Mar
2021

समाचार पत्रों से चयित अंश
Newspapers Clippings

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खंड : 46 अंक : 51 11 मार्च 2021

Vol.: 46 Issue : 51 11 March 2021

रक्षा विज्ञान पुस्तकालय

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Ministry of Defence

Wed, 10 March 2021 3:00PM

Successful tests of weapon systems by DRDO

Twenty eight (28) successful tests have been carried out by DRDO in the last one year. The major weapons and other systems that have been handed over to the armed forces by DRDO are: Astra Beyond Visual Range Missile System, 10 m Short Span Bridging System, Indian Maritime Situational Awareness System (IMSAS), Heavy Weight Torpedo (HWT) Varunastra, Border Surveillance System (BOSS) and Arjun Mk-1A. The development cum Production Partner (DcPP) policy for DRDO developed systems ensures involvement of industries from the beginning of development cycle, thus enabling industries and facilitating hand-holding throughout the development phase.

DRDO is a research and development organisation. All systems designed and developed by DRDO are manufactured by the Indian industries which includes both public and private sectors entities. Some of the Systems that are developed by such collaboration during last one year are as follows: Advanced Towed Artillery Gun System (ATAGS), Extended Range Pinaka System & Guided Pinaka Rocket System, 10 m Short Span Bridging System, Indian Maritime Situational Awareness System (IMSAS), Heavy Weight Torpedo (HWT) Varunastra, Border Surveillance System (BOSS) and Arjun Mk-1A etc.

DRDO has many foreign collaborations. DRDO works in futuristic R&D and technology development in collaboration with some Foreign Countries. DRDO co-chairs the following G-to-G Forums:-

- India-USA Joint Technology Group
- Indo-Israel Management Council
- India-Russia R&D Subgroup
- India-Singapore defence technology steering committee
- India-UK steering committee
- India-Korea steering committee

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Shrimati Rita Bahuguna Joshi in Lok Sabha today.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703757

Telangana Today

Thu, 11 March 2021

DRDO carried out 28 successful tests in last one year

The list also includes Heavy Weight Torpedo (HWT) Varunastra, Border Surveillance System (BOSS) and Arjun Mk-1A

New Delhi: Twenty-eight successful tests were carried out by the Defence Research and Development Organisation (DRDO) in the last one year, the government said on Wednesday. The major weapons and other systems which have been handed over to the armed forces by the DRDO during this period include Astra Beyond Visual Range Missile System, 10m Short Span Bridging System and Indian Maritime Situational Awareness System (IMSAS).

The list also includes Heavy Weight Torpedo (HWT) Varunastra, Border Surveillance System (BOSS) and Arjun Mk-1A.

Source: DRDO

"The Development cum Production Partner (DcPP) policy for DRDO developed systems ensures involvement of industries from the beginning of development cycle, thus enabling industries and facilitating hand-holding throughout the development phase," said Minister of State (Defence), Shripad Naik, while replying to a question asked by Rita Bahuguna Joshi in the Lok Sabha.

All systems designed and developed by the DRDO are manufactured by the Indian industries, which include both public and private sector entities.

Some of the systems that were developed in collaboration during the last one year include Advanced Towed Artillery Gun System (ATAGS), Extended Range Pinaka System and Guided Pinaka Rocket System, 10m Short Span Bridging System, Indian Maritime Situational Awareness System (IMSAS), Heavy Weight Torpedo (HWT) Varunastra, Border Surveillance System (BOSS) and Arjun Mk-1A etc.

The minister said that the DRDO also has many foreign collaborations and it works in futuristic research and development, and technology development in collaboration with some foreign countries.

The organisation also co-chairs various government to government fora, including India-USA Joint Technology group, Indo-Israel Management Council, India-Russia R&D subgroup, India-Singapore defence technology steering committee, India-UK steering committee and India-Korea steering committee.

On Tuesday, the DRDO conducted the final development test of Air Independent Propulsion (AIP) in Mumbai to make Indian submarines more lethal.

AIP allows a submarine to be submerged for longer periods under water and makes the sub-surface platform more deadly by making it quieter than a nuclear submarine. The Indian Navy now plans to retrofit all its Kalvari class non-nuclear attack with AIP during their first upgrade, expected around 2023.

https://telanganatoday.com/drdo-carried-out-28-successful-tests-in-last-one-year

हरिभूमि

Thu, 11 March 2021

DRDO ने एक साल में किये 28 सफल परीक्षण, श्रीपद नाइक ने दी जानकारी

रक्षा अनुसंधान एवं विकास एक अनुसंधान और विकास संगठन है। डीआरडीओ द्वारा डिजाइन और विकसित की गई सभी प्रणालियां भारतीय इंडस्ट्रीज द्वारा निर्मित की जाती हैं, जिनमें सार्वजनिक और निजी दोनों प्रकार की इकाइयां शामिल हैं।

रक्षा अनुसंधान एवं विकास ने पिछले एक साल में (डीआरडीओ)28 सफल परीक्षण किए गए हैं। डीआरडीओ द्वारा प्रमुख हथियारों और अन्य सिस्टमस को सशस्त्र बलों को सौंप दिया गया है। (प्रणालियों)

बता दें कि रक्षा अनुसंधान एवं विकास एक अनुसंधान और विकास संगठन है। डीआरडीओ द्वारा डिजाइन और विकसित की गई सभी प्रणालियां भारतीय इंडस्ट्रीज द्वारा निर्मित की जाती हैं, जिनमें सार्वजनिक और निजी दोनों प्रकार की इकाइयां शामिल हैं।

पिछले एक साल के दौरान इस तरह के सहयोग से विकसित किए गए कुछ सिस्टम इस प्रकार हैं -:) एडवांस टोवेड आर्टिलरी गन सिस्टमATAGS), एक्सटेंडेड रेंज पिनाका सिस्टम और गाइडेड पिनाका रॉकेट सिस्टम, 10 मीटर शॉर्ट स्पैन ब्रिजिंग सिस्टम, इंडियन मैरीटाइम सिचुएशनल अवेयरनेस सिस्टम)IMSAS), हेवी वेट टॉरपीडो)HWT) वरुणास्त्र, बॉर्डर सर्विलांस सिस्टम)BOSS) और अर्जुन एमके -1 ए आदि।

जानकारी के लिए आपको बता दें कि डीआरडीओ के कई विदेशी सहयोगी हैं। डीआरडीओ कुछ विदेशी देशों के साथ मिलकर भविष्य के अनुसंधान और विकास तथा प्रौद्योगिकी विकास में काम करता (रिसर्च) है।

डीआरडीओ ने जी अध्यक्षता की-जी फ़ोरम की सह-टू-

- भारत यूएसए संयुक्त प्रौद्योगिकी ग्रुप-
- भारत इज़राइल मैनेजमेंट काउंसिल-
- भारतरूस अनुसंधान- एवं विकास उपसमूह
- भारत सिंगापुर रक्षा प्रौद्योगिकी संचालन समिति-
- भारत ब्रिटेन संचालन समिति-
- भारत कोरिया संचालन समिति-

पीआईबी के मुताबिक, यह जानकारी आज लोकसभा में रीता बहुगुणा जोशी द्वारा पूछे गए एक प्रश्न के लिखित जवाब में रक्षा राज्य मंत्री श्रीपद नाइक द्वारा दी गई। जानकारी के लिए आपको बता दें कि पनडुब्बी निर्माण में भारत ने एक महत्वपूर्ण सफलता हासिल करते हुए स्वदेशी फ्यूल आधारित एयर इंडिपेंडेंट प्रोपल्शन प्रणाली तैयार की है। जिससे एक लंबे समय तक सबमरीन समंदर में रह (एआईपी) सकती है। रक्षा अनुसंधान एवं विकास की महाराष्ट्र स्थित एनआरएमएल लैब ने इस (डीआरडीओ) एआईपी को तैयार किया है।

https://www.haribhoomi.com/news/india/28-successful-tests-have-been-carried-out-by-drdo-india-in-the-last-one-year-mhyd-369493

india.com

Thu, 11 March 2021

Explained: New air independent propulsion system for Submarines is a significant milestone for Navy

Indian AIP system is unique and one of the most advanced AIP systems of the world where Fuel Cell technology is used to generate onboard power

By Amit Bansal

New Delhi: Someone says that the most powerful country in the world will be the one who will rule over its seas. A strong and expeditionary navy is the answer to it. India took a big leap towards it when it made two announcements. Firstly, it commissioned its third Scorpene Class Submarine – INS Karanj – at Mazagaon Docks Limited and the second one was the successful completion of trials of Indigenous Air Independent Propulsion (AIP) System jointly developed by Naval Materials Research Laboratory (NMRL) and Defence Research and Development Organisation (DRDO).

Indian Fuel Cell Based Air Independent Propulsion (AIP) System

Let us understand why this achievement is important for us. For this we have to understand how a submarine works. Traditionally we hear about two types of submarines- Nuclear and Diesel Electric. While Nuclear Submarines can stay submerged for prolonged period and remain undetected, Diesel Electric submarines cannot do so, and they must surface after a stipulated time interval.

heir Diesel Propulsion would need air to run the engine like any other Vehicle or Aircraft engines and for this they would need oxygen which is not available underwater hence they have to move closer to the surface so that their engines can breathe air through their snorkels. So, these diesel turbines charge the batteries available in the submarine and once the batteries are fully charged, submarine goes underwater where the propeller shaft as well as other systems run on the power stored in the batteries.

This makes the Submarine very much vulnerable to threats from Air, Sea or even underwater. Not only this, due to the storage of excessive fuel reduces the overall performance and weapon holding of the submarine too. Few may suggest than why manufacture these diesel electric submarines? We can induct only the nuclear submarines in the Navy. But this statement has a catch. Though Nuclear submarines can stay underwater for months, they can not do so with total stealth. While a diesel electric submarine (While underwater) is making no noise, Nuclear submarines have lot of vibrations which are generated from the coolant pumping system of their reactors which must run nonstop. This makes even nuclear submarines vulnerable to depth sonars. Moreover, the manufacturing cost of these submarines is several times higher than those of diesel electric ones. So, the most effective and commercially viable solution is a diesel electric submarine with AIP.

Over the years the biggest challenge before the mariners was to ensure that the submarines can sustain underwater for prolonged time and different types of Air Independent Propulsions (AIPs) were worked out in last 7-8 decades however a more robust and sustainable system was required for the same. While the first two submarines (INS Kalvari & INS Khanderi) are equipped with French made AIPs, the rest of the submarines will be equipped with Indian system. So, when India announced the success of the land-based model of its AIP on 9th March 2021, it joined the club of six other elites who have the capacity to design and install such complex systems. These countries are France, China, Spain, Sweden, Germany and Russia.

Indian AIP system is unique. It is one of the most advanced AIP systems of the world where Fuel Cell technology is used to generate onboard power. The first two Submarines of Scorpene category were equipped with French AIP system which has hydrogen-based fuel cell, but Indian scientists moved a step further to make a Phosphoric acid-based Fuel cell system where hydrogen is generated onboard. This enhanced the capacity of the system several times. It has total 360 number of fuel cells which generate enough power to sustain the submarine even under extreme contingencies. This system is tested repeatedly for its endurance, safety, and robustness for several months in multiple conditions and finally declared fit to be installed on Indian Submarines. India has partnered with private sector too and the commercial production of this AIP will be done in collaboration with L&T and Thermax- two prominent industry players of India.

Earlier Diesel Electric Submarines of India had an underwater endurance of few days but with the DRDO/NMRL developed AIP, our submarines can stay underwater for more than three weeks in low consumption mode, more than 2 weeks in endurance mode and 2-4 days in max power mode where all the systems of a submarine are working in full capacity.

This is another step for a country which was dependent upon other countries for its Naval equipment's till two decades back. We are making a rapid progress towards Make in India Initiative and hopefully in next one decade, we will be able to achieve complete indigenisation of Indian Navy. We are manufacturing Aircraft Carriers, we are manufacturing Nuclear Submarines, we are manufacturing AIP submarines, Destroyers, Corvettes, Minesweepers as well as anti-submarine systems and other Naval equipment's today and the day is not far when India will emerge as one of the top expeditionary navies of the world.

https://www.india.com/opinion/indian-navy-air-independent-propulsion-submarines-ins-karanj-major-milestone-explained-details-4481060/

The EurAsian Times

Thu, 11 March 2021

How DRDO's success with new propulsion technology will greatly benefit Indian Submarines against Pakistan

By Younis Dar

India's Defence Research and Development Organisation (DRDO) has achieved a key milestone in the development of the Air-Independent Propulsion (AIP) system for the Indian Navy's non-nuclear submarines that allows them to operate without using atmospheric oxygen.

INS Karanj

The move is seen as a big boost to the Modi government's Atmanirbhar Bharat (self-reliant India) initiative.

The DRDO said it has made important progress in the development of the AIP system proving the land-based prototype on March 8, 2021. Developed by Naval Materials Research Laboratory (NMRL) of DRDO with the support of industry partners L&T and Thermax, the AIP has a force multiplier effect on the lethality of a diesel-electric submarine as it enhances the submerged endurance of the boat, several folds, DRDO said.

"While there are different types of AIP systems being pursued internationally, fuel cell-based AIP of NMRL is unique as the hydrogen is generated onboard." According to DRDO, the system has now reached the stage of maturity for fitment into target vessels.

The AIP module is reported to contain a 270 KW phosphoric acid fuel cell (PAFC), and will be retrofitted on Scorpene submarines of the Indian Navy. using phosphoric acid as an electrolyte that reacts with hydrogen (generated from sodium borohydride) and liquid oxygen to generate electricity. The DRDO fuel cell aims to give endurance of up to 14 days to a conventional submarine.

The deployment of the AIP system by the Indian submarines is expected to offer a strategic edge to the country over Pakistan, as the system is expected to make the Indian submarines stealthier and harder to detect underwater.

The Pakistan Navy's 90B Agostas class submarines already have the AIP, although they use the MESMA (Module d'Energie Sous-Marine Autonome) system, which involves burning ethanol with stored oxygen to produce steam which then turns the submarine turbine providing the required propulsion.

The presence of the AIP has been given the Pakistan Navy a significant tactical advantage in its sea denial capability in a regional or bilateral conflict scenario.

With the eventual induction of the 8 Type 093B 'Yuan Class' submarines from China, Pakistan Navy is making huge strides in bolstering its sea power. The Type 093B, however, come with a Stirling generator AIP, which uses a closed-cycle diesel engine.

The development of the indigenous fuel-cell AIP technology moves India closer to becoming a self-sufficient nation in building its own submarines. The system is expected to arm the next generation of conventional submarines of the Indian Navy, under the Project 75I class.

According to the military experts, Pakistan will now need to be extra-vigilant in light of the newly acquired capability of India and extend its surveillance over a wide area. Pakistan is also due to induct the new Type 093B Chinese subs, expected to be acquired in 2023, and India's AIP acquisition balances that capability through operational effectiveness.

The single greatest limitation of the Indian submarines has been their inability to remain underwater for a significant amount of time to preserve their stealth and avoid being exposed.

The conventional submarines have this vulnerability where they need to rise to the surface to recharge their batteries, and with their limited endurance, they get exposed to air and surface detection by the adversary.

The underwater duration of a submarine depends on many factors, including the speed, propulsion, the equipment running on board, and the tactical situation prevalent in the area.

The conventional submarines are propelled by electric motors, which in turn are powered by batteries charged through diesel generators. However, the requirement for the diesel generators to run on air means the submarine will run out of it frequently and will have to rise to the surface to get the air supply again.

Typically, it's usually about every 2-3 days for the Indian submarines when they need to rise to the surface. This problem is solved by deploying the AIP system, which allows the whole propulsion system to run without having the need for external air.

Comparatively, nuclear submarines have far longer endurance and can remain submerged for months on. Some countries such as Japan are already moving away from even the AIP system to lithium-ion batteries, while the US only uses nuclear-powered submarines.

India is due to commission its third Scorpene class submarine on March 10, while two vessels have already been commissioned. Six French-origin Scorpene-class subs are expected to be commissioned into the Indian Navy, which in addition has 12 other diesel-electric submarines which are aging fast and need replacement.

https://eurasiantimes.com/why-is-indias-drdo-going-gaga-over-new-propulsion-system-for-submarines/

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Thu, 11 March 2021

India develops new propulsion technology to boost endurance of Submarines

India has moved a step nearer to having its conventional diesel-electric submarines outfitted with Air-Independent Propulsion (AIP) technology, which is able to improve their underwater endurance and stealth, even as the third Scorpene submarine is all set to be commissioned at Mumbai.

The DRDO said it had achieved "An important milestone" within the growth of the indigenous AIP system by proving its land-based prototype. Developed by the Naval Materials Research Laboratory (NMRL) of DRDO with the help of trade companions L&T and Thermax, the AIP system was operated in endurance mode for 14 days and most energy mode for 2 days.

The 270-kW gasoline cell-based AIP system will start to be progressively retrofitted on the Scorpene submarines, which is able to contain including an extra hull part to every boat after the primary one comes for upkeep and refit improve after 2023-2024. There are a few concerns on the large delay within the AIP mission, which was initially slated for completion by June 2017 after being sanctioned in 2014 with a preliminary value of Rs 270 crore.

Unlike nuclear submarines, which have just about limitless underwater endurance, diesel-electric boats have to floor or snorkel few days to get oxygen to recharge their lead-acid batteries. But these fitted with AIP can keep submerged for longer durations to considerably boost their stealth and fight capabilities.

Some nations like Japan, nonetheless, are already transferring in direction of excessive capability lithium-ion batteries to ultimately exchange AIP techniques for his or her conventional submarines. The US, of course, operates solely nuclear-powered submarines.

The DRDO, on its half, mentioned that whereas there are different types of AIP techniques being pursued internationally, the gasoline cell-based one of NMRL is "unique" because the hydrogen is generated onboard. "The AIP system has now reached the stage of maturity for fitment into target vessels," mentioned an official.

https://www.eletimes.com/india-develops-new-propulsion-technology-to-boost-endurance-of-submarines

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 March 2021 3:02PM

Export of Defence Equipment

The important defence equipment exported during last 05 years include Weapon Simulators, Tear Gas Launcher, Torpedo Loading Mechanism, Alarm Monitoring & Control, Night Vision Monocular & Binocular, Light Weight Torpedo & Fire Control Systems, Armoured Protection Vehicle, Weapons Locating Radar, HF Radio, Coastal Surveillance Radar etc.

Export leads/Interest for Indian Defence equipment from small components to major Defence platforms are being received from all over the world including Asian, European, North American, African, Latin American and SAARC countries. Presently Defence items from India are being exported to more than eighty four countries. Names of the countries cannot be divulged due to strategic reasons.

Many reforms/steps have been taken up to boost Defence exports in last 6 years. The reforms/steps taken up to promote defence exports are as follows:-

i. Special Chemicals, Organisms, Materials, Equipment and Technologies (SCOMET) Category 6 titled "Munitions List" that was hitherto "Reserved" has been populated and Military Stores list notified vide Notification No.115(RE-2013)/2009-2014 dated 13th March, 2015 stands rescinded.

ii. The Director General of Foreign Trade (DGFT) vide Public Notice No. 4/2015-20 dated 24th April, 2017, notified Department of Defence Production (DDP) as the Licensing Authority for export items in Category 6 of SCOMET. The export of items specified in Category 6 (Munitions List) except those covered under Notes 2 & 3 of Commodity Identification Note (CIN) of the SCOMET is now governed by the Standard Operating Procedure issued by the Department of Defence Production (DDP), Ministry of Defence.

iii. Standard Operating Procedure (SOP) for the export of munitions list items has been modified and placed on the website of the DDP.

iv. A completely end-to-end online portal for receiving and processing export authorisation permission has been developed. The applications submitted on this portal are digitally signed and the authorisation are also issued digitally, at faster pace.

v. In repeat orders of same product to the same entity, consultation process has been done away with and permission is issued immediately. For the repeat order of same product to different entity, the consultation earlier done with all stakeholders is now limited only with MEA.

vi. In Intra-Company business (which is especially relevant for outsourcing of work by defence related parent company abroad to its subsidiary in India), the earlier requirement of getting End User Certificate (EUC) from the Government of importing country has been done away with and 'Buying' Company is authorized to issue the EUC.

vii. The legitimate export of the parts and components of small arms and body armour for civil use are now being permitted after prior consultation with MEA.

viii. For export of items for exhibition purposes, the requirement of consultation with stakeholders has been done away with (except for select countries).

ix. Powers have been delegated to DRDO, DGOF, and CMD's of DPSUs for exploring export opportunities and participation in global tenders.

x. New End User Certificate Format for Parts & Components has been provided in SOP.

xi. Validity of Export Authorization has been increased from 02 years to date of completion of order/component whichever is later.

xii. A new provision for re-exporting parts and components for undertaking repair or rework to provide replacement for a component under warranty obligation is inserted in the SOP as a sub-classification of repeat orders.

xiii. MHA vide Notification dated 1.11.2018 has delegated its powers to this Department to issue export license under Arms Rules 2016 in Form X-A, for parts & components of small arms. With this the Department of Defence Production becomes the single point of contact for exporter for export of parts and components of Small Arms & Ammunitions.

xiv. The Government has notified the Open General Export License (OGEL) - a one time export license, which permits the industry to export specified items to specified destinations, enumerated in the OGEL, without seeking export authorisation during the validity of the OGEL.

xv. Scheme for Promotion of Defence Exports has been notified to provide an opportunity to the prospective exporters an option to get their product certified by the Govt. and provides access to the testing infrastructure of Ministry of Defence for initial validation of the product and its subsequent field trials. The certificate can be produced by the prospective exporter for marketing their products suitably in the global market.

xvi. A separate Cell has been formed in the Department of Defence Production to co-ordinate and follow up on export related action including enquiries received from various countries and facilitate private sector and public sector companies for export promotion.

xvii. In order to boost defence exports, webinars are being organized with Friendly Foreign Countries (FFCs) under the aegis of DDP, MoD through Industry Associations with active participation from Indian Defence Industries.

xviii. A Scheme to provide financial support to Defence Attaches for taking up actions for promoting exports of Indian made defence products both of public and private sector in the countries to which they are attached has been notified.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Shri Kaushal Kishore and Shri P P Chaudhary in Lok Sabha today.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703759

Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 March 2021 1:48PM

INS Karanj - third Kalvari class Submarine commissioned at Naval Dockyard, Mumbai

Major milestone for Indian Navy's Project 75 as India achieves Aatma Nirbharta with indigenous submarine construction at Mazagon Dock

Indian Navy's third stealth *Scorpene* class Submarine INS Karanj has been commissioned today at the Naval Dockyard Mumbai through a formal commissioning ceremony. Admiral VS Shekhawat PVSM, AVSM, VrC (Retd), former Chief of the Naval Staff, who was part of the commissioning crew of the old *Karanj* and later the Commanding officer during the 1971 Indo – Pak war, was the Chief Guest for the ceremony. Six Scorpene Class submarines are being built in India by the Mazagon Dock Shipbuilders Limited (MDL) Mumbai, under collaboration with M/s Naval Group, France. INS Karanj would form part of the Western Naval Command's Submarine fleet and would be another potent part of the Command's arsenal.

Admiral Karambir Singh, Chief of the Naval Staff, and other senior officers from the Indian Navy and MoD were amongst the several dignitaries who witnessed the commissioning ceremony. Crew of the erstwhile '*Karanj*', a Russian origin Foxtrot Class Submarine which was decommissioned in 2003 were also special invitees for the ceremony. During his address, the CNS said "this impetus to Indigenisation & AatmaNirbharBharat is a fundamental tenet of Indian Navy's growth story and future operational capabilities".

The Chief Guest Admiral Shekhawat also highlighted India's push towards AatmaNirbharta by saying "we live in an India launching numerous satellites, building nuclear submarines, manufacturing vaccines for the worlds - the new Karanj is another example of it"

This year is being celebrated as the '*Swarnim Vijay Varsh*' which marks 50 years of 1971 Indo – Pak war. Old INS Karanj, commissioned on 04 Sep 1969 at Riga in the erstwhile USSR, also took active part in the conflict under the Command of then Cdr VS Shekhawat. In recognition of the valiant action of her officers and crew, a number of personnel were decorated, including award of Vir Chakra to the then Commanding Officer Cdr VS Shekhawat. Interestingly, the commissioning Commanding Officer of the old INS Karanj Cdr MNR Samant later on became the first Chief of The Naval Staff of the newly formed Bangladesh Navy in the year 1971.

The *Scorpene* Submarines are one of the most advanced conventional submarines in the world. These platforms are equipped with the latest technologies in the world. More deadly and stealthier than their predecessors, these submarines are equipped with potent weapons and sensors to neutralise any threat above or below the sea surface.

The induction of Karanj is another step towards the Indian Navy, consolidating its position as a builder's Navy, as also is a reflection of MDL's capabilities as a premier ship and submarine building yard of the world. Project – 75 also marks a critical milestone in the Yard's continued importance in the field of Defence Production.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703732

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 10 March 2021 1:48PM

तीसरी स्कॉर्पीन श्रेणी की पनडुब्बी आइएनएस करंज को आज नौसेना के जंगी बेड़े में शामिल किया गया

भारतीय नौसेना के प्रोजेक्ट-75 के अंतर्गत मझगांव डॉक में स्वदेशी पनडुब्बी निर्माण के साथ भारत ने आत्मनिर्भर भारत की दिशा में एक कदम बढ़ाया

भारतीय नौसेना ने तीसरी स्टील्थ स्कॉर्पीन श्रेणी की पनडुब्बी आईएनएस करंज को आज नौसेना डॉकयार्ड मुंबई में औपचारिक कमीशनिंग समारोह में नौसेना के बेड़े में शामिल किया। समारोह में मुख्य अतिथि पूर्व नौसेना प्रमुख एडमिरल वीएस शेखावत पीवीएसएम, एवीएसएम, वीआरसी थे जो पुरानी करंज के कमीशनिंग क्रू का हिस्सा थे और बाद में 1971 के भारत-पाक युद्ध के दौरान कमांडिंग ऑफिसर थे। फ्रांस के मेसर्स नेवल ग्रुप के सहयोग से मझगांव डॉक शिपबिल्डर्स लिमिटेड (एमडीएल) मुंबई द्वारा भारत में छह स्कॉर्पीन श्रेणी की पनडुब्बियां बनाई जा रही हैं। आईएनएस करंज पश्चिमी नौसेना कमान के पनडुब्बी बेड़े का हिस्सा होगी और कमान के शस्त्रागार का एक और शक्तिशाली हिस्सा होगी ।

नौसेना प्रमुख एडमिरल करमबीर सिंह और भारतीय नौसेना व रक्षा मंत्रालय के अन्य वरिष्ठ अधिकारी कमीशनिंग समारोह के साक्षी बने साथ ही समारोह में अनेक गणमान्य लोगों भी शामिल थे। रूसी मूल की फॉक्सट्रॉट क्लास पनडुब्बी, जिसे 2003 में डी-कमीशन किया गया था, के चालक दल को भी समारोह के लिए विशेष आमंत्रित किया गया था। अपने संबोधन के दौरान नौसेना प्रमुख ने कहा कि "स्वदेशीकरण और आत्मनिर्भर भारत पर दिया जा रहा ज़ोर भारतीय नौसेना की विकास गाथा एवं भविष्य की सामरिक क्षमताओं का मूलभूत तत्व है।"

मुख्य अतिथि एडमिरल शेखावत ने भी आत्मनिर्भरता की ओर बढ़ाए जा रहे भारत के कदमों को चिह्नांकित किया और कहा कि "हम एक ऐसे भारत में रहते हैं जो कई उपग्रहों का प्रक्षेपण कर रहा है, परमाणु पनडुब्बियों का निर्माण कर रहा है और दुनिया के लिए टीकों का निर्माण कर रहा है- नई करंज इसका एक और उदाहरण है ।"

इस साल को 'स्वर्णिम विजय वर्ष' के रूप में मनाया जा रहा है जो 1971 के भारत-पाक युद्ध के 50 साल का प्रतीक है। तत्कालीन यूएसएसआर में रीगा में 04 सितंबर 1969 को कमीशन की गई पुरानी आईएनएस करंज ने भी तत्कालीन कमांडर वीएस शेखावत की देखरेख में युद्ध में सक्रिय भूमिका निभाई थी। आईएनएस करंज की वीरतापूर्ण कार्रवाई के परिणामस्वरूप पनडुब्बी के चालक दल के सदस्यों तथा अन्य कर्मियों को अलंकृत किया गया था, जिनमें तत्कालीन कमांडिंग ऑफिसर कमांडर वीएस शेखावत को मिलने वाला वीर चक्र भी शामिल है। दिलचस्प बात यह है कि पुरानी आईएनएस करंज के कमीशनिंग कमांडिंग ऑफिसर कमांडर एम एन आर सामंत 1971 में नवगठित बांग्लादेश नौसेना के नौसेना प्रमुख बने।

स्कॉर्पीन पनडुब्बियां दुनिया की सबसे उन्नत पारंपरिक पनडुब्बियों में से एक हैं। ये प्लेटफॉर्म दुनिया की नवीनतम तकनीकों से लैस हैं। अपनी पूर्ववर्ती पनडुब्बियों की तुलना में यह पनडुब्बियां अधिक घातक और

छिपकर, समुद्र की सतह के ऊपर या नीचे किसी भी खतरे को बेअसर करने के लिए शक्तिशाली हथियारों और सेंसरों से लैस हैं।

करंज का शामिल होना भारतीय नौसेना के एक निर्माता नौसेना होने की दिशा में एक और कदम है, जो अपनी स्थिति को मजबूत करता है, साथ ही दुनिया के एक प्रमुख जहाज एवं पनडुब्बी निर्माण यार्ड के रूप में एमडीएल की क्षमताओं का परिचायक भी है। रक्षा उत्पादन के क्षेत्र में इस यार्ड की लगातार बनी महत्ता में प्रोजेक्ट 75 भी एक महत्वपूर्ण मील का पत्थर है।

https://pib.gov.in/PressReleasePage.aspx?PRID=1703811

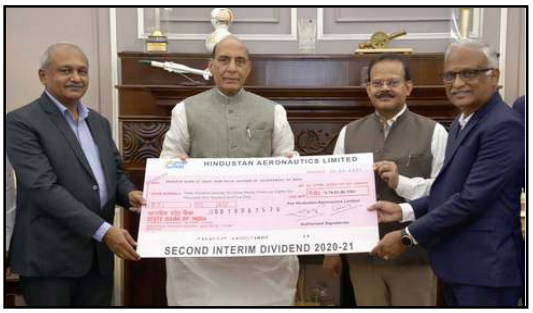
Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 March 2021 5:36PM

HAL pays second interim dividend of Rs 376.93 crore to Government

Defence Public Sector Undertaking (DPSU) Hindustan Aeronautics Limited (HAL) paid the second interim dividend of Rs 376.93 crore for the Financial Year (FY) 2020-21 to the Government. The dividend cheque was handed over to Raksha Mantri Shri Rajnath Singh by Chairman and Managing Director (CMD) of HAL Shri R Madhavan and Director (Finance), HAL Shri C B Ananthakrishnan in the presence of Secretary (Defence Production) Shri Raj Kumar in New Delhi on March 10, 2021.



The Company had declared the second interim dividend of Rs15/- per equity share of Rs10/- each amounting to Rs 501.58 crore on February 26, 2021, in addition to the first interim dividend of Rs15/- per equity share of Rs 10/- each amounting to Rs 501.58 crore already declared on December 09, 2020, totalling Rs 1,003.16 crore which included Government share of Rs 753.88 crore.

Shri Madhavan said that HAL has been consistently paying higher dividend more than the minimum dividend prescribed by Department of Public Enterprises (DPE) guidelines. Joint Secretary (Aero) Shri Chandraker Bharti and other senior officials of Ministry of Defence and HAL were present on the occasion.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703858

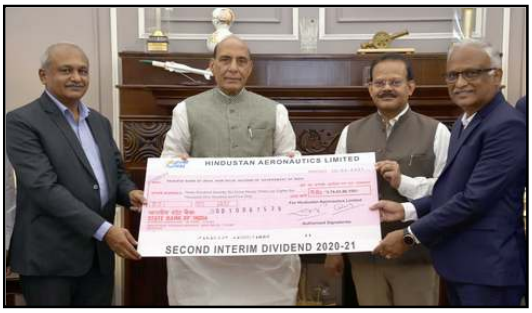
पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 10 March 2021 5:36PM

एचएएल ने सरकार को 376.93 करोड़ रुपए के दूसरे अंतरिम लाभांश का चेक सौंपा

रक्षा क्षेत्र के सार्वजनिक प्रतिष्ठान हिंदुस्तान एयरोनॉटिक्स लिमिटेड (एचएएल) ने वित्त वर्ष 2020-21 के लिए 376.93 करोड़ रुपए के दूसरे अंतरिम लाभांश का चेक सरकार को सौंपा। लाभांश का चेक एचएएल के अध्यक्ष एवं प्रबंध निदेशक श्री आर. माधवन और एचएएल के निदेशक (वित्त) श्री सी.बी. अनन्तकृष्णन ने सचिव (रक्षा उत्पादन) श्री राजकुमार की उपस्थिति में आज 10 मार्च, 2021 कोनई दिल्ली में रक्षामंत्री श्री राजनाथ सिंह को सौंपा।



कंपनी ने 26 फरवरी 2021 को 10 रुपए के प्रत्येक इक्विटी शेयर पर 15 रुपए का दूसरा अंतरिम लाभांश यानी कुल 501.58 करोड़ रुपए घोषित किया था। यह दूसरा इक्विटी शेयर 10 रुपए प्रति इक्विटी शेयर पर 15 रुपएपहले अंतरिम लाभांश के अतिरिक्त था। पहला, कुल 501.58 करोड़ रुपए का अंतरिम लाभांश 9 दिसंबर 2020 को घोषित किया गया था। इस तरह दोनों अंतरिम लाभांश का कुल जोड़ 1,003.16 करोड़ रुपए है जिसमें 753.88 करोड़ रुपए सरकार का शेयर है।

श्री माधवन ने कहा कि एचएएल लगातार उच्च लाभांश का भुगतान कर रहा है जो कि सार्वजनिक उद्यम विभाग के दिशानिर्देशों के तहत निर्धारित न्यूनतम लाभांश से कहीं ज्यादा है। इस अवसर पर संयुक्त सचिव (एईआरओ) श्री चंद्राकर भारती एवं रक्षामंत्रालय और एचएएल के अन्य वरिष्ठ अधिकारी भी उपस्थित थे।

https://pib.gov.in/PressReleasePage.aspx?PRID=1703903

Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 March 2021 3:01PM

Steps to reduce border infiltration

The Indian Army has adopted a robust counter infiltration strategy which has an appropriate mix of technology and human resource put together to check infiltration effectively. Innovative troops deployment, proactive use of surveillance and monitoring devices and the Anti Infiltration Obstacle System (AIOS) have enhanced the ability to detect and intercept terrorists attempting to infiltrate/exfiltrate. On the basis of regular analysis of threat assessment and past infiltration attempts, drill and procedures are modified to counter emerging threats. Some of the measures employed by Indian Army are as under:-

- Appraisal and upgradation of intelligence gathering capabilities.
- Reorientation of surveillance architecture to enmesh with counter infiltration deployment.
- Augmentation of Anti Infiltration Obstacle System (AIOS) incorporating surveillance assets.
- Enhanced incorporation of aerial platforms, night vision equipment, radars, underground sensors etc. to strengthen the surveillance architecture.
- Maintenance of heightened alert in areas along the LC.

The Indian Army, along with Research & Development agencies, regularly upgrade the design of Anti Infiltration Obstacle System (AIOS) on the fence to incorporate 'Smart' components such as Border Surveillance System (BOSS), Laser Fence, Short Range Surveillance Equipment etc.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Shri Talari Rangaiah in Lok Sabha today.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703760

Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 March 2021 7:41PM

Visit of US Secretary of Defence to India

Secretary of Defence of United States of America, General Lloyd J Austin will visit India from 19 to 21 March 2021. During his visit, Secretary Austin is expected to meet Raksha Mantri Shri Rajnath Singh and other senior dignitaries of the Government of India.

Both Sides are expected to discuss ways to further strengthen bilateral defence cooperation and exchange views on regional security challenges and common interests in maintaining a free, open and inclusive Indo-Pacific region. Discussions regarding defence cooperation would also focus on how both countries could consolidate military-to-military cooperation and defence trade and industry cooperation.

Secretary Austin's visit to India as part of his first overseas travel emphasizes the strength of the India-US strategic partnership.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703940

Press Information Bureau
Government of India

Ministry of Defence

Wed, 10 March 2021 2:57PM

Indo-Uzbekistan Field Training Exercise 'DUSTLIK ' commences in Ranikhet (Uttarakhand)

The India – Uzbekistan joint military exercise "DUSTLIK II" commenced today in Foreign Training Node Chaubatia, Ranikhet (Uttarakhand). This is the Second Edition of annual bilateral joint exercise of both armies. It will continue till 19th March 2021. The first edition of the exercise was held at Uzbekistan in Nov 2019.

45 Soldiers each from Uzbekistan and Indian Army are participating in the exercise. Both contingents will be sharing their expertise and skills in the field of counter terrorist operations in mountainous/rural/urban scenario under UN mandate. The exercise will culminate into a 36 hours joint validation exercise scheduled from 17 to 18 March 21. The validation exercise will be a test bed for the soldiers of both armies as they would be undergoing the challenges of actual operations in such scenarios.

This joint exercise will definitely provide impetus to the ever growing military and diplomatic ties between the two nations and also reflects the strong resolve of both nations to counter terrorism.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703755

FINANCIAL EXPRESS
Read to Lead

Thu, 11 March 2021

Big boost for Atmanirbhar Bharat! Indian Navy gets its 3rd Kalvari Class submarine INS Karanj

By Huma Siddiqui

On Wednesday (March 10, 2021), Indian Navy commissioned the third stealth Kalvari class Submarine INS Karanj. "This impetus to Indigenisation & AatmaNirbharBharat is a fundamental tenet of Indian Navy's growth story and future operational capabilities," the Chief of Naval staff Admiral Karambir Singh said in his address.

INS Karanj, the third Kalvari class (Scorpene) submarine commissioned at Naval Dockyard Mumbai

The submarine was commissioned at the Naval Dockyard Mumbai through a formal commissioning ceremony where Chief of the Naval Staff Admiral VS Shekhawat (Retd) was the chief guest. Besides the crew of the erstwhile 'Karanj', a Russian origin Foxtrot Class Submarine which was decommissioned in 2003, other senior officers from the Indian Navy and Ministry of Defence were present.

According to the Indian Navy, the former Naval Chief Admiral Shekhawat was part of the commissioning crew of

the old Karanj, later he was the Commanding officer during the 1971 Indo – Pak war. The chief guest while highlighting India's push towards Atma Nirbharta said "we live in an India launching numerous satellites, building nuclear submarines, manufacturing vaccines for the worlds – the new Karanj is another example of it".

History of INS Karanj

2021 is being celebrated as the 'Swarnim Vijay Varsh', marking 50 years of 1971 Indo – Pak war.

According to the Indian Navy the old INS Karanj, which was commissioned on September 04 Sep 1969, at Riga in the erstwhile USSR, took active part in the conflict under the Command of then Cdr VS Shekhawat.

And it was in recognition of the valiant action of her officers and crew, a number of personnel were decorated, this included award of Vir Chakra to the then Commanding Officer Cdr VS Shekhawat.

Interesting factoid

The commissioning Commanding Officer of the old INS Karanj Cdr MNR Samant later went on to become the first Chief of The Naval Staff of the newly formed Bangladesh Navy in the year 1971.

More about INS Karanj

The newly commissioned INS Karaj will be forming part of the Western Naval Command's Submarine fleet and would add more power to the command's arsenal.

The Mumbai based Mazagon Dock Shipbuilders Limited (MDL) Mumbai, under collaboration with M/s Naval Group, France, is building six Scorpene Class submarines.

Today's induction of the INS Karanj is another step towards consolidating Indian Navy's position as a builder's Navy. Project 75 has helped in reflecting MDL's capabilities as a premier ship and submarine building yard of the world.

The third Indian Kalvari-class submarine entirely made in India is based on Scorpene design of the Naval Group based in France. The submarine, as reported earlier by Financial Express Online, has been built totally by MDL with limited external support. It has been built with technology transfer from Naval Group during the construction and trials of the first two boats.

According to the Naval Group, this series of six submarines have been fitted with a number of equipment, built in India by highly trained industrial Micro, Small & Medium Enterprises (MSMEs) which form the sound base of submarine building ecosystem of India.

According to Pierre-Eric Pommellet, CEO & Chairman of Naval Group, "This program is a major element of the strategic autonomy enjoyed by the Indo-French partnership and strategic autonomy. This has developed over the last decades."

"The commissioning of INS Karanj, amidst Covid-19 challenges, represents one of its kind industrial milestones and illustrates the Atma Nirbharta (self-reliance) of Indian Navy and naval defence industry," he added.

The French company is planning to establish more meaningful partnerships with Indian industry that will help in sustainability of their global supply chain and industrial footprint.

About Kalvari class Submarines

These are one of the most advanced conventional submarines in the world and are equipped with the latest technologies available in the world. These submarines are considered as more deadly and stealthier than their predecessors. They have potent weapons and sensors which can neutralise any threat above or below the sea surface.

https://www.financialexpress.com/defence/big-boost-for-atmanirbhar-bharat-indian-navy-gets-its-3rd-kalvari-class-submarine-ins-karanj/2209844/

Hindustan Times

Thu, 11 March 2021

India, China will continue talks to resolve remaining issues along LAC: Govt

The border standoff between the Indian and Chinese armies erupted on May 5 following a violent clash in the Pangong lake areas and both sides gradually enhanced their deployment

New Delhi: India on Wednesday said it will continue discussions with China to resolve the remaining issues along the Line of Actual Control in eastern Ladakh and achieve the objective of disengagement from all friction points to restore peace and tranquillity in the border areas at an early date.

In responding to a question in Lok Sabha on whether China has admitted loss of lives of their commandos in the Galwan encounter, minister of state for external affairs V Muraleedharan said the Central Military Commission of China on February 19 announced awarding posthumously honorary titles and merit citations to Chinese soldiers.

"As per the announcement, these titles were awarded for the role of these soldiers in the faceoff at Galwan Valley in June 2020," he said.

Twenty Indian soldiers were killed in the fierce hand-to-hand combat in the Galwan Valley clash, an incident that marked the most serious military conflicts between the two sides in decades.

For the first time, China officially acknowledged last month that five Chinese military officers and soldiers were killed in the clash with the Indian Army.

"Government will continue discussions with the Chinese side to resolve the remaining issues along the LAC in eastern Ladakh and achieve the objective of disengagement from all friction points and restoration of peace and tranquillity in the India-China border areas at an early date," Muraleedharan said.

The border standoff between the Indian and Chinese armies erupted on May 5 following a violent clash in the Pangong lake areas and both sides gradually enhanced their deployment by rushing in tens of thousands of soldiers as well as heavy weaponry.

As a result of a series of military and diplomatic talks, the two sides completed withdrawal of troops and weapons from the north and south banks of Pangong lake in line with an agreement on disengagement.

In his response, Muraleedharan also referred to defence minister Rajnath Singh's announcement in Parliament on February 11 that India and China reached an agreement on disengagement in the North and South banks of Pangong Lake.

"The disengagement in the Pangong Lake area has been completed," he said.

After completion of the disengagement process in Pangong lake areas, senior military commanders of India and China held another round of talks on February 20 with a focus on taking forward the disengagement process in other friction points.

In the talks, India pitched for a faster disengagement process in areas like Hot Springs, Gogra and Depsang to bring down tension in the region.

https://www.hindustantimes.com/india-news/india-china-will-continue-talks-to-resolve-remaining-issues-along-lac-govt-101615428999790.html

Science & Technology News

Press Information Bureau
Government of India

Department of Space

Wed, 10 March 2021 5:12PM

Four Indian astronauts undergoing generic space flight training in Russia as part of Gaganyaan Programme nearing completion: Dr Jitendra Singh

Union Minister of State (Independent Charge) Development of North Eastern Region (DoNER), MoS PMO, Personnel, Public Grievances, Pensions, Atomic Energy and Space, Dr.Jitendra Singh said that four Indian astronaut candidates are currently undergoing generic space flight training in Russia as part of GaganyaanProgramme. In a written reply to a question in the Lok Sabha today, he said, the astronaut training activities in Russia are nearing completion. Major modules such as survival training (snow, water and steppe), parabolic flights, theoretical classes on orbital mechanics, astro-navigation and some Soyuz systems have been completed.

DrJitendra Singh said, Government of India has made reforms in Space sector by enabling private sector participation in Space activities.He said, the intention is to provide level playing field for private companies in satellites, launches and space-based services, to bring in predictable policy and regulatory environment to private players, to provide access to ISRO facilities and other relevant assets to improve their capacities, to provide opportunities in selected areas of planetary exploration, outer space travel, etc. to private sector and to liberalize the existing geo-spatial data policy for providing remote-sensing data to entrepreneurs.

DrJitendra Singh said that PSLV-C51 carried Amazonia-1 optical earth observation satellite of National Institute of Space Research of Brazil along with 18 small satellites on February 28, 2021.

https://pib.gov.in/PressReleasePage.aspx?PRID=1703826

THE TIMES OF INDIA

Thu, 11 March 2021

ISRO'S commercial arm NSIL bags 4 more contracts, eyes satellite-building deals

Bengaluru: ISRO'S commercial arm NewSpace India Limited (NSIL) has bagged four more dedicated launch service contracts even as it plans to pursue satellite building deals.

NSIL launched its first dedicated commercial mission on February 28, orbiting Brazilian satellite Amazonia-1 from Sriharikota spaceport of the Indian Space Research Organisation (Isro).

"We currently have four more dedicated launch service contracts, which will be executed in the coming two to three years," NSIL's Chairman and Managing Director G Narayanan told in an interview.

Apart from launchservices, NSIL is also actively pursuing the new policy change toprovide space-based services on 'demand driven basis', a shift from thecurrent supply driven model, he said.

"Towards this we are in discussions withseveral users to ascertain their demands and shortly you will hearfrom us regarding firm agreements for building and launching of satellites through NSIL and providing services primarily in thecommunication sector for the end customer", he said.

Asked if NSIL has any plans to buildsatellites for other countries, in addition to providing launch services at present, Narayanan said on the basis of its new mandate obtained as part of the spacereforms, the company will shortly enter into realising of satellites too. According to him, whilethe initial focus will be on driving the change nationally from supply-driven to demand-driven model in the domestic market, NSIL is not averseto taking up these activities for other countries. "In the long run wewill definitely embark on trying to capture market of other countriesalso in this field (satellite-building)", Narayanan said.

He also said that NSIL is in the process of identifying an Indian industry partner (whichcould be consortium of companies or a company) to undertake end-to-endproduction of Polar Satellite Launch Vehicle (PSLV), which is ISRO's workhorse rocket. "We expect to complete this complex process inabout six to eight months.Once the Indian industry partner is identified,I am confident that they will be in a position to deliver an entirelybuilt PSLV in about two to three years with appropriate hand holding from Isro", he said.

As part of this business initiative, NSIL has proposed to realise five PSLVs through identified Indian industry partner.

"As of now, about 80 per cent of mechanical systems and 60 per cent of electronic systems of PSLV come from the industry. However, the remaining percentages in both the areasare highly complex", Narayanan said.

The NSIL, he said, is also proactively working to improve the potential of Indian industries by way of technology transfer in several identified areasfrom Isro to them. "This will definitely help them play anincreasing role in the emerging space markets both nationally andglobally. So far, we have entered into 14 such technology transfer agreements and you will see much more such transfers in the days tocome", the official said. On the Small Satellite Launch Vehicle (SSLV), he said the compact launcher is being developed by the Isro as a newer launch-on-demand vehicle for meeting smaller satellite segment capacityglobally.

According to sources in Bengaluru-headquartered Isro, the maiden flight of the SSLV is expected in April.

SSLV is a three-stage all solid vehicle with a capability to launch up to 500 kg satellite mass into 500 km low earth orbit (LEO) and 300 kg to Sun Synchronous Orbit (SSO).

On NSIL's positioning strategy in the globalmarket in terms of pricing, reliability, and competitiveness, Narayanan said ISROs capabilities in space needs no explanation at this time.

From innovative and ingenious initiatives Isro could capture theappreciation of the world including that of premier space agencies forits capabilities to undertake the most complex missions with ease, he said.

"NSIL by virtue of having access to commercially exploit India's suchcapabilities in space is highly recognised globally in terms of competence, reliability and cost.

The just concluded launch contract (Amazonia-1) was won by NSIL through a competitive bidding process and this will speak for itself", Narayanan added.

https://timesofindia.indiatimes.com/india/isros-commercial-arm-nsil-bags-4-more-contracts-eyes-satellite-building-deals/articleshow/81431384.cms

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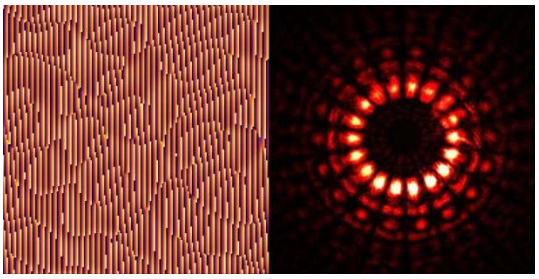
Thu, 11 March 2021

Finding quvigints in a quantum treasure map

Researchers have struck quantum gold—and created a new word—by enlisting machine learning to efficiently navigate a 20-dimensional quantum treasure map.

Physicist Dr. Markus Rambach from the ARC Centre of Excellence for Engineered Quantum Systems (EQUS) at The University of Queensland said the team was able to find unknown quantum states more quickly and accurately, using a technique called self-guided tomography.



Hologram encoding a quvigint (left), such as that photographed during the experiment (right). Credit: Markus Rambach

The team also introduced the 'quvigint', which is like a qubit (the quantum version of a classical bit that takes on the values '0' or '1') except that it takes on not two, but 20 possible values.

Dr. Rambach said high-dimensional quantum states such as quvigints were ideal for storing and sending large amounts of information securely.

However, finding unknown states becomes increasingly difficult in higher dimensions, because the same scaling that gives quantum devices their power also limits our ability to describe them.

He said this problem was akin to navigating a high-dimensional quantum treasure map.

"We know where we are, and that there's treasure, but we don't know which way to go to get to it," Dr. Rambach said.

"Using standard tomography, this problem would be solved by first determining which directions you need to look in to ensure you cover the whole map, then collecting and storing all the relevant data, and finally processing the data to find the treasure.

"Instead, using self-guided tomography, we pick two directions at random, try them both, pick the one that gets us closer to the treasure based on clues from the machine learning algorithm, and then repeat this until we reach it.

"This technique saves a huge amount of time and energy, meaning we can find the treasure—the unknown quvigint—much more quickly and easily."

To illustrate the technique, the team simulated a quvigint travelling through the atmosphere, as it would when being used to send quantum information between two points on Earth or to a satellite.

As the quvigint travels, it is modified by atmospheric turbulence.

Standard tomography is very susceptible to this type of noise, but by using self-guided tomography the team was able to reconstruct the original quvigint with high accuracy.

Dr. Jacq Romero, also at EQUS and UQ, said self-guided tomography was unlike other methods for finding unknown quantum states.

"Self-guided tomography is efficient, accurate, robust to noise and readily scalable to high dimensions, such as quvigints," Dr. Romero said.

"Self-guided tomography is a robust tomography method that is agnostic to the physical system, so it can be applied to other systems such as atoms or ions as well."

The study is published in *Physical Review Letters*.

Journal information: *Physical Review Letters*

https://phys.org/news/2021-03-quvigints-quantum-treasure.html

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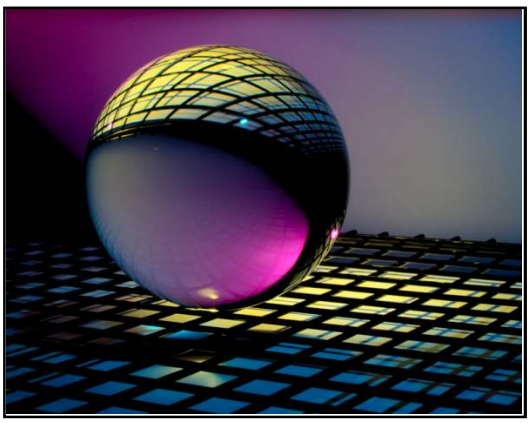
Thu, 11 March 2021

Physics undergraduate proposes solution to quantum field theory problem

When physicists need to understand the quantum mechanics that describe how atomic clocks work, how your magnet sticks to your refrigerator or how particles flow through a superconductor, they use quantum field theories.



Credit: Unsplash/CC0 Public Domain

When they work through problems in quantum field theories, they do so in "imaginary" time, then map those simulations into real quantities. But traditionally, these simulations nearly always include uncertainties or unknown factors that could cause equation results to be "off." So, when physicists interpret their simulation results into real quantities, these uncertainties amplify exponentially, making it difficult to have confidence that their results are as accurate as necessary.

Now, a pair of University of Michigan physicists have discovered that a set of functions called the Nevanlinna functions can tighten the interpretation step, showing that physicists may be able to overcome one of the major limitations of modern quantum simulation. The work, published in *Physical Review Letters*, was led by U-M physics undergraduate student Jiani Fei.

"It doesn't matter if it's lattice quantum chromodynamics, a simulation of a nickel oxide or a simulation of a superconductor, the last step of all of this is taking the data from the imaginary axis to the real axis," said Emanuel Gull, U-M associate professor of physics. "But there's a fundamental mismatch between what results the calculations give and where the experimental measurements are."

Gull gives the example of looking at the photoelectric effect in a metal such as copper. If you shine light at copper at a specific frequency, you'll be able to see the electrons that exist at that frequency, called a band structure. Within these band structures, the oscillations of the electrons peak sharply. Previous methodologies are good at examining what happens where the frequency peaks are. But the methodologies falter when examining the nadir of the frequency—at closer to zero energy, or what's called Fermi energy.

"If you can't resolve band structure, you can't say anything about where your electrons are or what is actually happening deep inside a crystal," Gull said. "If you can't resolve the near-Fermi surface structure, then all of the information about correlations, all of these interesting physics that make up magnetism or superconductivity, all of your quantum effects are hidden. You're not getting the quantum information you're looking for."

In examining this problem, Fei realized that to accurately convert quantum mechanic theories from imaginary to real numbers, physicists needed a class of functions that are causal. This means that when you trigger the system you're examining, a response in the function only happens after you've set off the trigger. Fei realized that the Nevanlinna functions—named after Finnish mathematician Rolf Nevanlinna's Nevanlinna theory, which was devised in 1925—guarantees that everything is always causal.

With a method developed by Fei, it is now possible to not only resolve the precise structure near Fermi energy, it's also possible to resolve the high frequency energies as well.

"It's like looking at the same type of theory with a much better microscope," Gull said.

Fei says this set of functions is general in finite temperature quantum systems, and to her, it's important to "use this structure to its full potential."

"By imposing structures similar to the Nevanlinna structure, we can get an approach to various kinds of response functions, such as the ones for optics and neutron scattering," she said.

The researchers say the main importance of their work is that it's interdisciplinary. Their study was motivated by problems in experimental physics, but uses tools from theoretical physics and mathematics.

"Via the mathematical structure of these, there are actually even connections that go all the way out to control theory," Gull said. "For example, if you have a factory and you want to make sure the factory doesn't blow up as you're changing various regulators and valves, the mathematical structure that you're using for describing this problem is exactly the same Nevanlinna functions that Jiani used for analytical continuation."

More information: Jiani Fei et al. Nevanlinna Analytical Continuation, *Physical Review Letters* (2021). DOI: 10.1103/PhysRevLett.126.056402

Journal information: *Physical Review Letters*

https://phys.org/news/2021-03-physics-undergraduate-solution-quantum-field.html

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Thu, 11 March 2021

Research predicts the high-temperature topological superconductivity of twisted double-layer copper oxides

By Ingrid Fadelli

Two-dimensional (2D) materials, such as graphene or transition metal dichalcogenides, can sometimes be assembled into bilayers with a twist between individual layers. In recent years, many researchers have been investigating the properties of these twisted double-layer structures and their potential advantages for fabricating electronic devices.

A research group at the University of British Columbia in Vancouver recently carried out a study exploring the properties of twisted double-layer copper oxides. In their paper, published in *Nature Physics*, they predict that structures composed of two monolayer-thin d-wave superconductors will exhibit high-temperature topological superconductivity.

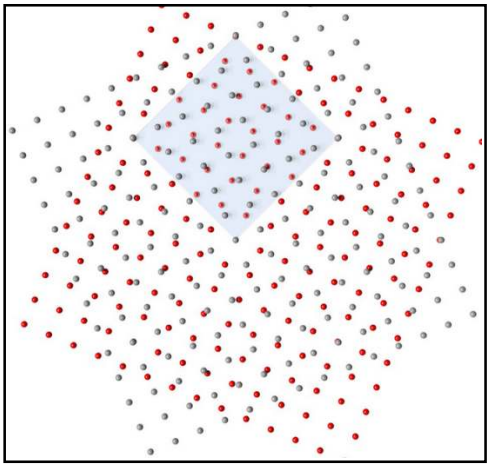

Illustration of a moire pattern obtained by superimposing two square lattices with a twist. For certain 'commensurate' angles, the resulting structure is periodic and can be generated by assembling shaded square regions next to one another like floor tiles. Credit: Can et al.

"Twisted bilayer graphene has been a big research topic over the past couple of years, and we were thinking about other 2D materials where twist-angle engineering could be applied," Marcel Franz, one of the researchers who carried out the study, told Phys.org. "The goal of our work, however, was to uncover some new physics, not just repeat what others have done in the context of graphene. After several false starts, we zeroed in on cuprate superconductors, which share some similarities with graphene, such as 2D basic structure and low-energy Dirac excitations, but are also in many aspects very different materials."

The most notable difference between graphene and cuprate-based superconductors is that they conduct electricity with no resistance at high temperatures. This characteristic could make them arguably more suitable for fabricating topological superconductors.

In their study, Franz and his colleagues specifically focused on single monolayer cuprate materials, such as $Bi_2Sr_2CaCu_2O_{8+\delta}$, which is known to be a so-called d-wave superconductor. This essentially means that its order parameter changes sign upon a 90-degree rotation, just like a d orbital in chemistry.

"It is this superconducting property of cuprate, established more that 20 years ago, that underpins the emergence of topological superconductivity in a bilayer of such a material when assembled with a twist," Franz said. "We constructed simple mathematical models describing this situation and they show unambiguous evidence for robust topological phase when the twist angle is close to 45 degrees."

Topological superconductors are extremely rare, and researchers have so far only identified a handful of materials that could be classified as such. Moreover, most of the topological superconductor candidates identified so far only reach the topological state at very low temperatures (i.e., below 1 degree Kelvin).

Franz and his colleagues modeled twisted $Bi_2Sr_2CaCu_2O_{8+\delta}$ bi-layer materials and found that it could reach the topological phase at temperatures as high as 80 Kelvin. The fact that it might enter this phase at higher temperatures could have notable advantages, as it could open up new possibilities for studying topological superconductivity, potentially enabling the development of the first true high-temperature topological superconductors.

"Several labs around the world, including researchers at my own Stewart Blusson Quantum Matter Institute, are currently preparing samples of twisted high temperature cuprates and are gearing up to be able to probe for signatures of the elusive topological phase," Franz said. "My group is engaged in a significant effort aimed at providing theoretical support to these experiments and it turns out that although the topological state should be robustly present in these samples, its signatures can be quite subtle. Through theoretical modeling, we are now working to predict characteristic behaviors of various experimentally measurable quantities."

More information: High-temperature topological superconductivity in twisted double-layer copper oxides. *Nature Physics*(2021). DOI: 10.1038/s41567-020-01142-7.

Journal information: *Nature Physics*

https://phys.org/news/2021-03-high-temperature-topological-superconductivity-double-layer-copper.html

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Thu, 11 March 2021

UK Covid-19 variant has significantly higher death rate, study finds

A highly infectious variant of Covid-19 that has spread around the world since it was first discovered in Britain late last year is between 30% and 100% more deadly than previous dominant variants, researchers said today

By Kate Kelland

London: A highly infectious variant of Covid-19 that has spread around the world since it was first discovered in Britain late last year is between 30% and 100% more deadly than previous dominant variants, researchers said on Wednesday.

In a study that compared death rates among people in Britain infected with the new SARS-CoV-2 variant - known as B.1.1.7 - against those infected with other variants of the COVID-19-causing virus, scientists said the new variant's mortality rate was "significantly higher".

The B.1.1.7 variant was first detected in Britain in September 2020, and has since also been found in more than 100 other countries.

It has 23 mutations in its genetic code - a relatively high number - and some of them have made it far more easily spread. Scientists say it is about 40%-70% more transmissible than previous dominant variants that were circulating.

In the UK study, published in the British Medical Journal on Wednesday, infection with the new variant led to 227 deaths in a sample of 54,906 COVID-19 patients, compared with 141 among the same number of patients infected with other variants.

"Coupled with its ability to spread rapidly, this makes B.1.1.7 a threat that should be taken seriously," said Robert Challen, a researcher at Exeter University who co-led the research.

Independent experts said this study's findings add to previous preliminary evidence linking infection with the B.1.1.7 virus variant with an increased risk of dying from COVID-19.

Initial findings from the study were presented to the UK government earlier this year, along with other research, by experts on its New and Emerging Respiratory Virus Threats Advisory Group, or NERVTAG, panel.

Lawrence Young, a virologist and professor of molecular oncology at Warwick University, said the precise mechanisms behind the higher death rate of the B.1.1.7 variant were still not clear, but "could be related to higher levels of virus replication as well as increased transmissibility".

He warned that the UK variant was likely fuelling a recent surge in infections across Europe.

https://www.livemint.com/science/health/uk-covid-19-variant-has-significantly-higher-death-rate-study-finds-11615380549853.html