

June
2021

समाचार पत्रों से चयित अंश Newspapers Clippings

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खंड : 46 अंक : 117 16 जून 2021
Vol.: 46 Issue : 117 16 June 2021



रक्षा विज्ञान पुस्तकालय
Defence Science Library
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र
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CONTENTS

S. No.	TITLE	Page No.
DRDO News		1-7
DRDO Technology News		1-5
1.	How P-75Is will boost the Indian Navy's submarine fleet	1
2.	Navy's first 3 three indigenous nuclear attack submarines to be 95 percent made-in-India	3
3.	DNA Special: How India stacks up against China, Pakistan in terms of nuclear weapons	4
COVID 19: DRDO's Contribution		6-7
4.	IICT enters into an MoU with Anthem Biosciences for 2-DG	6
5.	City-based dentist develops aerosol box to prevent cross infection in clinical spaces	7
Defence News		8-18
Defence Strategic: National/International		8-18
6.	Indian Army conducts rail trials on Dedicated Freight Corridor (DFC)	8
7.	भारतीय सेना ने समर्पित फ्रेट कॉरिडोर (डीएफसी) हेतु रेल परीक्षण किए	9
8.	Defence ministry wants wider discussion on new theatre commands	10
9.	Chinese counterpart listening, Rajnath calls for freedom of navigation in South China Sea	11
10.	Mazagon Dock to deliver INS Visakhapatnam by Oct, INS Vela by March to Indian Navy	12
11.	India's China challenge: Why Indo-Tibetan border police needs air support – Analysis	13
12.	A year after Galwan, India and China still face-off in Ladakh	15
13.	India, Indonesia discuss joint patrols in Malacca straits to advance defence and maritime ties	17
Science & Technology News		19-26
14.	Researchers find an improved method of imaging objects through fog	19
15.	शोधकर्ताओं ने कोहरे में भी वस्तुओं के चित्रांकन (इमेजिंग) का एक बेहतर तरीका खोजा	20
16.	Rare superconductor may be vital for quantum computing	22
17.	The electron merry-go-round: Researchers find new mechanism for classical behavior of many-particle quantum systems	23
18.	Researchers 3D-print rotating microfilter for lab-on-a-chip applications	24
COVID-19 Research News		26-26
19.	Why some COVID-19 patients develop life-threatening clots	26



Wed, 16 June 2021

How P-75Is will boost the Indian Navy's submarine fleet

It's hardly reassuring to see Pakistan and China expanding their naval fleets exponentially. Given this, it's imperative for India to augment its underwater combat arm urgently

By Prakash Chandra

The Indian Navy (IN)'s submarine modernisation plans finally look set to gather some steam with the Ministry of Defence (MoD) approving the long-delayed 'Project 75-I' ('I' for India) to build six submarines in the country. The Defence Acquisition Committee, India's highest decision-making body on procurement, made this decision on June 4 while also giving the nod to another project worth Rs 6,000 crore for air defence guns and ammunition.



Indian submarine- Image: Reuters

The ministry is expected to soon issue requests for proposal (RFP) for the Rs 43,000 crore submarine deal from foreign shipyards. For the first time, the RFP will seek strategic partnership (SP) bids for making the conventional diesel-electric submarines—all larger than the Scorpene vessels currently under construction at Mazagon Dockyards Ltd (MDL) in Mumbai. The SP model allows Indian industry to become involved in making four categories of weapon systems: submarines, fighter aircraft, helicopters and armoured vehicles. It stipulates that an Indian company must build the six subs in collaboration with a foreign original equipment manufacturer (OEM).

Two Indian strategic partners with submarine-building experience have reportedly been picked to collaborate with the OEMs: MDL on India's west coast and L&T on the east coast. Five OEMs are reportedly bidding for the project: the French Naval Group, German conglomerate Thyssenkrupp Marine Systems, Russia's Rubin Design Bureau, Spain's Navantia and South Korea's Daewoo Shipbuilding & Marine Engineering Co Ltd. The strategic partner has to ensure a minimum of 45 percent indigenisation in five of the subs and at least 60 percent indigenous content in the sixth one.

The navy, though, is likely to greet this development warily, given the chequered history of India's effort to modernise its submarine fleet which began in the late 1970s, but never took off as successive governments failed to prioritise it.

It was only in 1999 that the changing geostrategic equations—read rising Chinese influence—in the Indo-Pacific region finally prompted New Delhi to bolster its underwater assets. The 30-Year Submarine Construction Programme was then charted out to replace the submarine fleet with vessels built under two categories: the P-75 (Scorpene) and the P-75I. The original idea was to build six subs using western technology and six with Russian collaboration so that Indian engineers could construct a dozen more subs indigenously by forging design and construction partnerships

with domestic and foreign industry. But while the ball was set rolling on the P-75 in 2005, the P-75I had hung fire as the MoD dragged its feet over finalising an OEM. The Scorpene deliveries, meanwhile, missed several deadlines and only three submarines have materialised so far, with another three expected by 2024.

The navy saw fair weather only in 2011 when the Krishnamurthy Committee recommended opening the doors of submarine-building to private industry. It suggested inviting private sector investments through public-private partnerships and the need to rope in private sector shipyards to push through projects on a priority basis. Policy-makers realised that moving in this direction would not only obviate the need to import submarines, but would also allow Indian companies to access the Rs 50,000 crore market.

An even bigger concern for the navy is India's fast-depleting submarine strength. Ten Kilo-class Russian-origin submarines and four German HDW vessels form the backbone of the navy's current non-nuclear underwater fleet. These are all diesel-powered and becoming obsolete by the day. Since many of these are scheduled to be decommissioned soon, it would leave less than half a dozen operational subs with the navy at a time when 18 conventional submarines would be needed to defend India's coastline.

Even with the P-75I's launch, the first subs will still take at least eight to nine years to enter service. True, the new boats will have stealth and land-attack capabilities and are equipped with air-independent propulsion (AIP) systems to boost their operational capabilities. But the navy would still have to depend on nuclear submarines that have a vital role in India's nuclear deterrence policy.

The AIP, for instance, helps submarines stay submerged for much longer periods, narrowing the gap with nuclear-powered submarines which can operate underwater for virtually unlimited periods. Nevertheless, policy-makers know that the navy must move from diesel submarines, however advanced, to nuclear-powered and conventional cruise missile-equipped platforms sooner rather than later. The government acknowledged this in 2015 when it modified the 1999 submarine-building programme and approved a plan to build six nuclear-powered submarines.

The Indian Navy currently has only two nuclear submarines: the indigenously built INS Arihant and INS Arighat, and is building two more Arihant-class vessels at Visakhapatnam with Russian help in miniaturising their nuclear reactors. But this still falls short of the six nuclear fast attack subs and four nuclear subs with nuclear-tipped missiles that the navy needs to maintain strategic balance in the region.

India doesn't have a friendly neighbourhood, and considering most of its territories border the Indian Ocean and the Arabian Sea, it's hardly reassuring to see Pakistan and China expanding their naval fleets exponentially. It is imperative for the country to augment its underwater combat arm urgently as the navy cannot afford to drift anymore.

(Prakash Chandra is former editor of the Indian Defence Review. He writes on aerospace and strategic affairs. Views are personal.)

<https://www.moneycontrol.com/news/opinion/defence-how-p-75is-will-boost-the-indian-navys-submarine-fleet-7036621.html>

Navy's first 3 three indigenous nuclear attack submarines to be 95 percent made-in-India

This project is different from the Arihant class project, under which, six nuclear-powered submarines are being built with the capability of launching ballistic missiles

By Sangeeta Nair

The Indian Navy and Defence Research and Development Organisation (DRDO) will indigenously build the first three nuclear attack submarines at a cost of Rs 50,000 crore. The submarines will be 95 percent made-in-India.

The Union Cabinet Committee on Security is considering a proposal worth around Rs 50,000 crore for indigenously building three nuclear attack submarines, which would be built by the Defence Research and Development Organisation (DRDO) in Visakhapatnam.

The nuclear attack submarine project will provide a major boost to the submarine building capability within the country, as 95 percent of it would be made in India. This would also provide a big boost to the domestic defence sector including both private and public sector.



Reference Image

Key Highlights

- The nuclear attack submarine project is expected to be completed without any external help but if required the planners may take the help of its strategic partner countries.
- A total of three submarines are expected to be built under the project. The project will be extremely helpful for the economy, as it will create a large number of jobs in the defence sector.
- The Indian Navy and DRDO are expected to first get clearance for three of the submarines and then they will have the option of building three more after the completion of this project.
- This project is different from the Arihant class project, under which, six nuclear-powered submarines are being built with the capability of launching ballistic missiles.

Background

- The Indian Navy's proposal to build six indigenous nuclear attack submarines was one of the first major defence modernisation proposals to be cleared by the Narendra Modi government soon after it came to power in 2014.
- India has been making major progress in the field of indigenous submarine building capability. The first Arihant class submarine boat was commissioned a few years ago and the second one INS Arighat is currently undergoing sea trials and is expected to be commissioned in near future.
- India plans to revamp its naval ships by building 24 submarines including six nuclear attack ones which would give it a slight edge over adversaries in the Indian Ocean Region and will help the Navy maintain peace in the area.
- The first of the six conventional boats are already under construction in Mumbai under the Kalavati class project while the tender for the next six with greater capacity will be issued soon after Defence recent clearance by the Defence Ministry. India also plans to build six more conventional submarines under Project 76 but it will take a long time to be initiated.

What is Project 75I?

The Project 75I-class submarine is a follow-on of the Project 75 Kalvari-class submarine. Under Project 75I, the navy plans to build six diesel-electric submarines with advanced air-independent propulsion systems to substantially increase their operational range. All six submarines are expected to be built in Indian shipyards.

About Project 75

- The first Kalvari-class submarine, INS Kalvari was launched on October 28, 2015. INS Kalvari is the first of the six Scorpène-class submarines currently in service with the Indian Navy.
- INS Khanderi, the second of the Indian Navy's six Kalvari-class submarines, was commissioned into service on September 28, 2019, while INS Karanj -the third submarine of the batch was commissioned on March 10, 2021.
- INS Vela and INS Vagir, fourth and fifth Kalvari-class submarines are currently undergoing sea trials and they are expected to be commissioned into the Indian Navy in 2022. The last submarine in the batch, INS Vagsheer is still under construction and is expected to be commissioned in 2022-2023.

<https://www.jagranjosh.com/current-affairs/navys-first-3-three-indigenous-nuclear-attack-submarines-to-be-95-percent-madeinindia-1623756893-1>



Wed, 16 June 2021

DNA Special: How India stacks up against China, Pakistan in terms of nuclear weapons

Both China and Pakistan want to come out at the forefront of the nuclear arms race

Edited By Karishma Jain

Today, we will tell you about the nuclear hunger of China and Pakistan. These two countries have become a threat not only to India but to the whole world. Both these countries want to come out at the forefront of the nuclear arms race.

According to the annual report of the Stockholm International Peace Institute, an international organization tracking nuclear weapons, the number of nuclear weapons with Pakistan has increased from 160 to 165 in the last year. Meaning, in one year, Pakistan has developed five new nuclear bombs. China has also increased the number of nuclear weapons from 320 to 350 in the last year. And on the border, these two countries are a big challenge for India. India lags behind both China and Pakistan in the number of nuclear weapons.



In the last year, India has developed 6 new nuclear weapons, but even now this number has increased from 150 to 156. According to this, Pakistan has 9 more nuclear weapons than India and China has 194 more nuclear weapons than our country. If the nuclear weapons of both countries are added, this number becomes 515. You can say that at present 515 nuclear weapons are lying around India.

The situation in other countries has also been stated in this report. America has reduced the number of nuclear weapons. In 2020, it had 5,800 nuclear weapons, which are now 5,550.

Similarly, Russia has also reduced the number of nuclear weapons to 120. However, Russia still remains the country with the largest number of nuclear weapons in the whole world. You can say that Russia has so many nuclear weapons that 195 countries of the world can be destroyed three times.

Let us tell you one important thing that although America and Russia have reduced the number of nuclear weapons, but both these countries are engaged in giving a state-of-the-art form to the already existing nuclear weapons. Apart from this, there is another reason for this and that is an agreement between the Soviet Union and America in the 1970s, under which these countries set the goal of reducing the number of nuclear weapons for peace in the world. And they are working on that.

India, China and Pakistan - these countries have increased the number of nuclear weapons. And in such a situation, the question is, does this mean that these countries are stronger than India? So there are two answers to this question.

The first answer is that - which country has how many nuclear weapons, it is more important than how that country can launch these nuclear weapons. And India is far ahead in this matter. India can launch nuclear weapons from all three places, land, sky and water.

India has such long-range missiles, with the help of which it can use nuclear weapons. The first of these is Prithvi Two - the firepower of this ballistic missile is up to 350 km.

The second missile is Agni-I - which has a range of 700 km. This missile can cover almost the whole of Pakistan.

The third missile is Agni-II - which has a range of 2,000 kilometers. And entire southern China comes in the range of this missile. The fourth missile is Agni-III - which has a range of 3,000 kilometers. This missile can cover almost half the area of China.

India has developed another missile which is Agni-V - its strike range is 5,000 kilometers. After its development, the whole of Asia, China, Australia, Africa and some countries of Europe will come under its range.

Now we will tell you how India can launch nuclear weapons in the sky.

India has updated Sukhoi-30, Mirage 2000 and Jaguar fighter jets, which can fire nuclear weapons from the sky at other countries. Apart from this, nuclear attacks can also be carried out from Rafale planes in the coming times and this will increase India's power.

After land and sky, now let's talk about water.

India is also far ahead of Pakistan in carrying out nuclear attacks from water, but in this matter, we are slightly behind China. Till now, India has a Nuclear Submarine INS Arihant, from which nuclear attack can be done. INS Arihant is equipped with a 700 km range K-15 ballistic missile. Whereas Pakistan does not have a single such submarine yet and China has 6 submarines.

Even though China and Pakistan have a large number of nuclear weapons, but this does not mean that India is weak.

On July 16, 1945, America had successfully tested the world's first atomic bomb in New Mexico, and 20 days later, on August 6, 1945, America had fired on the Japanese city of Hiroshima. After this, on 9 August, the US dropped another atomic bomb on the city of Nagasaki, Japan. Then about 2 lakh people died in these nuclear attacks.

Since then, more than 13,000 atomic bombs have been made all over the world, but these bombs have never been used. And it is also mentioned in this report of Stockholm International Peace Institute. According to this report, 9 countries of the world are endowed with nuclear power, which have a total of 13080 nuclear weapons. However, last year the same number of nuclear weapons was 13,400.

<https://www.dnaindia.com/analysis/report-how-india-stacks-up-against-china-pakistan-in-terms-of-nuclear-weapons-2895551>

IICT enters into an MoU with with Anthem Biosciences for 2-DG

The agreement with Anthem Biosciences is the second collaboration on 2-DG drug announced by IICT

Hyderabad: City- based Indian Institute of Chemical Technology (IICT) on Tuesday announced signing an agreement for technology transfer and manufacture of the anti Covid drug 2-DG with Anthem Biosciences Pvt. Ltd, a Bengaluru-based integrated biopharmaceutical company.

The agreement with Anthem Biosciences is the second collaboration on 2-DG drug announced by IICT. A few days ago, it entered into a non-exclusive licensing agreement with Hyderabad-based Lee Pharma for synthesis of 2-DG.

The 2-DG drug, which was developed by DRDO and launched by Dr Reddy's Laboratories, is still available in limited quantities across the country. The multiple collaborations of IICT with pharma companies is expected to make 2-DG accessible and affordable in the near future.

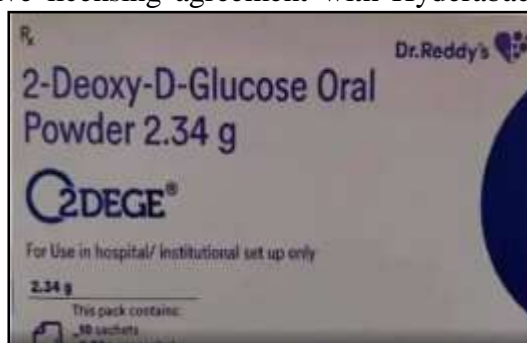
Limited studies have shown that 2- DG helps in quick recovery and reduction in oxygen dependence among moderately and severely affected Covid patients. On May 1, the Drug Controller General of India (DCGI) approved 2-DG for emergency use among such patients.

Under the terms of the license agreement, Anthem Biosciences gets non-exclusive license for the process knowhow for synthesis of 2-DG. "The agreement is in-line with CSIR's efforts to help people access various therapeutic options to combat Covid-19. CSIR labs have undertaken clinical trials of various repurposed drugs for the treatment of Covid-19," Director, CSIR-IICT, Dr S Chandrasekhar said.

Anthem Biosciences is in the process of filing the application for getting the approval from DCGI and will subsequently manufacture and commercialise 2-DG from their facilities located at Bommasandra, Bangalore and Harohalli, Kanakapura, Karnataka.

"We have hands-on experience in the development and manufacturing of prodrug of 2-DG API for a discovery research biopharmaceutical company from the USA. Because of our prior experience on 2-DG Prodrug, post DCGI approval, we are geared up to supply multi-ton API to meet the immediate demand that might arise due to ongoing Covid pandemic," said Ajay Bhardwaj, CEO and Founder of Anthem Biosciences.

<https://telanganatoday.com/iict-enters-into-an-mou-with-with-anthem-biosciences-for-2-dg>



Representational Image

City-based dentist develops aerosol box to prevent cross infection in clinical spaces

Hyderabad: A dental practitioner from the city has developed a medical device — an aerosol box — that is said to prevent the spread of Covid-19 during dental procedures. The device, developed by Dr Naveen Ramagani, is currently under trial by 75 dentists across the country. The idea was conceived in the wake of several dentists having to shut shop, fearing cross-infection due to the pandemic.

“While there are measures like wearing a mask, gloves among others to prevent direct spread from person to person, there has been no such measure in place to prevent spread in clinical spaces. This is what triggered our innovation,” said the doctor, who is currently the scientific advisor to Legala Innovations, the company which will manufacture the device.

The innovation not only seeks to mitigate risk of virus spread to healthcare workers who are exposed during procedures but also patients. The purpose of the device is to contain aerosols inside the box. The patient, doctor-friendly device is lightweight, has good visibility and is 84% effective in containment of helium, the lightest gas, delivered at six bars of pressure.

The medical aerosol box with HEPA integrated suction system prevents the spread of aerosols out of the console unit in operation theatres, emergency rooms, procedure rooms, consultation rooms among others. The filters that collect the air, release it after filtering it. To prevent cross-infection in clinical spaces, the virus is isolated and run through a UV chamber to kill it before releasing air.

“We are fine-tuning the device based on feedback from dentists using it, so that it can be used by other specialities as well. The innovation was developed with support of panel from the Defence Research and Development Laboratory (DRDL) and Ankura Hospital for Women and Children among other organisations. We are currently being reviewed by Biotechnology Industry Research Assistance Council (BIRAC),” the device’s innovator said.

<https://timesofindia.indiatimes.com/city/hyderabad/city-based-dentist-develops-aerosol-box-to-prevent-cross-infection-in-clinical-spaces/articleshow/83556072.cms>



The box contains aerosols, kills the virus using UV before releasing the air out in the open. The device is under trial by 75 dentists



Press Information Bureau
Government of India

Ministry of Defence

Tue, 15 June 2021 2:02PM

Indian Army conducts rail trials on Dedicated Freight Corridor (DFC)

The recently developed “Dedicated Freight Corridor (DFC)” by the Indian Railways provides faster movement of freight across the Country. The Indian Army on Monday (14 June 2021), conducted a successful trial by moving a military train loaded with vehicles and equipment from New Rewari to New Phulera validating the efficacy of the DFC. The intricate and synchronised coordination by the Indian Army with Dedicated Freight Corridor Corporation of India Ltd (DFCCIL) and Indian Railways will significantly enhance the mobilisation capability of the Armed Forces. These trials were part of the “Whole of the Nation Approach” for optimising national resources and achieve seamless synergy among various ministries and departments.

Interactions by the Indian Army with all stakeholders including DFCCIL & Indian Railways will now assist in leveraging the DFC and allied infrastructure into the mobilisation matrix of Armed Forces. Development of infrastructure at certain locations to support mobilisation and trials to validate move of defence owned rolling stock on Roll On-Roll Off (RO-RO) service is being formalised and modalities are being evolved.

These trials herald the first step in this process to pave the way for enhancing the operational readiness of Armed Forces. This initiative would set in place processes to ensure that military requirements are dovetailed in the national infrastructure development at the planning stage itself.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1727185>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 15 June 2021 2:02PM

भारतीय सेना ने समर्पित फ्रेट कॉरिडोर (डीएफसी) हेतु रेल परीक्षण किए

भारतीय रेलवे द्वारा हाल ही में विकसित "डेडिकेटेड फ्रेट कॉरिडोर (डीएफसी) देश भर में माल ढुलाई की आवाजाही तेजी से प्रदान करता है। भारतीय सेना ने सोमवार (14 जून, 2021) को डीएफसी की प्रभावकारिता को मान्य करते हुए न्यू रेवाड़ी से न्यू फुलेरा तक वाहनों और उपकरणों से भरी सैन्य गाड़ी को ले जाकर सफल परीक्षण किया। भारतीय सेना द्वारा डेडिकेटेड फ्रेट कॉरिडोर कॉरपोरेशन ऑफ इंडिया लिमिटेड (डीएफसीसीआईएल) और भारतीय रेलवे के साथ करीबी और समकालिक समन्वय से सशस्त्र बलों की लामबंदी क्षमता में काफी वृद्धि होगी। ये परीक्षण राष्ट्रीय संसाधनों को अनुकूलित करने और विभिन्न मंत्रालयों और विभागों के बीच बाधा रहित तालमेल की के लिए "हॉल ऑफ द नेशन एप्रोच" का हिस्सा थे।

भारतीय सेना द्वारा डीएफसीसीआईएल और भारतीय रेलवे सहित सभी हितधारकों के साथ बातचीत से अब सशस्त्र बलों की तैनाती में डीएफसी और संबद्ध बुनियादी ढांचे का लाभ उठाने में सहायता मिलेगी। रोल ऑन-रोल ऑफ (आरओ-आरओ) सेवा पर रक्षा स्वामित्व वाले रोलिंग स्टॉक के कदम को मान्य करने के लिए मोबिलाइज़ेशन और परीक्षणों का समर्थन करने हेतु कुछ स्थानों पर बुनियादी ढांचे के विकास को औपचारिक रूप दिया जा रहा है तथा तौर-तरीके विकसित किए जा रहे हैं।

यह परीक्षण सशस्त्र बलों की अभियान सम्बंधी तत्परता को बढ़ाने का मार्ग प्रशस्त करने के लिए इस प्रक्रिया में पहला कदम है। यह पहल यह सुनिश्चित करने वाली प्रक्रियाओं का निर्धारण करेगी कि योजना के स्तर पर ही राष्ट्रीय बुनियादी ढांचे के विकास में सैन्य आवश्यकताओं का आपसी मेलजोल हो।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1727260>

Defence ministry wants wider discussion on new theatre commands

Sources said the proposed theatre commands suggested bringing some of the paramilitary forces of the Ministry of Home Affairs under the theatre commands along with the Indian Coast Guard

By Manjeet Singh Negi

New Delhi: The Ministry of Defence (MoD) feels that there was a need to hold wider discussions for creating new military theatre commands with all stakeholders as such reforms have to be done after reaching “broad consensus”.

A presentation was made to the top functionaries of the defence ministry earlier this week involving officials from all departments concerned, top defence sources told India Today. This was the first time that a presentation on the theatre commands was made at senior level to the ministry on the draft cabinet note prepared for the new formations, they said.



A presentation on the theatre commands was made to the top functionaries of the defence ministry (PTI photo)

During the presentation, officials from the defence ministry pointed out certain issues brought out in the presentation. Sources said the proposed theatre commands suggested bringing some of the paramilitary forces of the Ministry of Home Affairs under the theatre commands along with the Indian Coast Guard. The defence functionaries in the meeting felt and suggested that since organisations from outside the MoD were involved, there was need for setting up inter-ministerial committees to discuss the matter with them.

The command structure, sources said, also suggest giving service extension to the proposed theatre commanders who would be above the vice chiefs of the three services and below the chiefs. Citing foreign models on theatre commands, points were raised as to why geography specific commands were being planned as the formations comprise the elements of all three services, they said.

According to reports, the Indian armed forces have to raise new theatre commands including maritime and air defence commands along with land-based commands.

<https://www.indiatoday.in/india/story/defence-ministry-discussion-new-theatre-commands-1815310-2021-06-16>

Chinese counterpart listening, Rajnath calls for freedom of navigation in South China Sea

Rajnath Singh was speaking at the virtual ASEAN Plus Defence Ministers' Meet, where US Secretary of Defense Llyod Austin was also present

By Snehesh Alex Philip

New Delhi: Noting that maritime security challenges is an area of concern, India Wednesday said it supports freedom of navigation, over flight, and unimpeded commerce in the South China Sea — a statement that comes amid Beijing's muscle-flexing in the international waterways.

Speaking at the ASEAN Plus Defence Ministers' Meet, Defence Minister Rajnath Singh also called for a free, open and inclusive order in the Indo-Pacific.

Both Chinese Defence Minister Gen Wei Fenghe and US Secretary of Defense Llyod Austin were part of the virtual meet, a platform for ASEAN and its eight Dialogue Partners — Australia, China, India, Japan, New Zealand, South Korea, Russia and the United States.

Talking about the present regional and international security environment, Singh said new challenges to international peace and security are emerging.

“The multitude of challenges of today's dynamic and interdependent world cannot be addressed with outdated systems that were designed to deal with trials of the past,” he said.

Singh underlined that India calls for a free, open and inclusive order in the Indo-Pacific, based upon respect for sovereignty and territorial integrity of nations, peaceful resolution of disputes through dialogue and adherence to international rules and laws.

Noting that maritime security challenges are another area of concern to India, he said the sea lanes of communication are critical for peace, stability, prosperity and development of the Indo-Pacific region.

“In this regard, developments in the South China Sea have attracted attention in the region and beyond. India supports freedom of navigation, over flight, and unimpeded commerce in these international waterways. India hopes that the Code of Conduct negotiations will lead to outcomes that are in keeping with international law, including the UNCLOS and do not prejudice the legitimate rights and interests of nations that are not party to these discussions,” Singh said.

On Covid, terrorism and cyber threats

Singh spoke about the common challenge of Covid-19 and said the virus is “mutating fast and testing our response as we find new variants that are more infective and potent”.

Noting that India is just emerging from a second wave that pushed its medical response to the limit, he said the disruptive effect of the pandemic is still unfolding.

“The test is therefore to make sure that the world economy moves on the path of recovery and to ensure that the recovery leaves no one behind. I am convinced that this is only possible if the entire humanity is vaccinated. Globally available patent free vaccines, unhindered supply chains and greater global medical capacities are some of the lines of effort that India has suggested for a combined effort,” he said.

Singh also flagged terrorism and radicalisation as the gravest threats to peace and security.

“India shares global concerns about terrorism and believes that, in an era when networking amongst terrorists is reaching alarming proportions, only through collective cooperation can the



Defence Minister Rajnath Singh inaugurated the second production line for LCA Tejas in Bengaluru | File photo | By special arrangement

terror organisations and their networks be fully disrupted, the perpetrators identified and held accountable, and strong measures be undertaken against those who encourage, support and finance terrorism and provide sanctuary to terrorists,” he said.

Singh also said cyber threats loom large, as demonstrated by the incidents of ransomware, WannaCry attacks and cryptocurrency thefts, and are a cause for concern.

“A multi-stakeholder approach, guided by democratic values, with a governance structure that is open and inclusive and a secure, open and stable internet with due respect to sovereignty of countries, would drive the future of cyberspace,” he said.

<https://theprint.in/defence/chinese-counterpart-listening-rajnath-calls-for-freedom-of-navigation-in-south-china-sea/678709/>



Wed, 16 June 2021

Mazagon Dock to deliver INS Visakhapatnam by Oct, INS Vela by March to Indian Navy

INS Visakhapatnam is undergoing sea trials and three other destroyers are under various stages of development by the state-run company, which had to revise the delivery schedule because COVID-19 disrupted operations

By Swaraj Baggonkar

Mazagon Dock Shipbuilders Ltd (MDSL) will deliver the first of the four stealth guided missile destroyers to the Indian Navy by October and a Scorpene-class submarine by the end of the fiscal year.

The state-run company under the defence ministry, which has an order book of nearly Rs 50,000 crore, will hand over Visakhapatnam-class (Project 15B) destroyer INS Visakhapatnam to the navy in the next 3-4 months. The delivery is delayed because the pandemic disrupted operations.



INS Visakhapatnam is the first of the four destroyers MDSL is building at its site in Mumbai which is also one of the largest that the Indian Navy will possess.

While INS Visakhapatnam is currently undergoing sea trials, three other destroyers of the same class – INS Mormugao, INS Imphal, INS Porbandar – are under various stages of development at MDSL.

This will be followed by the handing over of the fourth Scorpene-class submarine INS Vela by the end of the current financial year. Three such submarines have been delivered to the Indian Navy, the last one being INS Karanj in February this year.

“We are bracing to deliver one (Project) 15 Bravo destroyer named INS Vishakhapatnam by October and may be by end of this year another submarine,” said Narayan Prasad, chairman and managing director, MDSL speaking to analysts.

MDSL management said that the company has an order book of Rs 49,744 crore comprising four destroyers under Project 15 Bravo worth Rs 22,500 crore, four stealth frigates under Project 17 Alfa worth Rs 21,500 crore, six Scorpene submarines worth Rs 5500 crore of which three have been delivered.

The company also has a Rs 500 crore MRLC (medium term refit and life certification) contract for one submarine, Prasad added.

It has also bid for three cadet training ships for the Indian Navy, eight fast patrol crafts and 12 air cushion vehicles for the Coast Guard. Bids worth about Rs 1,800 crore are also being pursued with Argentina and the Suez Canal Authority of construction of 14 offshore patrol vessels.

Prasad said COVID-19 and the resultant lockdown measures taken by the government disrupted MDSL's launch schedules.

“The destroyer (INS Visakhapatnam) was to be delivered by March. There was a force majeure allocated by the government for a duration of four months. We are still falling short of three months. We have already strongly taken this with the government and within those four months the situation did not improve and it continued till October 30 and we were able to open the shipyard fully only by November 1,” Prasad added.

But the Maharashtra government relaxed its lockdown restriction in the first week of June after one full month of lockdown in May as the pace of new Covid-19 cases within the state began to soften. MDSL hopes to make up for lost time by speeding up operations.

“Whilst there has been an impact on account of the precarious situation created by this lockdown and also the stoppage of industrial oxygen supply, all this has resumed by and large to a normal standard and we should be able to catch up with whatever there is,” Prasad added.

<https://www.moneycontrol.com/news/business/companies/mazagon-dock-to-deliver-ins-visakhapatnam-by-oct-ins-vela-by-march-to-indian-navy-7036051.html>



Wed, 16 June 2021

India's China challenge: Why Indo-Tibetan border police needs air support – Analysis

By Grp Capt (Retd) AV Chandrasekaran and Dr Prakash Panneerselvam

India faces logistics challenges in its border areas against a militarily superior China: of a continuous, effective, and secure line of communication between logistics bases inland and troops at the front. An Indo-Tibetan Border Police (ITBP) proposal to wet-lease two twin engine helicopters has been approved by the Union Home Ministry, but there has been no actual movement on this front. Under the wet-lease contract system, the organisation operating the aircraft would provide aircraft as well as crew members to the lessee. It would also be responsible for aircraft maintenance. This commentary looks at why air support through wet-leasing is important for the ITBP, the sole Central Armed Police Force (CAPF) entrusted with safeguarding India's border with China under conditions of peace.



These border areas are located in inhospitable terrain, at dizzying altitudes of 9,000-18,500 feet, with thin oxygen levels, and threats of blizzards. The ITBP cadre's constant vigil leads to fatigue setting in rapidly. On the Chinese side, the People Liberation Army (PLA) Border Defence Regiment's (BDR) force levels along the Line of Actual Control (LAC) are inversely proportional to those of their Indian counterparts. Further, China continues to add to sophisticated military infrastructure in Tibet. This comprises operational air bases, helipads, an extensive rail network, and a network of roads all along the border.

China's strengthened physical border infrastructure, military hardware, and force positioning in this region enhances its overall capabilities in the event of a war with India. Its advantage is due to the flat terrain in Tibet, whereas India is confronted with very high elevations along the border, rendering infrastructure development difficult. On the Indian side, both the ITBP and Indian Army have problems accessing the border due to a lack of adequate roads along most of, and leading right up to, the LAC, despite the Border Roads Organisation (BRO) laying new roads at a healthy pace.

Over the past five years, the ITBP has constructed 25 Border Outposts (BOPs) along the border with China. A BOP can cater to a strength of about 100 troops, and there are about 180 BOPs in operation. These posts are located in far-flung areas, and barring a few, most can only be accessed on foot. Supplies are transported on mules or yaks. The Indian government has authorised the construction of 47 more posts and 12 staging camps for greater accessibility. These staging camps are for reprieve during patrols, and to act as temporary BOPs providing access to rations, logistics, and a place to stay. Staging camps will also reduce the distance between BOPs.

However, deteriorating weather conditions can restrict the supply of rations and medicines to troops. To address this problem, troops and essentials can be transported to ITBP staging posts via air, using rotary wing assets. The use of aerial assets will create greater flexibility in deployment, and consolidate the provision of mission material requirements, such as rations, bulk fuel, construction and medical materials, and repair parts. The Border Security Force's (BSF) air arm, with both fixed and rotary wing assets, is a useful example. Unfortunately, the area guarded by the BSF is vast, with wide-ranging terrains, which precludes a sharing of its aviation assets with the ITBP.

For the ITBP, outsourcing wet-leasing to an agency authorised by the government could hold the answer. There are a number of aviation agencies that have been vetted and cleared by the government to operate helicopters for varying purposes. The ITBP could outsource its needs to one such agency, and seek both light and medium-lift helicopters for 'post-to-post' air maintenance. The medium-lift Russian MI-17 V5 in operation with the Indian Air Force (IAF) and the BSF would be an ideal fit. This variant can carry a maximum of 24 passengers or a light vehicle. It has a 4,000 kg internal payload capacity, or it can carry underslung loads weighing up to 3,000 kg. Their procurement from Russia should not pose major hurdles. Further, these aircraft have an extensive track record of operating in India's border areas in similar roles.

In terms of personnel, the operator offering the service can use the vast pool of pilots fully trained in this same variant and familiar with the ITBP's terrain, who may be seeking a second career option after completing their terms of engagement with the IAF and the BSF. India also has a large number of engineers and technicians, all formerly of the IAF, who are qualified in servicing this type of aircraft. This would facilitate seamless maintenance. An added incentive for the personnel would be the aircraft being stationed centrally in Delhi, with pilots and technicians deployed on a rotational basis. In addition to saving training costs, this approach also enables comparative advantages such as reduced time to meet missions, access to new mission capabilities, flexibility, proximity to finite resources, reduced liabilities, and improved quality.

Another option that could be explored is wet-leasing the Bell-407 light helicopter manufactured in the US, as this variant can facilitate the 'post-to-post' transfer of personnel, and is already in extensive use in India. This helicopter is capable of operating in extreme weather conditions including high-altitude areas, and carries a maximum payload of 1,089 kg. It can accommodate up to seven passengers. For emergency/air ambulance applications, the large cabin accommodates a stretcher patient and medical attendants, which would be ideal for casualty evacuation operations. There are a number of operators operating this variant who could also provide the requisite services to the ITBP.

Procuring these aircraft would have gains on the diplomatic front as well, in terms of India's engagements with the US and Russia.

Leveraging private operators to meet the ITBP's logistics requirements will bring several benefits to operational capability as well as troop morale. Utilising private airline capabilities for

national security will facilitate the Indian armed forces' aviation wings to focus on high-priority missions. Together, this will enable the ITBP to work with much greater flexibility.

(Gp Capt (Retd) A V Chandrasekaran is a defence and strategic expert based in Chennai. Dr Prakash Panneerselvam is Assistant Professor at the National Institute of Advanced Studies (NIAS), Bengaluru)

<https://www.eurasiareview.com/16062021-indias-china-challenge-why-indo-tibetan-border-police-needs-air-support-analysis/>

Business Standard

Wed, 16 June 2021

A year after Galwan, India and China still face-off in Ladakh

The two-front threat (China-Pakistan) that strategists have long regarded as a worst-case military scenario for India is now a reality

By Ajai Shukla

New Delhi: A year ago, on the night of 15/16 June, 20 Indian soldiers, including a commanding officer of the rank of colonel, were killed by soldiers of the People's Liberation Army (PLA) in the Galwan River valley in Eastern Ladakh. The Indians were patrolling the Line of Actual Control (LAC) to verify whether Chinese troops had returned to their side, in accordance with a disengagement agreement between military commanders from both sides.

Beijing later acknowledged the deaths of four Chinese soldiers in that incident, which was the first deadly clash on the LAC, involving the loss of lives, since 1975. This clash involved no firearms; troops were barbarically clubbed to death or thrown off cliffs into the Galwan River.



Until that confrontation, the government of India had denied that any Chinese troops were in occupation of Indian-claimed territory. But the deaths of 20 Indian soldiers starkly raised the question: “Had they intruded into Chinese territory and were killed there? Or were the Chinese who killed them on the Indian side of the LAC?”

This incident was followed by a face-to-face winter deployment by both sides in Depsang, Galwan River, Hot Springs, Gogra, Pangong Tso and the Kailash Range. In February, senior military commanders agreed to a mutual disengagement and troop pullback in the Pangong and Kailash Range sectors. However PLA troops continue holding on to their gains in the other four sectors.

There are worrying strategic and tactical outcomes from this confrontation in Eastern Ladakh. First, the Indian military has had to pivot to the north, switching its traditional emphasis from the Pakistan border to that with China. In December 2020, the Indian Army switched the operational role for the mechanised 1 Corps from the plains border with Pakistan, to the mountain border with China, with the operational role of striking into Chinese territory.

In addition, India's Northern Command has deployed at least two mountain divisions to block the PLA's incursions into Ladakh, while another division has switched roles from Pakistan, to a new deployment against China on the Himachal and Uttarakhand borders. This has left the army unbalanced – stretched to the limit, with no further reserves at hand.

In effect, the PLA has forced the Indian Army into a year-round, militarised deployment in Ladakh, creating a second live border for India. The two-front threat (China-Pakistan) that strategists have long regarded as a worst-case military scenario for India is now a reality.

Second, China-Pakistan military, political and economic linkages have been reinforced by the Eastern Ladakh confrontation and the common cause that Beijing and Islamabad perceive against India. In 1965, 1971 and in Kargil in 1999, New Delhi felt free to take military action against Pakistan without serious worry about China interceding on its behalf. Now, however, India would have to factor in the likelihood of Chinese intervention on behalf of Pakistan.

Third, the PLA's intervention in Ladakh must be seen in the context of statements from Beijing criticising India's expansion of its road network. That means, before embarking on creating border roads or infrastructure, New Delhi will have to, hereafter, cater for China's negative reaction.

Fourth, India's increased border commitments on the LAC against the new reality of two powerful enemies acting in cahoots, will require a significant increase in defence spending at a time when healthcare spending on the Covid-19 pandemic is already stretching the budget. In case India's social development priorities do not allow for increased military spending, there will have to be a cut back in funding India's maritime ambitions in the Indo-Pacific, in order to direct increased funding to the Himalayan land border.

Fifth, even as New Delhi declined American assistance to deal with the Ladakh incursions, India's limited means force it to accept foreign military help to defend its borders. Already, US transport aircraft, such as the C-130J Super Hercules and C-17 Globemaster III; and US Chinook CH-47F and Apache AH-64E helicopters played prominent roles in the Indian build up. With drones from overseas now watching over the LAC, India's military reliance on foreign partners will inevitably expand.

Sixth, the Indian government's two-month long denial of the Chinese territorial incursions made it seem overly concerned about its image with domestic voters, even if that meant a tacit concurrence with China's argument that the PLA was on Chinese territory. By getting the Indian Army to endorse that claim, the impression was created that the Indian Army works on political directives, with operational imperatives taking a lower precedence.

Seventh, notwithstanding New Delhi's bluster that it would curtail Beijing's investments and exports, Chinese companies such as Alibaba continue investing in India. Chinese exports to India were at record levels last year. The global message that went out was that New Delhi's bombast does not necessarily translate into hard action.

Eighth, all through the Covid-19 pandemic, and even through a crushing second wave, New Delhi – unlike other major pandemic victims like the US – did not send out even a single strong statement on biological warfare by state actors.

Ninth, New Delhi's reluctance to purposefully investigate cyber-attacks on critical infrastructure, such as the recent intrusions into Powergrid, National Stock Exchange and National Payments Corporation of India, encourages China to expand its cyber activities without hindrance.

Leading into the summer campaigning season in Ladakh, China is keeping India engaged in border talks, even as it remains in firm control of an estimated 600-800 square kilometres of Indian territory, depending upon how it is calculated. China first tested this "forked tongue" strategy in 2017 in Doklam, Sikkim. It is now being implemented in Ladakh.

https://www.business-standard.com/article/politics/a-year-after-galwan-india-and-china-still-face-off-in-ladakh-121061500753_1.html

India, Indonesia discuss joint patrols in Malacca straits to advance defence and maritime ties

By Rahul Kumar

New Delhi: India and Indonesia, two major democracies in Asia are moving fast to strengthen their Comprehensive Strategic Partnership. Despite Covid-19 bringing the world to a halt, the two have been working on improving defence, maritime and security related issues since Prime Minister Narendra Modi's visit in May 2018.

Recently, V. Muraleedharan, India's Minister of State for External Affairs discussed cooperation on regional issues with Mahendra Siregar, Vice Minister of Foreign Affairs of Indonesia.

In an exclusive interview to India Narrative, Prof. Baladas Ghoshal, former chairman of the Centre for South and Southeast Asian Studies, JNU, and former General Secretary at the Society for Indian Ocean Studies says: "Much is happening between India and Indonesia in defence and maritime arenas. The two nations have been discussing the sale of Brahmos and India's role in capacity building Indonesia's maritime forces".

Indonesia, a prominent South East Asian nation, is also discussing the possibility of joint patrolling in the strategic strait of Malacca which connects the Andaman Sea in the Indian Ocean with the South China Sea in the Pacific Ocean. This is a maritime route through which a large percentage of the global trade crosses. The two nations have also been discussing increased access for India to Indonesia ports including Sabang and Aceh.

Prof. Ghoshal says: "If we get access to Indonesia ports, we look into the Pacific. France already has a presence there. If we put ourselves there, we can put China in great difficulty". He adds that the Aceh and Andaman link could be established for trade and financial purposes. "The Aceh port is only 80 km from Nicobar. The two countries are discussing creating a regional economic zone in this region".

There is a convergence of interests between the two nations who share civilization links and take pride in a common cultural heritage. What also brings Delhi and Jakarta closer is the fact that both pursue an independent foreign policy doctrine. Located strategically, Indonesia as a matter of policy, does not allow foreign military bases on its territory.

Modi's visit in 2018 led to a strategic engagement in which the nations decided to hold annual summit meetings and framed a "robust architecture of dialogue in place, including the Ministerial and Working Group Mechanisms". They also agreed to enhance mutual trust through regular interactions between the defence forces of the two countries.

A joint statement by Modi and Indonesian President Joko Widodo led to the adoption of a 'Shared Vision on Maritime Cooperation in the Indo-Pacific between India and Indonesia', with the belief that the two nations can cooperate in the maritime sector and be a force of stability in the region. The two are engaged comprehensively on this.

Despite the restrictions due to the Covid-19 pandemic, Delhi and Jakarta have made progress on the Comprehensive Strategic Partnership through regular discussions. Prof. Ghoshal says: "A lot is happening in terms of foreign policy--dialogues, visits and discussions. But India will have to up its game by walking the talk and reducing its bureaucratic tape. The ASEAN nations, including Indonesia, look for clear objectives. India will have to move faster on the discussions".

Analysts point out China's assertiveness in the Indo-Pacific region is also providing the subtext for spurring stronger New Delhi-Jakarta ties. China has been intruding in the direction of the Natuna islands claimed by Indonesia. India, on its part, has still not seen the restoration of status quo ante following China's ingress in Ladakh.

Indian strategic planners fully understand Indonesia's importance in ensuring a free and open Indo-Pacific region. Indonesian archipelago hosts at least four major choke points, which can be leveraged to counter Beijing, as some of them are critical for China's seaborne trade.

Foremost among these channels is the Malacca Strait—a narrow, 890 km stretch of water between the Malay Peninsula and the Indonesian island of Sumatra. The vast majority of China's oil imports, from the Gulf, Venezuela and Angola, passes through this route, which is also the lifeline for Japan and South Korea — the other major industrial economies of the region.

Indonesia also hosts the Sunda Strait—the channel between the islands of Sumatra and Java. It is an important waterway for ships travelling along the Cape route in Africa to East Asia. Australian vessels setting course to destinations in Southeast or East Asia, also make active use of this passage.

The third channel, the Lombok Strait, also a part of the Indonesian archipelago, is deep and wide. It is therefore ideal for transiting huge oil tankers and other monster ships with 100,000 dead weight tonnage or more. The Ombai-Wetar Straits, also in Indonesia, play a unique military role. Because they are extremely deep, they provide undetected passage for submarines traveling between the Pacific and Indian Ocean. Consequently, there is considerable interest in these straits among the strategic communities of the Indo-Pacific countries, who are wary of the transit of Chinese submarines from the Pacific to the Indian Ocean.

<https://www.daijiworld.com/news/newsDisplay?newsID=843646>



Press Information Bureau
Government of India

Ministry of Science & Technology

Tue, 15 June 2021 1:10PM

Researchers find an improved method of imaging objects through fog

Imaging of objects in foggy weather conditions may now be clearer. Researchers have found a method that can improve the images captured on such days. The technique involves modulating the light source and demodulating them at the observer's end.

Scientists have long attempted to use the physics of scattering and computer algorithms to process the resulting data and improve the quality of images. Whereas the improvements are not stark in some cases, computer algorithms require processing large volumes of data, involving ample storage and significant processing time.

Research by a team has offered a solution for improving the image quality without heavy computations. The team from the Raman Research Institute (RRI), Bengaluru, an autonomous institute of the Department of Science and Technology; Space Applications Centre, Indian Space Research Organisation, Ahmedabad; Shiv Nadar University, Gautam Buddha Nagar; and Université Rennes and Université Paris-Saclay, CNRS, France, modulated the light source and demodulated them at the observer's end to achieve sharper images. The research was published in the journal '*OSA Continuum*'.



Image by Maksim Šišlo via Unsplash

The researchers have demonstrated the technique by conducting extensive experiments on foggy winter mornings at Shiv Nadar University, Gautam Buddha Nagar, Uttar Pradesh. They chose ten red LED lights as the source of light. Then, they modulated this source of light by varying the current flowing through the LEDs at a rate of about 15 cycles per second.

The researchers kept a camera at a distance of 150 metres from the LEDs. The camera captured the image and transmitted it to a desktop computer. Then, computer algorithms used the knowledge of the modulation frequency to extract the characteristics of the source. This process is called 'demodulation'. The demodulation of the image had to be done at a rate that was equal to the rate of modulation of the source of light to get a clear image.

The team saw a marked improvement in the image quality using the modulation-demodulation technique. The time the computer takes to execute the process depends on the image's size. "For a 2160×2160 image, the computational time is about 20 milliseconds," shares Bapan Debnath, PhD scholar at RRI and a co-author of the study. That is roughly the size of the image containing the LEDs. His colleagues had estimated the rate in 2016.

The team repeated the experiment a few times and observed the improvement each time. Once, when the fog varied in intensity during the observation, they did not record a marked improvement in the image quality. In this case, there was a strong wind, and they observed fog trails across the scene. The density of the water droplets in the air changed as time passed, which rendered the modulation-demodulation technique less effective.

Next, the researchers changed the experimental setup. They made an external material, a piece of cardboard kept at a distance of 20 centimetres from the LEDs, to reflect the light to the camera.

The distance between the cardboard and the camera was 75 metres. The modulated light reflected from the cardboard travelled through the fog and was then captured by the camera. They demonstrated how their technique still significantly improved the quality of the resulting image.

Repeating the experiment under sunny conditions, they found that after performing the demodulation of the source, the image quality was high enough to distinguish the LEDs from the strongly reflected sunlight.

The study was partially funded by the Department of Science and Technology, Ministry of Science and Technology, Government of India.

The cost of the technique is low, requiring only a few LEDs and an ordinary desktop computer, which can execute the technique within a second. The method can improve the landing techniques of aeroplanes by providing the pilot with a good view of beacons on the runway, significantly better than relying only on reflected radio waves as is presently the case. The technique can help reveal obstacles in the path that would otherwise be hidden by fog in rail, sea, and road transportation and would also help spotting lighthouse beacons. More research can demonstrate the effectiveness in such real-life conditions. The team is investigating whether the technique can apply to moving sources.

Publication link: <https://doi.org/10.1364/OSAC.425499>
<https://pib.gov.in/PressReleasePage.aspx?PRID=1727176>



पत्र सूचना कार्यालय
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 15 June 2021 1:10PM

शोधकर्ताओं ने कोहरे में भी वस्तुओं के चित्रांकन (इमेजिंग) का एक बेहतर तरीका खोजा

कोहरे के मौसम में भी अब वस्तुओं के स्पष्ट चित्र लेना (इमेजिंग) सम्भव है। शोधकर्ताओं ने एक ऐसा तरीका खोजा है जो ऐसे दिनों में खींची गई तस्वीरों को बेहतर बना सकता है। तकनीक में प्रकाश के स्रोत को संशोधित करने के बाद उन्हें पर्यवेक्षक के पास उन्हें डिमॉड्युलेट करना शामिल है।

वैज्ञानिकों लंबे समय से परिणामी डेटा को संसाधित करने और छवियों की गुणवत्ता में सुधार करने के लिए विसरण की भौतिकी और कंप्यूटर एल्गोरिदम का उपयोग करने का प्रयास कर रहे थे। हालांकि कुछ मामलों में उतनी स्पष्टता नहीं मिली है इसके बावजूद कंप्यूटर एल्गोरिदम के बड़ी मात्रा में डेटा को संसाधित करने की आवश्यकता होती है और इसके लिए पर्याप्त भंडारण की सुविधा और प्रसंस्करण के लिए महत्वपूर्ण समय आवश्यक है।



एक टीम द्वारा अनुसंधान ने भारी गणनाओं के बिना छवि गुणवत्ता में सुधार के लिए एक समाधान की पेशकश की है। विज्ञान और प्रौद्योगिकी विभाग के एक स्वायत्त संस्थान, रमन अनुसंधान संस्थान (आरआरआई), बंगलुरु की टीम; अंतरिक्ष अनुप्रयोग केंद्र, भारतीय अंतरिक्ष अनुसंधान संगठन, अहमदाबाद; शिव नादर विश्वविद्यालय, गौतम बुद्ध नगर; और यूनिवर्सिटी रीन्स एवं यूनिवर्सिटी पेरिस -सैक्रेले, सी.एन.आर.एस, फ्रांस ने प्रकाश स्रोत को संशोधित किया और

अधिक सुस्पष्ट चित्रों (छवियों) को प्राप्त करने के बाद उन्हें डिमोड्युलेट करके पर्यवेक्षक के पास भेजा। यह शोध 'ओएसए कॉन्टिनम' पत्रिका में प्रकाशित हुआ था।

शोधकर्ताओं ने शिव नादर विश्वविद्यालय, गौतम बुद्ध नगर, उत्तर प्रदेश में सर्दियों के मौसम में कोहरे वाली सुबह इस प्रौद्योगिकी के व्यापक प्रयोग करके का प्रदर्शन किया है। उन्होंने प्रकाश के स्रोत के रूप में दस लाल एलईडी लाइटों को चुना। फिर, उन्होंने एलईडी के लिए प्रयुक्त होने वाली विद्युत् धारा को लगभग 15 चक्र प्रति सेकंड की दर से प्रवाहित करके और आवृत्ति बदल-बदल कर प्रकाश के इस स्रोत को संशोधित किया।

शोधकर्ताओं ने एक कैमरा एलईडी से 150 मीटर की दूरी पर रखा। कैमरे ने इन चित्रों को खींचने के बाद उन्हें एक डेस्कटॉप कंप्यूटर पर प्रेषित किया। फिर, कंप्यूटर एल्गोरिदम ने स्रोत की विशेषताओं को जानने के लिए मॉड्यूलेशन आवृत्ति से सम्बन्धित जानकारी का उपयोग किया। इस प्रक्रिया को 'डिमॉड्यूलेशन' कहा जाता है। छवि का डिमॉड्यूलेशन उस दर पर किया जाना था जो एक स्पष्ट छवि प्राप्त करने के लिए प्रकाश के स्रोत के मॉड्यूलेशन की दर के बराबर था।

टीम ने मॉड्यूलेशन-डिमॉड्यूलेशन तकनीक का उपयोग करके प्राप्त चित्रों की गुणवत्ता में उल्लेखनीय सुधार देखा। कंप्यूटर को प्रक्रिया को निष्पादित करने में लगने वाला समय छवि के आकार पर निर्भर करता है। आरआरआई में पीएचडी विद्वान और अध्ययन के सह-लेखक बापन देबनाथ के अनुसार " 2160 × 2160" चित्रों के लिए, गणना का (कम्प्यूटेशनल) समय लगभग 20 मिलीसेकंड है"। यह मोटे तौर पर एलईडी वाली छवि का आकार है। उनके सहयोगियों ने 2016 में इस दर का अनुमान लगाया था।

टीम ने इस प्रयोग को कई बार दोहराया और हर बार सुधार मिला। एक बार, जब परीक्षण/अवलोकन के दौरान कोहरे की तीव्रता में अंतर था, तब उन्हें चित्रों की गुणवत्ता में उल्लेखनीय सुधार नहीं दिखाई दिया। ऐसे ही एक प्रयोग में, तेज हवा चल रही थी, और उन्होंने पूरे दृश्य में कोहरे के निशान देखे। समय बीतने के साथ हवा में पानी की बूंदों का घनत्व बदल गया जिससे मॉड्यूलेशन-डिमॉड्यूलेशन की तकनीक को उतनी प्रभावी नहीं रह पाई।

इसके बाद, शोधकर्ताओं ने अपने प्रयोगात्मक सेटअप को बदल दिया। उन्होंने एक बाहरी सामग्री बनाई जो गत्ते (कार्डबोर्ड) का एक पट्टा था और जिसे एलईडी से 20 सेंटीमीटर की दूरी पर रखा गया था, ताकि कैमरे की रोशनी को परावर्तित किया जा सके। कार्डबोर्ड और कैमरे के बीच की दूरी 75 मीटर थी। कार्डबोर्ड से परावर्तित मॉड्युलेटेड प्रकाश कोहरे के माध्यम से यात्रा करता है और फिर कैमरे द्वारा उसका चित्रांकन (कैप्चर) किया जाता है। यहां उन्होंने दिखाया कि कैसे उनकी तकनीक से अभी भी अंतिम रूप से प्राप्त चित्रों की गुणवत्ता में काफी सुधार मिला है।

फिर साफ़ मौसम में धूप की परिस्थितियों में प्रयोग को दोहराते हुए, उन्होंने पाया कि स्रोत का डिमोड्यूलेशन करने के बाद, छवि गुणवत्ता इतनी अधिक थी कि एलईडी को दृढ़ता से परावर्तित सूर्य के प्रकाश से अलग किया जा सके। इस अध्ययन को विज्ञान और प्रौद्योगिकी विभाग, विज्ञान और प्रौद्योगिकी मंत्रालय, भारत सरकार द्वारा आंशिक रूप से वित्त पोषित किया गया था।

इस तकनीक की लागत कम है और इसके लिए केवल कुछ एलईडी और एक साधारण डेस्कटॉप कंप्यूटर की आवश्यकता होती है, जो परिणामों को एक सेकंड के भीतर निष्पादित कर सकता है। यह प्राविधि वायुयानों के चालकों (पायलटों) को रनवे पर बीकन का एक अच्छा दृश्य उपलब्ध करवाती है और इससे हवाई जहाज की लैंडिंग तकनीकों में सुधार कर लाया जा सकता है, जो वर्तमान में अभी केवल परावर्तित रेडियो तरंगों पर निर्भर होने से कहीं बेहतर और अद्यतन तकनीकी है। यह तकनीक सामने आने वाली में बाधाओं ऐसी को दूढ़ने में मदद कर सकती है जो आमतौर पर कोहरे के दौरान रेल, समुद्र

और सड़क परिवहन के दौरान दिखाई नहीं देती और यह तकनीक समुद्र में जहाज़ों को लाइटहाउस बीकन को खोजने में भी मदद करेगी। इस बारे में अधिक शोध दैनिक आधार पर वास्तविक परिस्थितियों भी अपनी में प्रभावशीलता प्रदर्शित कर सकते हैं। यह टीम यह भी जानने का प्रयास कर रही है कि क्या इस तकनीक को चलायमान स्रोतों पर भी लागू किया जा सकता है या नहीं।

प्रकाशन लिंक: <https://doi.org/10.1364/OSAC.425499>

<https://pib.gov.in/PressReleasePage.aspx?PRID=1727282>



Wed, 16 June 2021

Rare superconductor may be vital for quantum computing

Research led by the University of Kent and the STFC Rutherford Appleton Laboratory has resulted in the discovery of a new rare topological superconductor, LaPt₃P. This discovery may be of huge importance to the future operations of quantum computers.

Superconductors are vital materials able to conduct electricity without any resistance when cooled below a certain temperature, making them highly desirable in a society needing to reduce its energy consumption.

Superconductors manifest quantum properties on the scale of everyday objects, making them highly attractive candidates for building computers which use quantum physics to store data and perform computing operations, and can vastly outperform even the best supercomputers in certain tasks. As a result, there is an increasing demand from leading tech companies like Google, IBM and Microsoft to make quantum computers on an industrial scale using superconductors.



Credit: CC0 Public Domain

However, the elementary units of quantum computers (qubits) are extremely sensitive and lose their quantum properties due to electromagnetic fields, heat and collisions with air molecules. Protection from these can be achieved by making more resilient qubits using a special class of superconductors called topological superconductors which in addition to being superconductors also host protected metallic states on their boundaries or surfaces.

Topological superconductors, such as LaPt₃P, newly discovered through muon spin relaxation experiments and extensive theoretical analysis, are exceptionally rare and are of tremendous value to the future industry of quantum computing.

To ensure its properties are sample and instrument independent, two different sets of samples were prepared in the University of Warwick and in ETH Zurich. Muon experiments were then performed in two different types of muon facilities: in the ISIS Pulsed Neutron and Muon Source in the STFC Rutherford Appleton Laboratory and in PSI, Switzerland.

Dr. Sudeep Kumar Ghosh, Leverhulme Early Career Fellow at Kent and Principle Investigator said: "This discovery of the topological superconductor LaPt₃P has tremendous potential in the field of quantum computing. Discovery of such a rare and desired component demonstrates the importance of muon research for the everyday world around us."

More information: P. K. Biswas et al, Chiral singlet superconductivity in the weakly correlated metal LaPt₃P, *Nature Communications* (2021). DOI: [10.1038/s41467-021-22807-8](https://doi.org/10.1038/s41467-021-22807-8)

Journal information: [*Nature Communications*](#)

<https://phys.org/news/2021-06-rare-superconductor-vital-quantum.html>

The electron merry-go-round: Researchers find new mechanism for classical behavior of many-particle quantum systems

Photoemission is a property of metals and other materials that emit electrons when struck by light. Electron emission after light absorption was already explained by Albert Einstein. But since this effect is a highly complex process, scientists have still not been able to fully elucidate its details. Prof. Dr. Bernd von Issendorff and his team at the University of Freiburg's Institute of Physics have now succeeded in detecting a previously unknown quantum effect in the angular distributions of photoelectrons from cryogenic mass-selected metal clusters. The angular distributions resemble those of classical particles, a behavior that is surprisingly explainable by the strong electron-electron interaction in these many-electron systems. The researchers published this finding in the current issue of *Physical Review Letters*.

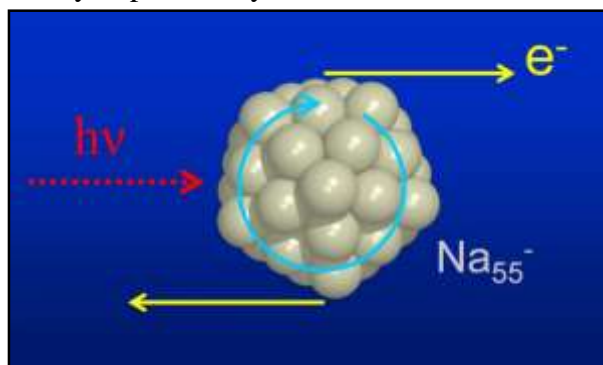


Illustration of photoemission: Electrons orbiting in a cluster (here in an anionic sodium cluster with 55 atoms) keep their momentum parallel to the surface, causing them to be emitted at a tangent to it at certain photon energies. Credit: Bernd von Issendorff

Electrons with well-defined angular momenta

Metal clusters may be seen as quantum systems consisting of a countable amount of quantum particles—in this case electrons—in a simple spherical box potential. Electrons in simple metal clusters possess relatively well-defined angular momenta, although a cluster is never perfectly round. This is due to the virtually optimal shielding of the atomic nuclei by the electron system. Hence, a single electron experiences only an average interaction that is remarkably close to the interaction with a spherical box potential. As a consequence, the electrons practically assume angular momentum eigenstates, i.e., rotate with a well-defined angular momentum. Moreover, the photoemission of the electron occurs only at the cluster surface, because only there can the required radial momentum be transferred to the electron.

Electron emission occurs only at the surface

Researchers expected that the electron's momentum would be preserved parallel to the surface during photoemission, as there are no forces acting in this direction. "Since an electron with a defined angular momentum at the surface has a defined momentum parallel to it, it could be assumed," explains von Issendorff, "that the angular distribution of the electrons corresponds to that of balls simply released by children from a rotating merry-go-round. They do not fly radially outward but tangentially to the circular path." The Freiburg researchers observed just this effect on metal clusters, thus verifying that the electrons indeed can be seen as particles rotating in a box potential and that the electron emission actually does occur only at the surface. The surprise, however, says von Issendorff, is that this observation is completely contradictory to quantum mechanical simulations, which always predict a much more complex behavior dominated by inferences and resonances in the ionization process.

Mathematical description of the angular functions

However, the Freiburg researchers were able to resolve this contradiction: On the basis of their earlier work and in discussions with researchers at the Max Planck Institute for the Physics of Complex Systems in Dresden, they derived a complete mathematical description of the angular

functions that corresponds very well to the experiment. The core assumption of this new description is that the cluster is completely non-transparent for electrons: Electrons are strongly decelerated inside the cluster. This leads to a suppression of the interference and resonance effects and thus to an almost classical behavior. It was already known that decoherence suppresses interferences. What is new, however, is that the strong dissipation does not lead to a complete washout of the angular distributions of the electrons, but on the contrary, produces very structured and almost classical distributions.

Behavior like a classical particle

"We're used to quantum effects predominating at small scales, whereas a classical description is often a good approximation for effects at larger scales," explains von Issendorff. "Here, classical behavior arises even at a small scale through dissipation. The complicated interplay between a multitude of electrons results in one of these electrons behaving like a classical particle."

More information: Adam Piechaczek et al, Decoherence-Induced Universality in Simple Metal Cluster Photoelectron Angular Distributions, *Physical Review Letters* (2021). [DOI: 10.1103/PhysRevLett.126.233201](https://doi.org/10.1103/PhysRevLett.126.233201)

Journal information: [Physical Review Letters](https://phys.org/news/2021-06-electron-merry-go-round-mechanism-classical-behavior.html)
<https://phys.org/news/2021-06-electron-merry-go-round-mechanism-classical-behavior.html>



Wed, 16 June 2021

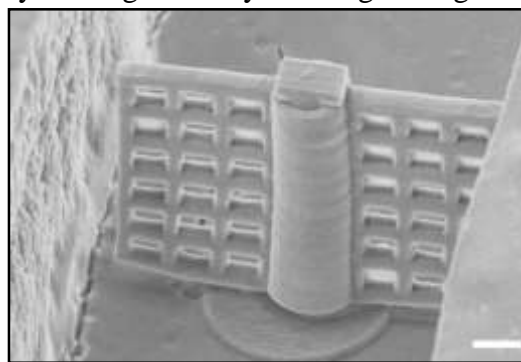
Researchers 3D-print rotating microfilter for lab-on-a-chip applications

Researchers have fabricated a magnetically driven rotary microfilter that can be used to filter particles inside a microfluidic device. They made the tiny turning filter by creating a magnetic material that could be used with a very precise 3D printing technique known as two-photon polymerization.

Microfluidic devices, also known as lab-on-a-chip devices, can be used to perform multiple laboratory functions inside a chip that usually measures a few square centimeters or less. These devices contain intricate networks of microfluidic channels and are becoming more and more complex. They may be useful for a variety of applications such as screening molecules for therapeutic potential or performing blood tests that detect disease.

"By changing the direction of external magnetic field, the microfilter we made can be remotely manipulated on demand to either filter certain-sized particles or to allow them all to pass," said Dong Wu, a member of the research team from the University of Science and Technology of China. "This functionality could be used for many types of chemical and biological studies performed in lab-on-a-chip devices, and importantly, makes it possible for the chips to be reused."

In The Optical Society (OSA) journal *Optics Letters*, Wu, together with colleagues from the Hefei University of Technology and RIKEN Center for Advanced Photonics in Japan, show that their new rotary microfilter filters can sort particles in a microfluidic device with high performance.



Researchers fabricated tiny magnetically driven rotating filters for use in microfluidic channels. The filters are just 70 microns wide and 60 microns tall with square openings that measure 6.5 microns on each side. Scale bar: 10 microns. Credit: Dong Wu, University of Science and Technology of China

"This filter could eventually be used to sort cells of different sizes for applications such as isolating circulating tumor cells for analysis or detecting abnormally large cells that may indicate disease," said Chaowei Wang from University of Science and Technology of China. "With further development it might even be possible to use it in devices placed inside the body for cancer detection."

A more versatile filter

Filters with micrometer-sized holes are often used in microfluidic chips as a passive way to sort particles or cells based on sizes of the holes. However, because the number and shape of holes in the filter cannot be dynamically changed, available devices lack the flexibility to sort different types of particles or cells on demand. To expand the usefulness of microfluidic devices, the researchers developed a filter that can freely switch between modes such as selective filtering and passing.

They created the new filter using two-photon polymerization, which uses a focused femtosecond laser beam to solidify, or polymerize, a liquid light-sensitive material known as photoresist. Thanks to two-photon absorption, the polymerization can be done in a very precise manner, enabling fabrication of complex structures on the micron scale.

To make the microfilter, the researchers synthesized magnetic nanoparticles and mixed them with the photoresist. Fabricating the rotary microfilter required them to optimize the laser power density, number of pulses and scanning intervals used for polymerization. After testing its magnetically driven properties on a glass slide, they integrated the microfilter into a microfluidic device.

Multiple filtering modes

To filter larger particles, a magnetic field perpendicular to the microchannel is applied. After the filtering process is complete, the large particles can be released by applying a magnetic field that is parallel to the microchannel, which will rotate the microfilter by 90°. The filtering process can then be repeated as needed.

The researchers verified the filtering performance of the filter using polystyrene particles with diameters of 8.0 and 2.5 microns that were mixed in an alcohol solution. "It was clear that particles smaller than the pore size easily passed through microfilter while bigger ones were filtered out," said Chenchu Zhang from University of Science and Technology of China. "When in passing mode, any larger particles captured by the filter were washed away with the fluid, which prevents filter clogging and allows reuse of the microfilter."

More information: Chaowei Wang et al, Magnetically driven rotary microfilter fabricated by two-photon polymerization for multimode filtering of particles, *Optics Letters* (2021). DOI: [10.1364/OL.428751](https://doi.org/10.1364/OL.428751)

Journal information: *Optics Letters*
<https://phys.org/news/2021-06-3d-print-rotating-microfilter-lab-on-a-chip-applications.html>

Why some COVID-19 patients develop life-threatening clots

New insights could lead to new therapies for COVID-19

Summary:

Scientists have identified how and why some COVID-19 patients can develop life-threatening clots, which could lead to targeted therapies that prevent this from happening.

Scientists have identified how and why some Covid-19 patients can develop life-threatening clots, which could lead to targeted therapies that prevent this from happening.

The work, led by researchers from RCSI University of Medicine and Health Sciences, is published in the *Journal of Thrombosis and Haemostasis*.

Previous research has established that blood clotting is a significant cause of death in patients with Covid-19. To understand why that clotting happens, the researchers analysed blood samples that were taken from patients with Covid-19 in the Beaumont Hospital Intensive Care Unit in Dublin.

They found that the balance between a molecule that causes clotting, called von Willebrand Factor (VWF), and its regulator, called ADAMTS13, is severely disrupted in patients with severe Covid-19.

When compared to control groups, the blood of Covid-19 patients had higher levels of the pro-clotting VWF molecules and lower levels of the anti-clotting ADAMTS13. Furthermore, the researchers identified other changes in proteins that caused the reduction of ADAMTS13.

"Our research helps provide insights into the mechanisms that cause severe blood clots in patients with Covid-19, which is critical to developing more effective treatments," said Dr Jamie O'Sullivan, the study's corresponding author and research lecturer within the Irish Centre for Vascular Biology at RCSI.

"While more research is needed to determine whether targets aimed at correcting the levels of ADAMTS13 and VWF may be a successful therapeutic intervention, it is important that we continue to develop therapies for patients with Covid-19. Covid-19 vaccines will continue to be unavailable to many people throughout the world, and it is important that we provide effective treatments to them and to those with breakthrough infections."

This work was funded by Irish COVID-19 Vasculopathy Study (ICVS) through the Health Research Board COVID-19 Rapid Response award as well as a philanthropic grant from the 3M Foundation to RCSI University of Medicine and Health Sciences in support of COVID-19 research.

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