोजिट का उपयोग लिथियम बटन सेल में किया गया था। बैटरी कंडीशन में उत्कृष्ट स्थिरता हासिल की गयी है। कंपोजिट तापमान के बड़े दायरे में बैटरी के इस्तेमाल की संभावनायें देता है।

इसके अलावा, नमूने इलेक्ट्रिक डबल-लेयर (ईडीएलसी) सुपरकेपैसिटरके लिए इलेक्ट्रोलाइट्स के रूप में उपयोग किये जा रहे हैं। 10000 चक्र के लिये 200 एफ/जी के करीब की उच्च क्षमता और कम से कम 100 डिग्री सेल्सियस की तापीय स्थिरता प्राप्त की गयी है। ईडीएलसी का उपयोग एलईडी को सफलतापूर्वक बिजली देने के लिये किया गया था। ईडीएलसी को 200 डिग्री सेल्सियस पर कार्य करने के लिये तैयार किया जा रहा है।

डॉ दलवी ने आगे विस्तार से बताया, "नासिकॉन, गार्नेट और कुछ अन्य तीव्र आयनिक ठोस के साथ आयनिक तरल कंपोजिट उच्च तापमान ऊर्जा भंडारण उपकरणों के विकास में आशाजनक पाये गये हैं। ये उपकरण सैन्य और अंतरिक्ष अनुप्रयोगों के लिए रणनीतिक रूप से महत्वपूर्ण हैं।"

<https://pib.gov.in/PressReleasePage.aspx?PRID=1762346>



Sat, 09 Oct 2021

A novel neural network to understand symmetry, speed materials research

Understanding structure-property relations is a key goal of materials research, according to Joshua Agar, a faculty member in Lehigh University's Department of Materials Science and Engineering. And yet currently no metric exists to understand the structure of materials because of the complexity and multidimensional nature of structure.

Artificial neural networks, a type of machine learning, can be trained to identify similarities—and even correlate parameters such as structure and properties—but there are two major challenges, says Agar. One is that the majority of vast amounts of data generated by materials experiments are never analyzed. This is largely because such images, produced by scientists in laboratories all over the world, are rarely stored in a usable manner and not usually shared with other research teams. The second challenge is that neural networks are not very effective at learning symmetry and periodicity (how periodic a material's structure is), two features of utmost importance to materials researchers.

Now, a team led by Lehigh University has developed a novel machine learning approach that can create similarity projections via machine learning, enabling researchers to search an unstructured image database for the first time and identify trends. Agar and his collaborators developed and trained a neural network model to include symmetry-aware features and then applied their method to a set of 25,133 piezoresponse force microscopy images collected on diverse materials systems over five years at the University of California, Berkeley. The results: they were able to group similar classes of material together and observe trends, forming a basis by which to start to understand structure-property relationships.

"One of the novelties of our work is that we built a special neural network to understand symmetry and we use that as a feature extractor to make it much better at understanding images," says Agar, a lead author of the paper where the work is described: "Symmetry-Aware Recursive Image Similarity Exploration for Materials Microscopy," published today in *npj Computational Materials*. In addition to Agar, authors include, from Lehigh University: Tri N. M. Nguyen, Yichen Guo, Shuyu Qin and Kylie S. Frew and, from Stanford University: Ruijuan Xu. Nguyen, a lead author, was an undergraduate at Lehigh University and is now pursuing a Ph.D. at Stanford.



Low-dimensional uniform manifold approximation projection to visualize how neural networks learn semantic similarity of natural images. Credit: Joshua Agar/Lehigh University

The team was able to arrive at projections by employing Uniform Manifold Approximation and Projection (UMAP), a non-linear dimensionality reduction technique. This approach, says Agar, allows researchers to learn "...in a fuzzy way, the topology and the higher-level structure of the data and compress it down into 2D."

"If you train a neural network, the result is a vector, or a set of numbers that is a compact descriptor of the features. Those features help classify things so that some similarity is learned," says Agar. "What's produced is still rather large in space, though, because you might have 512 or more different features. So, then you want to compress it into a space that a human can comprehend such as 2D, or 3D—or, *maybe*, 4D."

By doing this, Agar and his team were able to take the 25,000-plus images and group very similar classes of material together.

"Similar types of structures in material are semantically close together and also certain trends can be observed particularly if you apply some metadata filters," says Agar. "If you start filtering by who did the deposition, who made the material, what were they trying to do, what is the material system... you can really start to refine and get more and more similarity. That similarity can then be linked to other parameters like properties."

This work demonstrates how improved data storage and management could rapidly accelerate materials discoveries. According to Agar, of particular value are images and data generated by failed experiments.

"No one publishes failed results and that's a big loss because then a few years later someone repeats the same line of experiments," says Agar. "So, you waste really good resources on an experiment that likely won't work."

Instead of losing all of that information, the data that has already been collected could be used to generate new trends that have not been seen before and speed discovery exponentially, says Agar.

This study is the first "use case" of an innovative new data-storage enterprise housed at Oak Ridge National Laboratory called DataFed. DataFed, according to its website is "...a federated, big-data storage, collaboration, and full-life-cycle management system for computational science and/or data analytics within distributed high-performance computing (HPC) and/or cloud-computing environments."

"My team at Lehigh has been part of the design and development of DataFed in terms of making it relevant for scientific use cases," says Agar. "Lehigh is the first live implementation of this fully-scalable system. It's a federated database so anyone can pop up their own server and be tied to the central facility."

Agar is the machine learning expert on Lehigh University's Presidential Nano-Human Interface Initiative team. The interdisciplinary initiative, integrating the social sciences and engineering, seeks to transform the ways that humans interact with instruments of scientific discovery to accelerate innovations.

"One of the key goals of Lehigh's Nano/Human Interface Initiative is to put relevant information at the fingertips of experimentalists to provide actionable information that allows more informed decision-making and accelerates scientific discovery," says Agar. "Humans have limited capacity for memory and recollection. DataFed is a modern-day Memex; it provides a memory of scientific information that can easily be found and recalled."

DataFed provides an especially powerful and invaluable tool for researchers engaged in interdisciplinary team science, allowing researchers who are collaborating on team projects located in different/remote locations to access each other's raw data. This is one of the key components of our Lehigh Presidential Nano/Human Interface (NHI) Initiative for accelerating scientific discovery," says Martin P. Harmer, Alcoa Foundation Professor in Lehigh's Department of Materials Science and Engineering and Director of the Nano/Human Interface Initiative.

More information: Symmetry-aware recursive image similarity exploration for materials microscopy, *npj Computational Materials*, DOI: [10.1038/s41524-021-00637-y](https://doi.org/10.1038/s41524-021-00637-y)
<https://phys.org/news/2021-10-neural-network-symmetry-materials.html>

An electrolyte design strategy for making divalent metal batteries

By Bob Yirka

A team of researchers working at the University of Maryland has developed an electrolyte design strategy for making divalent metal batteries. In their paper published in the journal *Science*, the group describes solving problems associated with divalent rechargeable metal batteries and the strategy they developed to overcome them. Pengjian Zuo and Geping Yin with the Harbin Institute of Technology outline issues with the development of divalent metal batteries and describe the work done by the Maryland team in a paper published in the same journal issue.

The atoms of divalent metals can combine with dual hydrogen atoms. Some of the most well-known are calcium and magnesium—two metals that are far more abundant and easily accessed than lithium, which is commonly used in batteries. So researchers have been looking for a way to use them in rechargeable batteries. Low working voltages and less than desired cycling performance are obstacles due to the lack of an electrolyte that does not form layers on the anode. There have also been issues with metal migration into the cathode. In this new effort, the researchers have developed a design strategy that overcomes these problems for magnesium.

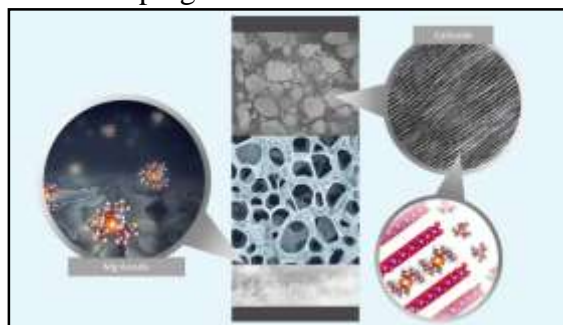
The strategy involved the use of a versatile electrolyte design in which chelating agents interact with cations, which improved the reversibility of the battery and its charge-transfer kinetics. The researchers noted that magnesium's solvent interface is generally stable compared to lithium. That led them to look for and find a group of methoxyethyl-amine chelants that tend to promote charge transfer without side reactions, as the ligands attach to the atoms in the metal in multiple locations. In testing, the batteries using the chelants, were capable of stable, reversible cycling of both RCB and RMB cells, and they had both high density and high efficiency as well. The researchers suggest that their work provides a design strategy for using divalent metals to make workable, rechargeable batteries.

More information: Singyuk Hou et al, Solvation Sheath Reorganization Enabled Divalent Metal Batteries with Fast Interfacial Charge Transfer Kinetics, *Science* (2021). DOI: [10.1126/science.abg3954](https://doi.org/10.1126/science.abg3954). www.science.org/doi/10.1126/science.abg3954

Pengjian Zuo et al, Chelated electrolytes for divalent metal ions, *Science* (2021). DOI: [10.1126/science.abi6643](https://doi.org/10.1126/science.abi6643). www.science.org/doi/10.1126/science.abi6643

Journal information: *Science*

<https://phys.org/news/2021-10-electrolyte-strategy-divalent-metal-batteries.html>



Battery electrolytes using amine-based chelants solvating divalent cations demonstrated stable and highly reversible plating/stripping of Mg metal as illustrated by the scanning electron microscopy (SEM) image of the cycled Mg anode shown on a left together with a representative solvation shell of the Mg²⁺ cation. The same electrolyte showed reversible intercalation/ deintercalation into a high voltage metal oxide cathodes such as Mg_{0.15}MnO₂ (shown on a right). Batteries consisting of magnesium metal coupled with Mg_{0.15}MnO₂ cathode reached an energy density of 420 Wh kg⁻¹ at electrode level. Credit: Nina Borodin, Singyuk Hou, Xiao Ji

Controlling electrons and vibrations in a crystal with polarized light

The quantum behavior of atomic vibrations excited in a crystal using light pulses has much to do with the polarization of the pulses, say materials scientists from Tokyo Tech. The findings from their latest study offer a new control parameter for the manipulation of coherently excited vibrations in solid materials at the quantum level.

Modeling Coherent Control of Crystal Vibrations with Light

In solids, ultrashort light pulses can coherently excite and manipulate optical phonons

These phonons have an interesting dependence on light polarization

Longitudinal optical (LO) phonons in gallium arsenide (GaAs) with polarized double pulses

Theoretical modeling

Phonon control

Interference patterns due to quantum-path interference can be predicted for different polarizations

Parallel polarization

Amplitude (arb. units)

Pump - Pump Delay (fs)

- Electronic + phonon interference independent of crystal orientation and Raman scattering

Orthogonal polarization

Amplitude (arb. units)

Pump - Pump Delay (fs)

- Only phonon interference at an angle $\pi/4$ from [100] direction
- Electron + phonon interference for one pulse traveling along [100] axis

LO phonons in GaAs crystals can be coherently controlled by polarized light for applications in electronics and thermoelectrics

Theory for coherent control of longitudinal optical phonons in GaAs using polarized optical pulses with relative phase locking

Takagi et al. (2021) | *Physical Review B* | DOI: 10.1103/PhysRevB.00.004300

東京工業大学
Tokyo Institute of Technology

Credit: Tokyo Institute of Technology

To the naked eye, solids may appear perfectly still, but in reality, their constituent atoms and molecules are anything but. They rotate and vibrate, respectively defining the so-called "rotational" and "vibrational" energy states of the system. As these atoms and molecules obey the rules of quantum physics, their rotation and vibration are, in fact, discretized, with a discrete "quantum" imagined as the smallest unit of such motion. For instance, the quantum of atomic vibration is a particle called "phonon."

Atomic vibrations, and therefore phonons, can be generated in a solid by shining light on it. A common way to do this is by using "ultrashort" light pulses (pulses that are tens to hundreds of femtoseconds long) to excite and manipulate phonons, a technique known as "coherent control."

While the phonons are usually controlled by changing the relative phase between consecutive optical pulses, studies have revealed that light polarization can also influence the behavior of these "optical phonons."

Dr. Kazutaka Nakamura's team at Tokyo Institute of Technology (Tokyo Tech) explored the coherent control of longitudinal optical (LO) phonons (i.e., phonons corresponding to longitudinal vibrations excited by light) on the surface of a GaAs (gallium arsenide) single crystal and observed a "quantum interference" for both electrons and phonons for parallel polarization while only phonon interference for mutually perpendicular polarization.

"We developed a quantum mechanical model with classical light fields for the coherent control of the LO phonon amplitude and applied this to GaAs and diamond crystals. However, we did not study the effects of polarization correlation between the light pulses in sufficient detail," says Dr. Nakamura, Associate Professor at Tokyo Tech.

Accordingly, his team focused on this aspect in a new study published in *Physical Review B*. They modeled the generation of LO phonons in GaAs with two relative phase-locked pulses using a simplified band model and "Raman scattering," the phenomenon underlying the phonon generation, and calculated the phonon amplitudes for different polarization conditions.

Their model predicted both electron and phonon interference for parallel-polarized pulses as expected, with no dependence on crystal orientation or the intensity ratio for allowed and forbidden Raman scattering. For perpendicularly polarized pulses, the model only predicted phonon interference at an angle of 45° from the [100] crystal direction. However, when one of the pulses was directed along [100], electron interference was excited by allowed Raman scattering.

With such insights, the team looks forward to a better coherent control of optical phonons in crystals. "Our study demonstrates that polarization plays quite an important role in the excitation and detection of coherent phonons and would be especially relevant for materials with asymmetric interaction modes, such as bismuth, which has more than two optical phonon modes and electronic states. Our findings are thus extendable to other materials," says Nakamura.

More information: Itsuki Takagi et al, Theory for coherent control of longitudinal optical phonons in GaAs using polarized optical pulses with relative phase locking, *Physical Review B* (2021). DOI: [10.1103/PhysRevB.104.134301](https://doi.org/10.1103/PhysRevB.104.134301)

Journal information: *Physical Review B*

<https://phys.org/news/2021-10-electrons-vibrations-crystal-polarized.html>



Sun, 10 Oct 2021

Research finds different antibody responses following COVID vaccination and natural infection

By Dr. Maheswari Rajasekaran

The coronavirus disease (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Infection with SARS-CoV-2 produces B cell responses that persist for at least one year. Thus, immunological memory is essential to prevent re-infection, and B cells play a vital role in this aspect of the defense mechanism provided by the immune system.

B cell memory develops in response to infections or vaccinations. The rapid recall responses elicited by memory B cells help provide long-term protection against pathogens.

A new study published in the journal *Nature* attempted to investigate memory B cell evolution 5 months after vaccination with mRNA vaccines such as Moderna (mRNA-1273) or Pfizer-BioNTech (BNT162b2) in SARS-CoV-2 naïve individuals. The study explored various aspects of memory B cell antibody response like neutralizing response, affinity, epitope targeting, and neutralizing breadth.

Study population

The study recruited 32 volunteers with no prior history of SARS-CoV-2 infection who had received any of the two mRNA vaccines Moderna or Pfizer-BioNTech.

Blood samples were collected sequentially from 8 subjects who had received Moderna and 24 subjects treated with Pfizer-BioNTech. Samples were collected from study subjects at an average of 2.5 weeks after their first dose, and they were identified as “prime.”

Similarly samples were also collected from subjects who had taken the second vaccine dose and completed their vaccination regime. In this group of individuals, samples were drawn at two time points, one at an average of 1.3 months and the other at around 5 months after the booster doses were administered. The age of the study population ranged between 23-78 years with a median age of 34.5 years, and 53% of the population was male while 47% was female.

Significant increase in plasma neutralizing activity seen in naïve individuals who had received the COVID-19 mRNA vaccines

ELISA (enzyme-linked immunosorbent assay) was performed to assess the plasma Immunoglobulin M (IgM), Immunoglobulin G (IgG), and Immunoglobulin A (IgA) responses to the SARS-CoV-2 receptor-binding domain (RBD).

This study showed that during the period between the prime and booster vaccine doses, a significant increase in IgG reactivity to RBD was detected, which correlated with earlier evidence.

After the booster dose, the levels of IgM and IgA titers were found to be low when compared to IgG. An inverse correlation was significantly identified between the magnitude of response and age after the prime vaccine dose. However, this correlation was not significantly detected in this small study population at 1.3 or 5 months after the booster dose. Further, during the period between 1.3 and 5 months after the booster dose, there was a significant decrease in the IgG and IgA titers against RBD. In the case of IgG titers, a 4.3 fold decrease was observed and the reduction in their activity showed a significant direct correlation with time after vaccination.

HIV-1 pseudotyped with the SARS-CoV-2 spike were employed for assessing neutralizing activity. In naïve individuals who received the first vaccine dose, a significant inverse correlation was observed between age and neutralizing activity.

In the study population that received the booster dose, there was a similar 12 fold increase in the neutralizing activity that did not differ with gender or age. Further, a significant positive correlation was observed in binding and neutralizing activity between the booster dose and the first vaccine dose.

In naïve individuals who received the booster dose, it was found that at 1.3 and 5 months after the booster, they showed 4.9 and 3.6 fold higher neutralizing titers when compared to infected individuals who were assessed 1.3 and 5 months after COVID-19 symptom onset.

This study's findings suggest a significant increase in plasma neutralizing activity in naïve individuals who had received the COVID-19 vaccine, which correlated with enhanced vaccine efficacy after the booster dose. Furthermore, higher neutralizing titers were observed in individuals who had completed the vaccination regime when compared to COVID-19 infected individuals.

When 28 of the study subjects were assessed 5 months after their booster dose, it was identified that neutralizing activity inversely correlated with time and directly correlated with IgG anti-RBD binding titers. As reported earlier, at 1.3 months post booster dose, the binding to neutralizing serum titers was higher in vaccinated individuals when compared to convalescent patients, but this difference in effect disappeared at later time intervals.

Similar to previous reports, the neutralizing activity against the variants tested were found to be lower when compared to the original Wuhan Hu-1 strain. In addition, the neutralizing activity was also found to decrease against the original strain and the variants as the time from vaccination increased further.

Memory B cells may continue to evolve for up to 5 months post-COVID-19 mRNA vaccinations

The effect of the mRNA vaccines on the memory B cell compartments was assessed by flow cytometry wherein the B cells expressing receptors that facilitate binding to Wuhan Hu-1 (wild type, WT) and the B.1.351 K417N/E484K/N501Y variant RBDs were measured. Memory B cells expressing receptors for Wuhan-Hu RBD were detected after the initial mRNA vaccine dose, and their numbers continued to increase 5 months post vaccination.

Memory B cells expressing receptors for binding to RBD of the variants tested were detected at very low levels compared to the wild type. After the booster dose, an increase in the IgG memory cells was observed, but IgM expressing memory B cells that were initially increased after the prime vaccine dose was nearly absent after the booster dose.

Plasmablasts are antibody-producing stem cells, and RBD-specific plasmablasts were detected after the first vaccine dose and were detected significantly after the booster doses.

The memory compartment is known to evolve for up to one year after natural infection and results in the enrichment of cells that produce antibodies effective against pathogens. The study examined the characteristics of the memory compartment after mRNA vaccination.

2,327 paired antibody sequences from 11 individuals obtained at the time points that had already been described in the study were examined. IGHV3-30 and IGHV3-53 were prevalent after the prime and booster doses and remained prevalent 5 months after vaccination. Expanded clones of memory B cells expressing the IGHV and IGHM genes were observed in all the individuals studied.

The study found that the amount of memory cells varied between initial vaccine dose, booster dose, and between individuals and also decreased with time. Detection of unique clones in vaccinated individuals suggests that memory cells evolve for up to 5 months post-vaccination.

It was also observed that memory cells isolated after the booster dose had significantly high levels of somatic mutations when compared to plasmablasts and B cells that were obtained after the initial vaccine dose. The study shows that after mRNA vaccinations the memory B cells may continue to mutate or evolve for 5 months post the booster dose.

The booster dose of the COVID-19 mRNA vaccines enhances the neutralizing response of the antibodies expressed in the memory compartment

ELISA was performed to assess the neutralizing activity of antibodies that were isolated from memory B cells that bind to RBD. Four hundred fifty-eight antibodies were tested, and 94% of the antibodies exhibited binding to Wuhan Hu-1 RBD, confirming the efficiency of the method that was used to isolate the RBD-specific memory B cells. The geometric mean ELISA half-maximal concentration (EC₅₀) of the antibodies obtained at various time points was estimated, and there was no significant difference in binding of these antibodies at the time points tested. The EC₅₀ of the antibodies from samples obtained at prime, 1.3- and 5-months after the second dose was 3.5, 2.9 and 2.7 ng/ml, respectively.

The neutralizing activity of 430 RBD-binding antibodies was evaluated using HIV-1 pseudotyped with the SARS-CoV-2 spike. It was found that the geometric mean half-maximal inhibitory concentration (IC₅₀) of the antibodies tested was enhanced from 376ng/mL after the first vaccine dose to 153ng/mL after the second vaccine dose, and this increase in activity correlated with a decrease in the non-neutralizing antibodies and increase in neutralizing antibodies.

Memory B cells recruited after the second dose of the mRNA vaccine are responsible for the enhanced neutralizing activity observed between the first and second dose. The booster dose of the mRNA vaccines results in an improved neutralizing response of the antibodies expressed in the memory compartment.

The neutralizing activity of the monoclonal activities obtained was not significantly enhanced between 1.3 and 5 months post-vaccination. Interestingly, in convalescent individuals, the antibodies from memory cells showed enhanced activity between the period of 1.33 and 6.2 months after symptom onset, with further improvement observed after one year of symptom onset. This was attributed to the increasing neutralizing activity of persistent clones.

Memory antibodies from convalescent individuals show more improved affinity and neutralization breadth post-infection than in case of COVID-19 mRNA vaccinations

Bio-layer interferometry (BLI) analysis was performed employing Wuhan Hu-1 RBD to assess the affinity maturation, which is the process wherein the immune system produces antibodies of increased affinity during an immune response. Antibodies were obtained after the prime dose, 1.3 months and 5 months after the booster amounting to a total of 147 antibodies.

On comparing the affinity of the antibodies, it was found that there was a 3 fold difference in affinities of the antibodies obtained at prime and 1.3 months post booster dose and a 7.5 fold difference in affinities between the 1.3 months and 5 month post booster antibodies.

Affinities of pairs of antibodies from persisting clones obtained at 1.3 and 5 months post booster showed a 4.5 fold increase in affinity, while in the case of convalescent individuals, antibodies from persisting clones obtained at 1.3 and 6.2 months after symptom onset showed an 11.2 fold increase in affinity.

The study also explored if there is a change in the epitopes targeted by the monoclonal antibodies. It found that there was no significant change in the epitopes targeted by the 52 antibodies studied, which were obtained at 1.3 and 5 months post-vaccination and exhibited similar neutralizing activity.

In convalescent individuals, it had been found that the neutralizing breadth of antibodies from memory cells increases along with their potencies over time. The neutralizing potential of antibodies obtained at prime and 1.3 months post-vaccination were tested against a panel of pseudotypes encoding RBD mutations. It was found that there was only a small change in breadth and an increase in resistance to K417N and A475V substitutions. It was found that there was a little increase in neutralizing breath during the post-vaccination period of mRNA vaccines when compared to a similar period post-COVID-19 infection in convalescent individuals.

Conclusion

The findings from the study suggest that providing booster doses of mRNA vaccines to vaccinated individuals will result in increased plasma neutralizing activity. However, it may not

produce antibodies that exhibit neutralizing breadth against variants of concern, as observed in the case of convalescent individuals.

Convalescent individuals, when boosted with mRNA vaccines, develop strong protection against the original Wuhan-Hu-1 strain and the variants of concern.

Further investigation needs to focus on whether an additional boost with Wuhan-Hu-1 based or variant based vaccine or re-infection will result in memory B cells that may produce antibodies showing increased neutralizing breadth.

Journal reference:

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