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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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Press Information Bureau
Government of India
Ministry of Defence

Thu, 25 Nov 2021 2:07PM

Fourth Submarine of Project-75 ‘INS Vela’ commissioned at Naval Dockyard, Mumbai

- *Another major milestone for Indian Navy’s Project 75 and Make in India initiative*
- *INS Vela would form part of the Western Naval Command*
- *The submarine has advanced stealth features and long range guided torpedoes as well as anti-ship missiles*

INS Vela, the fourth submarine in the series of six submarines of Project-75, was commissioned on 25 Nov 21 in the presence of Admiral Karambir Singh, Chief of the Naval Staff. The formal commissioning ceremony took place at the Naval Dockyard in Mumbai. The Scorpene Class submarines are being built in India by the Mazagon Dock Shipbuilders Limited (MDL) Mumbai, under collaboration with M/s Naval Group (earlier DCNS), France. The commissioning of the 4th in class submarine is a major milestone achieved today. INS Vela would form part of the Western Naval Command’s Submarine fleet and would be another potent part of its arsenal.

Member of Parliament Shri Arvind Sawant, Flag Officer Commanding-in-Chief, Western Naval Command Vice Admiral R Hari Kumar, Chairman & Managing Director, Mazagon Dock Shipbuilders Limited Vice Admiral Narayan Prasad (Retd) and other senior civil & military officials of Ministry of Defence were present during the commissioning ceremony of INS Vela. Crew of the erstwhile ‘Vela’, a Russian origin Foxtrot Class Submarine, which was decommissioned in 2010, were also present amongst the guests on this occasion.

The Scorpene submarines are extremely potent platforms, they have advanced stealth features and are also equipped with both long range guided torpedoes as well as anti-ship missiles. These submarines have a state of the art SONAR and sensor suite permitting outstanding operational capabilities. They also have an advanced Permanent Magnetic Synchronous motor (PERMASYN) as its propulsion motor.

The delivery of Vela is yet another affirmation of the impetus being given by the Indian Navy towards consolidating its position as a ‘Builder’s Navy’ as also indicative of MDL’s capabilities as a premier ship and submarine building yard. The commissioning of the submarine is coinciding with ‘Azaadi ka Amrit Mahotsav’ and ‘Swarnim Vijay Varsh’ celebrations.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1774977>



पत्र सूचना कार्यालय

भारत सरकार

रक्षा मंत्रालय

Thu, 25 Nov 2021 2:07PM

प्रोजेक्ट-75 की चौथी पनडुब्बी 'आईएनएस वेला' नौसेना डॉकयार्ड, मुंबई में नौसेना में शामिल

- भारतीय नौसेना के प्रोजेक्ट 75 और मेक इन इंडिया पहल के लिए एक और बड़ा मील का पत्थर
- आईएनएस वेला पश्चिमी नौसेना कमान का हिस्सा बनेगी
- पनडुब्बी में उन्नत स्टील्ड विशेषताएं तथा लंबी दूरी की गाइडेड टारपीडो के साथ-साथ एंटी-शिप मिसाइलें हैं

प्रोजेक्ट-75 की छह पनडुब्बियों की श्रृंखला में चौथी पनडुब्बी आईएनएस वेला नौसेना प्रमुख एडमिरल करमबीर सिंह की उपस्थिति में दिनांक 25 नवंबर 2021 को कमीशन की गई थी। औपचारिक कमीशनिंग समारोह मुंबई के नेवल डॉकयार्ड में हुआ। स्कॉपीन श्रेणी की पनडुब्बियों का निर्माण भारत में मैसर्स नेवल ग्रुप (पहले डीसीएनएस), फ्रांस के सहयोग से मझगांव डॉक शिपबिल्डर्स लिमिटेड (एमडीएल) मुंबई द्वारा किया जा रहा है। इस चौथी पनडुब्बी की कमीशनिंग आज एक बड़ी उपलब्धि है। आईएनएस वेला पश्चिमी नौसेना कमान के पनडुब्बी बेड़े का हिस्सा होगी और इसके शस्त्रागार का एक और शक्तिशाली भाग बनेगी।

सांसद श्री अरविंद सावंत, पश्चिमी नौसेना कमान के फ्लैग ऑफिसर कमांडिंग-इन-चीफ वाइस एडमिरल आर हरि कुमार, मझगांव डॉक शिपबिल्डर्स लिमिटेड के अध्यक्ष और प्रबंध निदेशक वाइस एडमिरल नारायण प्रसाद (सेवानिवृत्त) और मंत्रालय के अन्य वरिष्ठ रक्षा, नागरिक एवं सैन्य अधिकारी आईएनएस वेला के कमीशनिंग समारोह के दौरान मौजूद थे। इस अवसर पर आए मेहमानों के बीच तत्कालीन 'वेला', जो एक रूसी मूल की फॉक्सट्रॉट क्लास सबमरीन है जिसे 2009 में सेवा से हटा दिया गया था, के कर्मी भी उपस्थित थे। स्कॉपीन पनडुब्बियां अत्यंत शक्तिशाली प्लेटफॉर्म हैं, उनके पास उन्नत स्टील्ड विशेषताएं हैं और ये लंबी दूरी के गाइडेड टारपीडो के साथ-साथ जहाज-रोधी मिसाइलों से भी लैस हैं। इन पनडुब्बियों में अत्याधुनिक सोनार और सेंसर सूट है जो उत्कृष्ट अभियानगत क्षमताएं प्रदान करते हैं। पनडुब्बियों में प्रणोदन मोटर के रूप में एक उन्नत स्थायी चुंबकीय सिंक्रोनस मोटर भी है।

वेला की आपूर्ति भारतीय नौसेना द्वारा 'बिल्डर्स नेवी' के रूप में अपनी स्थिति को मजबूत करने की दिशा में दिए जा रहे जोर की एक बार फिर पुष्टि करती है और साथ ही एक प्रमुख जहाज और पनडुब्बी निर्माण यार्ड के रूप में एमडीएल की क्षमताओं का भी संकेत है। पनडुब्बी की कमीशनिंग ऐसे समय हो रही है जब 'आजादी का अमृत महोत्सव' और 'स्वर्णिम विजय वर्ष' समारोह भी मनाया जा रहा है।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1775033>

DRDO-built radar tech to power IAF's Airbus aircraft

Ch Sushil Rao

Hyderabad: Airbus, Spain, will procure two advanced radar systems -- Radar Warning Receiver (RWR) and Missile Approach Warning Systems (MAWS) -- developed by the Defence Research and Development Organisation (DRDO), which would be incorporated into the 56 Airbus C295 aircraft ordered by the Indian Air Force (IAF).

This is the first "Make in India" aerospace programme in the private sector, involving the full development of a complete industrial ecosystem -- from manufacture, assembly, test, and qualification to delivery and maintenance, in the complete lifecycle of the aircraft.

Airbus will acquire the RWR and MAWS from Bharat Electronics Limited (BEL). This was disclosed during a presentation that the DRDO made at IIT, Delhi, at the 5th World Congress on Disaster Management.

DRDO's Ultra Violet-based Missile Approach Warning Systems (UVMAWS) is a passive missile warning system, which detects incoming missile attacks and warns pilots for initiating countermeasures. It is a small-sized highperformance system with low power consumption and low weight, suitable for helicopters and transport aircraft.

16 aircraft to be delivered over four years

The state-of-the-art RWR system is capable of intercepting radio emissions of radar systems periodically by scanning across frequency bands, DRDO said on its social media platforms. In September, India formalized the acquisition of 56 Airbus C295 aircraft to replace IAF's legacy AVRO fleet.

"Under the contractual agreement, Airbus will deliver the first 16 aircraft in 'flyaway' condition from its final assembly line in Seville, Spain. The subsequent 40 aircraft will be manufactured and assembled by Tata Advanced Systems in India, as part of an industrial partnership between the two companies," Airbus, Spain, said on its website.

The first 16 aircraft will be delivered over four years after the contract implementation. All the IAF C295s will be handed over in transport configuration.

"This contract will support the development of India's aerospace ecosystem, bringing investment and 15,000 skilled direct jobs and 10,000 indirect positions over the coming 10 years," Michael Schoellhorn, CEO of Airbus Defence and Space, said.

<https://timesofindia.indiatimes.com/city/hyderabad/drdo-built-radar-tech-to-power-iafs-airbus-aircraft/articleshow/87920549.cms>

DRDO's Indigenous Warning Systems to be procured by Spanish Firm as part of IAF Contract

Earlier in the month of September, the Indian government signed a ₹20,000 contract with Spain-based aircraft manufacturer, Airbus Defence and Space.

By Nikita Bishay

In another milestone in the field of defence manufacturing, the Defence Research and Development Organisation (DRDO) has developed two indigenous warning systems Radar Warning Receiver (RWR) and Missile Approach Warning Systems (MAWS), which are to be procured by Airbus Defence and Space from India's Bharat Electronics Limited (BEL) for the upcoming C295 aircraft programme of the central government.

This came under the contract signed between Airbus and BEL for manufacturing and supplying RWR and MAWS as a part of Airbus' commitments.

Lauding the Defence Electronics Research Laboratory (DLRL) for their efforts towards promoting India's *Atmanirbhar Bharat* initiative and developing these under the Make in India scheme, the DRDO took to Twitter to inform about the same and provided further information about it.



Image: Pixabay/Twitter/@RajnathSingh

DRDO said that the RWR system is capable of intercepting radio emissions of radar systems across the frequency bands followed by the Ultraviolet-based Missile Approach Warning System (UVMAWS), which helps in detecting incoming missile attacks and warning the pilots for taking necessary countermeasures.

"Ultra violet missile approach warning system is a small sized high performance system with low power consumption and less weight, suitable for helicopters and transport aircrafts", DRDO added.

Meanwhile, the RWR and UVMAWS will be soon given to the Indian Air Force further helping in strengthening their defence capabilities.

Indian government signs a contract with Airbus Defence and Space

Earlier in the month of September, the Indian government signed a ₹20,000 contract with Spain-based aircraft manufacturer Airbus Defence and Space for procuring 56 C-295 transport aircrafts and replacing the Avro-748 aircrafts of the Indian Air Force.

As a part of it, Airbus has partnered with Bharat Electronics Limited and is working towards making the 'Make in India' dream of the central government a success.

<https://www.republicworld.com/india-news/general-news/drdo-indigenous-warning-systems-to-be-procured-by-spanish-firm-as-part-of-iaf-contract.html>

Airbus to procure DRDO's radar and missile systems for C-295 aircraft programme

India has inked a nearly Rs 20,000 crore contract with Airbus Defence and Space to procure 56 C-295 transport aircraft to replace the Avro-748 planes of the IAF

- *DRDO's Defence Electronics Research Laboratory has developed these systems.*
- *The procurement will take place via Bharat Electronics Limited (BEL).*
- *This is the biggest export order received till date by BEL, the company said.*

Airbus Defence and Space will procure the indigenous Radar Warning Receiver (RWR) and Missile Approach Warning System (MAWS) developed by the Defence Research and Development Organisation (DRDO) for its C-295 transport aircraft for the Indian Air Force (IAF).

The procurement will take place via Bharat Electronics Limited (BEL), the DRDO said in a series of tweets on Thursday while lauding the efforts of its Defence Electronics Research Laboratory (DRDL) in developing these systems. This is the biggest export order received to date by the BEL.

"The state-of-the-art RWR system is capable of intercepting the radio emissions of Radar systems periodically by scanning across the frequency bands," it tweeted.

"Ultra Violet-based Missile Approach Warning System (UVMAWS) is a passive missile warning system which detects the incoming missile attacks and warns the pilots for initiating countermeasures," the DRDO said in another tweet.

"UVMAWS is a small sized high performance system with low power consumption and less weight, suitable for helicopters and transport aircrafts," it added.

As part of its offset commitments under the C-295 aircraft programme, Airbus has signed a contract with Bharat Electronics Limited for the manufacture and supply of the RWR and MAWS, reported The Hindu.

In September, India has inked a nearly Rs 20,000 crore contract with Airbus Defence and Space to procure 56 C-295 transport aircraft to replace the Avro-748 planes of the IAF under a project that entails manufacturing of military aircraft in the country for the first time by a private company.

Under the agreement, Airbus will deliver the first 16 aircraft in "fly-away" condition from its final assembly line in Seville, Spain. The subsequent 40 aircraft will be manufactured and assembled by Tata Advanced Systems (TASL) in India as part of an industrial partnership between the two companies.

With a proven capability of operating from short or unprepared airstrips, the C295 is used for tactical transport of up to 71 troops or 50 paratroopers, and for logistic operations to locations that are not accessible to current heavier aircraft, it said.

The aircraft can airdrop paratroops and loads, and also be used for casualty or medical evacuation. The aircraft is capable of performing special missions as well as disaster response and maritime patrol duties. (With inputs from PTI)

<https://www.news9live.com/india/airbus-to-procure-drdo-radar-and-missile-systems-for-c-295-aircraft-programme-136342>

Science and tech fest from Dec 10 to 13

Panaji: The seventh edition of the India International Science Festival (IISF), a four-day event, will be held in Goa from December 10 to 13 in a hybrid mode.

At the curtain raiser of IISF-2021, held in the state capital, chief minister Pramod Sawant said that all people, especially the students from secondary schools to postgraduate level, should visit the mega expo. "It will be a one time opportunity to familiarise with the technological achievements of our country," he said.

A joint initiative of the ministry of science and technology, ministry of earth sciences (MoES), CSIR, Vijnana Bharati and the Swadeshi Science Movement, the festival will feature 11 programmes and will have delegates participating from across the world.

The mega expo will be held at SAG ground, Campal in Panaji, with all the research laboratories under CSIR, MoES and other research organisations such as Bhabha Atomic Research Centre (BARC), Indian Space Research Organisation (ISRO), Defence Research and Development Organisation (DRDO) and many others.

"The festival is conceptualised as a celebration of science to promote skill development, innovation, self reliance, confidence and pride of our country, its heritage and achievements," said Jayant Sahasrabudhe, national organising secretary at Vijnana Bharati.

<https://timesofindia.indiatimes.com/city/goa/science-and-tech-fest-from-dec-10-to-13/articleshow/87918648.cms>

DRDO on Twitter


 **Barry O'Farrell AO** @AusHCIndia · 13h
Australia's defence science & technology relationship with @DRDO_India is a key part of 🇦🇺🇮🇳 Comprehensive Strategic Partnership & our shared interests in a free & open #IndoPacific. Met Dr G. Satheesh Reddy, Secretary Department of Defence R&D and Chairman DRDO today.



DRDO and Department of Defence

 **Prasar Bharati News Services पी.बी.एन.एस.** @PBNS_India
DRDO is participating in the 5th World Congress on Disasters Management (WCDM) at @iitdelhi.
Plenary address on 'Technology & Innovation for Building Resilience to Disasters' will be delivered along with presentations of disaster mitigating technologies developed by DRDO.
1:35 PM · Nov 25, 2021

 **DRDO** @DRDO_India · 19h
DRDO developed Radar Warning Receiver (RWR) and Missile Approach Warning Systems (MAWS) to be procured by Airbus, Spain from BEL for C295 Programme to be delivered to #IAF . Kudos to efforts of team DLRL. #AtmaNirbharBharat #MakeInIndia

 **DRDO** @DRDO_India · 19h
The state-of-the-art RWR system is capable of intercepting the radio emissions of Radar systems periodically by scanning across the frequency bands.



DRDO ✓ @DRDO_India · 19h

...

Ultra Violet based Missile Approach Warning System (UVMAWS) is a passive missile warning system which detects the incoming missile attacks and warns the pilots for initiating countermeasures.



DRDO ✓ @DRDO_India · 19h

...

Ultra violet missile approach warning system is a small sized high performance system with low power consumption and less weight, suitable for helicopters and transport aircrafts.



DRDO ✓ @DRDO_India · 17h

...

DRDO is participating in the 5th World Congress on Disasters Management (WCDM) at @iitdelhi. Plenary address on 'Technology & Innovation for Building Resilience to Disasters' delivered along with presentations and showcase of disaster mitigating technologies developed by DRDO.

Fri, 26 Nov 2021

INS Vikrant will be commissioned into Indian Navy by August 2022: Admiral Karambir Singh

Indian Navy Chief Admiral Karambir Singh said on Thursday that the Indigenous Aircraft Carrier (IAC) INS Vikrant will be commissioned by August 2022.

By Aayush Anandan

Indian Navy Chief Admiral Karambir Singh said on Thursday that the Indigenous Aircraft Carrier (IAC) INS Vikrant will be commissioned by August 2022, he said while addressing an event at the naval dockyard in Mumbai, where INS Vela, the fourth Scorpene-class submarine was commissioned into the Indian Navy today. The Naval Chief said, "We recently conducted a successful sea trial of INS Vikrant. We should be able to commission INS Vikrant by August 2022."

He said while talking INS Vela, "INS Vela has the ability to undertake an entire spectrum of submarine operations. Given today's dynamic and complex security situation, its capability and firepower will play a crucial role in enhancing Navy's ability to protect India's maritime interests." Admiral Singh said that the P-75 project represents the growing strategic congruence between India and France. He added, "Today's commissioning marks another high point in this enduring partnership. We crossed halfway mark of Project 75."



Image: ANI

Admiral Singh: Indian Navy paying close attention to ties between China and Pakistan

Admiral Singh also said that the Indian Navy is paying close attention to the defence cooperation between China and Pakistan. He was quoted saying, "We are closely monitoring the defence cooperation between China and Pakistan. The recent procurements by Pakistan from China may change the dynamics, so we need to remain cautious." He further talked about COVID-19 and the tension at Line of Actual Control (LAC), "COVID was the toughest challenge of my tenure as Chief of the Naval Staff and tensions at the LAC was during that same period, so the challenge became tougher. It wasn't possible for us to maintain physical distancing on ships, but we battled everything."

The second sea trials of Vikrant were conducted in October this year and the maiden sea trials were conducted in August. During the sailing trials, the ship's performance, including hull, main propulsion, Power Generation and Distribution (PGD) and auxiliary equipment were tested. Vice Admiral AK Chawla, Flag Officer Commanding-in-Chief Southern Naval Command reviewed the testing. The Indigenous Aircraft Carrier is 262 metres long, 62 metres at the widest part and a height of 59 metres including the superstructure. There are 14 decks in all, including five in the superstructure. The ship has over 2,300 compartments, designed for a crew of around 1700 people, having gender-sensitive accommodation spaces for women officers. The ship with a high degree of

automation for machinery operation, ship navigation and survivability, has been designed to accommodate an assortment of fixed-wing and rotary aircraft. *With ANI inputs*

<https://www.republicworld.com/india-news/general-news/ins-vikrant-will-be-commissioned-into-indian-navy-by-august-2022-admiral-karambir-singh.html>

R. REPUBLICWORLD.COM

Fri, 26 Nov 2021

'China's Military hardware export to Pak will affect our security,' Says Indian Navy Chief

China's exporting a lot of military hardware to Pakistan will affect security dynamics in the Indian Ocean region, said Navy chief Admiral Karambir Singh

By Swagata Banerjee

Indian Navy chief Admiral Karambir Singh said on Thursday that China is exporting a lot of military hardware like ships and submarines to Pakistan and it will affect security dynamics in the Indian Ocean region. He further stated that the Indian Navy has to be prepared for this development and India is closely watching the naval cooperation between Pakistan and China.

In a press meet, while responding to a question on China delivering Pakistan its largest and most advanced warship earlier this month, Navy chief Admiral Singh said, "A lot of hardware is being exported to Pakistan from China, like ships and submarines. This will affect a lot the security dynamics here. We have to be prepared for this.



Image: PTI, AP

"We have had their submarines coming in (in the IOR) at regular intervals in the past. As of now, most of the Chinese activities are centered around their research vessel, their intelligence gathering, and their survey vessels. We are monitoring that very carefully," the Navy chief added.

He also stated that the P8i maritime reconnaissance anti-submarine patrol aircraft has been a real force multiplier for India along with the Sea Guardian drones, leased from the US.

On November 9, China had delivered its largest and most advanced warship to Pakistan. It was delivered to the Pakistan Navy at a commissioning ceremony in Shanghai, the China State Shipbuilding Corporation Limited (CSSC) announced in a statement. It has been designed and built by CSSC. As per reports, the 054A/P frigate was named the PNS Tughril. Pakistani Ambassador to China Moin ul Haque said that the commissioning of the PNS Tughril ensures a balance of power in the Indian Ocean.

What is the PNS Tughril?

The PNS Tughril is the first hull of four Type 054 frigates being constructed for the Pakistan Navy and the vessel is a technologically advanced and highly capable platform with enormous surface-to-surface, surface-to-air, and underwater firepower, besides extensive surveillance potentials, the Daily quoted a Pakistan Navy official's statement. Equipped with state-of-the-art combat management and an electronic warfare system along with modern self-defence capabilities, the Type 054A/P frigate can simultaneously execute a number of naval warfare missions in a highly-intense multi-threat environment, it said. The frigate is the largest and most advanced warship China has ever exported, CSSC informed.

<https://www.republicworld.com/india-news/general-news/chinas-military-hardware-export-to-pak-will-affect-our-security-says-indian-navy-chief.html>

How INS Vela will boost India's strategic depth to counter Beijing's String of Pearls

As the Indo-Pacific becomes a geostrategic focal point, INS Vela will help New Delhi to counter Beijing's power projection in the Indian Ocean Region

The Indian Navy is set to commission INS Vela — the fourth Scorpene-class submarine — in Mumbai on Thursday.

The submarine is the fourth of six underwater warships being built in India with French collaboration. INS Vela is a diesel-electric attack submarine. That means it is specialised in its role as a hunter-killer, designed and armed to effectively target and take out surface ships and other submarines. In other words, it would perform for the Indian Navy in the water a similar role that the MiG-21 and Tejas play for the Indian Air Force.



The Indian Navy is set to commission INS Vela, the fourth Scorpene-class submarine, in Mumbai on Thursday. | Photo Credit: ANI

India's growing fleet of attack submarines underlines its focus on expanding tactical capabilities in the Indian Ocean Region, with the primary goal being the security of critical sea lanes of communication.

The ongoing induction of the Kalvari class of submarines also comes as China continues to claw away in the region, piggybacking strategic ports on apparent economic projects. Beijing's strategy seemingly is to operationalize its oft-stated position that "the Indian Ocean is not India's ocean". However, the Indian Navy is hardly a pushover and stands shoulders above the much smaller navies that China is used to bullying.

As New Delhi and Beijing increasingly engage in growing competition, the Indo-Pacific has become a geostrategic focal point for both countries. With new warships and submarines and the largest number of major combatants, People Liberation Army Navy's (PLAN) is the second-largest naval force, after the US Navy, in terms of tonnage. The PLAN has an established strategy of surrounding India with a string of strategically-located naval bases in the Indian Ocean Region, known as the String of Pearls. It has a presence in Myanmar, Sri Lanka, Pakistan and the African coast, making it imperative that India has a navy that is swift and stealthy.

In this light, INS Vela is a huge boost to the Indian Navy. The Scorpene-class submarine is lethal as an attack warship, with powerful diesel propulsion and additional air-independent propulsion (AIP). It has an endurance of 50 days, with an additional 21 days on AIP. The Kalvari class of submarines is considered superior as they include multiple aspects of naval combat performing anti-ship, anti-submarine, intelligence, mine laying, and area surveillance operations.

Besides INS Vela, the Indian Navy's firepower got another fillip with INS Visakhapatnam that was commissioned on Sunday. India's first indigenously built, P15B stealth guided-missile destroyer is endowed with the top-class features of the magnanimous vessel and is equipped with state-of-art technology.

It is packed with the most sophisticated weapons and sensors. From Surface to Surface Missile and Surface to Air Missiles to a modern Surveillance Radar, which provides target data to the gunnery weapon systems of the ship. The ship's Anti-Submarine Warfare capabilities are provided by the indigenously developed Rocket Launchers, Torpedo Launchers and ASW helicopters. The destroyer is equipped to fight under Nuclear, Biological and Chemical (NBC) warfare conditions.

Considering PLAN's capacity and strategy, New Delhi ought to have strong naval defence capabilities to deal with maritime security threats from Beijing given its growing assertiveness, presence and insatiable expansionism in the Indian Ocean region.

<https://www.timesnownews.com/india/article/how-ins-vela-will-boost-indias-strategic-depth-to-counter-beijing-s-string-of-pearls/834994>

Explained: What is INS Vela, the submarine commissioned by Indian Navy?

Vela is named after a decommissioned submarine Vela, which served the Navy from 1973 to 2010. The earlier Vela belonged to Foxtrot class submarine of Soviet origin.

By Yogesh Naik

Vela, the fourth submarine of P75 of the Indian Navy, was Thursday commissioned by Navy chief Admiral Karambir Singh at the naval dockyard. This will be the second addition to the Indian Navy's fleet of warships after INS Vishakapatnam's commissioning on Sunday.

What is Project 75?

Conceptualised for the acquisition for 25 submarines at the time of the IK Gujral government, P 75 evolved into a 30-year plan for building submarines. In 2005, India and France signed a \$ 3.75 billion contract for building six Scorpene class submarines. The executing company on the Indian side is Mazgaon Docks Ltd, and on the French side, it is DCNS, which is now called Naval Group. The project has been dogged by delays and questions over the reluctance of the French government to act on the commitment for "transfer of technology" that was an integral part of the contract. As a result, the first of the six subs, INS Kalvari, was commissioned five years behind schedule, in 2017.



A view of Vela, the fourth submarine of Project-75. The submarine is scheduled to be commissioned in the Indian Navy on November 25. (PTI Photo)

What has been the progress so far?

After Kalvari, two more submarines under the contract, INS Khanderi and INS Karanj, were commissioned. Vela is the fourth, and sea trials are ongoing for Vagir, while the sixth, Vagsheer, is under construction.

How did Vela get its name?

Vela is named after a decommissioned submarine Vela, which served the Navy from 1973 to 2010. The earlier Vela belonged to Foxtrot class submarine of Soviet origin.

What is the carrying capacity of Vela?

Naval sources said the submarine can take up to eight officers and 35 men.

What are the weapons on Vela?

The submarine is equipped with C303 anti torpedo countermeasure system, and can carry up to 18 torpedoes or Exocet anti-ship missiles or 30 mines in place of torpedoes.

What is Vela's home base?

Vela will be commissioned into the Indian Navy's western command, and will be based in Mumbai.

Did Covid-19 delay Vela's commissioning?

The sea trials of Vela were delayed due to COVID 19, which led to a delay in its commissioning.

What are the dimensions of Vela and its engine power?

Vela has a length of 67.5 metres and height of 12.3 metres. The beam measures 6.2 metres. It can reach a top speed of 20 knots when submerged and a surface top speed of 11 knots.

The submarine has four MTU 12V 396 SE84 diesel engines and 360 battery cells for power, and has a silent Permanently Magnetised Propulsion Motor. The hull, fin and hydroplanes are designed for minimum underwater resistance and all equipment inside the pressure hull is mounted on shock-absorbing cradles for enhanced stealth.

Vela is a diesel-electric powered attack submarine, designed to act as “sea denial” as well as “access denial” warfare to the adversary.

The submarine can engage in offensive operations across the entire spectrum of naval warfare, including anti-surface warfare, anti-submarine warfare, intelligence gathering, mine laying and area surveillance.

<https://indianexpress.com/article/explained/explained-ins-vela-submarine-indian-navy-7639778/>

mint

Fri, 26 Nov 2021

IAF receives two Mirage 2000 fighters from France to boost combat aircraft fleet

- *The aircraft would now be upgraded to the latest standards as part of the Mirage upgrade programme going on in the Hindustan Aeronautics Limited*
- *The IAF had acquired around 51 Mirages in different batches and they form three squadrons which are all based in the Gwalior Air Force station.*

New Delhi: The Indian Air Force on Thursday received two Mirage 2000 fighter aircraft from France at its Gwalior air base.

The two-second hand combat aircrafts come as boost to their fighter jet fleet at a time when there is growing tensions on the Line of Actual Control (LAC), especially with China.

The aircraft would now be upgraded to the latest standards as part of the Mirage upgrade programme going on in the Hindustan Aeronautics Limited, the sources said.

"The Indian Air Force has received two Mirage 2000 trainer version aircraft from France. The two aircraft were flying with their Air Force and arrived at the Gwalior airbase recently," government sources told new agency ANI.

The two aircraft were acquired by the Indian Air Force as part of the programme to make up the number of aircraft in the Mirage fighter fleet to around 50.

The IAF had acquired around 51 Mirages in different batches and they form three squadrons which are all based in the Gwalior Air Force station.

Sources said the Mirage upgrade deal between the French and Indian sides was for enhancing the capabilities of 51 aircraft and some of these kits are left due to crashes involving these planes.

The same kits can be put on these two French Air Force planes and make them suitable for combat operations, the sources said. The Indian Air Force has invested very smartly in finding the spares for the Mirages in form of phased out old French aircraft and this is going to help the Air Force maintain them till 2035, the sources said. The Mirages have been in service from the 1980s and have been the mainstay of the force from the Kargil war to the 2019 Balakot airstrikes where they bombed a Jaish e Mohammed terrorist camp in Pakistan.

The Mirages also successfully took out Pakistan Army camps and bunkers on the Tiger Hilltop in the Kargil war and changed the face of the war by successfully hitting enemy camps at such high altitudes with pinpoint precision using laser-guided bombs.

<https://www.livemint.com/news/india/iaf-receives-two-mirage-2000-fighters-from-france-to-boost-combat-aircraft-fleet-11637832339099.html>



The IAF had acquired around 51 Mirages in different batches and they form three squadrons which are all based in the Gwalior Air Force station.

6 Rafale fighter jets with India specific enhancement to arrive in Dec-Jan 2022

It is understood that once the India specific enhancements are tested to satisfaction in Indian conditions, the existing fleet of 30 Rafales will be retrofitted with the same enhancements in the coming year.

By Shishir Gupta

New Delhi: India is set to get remaining six Rafale multi-role jets with country-specific enhancements including long range air-to-air missiles, frequency jammers and advanced communications in the coming two months.

According to IAF officials, first of the three Rafales with India specific enhancements will arrive from Istres-Le Tube air base, north-west of Marseille, France in December while the last three of multi-role fighters will be flown into Ambala air base in January 2022. The Istres air base is equipped with test bed facilities for manufacturer Dassault Aviation to install India specific enhancements on Rafale fighters.

It is understood that once the India specific enhancements are tested to satisfaction in Indian conditions, the existing fleet of 30 Rafales will be retrofitted with the same enhancements in the coming year. The Indian Rafales are based in Ambala to handle the two front threat and in Hashimara to respond to any emergency in the eastern sector.

Apart from the Meteor air-to-air beyond visual range missiles, the Rafale has potent weapons like SCALP air to ground laser guided ammunition to target the enemy from over 300 kilometers range and HAMMER precision terrain hugging ammunition which hunts and destroy high value enemy targets from 60 kilometers away.

With 36 Rafale in its armory, the Indian Air Force will also become much more potent in December with the induction of at least two S-400 air defence systems in India. The Russian S-400 will not only match similar system deployed with the Chinese Army on the Line of Actual Control (LAC) but also deter any aerial threat from across the Tibetan border from 400 kilometers. Indian Air Force with longest beyond visual range air to air missiles onboard Rafale and S-400 air defence system to protect the air bases and skies above, any enemy will think many a times before casting an evil eye towards India.

<https://www.hindustantimes.com/india-news/6-rafale-fighter-jets-with-india-specific-enhancement-to-arrive-in-dec-jan-2022-101637821271866.html>



With the induction of Rafales and Russian S-400 air defence systems, India will have a potent arsenal to deter any threat in the region.

Army, airforce take part in war games to enhance coordination

Jaisalmer: Around 30,000 soldiers of the Indian Army and Airforce took part in an extensive war game exercise, Dakshin Shakti, to enhance coordination on Thursday. The exercise was conducted by the Southern Command of the Indian Army to fine-tune the model of integrated theatre commands. In a war situation, all three wings of the army striking better coordination can demolish the enemy.

Clouds of dust, the grumbling of tanks, bomb explosions, sounds of firing, movement of fighter planes and helicopters gave the sight of a war area.

For the first time, space technology and artificial intelligence had been included. Army's T-90 tanks, T-72 tanks, BMP, missiles, RCL guns, and other weapons foiled the pseudo whereabouts of the enemies. Fighter planes of the Indian airforce, including Su 30, jaguar, fighter helicopter Rudra, cheetah, MI 17, and Dhruva demonstrated a war-like situation in the exercise and took flight.

Army chief MM Narwane, Southern Command GoC-in-chief Lt Gen JS Nain, Lt Gen Rakesh Kapoor, and air officer commanding-in-chief South Western Air Command (SWAC) air marshal Vikram Singh were present during the drill.

On Friday, the drill will end with around 400 paratroopers para jumping and through parachutes showing how an assault vehicle is landed in the war area.

In this pseudo-war area, the Indian army got the information that the enemy had entered into the Indian area and the enemy making bunkers at places had seized the area after which the army and the airforce with coordinated efforts surrounded the entire area with the Indian army's armed, infantry, artillery and fighter planes from all the four sides.

The T90 and BMP of the Indian army were moving ahead in the enemy's area and tanks were firing mortars and the infantry moving on their knees and gave a wonderful demonstration. The army jawans crawling on the sand were firing on the enemy's whereabouts and were demolishing the bunkers of the enemy and firing flares in the air were giving the information of the victory and seized the bunkers of the enemy shouting encouraging slogans.

The fighter planes and lightweight helicopters of the Indian air force were bombarding the enemy due to which infantry was moving ahead. The latest technique is being used in this war exercise especially the drone has been made part of this exercise. Integrated battlegroups have been included in this war exercise. The Indian army was preparing to test it for the last three years.

<https://timesofindia.indiatimes.com/city/jaipur/army-airforce-take-part-in-war-games-to-enhance-coordination/articleshow/87918514.cms>

पाकिस्तान बॉर्डर के पास सेना का बड़ा युद्धाभ्यास:30 हजार जवान कर रहे लड़ाई की तैयारी; आर्मी, नेवी और एयरफोर्स भी शामिल

जैसलमेर: भारतीय सेना इन दिनों भारत-पाकिस्तान बॉर्डर पर दक्षिण शक्ति नाम से सबसे बड़ा युद्धाभ्यास कर रही है। करीब 500 किलोमीटर के दायरे में चल रहे इस युद्धाभ्यास में थल सेना के साथ वायुसेना भी शामिल है। दोनों ही मोर्चों पर दुश्मनों पर हमले का अभ्यास किया जा रहा है। गुजरात के कच्छ में भी ऐसा ही युद्धाभ्यास चल रहा है, जिसमें एक साथ आर्मी, नेवी और एयरफोर्स की वॉर एक्सरसाइज चल रही है, जिसे दक्षिण शक्ति का नाम दिया गया है। इसमें कुल 30 हजार जवान हिस्सा ले रहे हैं। भविष्य को ध्यान में रखते हुए यह ट्रेनिंग की जा रही है।



युद्धाभ्यास में एयर स्पेस, साइबर, इलेक्ट्रॉनिक एंड इन्फॉर्मेशन टेक्नोलॉजी को आजमाया जा रहा है।

इस युद्धाभ्यास का समापन शुक्रवार को होगा। समापन समारोह में रक्षा मंत्री राजनाथ सिंह भी शामिल हो सकते हैं। गुरुवार को थल सेनाध्यक्ष मनोज मुकुंद नरवणे इसके साक्षी होंगे। पाकिस्तान के बॉर्डर के नजदीक चल रहे इस युद्धाभ्यास में भारतीय सेना का न केवल दम-खम दिख रहा है, बल्कि उनके रण कौशल से पाकिस्तान की सेना में हलचल मची है।

युद्ध कौशल से दिख रहा है तीनों सेनाओं का तालमेल

तीनों सेना थार के रेगिस्तान से लेकर कच्छ के रण तक युद्धाभ्यास कर रही है। करीब 500 किलोमीटर के दायरे में चल रहे इस वॉर एक्सरसाइज में सेना ने पूरी ताकत झाँक दी है। युद्धाभ्यास दक्षिण शक्ति के तहत सेना ने रेगिस्तान में अपनी क्षमता को परखा।

युद्धाभ्यास दक्षिण शक्ति के जरिए सेना बदलते परिवेश में रणक्षेत्र के नए तरीकों पर प्रयोग कर रही है, ताकि कम से कम समय में जवाबी हमला बोलकर दुश्मन को ना केवल चौंकाया जा सके, बल्कि उसके स्ट्रेटेजिक पॉइंट पर कब्जा भी किया जा सके। इसी को ध्यान में रखकर एयर स्पेस, साइबर, इलेक्ट्रॉनिक एंड इन्फॉर्मेशन टेक्नोलॉजी को आजमाया जा रहा है।

इस युद्धाभ्यास में देश में ही विकसित हल्के लड़ाकू हेलिकॉप्टर के अलावा ड्रोन का भी उपयोग किया जा रहा है। इस वॉर एक्सरसाइज में आर्मी, नेवी, एयरफोर्स के अलावा कोस्ट गार्ड, BSF, पुलिस और दूसरी इंटेलिजेंस एजेंसियां शामिल हुई हैं। इन सबके बीच तालमेल को परखा जा रहा है।

कल समापन, 400 जवान एक साथ करेंगे पैरा जंप

जैसलमेर में चल रही ये एक्सरसाइज का शुक्रवार को समापन होगा, इस दौरान करीब 400 पैराड्रूपर्स एक साथ पैरा जंप करेंगे। ये पहला मौका है जब पाकिस्तान से सटी सीमा पर नई टेक्नोलॉजी से वॉर एक्सरसाइज की जा रही है।

भविष्य के युद्ध परमाणु शक्ति से लैस देशों के बीच कम समय में और सीमित स्थान पर लड़े जा सकते हैं। ऐसे में उनमें इंटीग्रेटेड बैटल ग्रुप यानी IBG बनाए जाने लगे हैं। सभी IBG को मिशन, खतरे और इलाके के हिसाब से गठित किया गया है। IBG का आकार किसी भी सैन्य ब्रिगेड से बड़ा और किसी डिवीजन से थोड़ा कम होगा।

IBG की कमान मेजर जनरल रैंक के एक अधिकारी के पास होगी। इंटीग्रेटेड बैटल ग्रुप में सेना, थलसेना और वायुसेना के माहिर जवान होंगे। इस ग्रुप में टैंक, तोप, इंजीनियर्स, लॉजिस्टिक, सपोर्ट यूनिट भी होगी। अब तक ये सब अलग-अलग यूनिट के तौर पर तैनात हैं। युद्ध के वक्त एक साथ आते हैं, लेकिन अब सबको मिलाकर छोटा और मारक ग्रुप बनाया जा रहा है। इसका सिचुएशनल ट्रायल भी चल रहा है।

<https://www.bhaskar.com/local/rajasthan/barmer/jaisalmer/news/the-cry-of-the-indian-army-from-water-to-land-and-sky-defense-minister-and-chief-of-army-staff-will-become-witnesses-on-26th-129152198.html>



Fri, 26 Nov 2021

Pakistan successfully test fires surface-to-surface ballistic missile Shaheen 1-A

Pakistan Army did not share any technical detail of the missile

Islamabad: Pakistan on Thursday conducted a successful flight test of the Shaheen-1A surface-to-surface ballistic missile.

"The test flight was aimed at re-validating certain design and technical parameters of the weapon system," the army said in a statement.

However, the army did not share any technical detail of the missile.

The flight test was witnessed by Lieutenant General Nadeem Zaki Manj, Director General Strategic Plans Division; Lieutenant General Muhammad Ali, Commander Army Strategic Forces Command and the scientists and engineers of strategic organisations.

Congratulating scientists and engineers on the successful conduct of the flight test, Mr. Manj appreciated their technical prowess, dedication and commitment, the statement said.

President Arif Alvi, Prime Minister Imran Khan and senior army leadership also congratulated the scientists and engineers on this achievement.

In March, the armed forces had conducted the successful test launch of the nuclear-capable Shaheen 1-A medium-range ballistic missile. It had a range of 900 kilometres.

<https://www.thehindu.com/news/international/pakistan-successfully-test-fires-surface-to-surface-ballistic-missile-shaheen-1-a/article37689233.ece>



Earlier in March, Pakistan had conducted the successful test launch of the nuclear-capable Shaheen 1-A medium-range ballistic missile. File | Photo Credit: Reuters



Fri, 26 Nov 2021

Gaganyaan an example of International cooperation in Space, India working with over 6 countries: ISRO Chief Dr K Sivan

Speaking at the Sydney Dialogue, an initiative by the Australian Strategic Policy Institute, he added that Gaganyaan project was a stepping stone for sustained Indian presence in outer space
By Sidharth MP

Chennai: India is working with more than six countries to achieve the Gaganyaan Human Spaceflight mission, which is a symbol of International Cooperation, said Dr K Sivan, Chairman, Indian Space Research Organisation (ISRO).

“Indian astronauts have completed their training at the Gagarin Cosmonaut Training Center in Russia, we are working with French space agency CNES in the field of Space medicine, with Canada and Romania for wind-tunnel testing, Australia (ASA) and European Space Agency for ground station support,” Dr Sivan said.



File Photo

Speaking at the Sydney Dialogue, an initiative by the Australian Strategic Policy Institute, he added that Gaganyaan project was a stepping stone for sustained Indian presence in outer space and that the ongoing cooperation would continue and would grow into increased engagement with international partners in the years to come.

On the potential and scientific possibilities of future exploration missions to moon, he said, radio astronomy receivers could be deployed and operated in the RadioFrequency-free (RF-free) far side of the moon, besides the moon serving as a potential observatory, as there is practically no atmosphere that would affect the signals coming in from space. “Such observatories could be used to study the infrared signatures to better understand global warming,” he said.

Pertaining to Mars exploration, which is the much-talked-about science, he spoke about the hypothetical process of terraforming (modifying the temperature, atmosphere, topography and ecology) the Red Planet in order to make it habitable like earth.

“A capsule can be sent, aided by human astronauts and can be kept isolated from Martian environment. This can be taken up as a model and scaled up. With human presence, it will be possible to search for bio-signatures on Mars,” he elaborated on scientific exploration possibilities.

More importantly, he touched upon the need to explore ways and means for in-situ resource utilization on moon and Mars, which can sustain human presence.

“To generate propulsion(fuel) using local resources, astronauts may demonstrate vacuum pyrolysis on the moon and Sabatier reaction on Mars. The dexterity of astronauts will help in performing experiments on a smaller scale and then scaling it up with suitable mechanisms and automation” Dr Sivan said.

Vacuum pyrolysis on the moon refers to the process of extracting oxygen and other valuable gases, hydrocarbons from the lunar surface by using very high temperatures.

<https://zeenews.india.com/india/gaganyaan-an-example-of-international-cooperation-in-space-india-working-with-over-6-countries-isro-chief-dr-k-sivan-2413519.html>

Astronaut training facility in Bengaluru nearly ready, could open in December

By Chethan Kumar

New Delhi: The Indian Space Research Organisation (Isro), which has finalised the syllabus for astronaut training in India, mainly for the Gaganyaan programme now, will soon be making operational a basic or an ad hoc astronaut training facility off old airport road in Bengaluru. While this centre — hosting at least three types of simulators and other training facilities — is expected to become operational as early as December, a larger, more sophisticated astronaut training unit will eventually come up in Challakere, some 200 km from Bengaluru for future human-space programmes.

“We are looking at next month for the inauguration. This will be an ad hoc facility being designed specifically for Gaganyaan,” Isro chairman K Sivan said.

As reported by TOI earlier, Isro, which had been planning a human spaceflight programme from at least 2010, had considered multiple areas for the proposed astronaut training facility. Initially, the proximity to its own headquarters and the Institute of Aerospace Medicine (IAM) on old airport road was considered significantly important. Given the extent of land required, the agency was looking at an area near one of its guest houses in Devanahalli near KIA, which would be close enough to Bengaluru, while also exploring places near IAM within the city. The Devanahalli plot, a senior scientist said, was in play immediately after Prime Minister Narendra Modi announced the mission. Eventually, Isro decided to create a full-fledged astronaut training centre in Challakere. This will come up in a few years later and is meant for future missions as it could not be developed within the timeline set for Gaganyaan.

The facility & syllabus

Isro Human Space Flight Centre (HSFC) director S Unnikrishnan Nair told TOI the plot belongs to URSAC and is near IAM and Isro Satellite Integration and Testing Establishment. “This is where Gaganyaan astronauts will train. The facility will host different kinds of simulators and also have space for theory classes.”

He added that the syllabus for astronaut training has been finalised and that the faculty panel has members from institutions like IAM, IISc, IIT, former astronauts like Rakesh Sharma and some former Isro directors/deputy directors.

“It is a vast syllabus focusing on areas like crew module, orbital module, redundancies, where various items will be in the module, orbital distance, technical and theoretical systems, humidity and temperature et al,” Nair said.

For the practical training, he added Isro was working on commissioning three types of simulators, including the final one that will be the crew-module simulator with internal settings and environment control and life support systems.

“The first ones are virtual reality simulators being procured commercially. Here the crew will have various displays to learn from and these will be put up on a desktop. From vehicle parameters to mission and support, everything will be on a desktop. The second simulator will simulate various interactions with the machine and so on. And then the real-crew-module simulator with all the internal settings will come up. The last one will be built gradually,” Nair said.

Nair added that no decision was made on what would happen to this facility once the full-fledged astronaut training centre comes up in Challakere, while Sivan said that is still some time away. “Right now, we’re focused on training for Gaganyaan in particular.”

<https://timesofindia.indiatimes.com/india/astronaut-training-facility-in-bengaluru-nearly-ready-could-open-in-december/articleshow/87918118.cms>

A doubly magic discovery

A team of researchers, including scientists from the National Superconducting Cyclotron Laboratory (NSCL) and the Facility for Rare Isotope Beams (FRIB) at Michigan State University (MSU), have solved the case of zirconium-80's missing mass.

To be fair, they also broke the case. Experimentalists showed that zirconium-80—a zirconium atom with 40 protons and 40 neutrons in its core or nucleus—is lighter than expected, using NSCL's unparalleled ability to create rare isotopes and analyze them. Then FRIB's theorists were able to account for that missing piece using advanced nuclear models and novel statistical methods.

"The interaction between nuclear theorists and experimentalists is like a coordinated dance," said Alec Hamaker, a graduate research assistant at FRIB and first author of the study the team published 25 November in the journal *Nature Physics*. "Each take turns leading and following the other."

"Sometimes theory makes predictions ahead of time, and other times experiments find things that weren't expected," said Ryan Ringle, FRIB Laboratory senior scientist, who was in the group that made the zirconium-80 mass measurement. Ringle is also an adjunct associate professor of physics at FRIB and MSU's Department of Physics and Astronomy in the College of Natural Science.

"They push each other and that results in a better understanding of the nucleus, which basically makes up everything that we interact with," he said.

So this story is bigger than one nucleus. In a way, it's a preview of the power of FRIB, a nuclear science user facility supported by the Office of Nuclear Physics in the U.S. Department of Energy Office of Science.

When user operations begin next year, nuclear scientists from around the globe will have the chance to work with FRIB's technology to create rare isotopes that would be impossible to study elsewhere. They'll also have the opportunity to work with FRIB's experts to understand the results of those studies and their implications. That knowledge has a range of applications, from helping scientists make more sense of the universe to improving cancer treatments.

"As we move forward into the FRIB era, we can do measurements like we've done here and so much more," Ringle said. "We can push further beyond. There's enough capability here to keep us learning for decades."

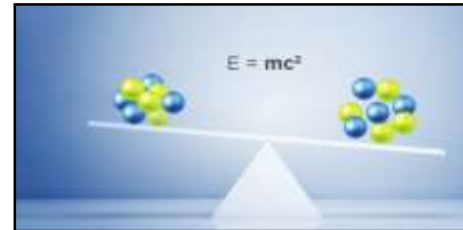
That said, zirconium-80 is a really interesting nucleus in its own right.

For starters, it's a tough nucleus to make, but making rare nuclei is NSCL's specialty. The facility produced enough zirconium-80 to enable Ringle, Hamaker, and their colleagues to determine its mass with unprecedented precision. To do this, they used what's known as a Penning trap mass spectrometer in NSCL's Low-Energy-Beam and Ion Trap (LEBIT) Facility.

"People have measured this mass before, but never this precisely," Hamaker said. "And that revealed some interesting physics."

"When we make mass measurements at this precise a level, we're actually measuring the amount of mass that's missing," Ringle said. "The mass of a nucleus isn't just the sum of the mass of its protons and neutrons. There's missing mass that manifests as energy holding the nucleus together."

This is where one of science's most famous equations helps explain things. In Albert Einstein's $E = mc^2$, the E stands for energy and m stands for mass (c is the symbol for the speed of light).



The deformed nucleus of zirconium-80 is lighter than the sum of the masses of its 40 protons and 40 neutrons. The missing mass is converted into binding energy through $E=mc^2$. The binding energy is responsible for holding the nucleus together. Credit: Facility for Rare Isotope Beams

This means that mass and energy are equivalent, although this only becomes noticeable in extreme conditions, such as those found at the core of an atom.

When a nucleus has more binding energy—meaning it's got a tighter hold of its protons and neutrons—it'll have more missing mass. That helps explain the zirconium-80 situation. Its nucleus is tightly bound, and this new measurement revealed that the binding was even stronger than expected.

This meant that FRIB's theorists had to find an explanation and they could turn to predictions from decades ago to help provide an answer. For example, theorists suspected that the zirconium-80 nucleus could be magic.

Every so often, a particular nucleus bucks its mass expectations by having a special number of protons or neutrons. Physicists refer to these as magic numbers. Theory posited that zirconium-80 had a special number of protons and neutrons, making it doubly magic.

Earlier experiments have shown that zirconium-80 is shaped more like a rugby ball or American football than sphere. Theorists predicted that the shape could give rise to this double magicity. With the most precise measurement of zirconium-80's mass to date, the scientists could support these ideas with solid data.

"Theorists had predicted that zirconium-80 was a deformed doubly-magic nucleus over 30 years ago," Hamaker said. "It took some time for the experimentalists to learn the dance and provide evidence for the theorists. Now that the evidence is there, the theorists can work out the next few steps in the dance."

So the dance continues and, to extend the metaphor, NSCL, FRIB, and MSU offer one of the finest ballrooms for it to play out. It boasts a one-of-a-kind facility, expert staff and the nation's top-ranked nuclear physics graduate program.

"I am able to work onsite at a national user facility on topics at the forefront of nuclear science," Hamaker said. "This experience has allowed me to develop relationships and learn from many of the lab's staff and researchers. The project was successful because of their dedication to the science and the world-leading facilities and equipment at the lab."

More information: Alec Hamaker, Precision mass measurement of lightweight self-conjugate nucleus ^{80}Zr , *Nature Physics* (2021). DOI: [10.1038/s41567-021-01395-w](https://doi.org/10.1038/s41567-021-01395-w). www.nature.com/articles/s41567-021-01395-w

Journal information: [Nature Physics](https://www.nature.com/journal/nature-physics)
<https://phys.org/news/2021-11-doubly-magic-discovery.html>

'Super jelly' can survive being run over by a car

Researchers have developed a jelly-like material that can withstand the equivalent of an elephant standing on it, and completely recover to its original shape, even though it's 80% water.

The soft-yet-strong material, developed by a team at the University of Cambridge, looks and feels like a squishy jelly, but acts like an ultra-hard, shatterproof glass when compressed, despite its high water content.

The non-water portion of the material is a network of polymers held together by reversible on/off interactions that control the material's mechanical properties. This is the first time that such significant resistance to compression has been incorporated into a soft material.

The 'super jelly' could be used for a wide range of potential applications, including soft robotics, bioelectronics or even as a cartilage replacement for biomedical use. The results are reported in the journal *Nature Materials*.

The way materials behave—whether they're soft or firm, brittle or strong—is dependent upon their molecular structure. Stretchy, rubber-like hydrogels have lots of interesting properties that make them a popular subject of research—such as their toughness and self-healing capabilities—but making hydrogels that can withstand being compressed without getting crushed is a challenge.

"In order to make materials with the mechanical properties we want, we use crosslinkers, where two molecules are joined through a chemical bond," said Dr. Zehuan Huang from the Yusuf Hamied Department of Chemistry, the study's first author. "We use reversible crosslinkers to make soft and stretchy hydrogels, but making a hard and compressible hydrogel is difficult and designing a material with these properties is completely counterintuitive."

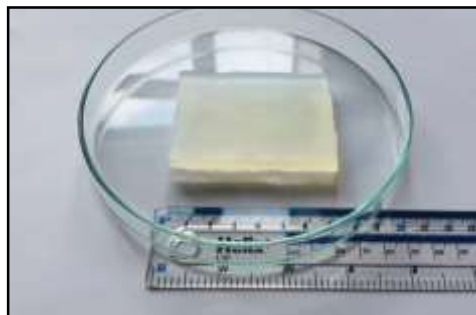
Working in the lab of Professor Oren Scherman, who led the research, the team used barrel-shaped molecules called cucurbiturils to make a hydrogel that can withstand compression. The cucurbituril is the crosslinking molecule which holds two guest molecules in its cavity—like a molecular handcuff. The researchers designed guest molecules that prefer to stay inside the cavity for longer than normal, which keeps the polymer network tightly linked, allowing for it to withstand compression.

"At 80% water content, you'd think it would burst apart like a water balloon, but it doesn't: it stays intact and withstands huge compressive forces," said Scherman, Director of the University's Melville Laboratory for Polymer Synthesis. "The properties of the hydrogel are seemingly at odds with each other."

"The way the hydrogel can withstand compression was surprising, it wasn't like anything we've seen in hydrogels," said co-author Dr. Jade McCune, also from the Department of Chemistry. "We also found that the compressive strength could be easily controlled through simply changing the chemical structure of the guest molecule inside the handcuff."

To make their glass-like hydrogels, the team chose specific guest molecules for the handcuff. Altering the molecular structure of guest molecules within the handcuff allowed the dynamics of the material to 'slow down' considerably, with the mechanical performance of the final hydrogel ranging from rubber-like to glass-like states.

"People have spent years making rubber-like hydrogels, but that's just half of the picture," said Scherman. "We've revisited traditional polymer physics and created a new class of materials that span the whole range of material properties from rubber-like to glass-like, completing the full picture."



Credit: Zehuan Huang

The researchers used the material to make a hydrogel pressure sensor for real-time monitoring of human motions, including standing, walking and jumping.

"To the best of our knowledge, this is the first time that glass-like hydrogels have been made. We're not just writing something new into the textbooks, which is really exciting, but we're opening a new chapter in the area of high-performance soft materials," said Huang.

Researchers from the Scherman lab are currently working to further develop these glass-like materials towards biomedical and bioelectronic applications in collaboration with experts from engineering and materials science. The research was funded in part by the Leverhulme Trust and a Marie Skłodowska-Curie Fellowship.

More information: Zehuan Huang et al, Highly compressible glass-like supramolecular polymer networks, *Nature Materials* (2021). DOI: [10.1038/s41563-021-01124-x](https://doi.org/10.1038/s41563-021-01124-x)

Journal information: [Nature Materials](https://phys.org/news/2021-11-super-jelly-survive-car.html)
<https://phys.org/news/2021-11-super-jelly-survive-car.html>



Wed, 24 Nov 2021

On-chip frequency shifters in the gigahertz range could be used in next generation quantum computers and networks

By Leah Burrows

The ability to precisely control and change properties of a photon, including polarization, position in space, and arrival time, gave rise to a wide range of communication technologies we use today, including the Internet. The next generation of photonic technologies, such as photonic quantum networks and computers, will require even more control over the properties of a photon.

One of the hardest properties to change is a photon's color, otherwise known as its frequency, because changing the frequency of a photon means changing its energy.

Today, most frequency shifters are either too inefficient, losing a lot of light in the conversion process, or they can't convert light in the gigahertz range, which is where the most important frequencies for communications, computing, and other applications are found.

Now, researchers from the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) have developed highly efficient, on-chip frequency shifters that can convert light in the gigahertz frequency range. The frequency shifters are easily controlled, using continuous and single-tone microwaves.

The research is published in *Nature*.

"Our frequency shifters could become a fundamental building block for high-speed, large-scale classical communication systems as well as emerging photonic quantum computers," said Marko Lončar, the Tiansai Lin Professor of Electrical Engineering and senior author of the paper.

The paper outlines two types of on-chip frequency shifter—one that can convert one color to another, using a shift of a few dozen gigahertz, and another that can cascade multiple shifts, a shift of more than 100 gigahertz.

Each device is built on the lithium niobate platform pioneered by Lončar and his lab.

Lithium niobate can efficiently convert electronic signals into optical signal but was long considered by many in the field to be difficult to work with on small scales. In previous research, Lončar and his team demonstrated a technique to fabricate high-performance lithium niobate microstructures using standard plasma etching to physically sculpt microresonators in thin lithium niobate films.

Here, using the same technique, Lončar and his team etched coupled ring-resonators and waveguides on thin-film lithium niobate. In the first device, two coupled resonators form a figure eight-like structure. Input light travels from the waveguide through the resonators in a figure eight pattern, entering as one color and emerging as another. This device provides frequency shifts as high as 28 gigahertz with about 90% efficiency. It can also be reconfigured as tunable frequency-domain beam splitters, where a beam of one frequency gets split into two beams of another frequency.

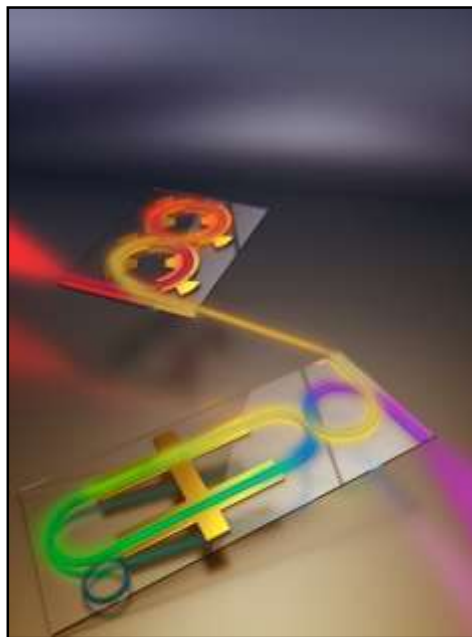
The second device uses three coupled resonators: a small ring resonator, a long oval resonator called a racetrack resonator, and a rectangular-shaped resonator. As light speeds around the racetrack resonator, it cascades into higher and higher frequencies, resulting in a shift as high as 120 gigahertz.

"We are able to achieve this magnitude of frequency shift using only a single, 30-gigahertz microwave signal," said Yaowen Hu, a research assistant at SEAS and first author of the paper. "This is a completely new type of photonic device. Previous attempts to shift frequencies by amounts larger than 100 gigahertz have been very hard and expensive, requiring an equally large microwave signal."

"This work is made possible by all of our previous developments in integrated lithium niobate photonics," said Lončar. "The ability to process information in the frequency domain in an efficient, compact, and scalable fashion has the potential to significantly reduce the expense and resource requirements for large-scale photonic circuits, including quantum computing, telecommunications, radar, optical signal processing and spectroscopy."

More information: Marko Loncar, On-chip electro-optic frequency shifters and beam splitters, *Nature* (2021). DOI: [10.1038/s41586-021-03999-x](https://doi.org/10.1038/s41586-021-03999-x). www.nature.com/articles/s41586-021-03999-x

Journal information: [Nature](https://www.nature.com)
<https://phys.org/news/2021-11-on-chip-frequency-shifters-gigahertz-range.html>



In the top device, two coupled resonators form a figure eight-like structure. Input light travels from the waveguide through the resonators, entering as one color and emerging as another. The bottom device uses three coupled resonators: a small ring resonator, a long oval resonator called a racetrack resonator, and a rectangular-shaped resonator. As light speeds around the racetrack resonator, it cascades into higher and higher frequencies, resulting in a shift as high as 120 gigahertz. Credit: Second Bay Studios/Harvard SEAS

Fri, 26 Nov 2021

Covid Research: Why Delta variant of SARS-CoV-2 spreads easily and infects people so quickly

Delta's outstanding capacity to catalyse membrane fusion causes it to be transmitted much faster, US scientists have explained in a study published in Science journal

By Radifah Kabir

New Delhi: The Delta variant of SARS-CoV-2 has wreaked havoc across the globe, and has been the dominant strain for several months now. The variant spreads easily and infects people quickly. In a new study, published in the Science journal, scientists from Boston Children's Hospital have explained the reason why the Delta variant is so contagious.

Last year, Bing Chen, the lead author of the new study, showed how other SARS-CoV-2 variants (Alpha, Beta, G614) became more infectious than the original virus. Chen found that a genetic change caused the spike protein on the virus' surface to be stabilised, according to the study conducted last year.

Soon after the study, the Delta variant emerged, and became the most infectious variant known to date.

What Makes Delta Variant More Infectious

The spike protein of the SARS-CoV-2 needs to attach itself to a receptor called ACE2 to infect host cells. After attaching itself to the receptor, the spike changes its shape, and folds in on itself. As a result, the virus's outer membrane fuses with the membrane of the cell, thus allowing the virus to gain entry.

A statement issued by Boston Children's Hospital said Chen and his colleagues used two kinds of cell-based assays to demonstrate that Delta's spike protein is very good at membrane fusion. The researchers created a simulated delta virus, which was observed to infect human cells more quickly and efficiently than the other five SARS-CoV-2 variants, the study states. When cells had low amounts of the ACE2 receptor, the Delta variant found it easier to infect the cells, according to the peer-reviewed study.

Chen explained that membrane fusion requires a lot of energy, and needs a catalyst, and that delta stood out in its ability to catalyse membrane fusion, mentions a statement by the Boston Children's Hospital. He added that Delta's outstanding capacity to catalyse membrane fusion causes it to be transmitted much faster. This is also the reason why the Delta variant can infect more cells and produce high viral loads in the body, he said.

How Mutations Affect Spike Protein's Structure

The researchers also investigated the effect of mutations on the spike protein's structure. They used cryo-electron microscopy to image spike protein's from the Delta, Kappa, and Gamma variants, and compared them to spikes of G614, Alpha, and Beta variants.

The researchers observed that the immune system recognises some changes in two key parts of the spike protein. There were changes in the receptor-binding domain (RBD), which binds to the ACE2 receptor, and the N-terminal domain (NTD) (first part of the protein that exits the ribosome during protein biosynthesis) in all six variants.



The Delta variant of SARS-CoV-2 became the most infectious variant known to date soon after it emerged | Photo: Getty

The ability of neutralising antibodies to bind to the spike and contain the virus decreases due to mutations in either domain, the study said.

Chen said in the statement the large change in the NTD is responsible for the resistance of the Delta variant to neutralising antibodies. However, the RBD change led to little change in antibody resistance, he added.

Suggesting a more targeted strategy for developing next-generation Covid-19 vaccines and treatments, Chen said vaccines must not target the NTD, because the virus can quickly mutate and change its structure. He said it might be most effective to target the RBD, and to focus the immune system on that critical domain, rather than the whole spike protein.

<https://news.abplive.com/health/covid-research-study-explains-why-the-delta-variant-of-sars-cov-2-spreads-easily-and-infects-people-so-quickly-1495604>

