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First consignment of parts for Kaveri engine

Hyderabad: MIDHANI - Mishra Datu Nigam Limited, has announced the dispatch of the first consignment of high temperature alloy for the country's indigenous 'Kaveri dry engine program' powering Unmanned Combat Aerial Vehicle (UCAV). The supply of the first batch was flagged off by chief engineer of Centre for Military Airworthiness & Certification (CEMILAC) of Defence Research and Development Organisation (DRDO) APVS Prasad in the presence of MIDHANI chairman and managing director Sanjay Kumar Jha recently.

The consignment was containing nickel base superalloy (Superni 263A) and titanium alloy (Titan 31A) forged bars thoroughly qualified in airworthy certification requirements. These materials go for various class I & class II components of the engine. The manufacturing of these materials is with 75% indigenous content with the first consignment manufactured and certified successfully in mission mode within 2.5 months, said a press release.



<https://www.thehindu.com/news/cities/Hyderabad/first-consignment-of-parts-for-kaveri-engine/article34157072.ece>

Remembering Dr E Bhagiratha Rao of DLRL and his contributions to defence electronics

By M Somasekhar

It was sometime in the mid 1980's, as a young Journalist with the news agency PTI that I got a chance to visit the Defence Electronics Research Laboratory (DERL), in Kanchanbagh, Hyderabad. Those days, in the name of high security, media was hardly allowed into the Defence labs.

The Director of DLRL was Dr E Bhagiratha Rao. After all the checks, I was ushered into his chambers. For the next couple of hours, it was a fascinating tour for me of the facilities in defence electronics and some of the futuristic projects that were being pursued in electronic warfare to key missile technologies.

With neither Google nor published literature available on defence research and activities in India, it was very interesting to get an idea of what was going on. One thing that got etched in my memory was, Dr Bhagiratha Rao explaining to me about future scenarios of Autonomous Vehicles guided by technology and Driverless Vehicles. It sounded more science fiction to me then.

On March 22, when I heard that Dr Bhagiratha Rao passed away at the ripe age of 90, many things that he was dabbling into with his teams at the DLRL came flashing. All of us know of the Google's 'Driverless Cars' now and the strides that strategic electronics has taken globally.

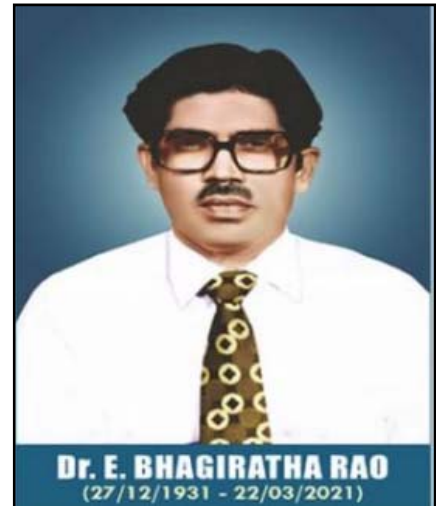
However, India continues to be struggling with electronics. It's imports of electronic products and components etc runs into billions of dollars, next only to petroleum products import. Similarly, in defence technology too the country continues to be challenged in strategic and key electronics in its security related projects.

The DLRL in Hyderabad was established in 1961 to bridge the gap and develop indigenous technologies and import substitute key components to support national security efforts, especially in communications and radar systems. Hyderabad was emerging as a defence hub with the DRDL, DMRL already established.

Dr Bhagiratha Rao was the second Director of the Lab, succeeding the conservative, Dr V Narayan Rao, who had a long innings till 1982 and initiated many projects. He came from the Defence Electronics Applications Laboratory (DEAL), Dehradun.

A national lab, DEAL specialised in communications and surveillance technologies for the military. As the first director, Dr Bhagiratha Rao shaped the growth and direction of the research of the Lab for over a decade and brought it into prominence.

A doctorate from the Andhra University, Dr Rao began his career from a special project called the Himalayan Radio Propagation Unit of the Defence Research and Development Organisation (DRDO) Dehradun in the early 1960's. It later was upgraded with significant leadership from him and diversification of research work. In 1976, it was renamed as DEAL.



The stint of Rao at the DLRL in Hyderabad was short, 1982-85, but he brought in new energy, set in the modernisation of the Labs and also launched several futuristic projects, recalls Dr Srihari Rao, a former Director of DLRL and Chief Controller (R&D) of the DRDO.

Dr Bhagiratha Rao was technically strong, forthright, a sharp thinker, a quick decision maker and looked far ahead of time during discussions and project formulations for the Institutes, wherever he worked, he said.

From DLRL, Dr Rao was moved to the fledgling Institute of Armament Technology (IAT) in Pune by the DRDO. He contributed well during his tenure by expanding the research and teaching activities. The IAT has since got a University status too.

His forthrightness also got him into trouble. During his stewardship at the DLRL, he suspended over 40 sta. This led to an unprecedented strike for a few weeks. The then Director General of the DRDO, Dr V S Arunachalam, who was earlier director of the DMRL, intervened to diffuse the situation. In a way, this incident led to Bhagiratha Rao's shift to IAT, Pune later.

During the same time, the Integrated Guided Missile Development Programme (IGMDP) was launched with APJ Abdul Kalam as the Chief. The indigenous development of Missiles-Agni, Prithvi, Nag, Trishul & Akash got key electronics support from DLRL beginning with Dr Rao and continues till date.

Post retirement, Dr Rao was active with the Engineering Staff College of India (ESCI), Hyderabad, where he helped establish, electronics & IT. He was also associated actively with the MVSR College of Engineering.

More importantly, Dr Rao was the first President of the Institute of Defence Scientists & Technologists (IDST), an organisation of defence scientists in Hyderabad, especially those retired to take up consultancy and capacity building activities to support the defence Institutes, Dr N Divakar, another, former DLRL Director and Padmasri awardee.

It's a not for profit organisation that will promote the utilisation of the services of key professionals in projects on a time bound manner. There are four branches of IDST in Hyderabad, Pune, Bengaluru and New Delhi. The DRDO has been favourable to the concept and encouraging, says Dr Divakar.

Dr Rao, who lost his wife in the early 1990's, was active in the cultural field too and was closely associated with the literary organisation called Hamsadhwani. He won the VASVIK award for his contributions to electrical and electronics technologies.

(The writer is an Independent Journalist, specialising in Science & Business.)

<https://english.sakshi.com/news/editors-picks/remembering-dr-e-bhagiratha-rao-dlrl-and-his-contributions-defence-electronics>



Press Information Bureau
Government of India

Ministry of Defence

Wed, 24 March 2021 2:57PM

Induction of New Weapons in Armed Forces

The induction of new aircraft, weapons etc into the Armed Forces is a continuous process. The details of important recent inductions in this regards are as under:-

Indian Army:

1. Cheetal Helicopters.
2. Advanced Light Helicopters (ALH) Mark 0/I/II/III.
3. ALH (Weapon System Integrated [WSI]).
4. 20 mm Turret Gun – Integrated with ALH (WSI) platform.
5. 70 mm Turret Gun – Integrated with ALH (WSI) platform.

Indian Navy:

1. Dornier 228 aircraft
2. Advance Light Helicopters (ALH MK III)
3. Chetak Helicopters
4. P81 aircraft

Indian Air Force:

1. Rafale aircraft
2. Light Combat Aircraft
3. C-17 and C-130 transport aircraft
4. Chinook and Apache Helicopters

The Government is committed to boost “Atmanirbhar Bharat” scheme by inducting LCH and LUH helicopters in Armed Forces.

So far, till February 2021, the Government has issued 523 Industrial licenses for manufacturing of various items in Defence sector.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Shri Prathap Simha and Shri L S Tejasvi Surya in Lok Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1707217>



Wed, 24 March 2021 2:55PM

Domestic Defence Production Ecosystem

As part of the recommendations of the Sectoral Group of Secretaries-10 (SGoS-10), Department of Defence Production (DDP) has adopted a Vision and Action Plan 2019-2024 to enhance self-reliance and technologies, leveraging 'Make in India' and maximize the untapped employment and economic potential of the Defence Sector. The details of action taken by the Government are as follows:-

- The Government is focusing on development of suitable human resource pool to support indigenization of the science intensive industry like special technology universities and special departments within existing universities.
- The R&D Infrastructure Schemes such as Sophisticated Analytical and Technical Help Institutes (SATHI) and Promotion of University Research in Scientific Excellence (PURSE) are open to start ups and manufacturing industries along with the researchers/scientists of academic organizations including development of suitable human resource pool to support indigenization of the science intensive industry like special technology universities and special departments within existing universities.
- Under the SATHI scheme, dedicated manpower will be made available to help with the data collection, interpretation and dissemination of the information. The aims of this scheme are: (a) procurement and maintenance of high-end equipment and infrastructure facility necessary for research/testing/manufacturing/fabrication to cater to the demands of researchers, scientists, students, start-ups, manufacturing units, industries and R&D Labs; (b) Providing access and sharing of scientific equipment and infrastructure; (c) Capacity Building of operators and technicians for efficient operations and interpretations of results/outcome; and (d) Monitoring of usage of expensive scientific research infrastructure for maximum utilization of Infrastructure Management with efficient operations and to be a part of 'Aatmanirbhar Bharat Abhiyan' (Self Reliant India Campaign). Currently, three SATHI Centres have been established at IIT Delhi, BHU Varanasi and IIT Kharagpur.
- The PURSE program is an on-going scheme exclusively for the University Sector being implemented by R&D Infrastructure Division of Department of Science & Technology since 2009. This program has broadened and created excellence in the R&D base around the performing Universities in India. The synergy and focus of research under this scheme may preferably be aligned to National Missions/priorities. The broad objective in each case is to support potentially high impact, interdisciplinary research (both basic and applied) aligned to National Priorities/Missions. Currently, 54 Universities have been identified for support under the PURSE Program.
- In addition, Department of Defence Production through Innovations for Defence Excellence (iDEX) framework aims to achieve self-reliance and foster innovation and technology development in Defence and Aerospace by engaging industries including MSMEs, start-ups, individual innovators, R&D institutes and academia. iDEX has forged strategic partnerships with premier institutions of the country such as IIT Madras, IIT Bombay, IIT Delhi, IISc Bangalore, T-Hub, IIIT Hyderabad, IIT Hyderabad, IIM Ahmedabad, Forge Coimbatore and Maker Village, Kerala. These Partner Incubators help discover, explore and support startups/MSMEs and develop human resource pool to support indigenization of the science intensive industry.

This information was tabled in a written reply by Raksha Rajya Mantri Shri Shripad Naik to a question asked by Dr Arvind Kumar Sharma in Lok Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1707215>



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Ministry of Defence

Wed, 24 March 2021 2:54PM

Hindustan Aeronautics Limited (HAL)

Business done by HAL in last ten years is as under:-

Particulars	Rs. in Crore									
	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Revenue from Operations	13124	14211	14328	15135	15730	16758	17950	18519	20008	21438
Profit before tax	2839	3328	3497	3578	3172	3207	3583	3240	3742	3928

The list of defence equipment manufactured by HAL is given below:-

1. Fighters:

- Su-30MKI
- Light Combat Aircraft LCA
- MiG-21/Bison
- Jaguar

2. Trainers:

- Kiran MK I/II
- Hawk

3. Transport Aircraft:

- Do-228
- HS-748

4. Helicopters:

- Advanced Light Helicopter (ALH)
- Chetak
- Cheetah
- Cheetal

HAL is also manufacturing Engines, Communication equipment, Navigation equipment, Display systems, Hydraulic systems, Electric equipment etc., required for aircraft/helicopters.

Currently, out of the total airborne fleet in use by Indian Defence Services, HAL has supplied about 61% and is supporting 75% of all the aircrafts/helicopters.

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

<https://pib.gov.in/PressReleasePage.aspx?PRID=1707214>

CDS' new defence import ban list to push indigenous ammunition, weapon systems

By Ajit K Dubey

- *The import of items mentioned in the list is not going to be stopped immediately and time would be given by the Defence Ministry to the forces as well as the local manufacturers to prepare their production base*

New Delhi: The next list of 101 defence-related items whose import would be banned to push 'Make in India' in the military hardware sector is expected to include ammunition for major weapon systems and integrated systems such as aircraft.

To prepare the list known as the 'positive list of indigenisation' is expected to be issued by the Department of Military Affairs headed by Chief of Defence Staff Gen Bipin Rawat by the end of this month and discussions are being held with the indigenous defence industry players mainly involving the private sector.



Chief of Defence Staff Bipin Rawat. (PTI)

A major focus would be on banning the import of all types of ammunition in a given timeframe as this is the most critical part of our defence preparedness. If the ammunition is produced within the country, we would be able to meet our requirements even during times of emergency, senior government sources told ANI.

This would also help the country to save money demanded by the foreign suppliers in times of crisis like the ones we had in China and Pakistan in the recent past, they said.

The DMA has been holding discussions with the possible industry partners and asking them to provide a certain timeframe in which they would be able to develop and produce the desired ammunition within the country, the sources said.

The DMA has also been discussing the possibility of the private sector industry producing major weapon systems such as aircraft for military requirements and other such systems.

The first such list was issued around the same time last year and has stopped the import of any foreign artillery guns and submarines and they are supposed to be built in India even if there is a requirement of a foreign partner in it.

This also led to the Indian Army withholding a possible deal to procure artillery guns from Israel and is now evaluating an indigenous gun system called ATAGS developed by the DRDO and produced by the Tata-Kalyani combination.

The import of items mentioned in the list is not going to be stopped immediately and time would be given by the Defence Ministry to the forces as well as the local manufacturers to prepare their production base.

Prime Minister Narendra Modi has been emphasizing on Aatmanirbharta (self-reliance) in the defence sector to reduce imports for the military and create new jobs and expanding exports of weapon systems to friendly foreign countries.

<https://www.livemint.com/news/india/cds-new-defence-import-ban-list-to-push-indigenous-ammunition-weapon-systems-11616577263077.html>

Focus must remain on coastal surveillance: General Rawat

Chennai: The focus of the Coast Guard must remain on the primary task of coastal surveillance and under no circumstances should the force be diverted from that task, Chief of Defence Staff General Bipin Rawat said on Wednesday.

Synergy among the Navy, Coast Guard and the maritime police in coordination with the local agencies and state governments has become the need of the hour, he said at the commissioning ceremony of the Coast Guard ship 'Vajra' at Chennai Port Trust here.

"We are confident of such improvement and capabilities. The Coast Guard will be able to safeguard our coastal areas along with other agencies responsible for their assignments," he said

The 'Vajra' is the sixth in the series of the contract awarded by the Ministry of Defence to Larsen and Toubro Shipbuilding Ltd.

As part of commissioning the ship, Rawat unveiled a plaque and a nameboard of the ship during the function.

He said, "The country has a vast and exclusive economic zone, far-flung island territories and a large coastline. It is the preferred partner to most of the nations in the Indian Ocean Region."

"Focus must remain on the primary task and under no circumstances should we divert our forces from their primary role of coastal surveillance and security in ensuring safety of our cargo and making sure there is no piracy on the high seas," he said.

Noting that the Coast Guard and the Navy were instruments in ensuring seas remain safe, he said, "The nation's engagement with the world has seen an exponential growth with various initiatives implemented by the government."

"Today, the Coast Guard is operating 24x7 to safeguard the nation's interest apart from building bridges of confidence at sea," he said.

The Coast Guard must remain vigilant with the available means -- technical as well as human -- thus remaining the most reliable means of ensuring deterrence in the maritime domain, he said.

"Initiatives like the community interaction programmes and safety awareness drive for the fishermen community and making them as eyes and ears to our national cause are pragmatic steps taken by the Coast Guard," he said.

Rawat appreciated the Coast Guard for taking a progressive step in making community interaction to community integration thus giving an opportunity to the fisherfolk joining the service and in turn neutralising their vast seafaring experience towards maritime surveillance and security. Aimed at enhancing the coastal security, the ship is fitted with highly sophisticated navigation and communication systems.

The ship has a 30-mm gun as main armament and fitted with two 12.7-mm SRCG (Stabilised Remote Controlled Gun) for enhanced fighting efficiency.

Some of the hi-tech features include an integrated bridge system, high-power external fighting system, bow thruster, automated power management system among others.

The ship is designed to carry one twin-engine helicopter with night-flying capabilities and can also carry four high-speed boats, two rigid hull inflatable boats for taking up search and rescue, law enforcement and maritime patrolling.



A pollution response equipment to contain oil spills at sea is fitted in the ship, which is propelled by twin MTU 8000 series engines capable of achieving 26 knots of top speed and endurance of 5,000 nautical miles.

Deputy Inspector General Alex Thomas is the commanding officer of the ship, which would have 14 officers and 88 men.

The ship would be based in Tuticorin under the operational control of the Coast Guard eastern region.

In view of the Covid-19 pandemic, the commissioning ceremony was conducted in adherence to the standard operating procedures laid out by the government, including wearing of masks and maintaining social distancing among the participants.

<https://timesofindia.indiatimes.com/india/focus-must-remain-on-coastal-surveillance-general-rawat/articleshow/81668944.cms>



Thu, 25 March 2021

In a first, Special Forces to demonstrate its prowess

The Indian Army for the first time will let its air-borne Special Forces (SF) demonstrate their operational prowess of the size of a battalion, that too in front of a visiting foreign dignitary

By Mayank Singh

New Delhi: The Indian Army for the first time will let its air-borne Special Forces (SF) demonstrate their operational prowess of the size of a battalion, that too in front of a visiting foreign dignitary.

It will be capability demonstration of the parachute brigade at Agra Cantonment in front of South Korean Defence Minister Suh Wook on March 27, said an army officer.

“This will be a battalion size demonstration in which the troopers will be lining up with their complete special operations heavy equipment load, including the infantry combat vehicle and artillery guns,” the officer added. It will also have the support components like the para field ambulance and other auxiliary for such special units.

Wook is arriving on a three-day visit to India on Thursday. He will be holding high-level talks with Defence Minister Rajnath Singh.

Lt Gen Vinod Bhatia (retd) said: “Air-borne forces are meant to address the operational strategic value targets behind the enemy lines to turn the enemy flank and also creating decision dilemma into the mind of the enemy’s leadership.” The SFs are trained and equipped to accomplish high-value aims and are secretive about their operational training and skills.

<https://www.newindianexpress.com/nation/2021/mar/25/in-a-first-special-forces-to-demonstrate-its-prowess-2281251.html>



Advanced Towed Artillery Gun system (ATAGS) developed by DRDO. (Photo | Shekhar Yadav, EPS)

3 Rafale fighters landing next week, 9 more in April to add to IAF's firepower

The IAF's combat capability in India's eastern flank will get more teeth when the Hasimara airbase in West Bengal is activated next month with the induction of at least five Rafales

By Shishir Gupta

New Delhi: The Indian Air Force (IAF) is set to acquire more teeth with three more Rafale omni-role fighters on their way to Ambala early next week with another nine slated to land by mid-April from France. The Hasimara forward base in north Bengal will start operations with five fighters next month, people aware of the matter said.

According to French and Indian diplomats, an IAF team has already reached Merignac airbase in Bordeaux to finalise the date for ferrying three Rafales to Ambala. The expected date is either March 30 or 31 with the fighters to be refuelled mid-air by French refuellers as per availability with a stop-over at Al Dhafra airbase in the UAE.

India ordered 36 planes from France (the equivalent of two squadrons with 18 jets each) in September 2016 for ₹59,000 crore under a government-to-government deal. The IAF's Ambala-based Golden Arrows Squadron has already inducted 11 Rafale jets between July 2020 and January 2021. These fighter jets have been operated in the Ladakh theatre where the military is on high alert amid a border standoff with China since early May 2020.

Dassault Aviation has already handed over seven more fighters to the IAF for training in France and will deliver the remaining six Rafale jets after April to complete the delivery of 36 aircraft by end of this year.

The aircraft carries a range of potent weapon systems including long-range Meteor missiles, HAMMER smart munition and SCALP cruise missile. The beyond visual range air-to-air Meteor missile is considered a game-changer by defence experts with undisclosed range well beyond 100 kilometres. Diplomats cited above said there was a remote possibility that IAF chief Air Chief Marshal RKS Bhadauria, who will be on a bilateral visit to France around April 20-22, could flag off the nine fighters from Merignac airbase.

The arrival of nine Rafales in April will complete the Ambala squadron with 18 aircraft. The second squadron at Hasimara forward base will be raised with five fighters. Although Hasimara is a front-line airbase for the fourth-generation-plus fighters in the eastern sector to keep a close eye on Sikkim and Arunachal Pradesh borders with China, the fighters will be deployed all over the country, particularly north Assam.

Air force officials said after the induction of Rafales in Hasimara, India's eastern flank will enhance the strategic capability of the IAF with a C-130J Hercules squadron based at West Bengal's Panagarh.

National security planners are also pushing for the upgrade of Indian airbases in the eastern sector with more blast pens and surface-to-air missile cover given the rapid upgrade of Chinese infrastructure and military airbases all along the Line of Actual Control. An influential section within the military believes that IAF's eastern air command, currently headquartered in salubrious climes of Shillong in Meghalaya, should be shifted closer to north Assam for rapid response.

<https://www.hindustantimes.com/india-news/3-rafale-fighters-landing-next-week-9-more-in-april-to-add-to-iaf-s-firepower-101616645122653-amp.html>



There is a remote possibility that IAF's Air Chief RKS Bhadauria could flag off the nine Rafale fighter jets scheduled to leave from France next month (Dassault Aviation/A Boissaye)

For Navy, 6 nuclear-powered submarines take priority over 3rd aircraft carrier

India's emphasis on submarines to counter China comes against the backdrop of Beijing raising its capacity to build a destroyer in just 5 years

By Shishir Gupta

The Indian Navy has informed the Narendra Modi government that the induction of six nuclear-powered submarines would take priority over a third heavy aircraft carrier discussed earlier to counter the rapid expansion of the People's Liberation Army Navy (PLAN) and dominate the Indian Ocean, people familiar with the matter said.

According to South Block officials, the Indian Navy told the country's national security planners at the Combined Commanders Conference this month that the plan to build the nuclear-powered attack submarines or SSNs should take priority over the project to build a third aircraft carrier (also called indigenous aircraft carrier 2). It is understood that the Navy will seek "acceptance of necessity" or AON approval from the government on the submarine project soon as China has developed the capacity to produce 12,000-tonne Renhai class destroyers in just five years.



India's sole nuclear powered attack submarine INS Chakra, which is on lease from Russia. (Wikimedia Commons/Ilya Kurganov)

While even Pakistan's Agosta 90B submarine, the only one of the five that are operational, can make its way to the Bay of Bengal with an intrepid crew, the SSN class of submarines, carrying a conventional missile and weapon systems, is only limited in range by food supplies.

The nuclear-powered submarines can patrol the entire Indo-Pacific without even surfacing once and remain undetected on high seas and equatorial waters. China has nearly a dozen such submarines in operation. Its latest, the Type 095 attack submarine has a reduced acoustic signature as compared to the Han class of submarines.

While India has a number of options to jointly design and develop the submarines with countries such as Russia, France and the US under the Atma Nirbhar Bharat rubric, India's preferred partner appears to be Paris as it is already designed Kalvari class of diesel attack submarines for Indian Navy and is currently jointly developing a nuclear attack submarine (named Alvaro Alberto) for Brazil under a strategic partnership.

Apart from being India's closest allies in defence technology, joint development of submarines with France is free from any regulatory regimes such as the International Traffic in Arms Regulation (ITAR) with the US or any future sanctions in case of Russia. India already operates one Akula class SSN from Russia on lease with an agreement to get another one when the lease on the first expires.

The government's emphasis on upgrading naval assets is an attempt to counter China's navy in the Indian Ocean and beyond. The PLA's navy is larger than the US navy in terms of the number of ships, although the US is still ahead in terms of tonnage and capability.

It is in this context that the Navy is also seriously thinking of reviving its heavy-destroyer project to counter the 12,000-tonne cruisers being built by China. The first of India's 7,500 tonne INS Visakhapatnam class of guided-missile destroyers is expected to be commissioned within a year.

Indian national security planners believe that the next threat from China will come on Indo-Pacific, particularly in the Indian Ocean with the US Navy continuously deployed in the South

China Sea and ensuring that the PLAN ballistic missile submarines do not cross the first island chain. This means that PLAN will have to take a circuitous route to deploy its nuclear submarines in the Indian Ocean as it is mandatory for sub-surface vessels to surface when they cross Malacca Straits, Sunda or Lombok straits.

As part of India's effort to match China, India will commission its second aircraft carrier INS Vikrant - it is New Delhi's first indigenously-built aircraft carrier - later this year. It will be home-based on the eastern seaboard while INS Vikramaditya, the other carrier built by Russia, will be on the western seaboard of India. INS Arighat, the second nuclear-powered ballistic missile submarine (SSBN) will also be commissioned this year.

<https://www.hindustantimes.com/india-news/for-navy-6-nuclear-powered-submarines-take-priority-over-3rd-aircraft-carrier-101616564522467.html>



Thu, 25 March 2021

In a first, Indian Navy to participate in French Naval exercise La Perouse, Quad allies to join

For the first time, the Indian Navy will be part of a French naval exercise known as 'La Perouse' in the Bay of Bengal next month. The other Quad nations – the US, Japan and Australia – will also participate

By Abhishek Bhalla

New Delhi: The Indian Navy will be part of a French naval exercise in the Bay of Bengal next month. The participating nations also include the other Quadrilateral Security Dialogue (Quad) member countries -- Australia, Japan and the United States of America (USA).

This is the first time that the Indian Navy will be part of the France-led war game 'La Perouse'. Until now, India was not invited for the French naval exercise.

After the Malabar Exercise in November last year, during which the navies of India, the US and Japan got together with Australia as the new addition, India's inclusion in the France-led joint naval drill is a significant step.

"The exercise is scheduled between April 5 and 7," said an official.

This will be followed by another important naval exercise 'Varuna', which takes place annually between India and France. This time it will also include the United Arab Emirates (UAE).

"It will take place in the last week of April in the Western Indian Ocean," the official informed.

India's maritime diplomacy

India's maritime diplomacy involves naval exercises with several friendly countries, keeping in mind China's increasing influence in the Indian Ocean region. The inclusion of more navies in such exercises is also a response to Chinese aggression in international waters and its increasing foray into the region.

As part of maritime cooperation, the Indian and Vietnamese navies carried out a passage exercise in the South China Sea in December 2020.



The Indian Navy will be part of a French naval exercise called 'La Perouse' in the Bay of Bengal next month. The Quad nations – the US, Japan and Australia – will also take part. (Photo: PTI file) (Representative Image)

The Indian Navy also carried out war games with the navies of Singapore and Thailand in the Andaman Sea, soon after the Malabar Exercise.

As part of the Indian government's 'Neighbourhood First' vision, the Indian Navy undertook joint exclusive economic zone surveillance with Maldives, Seychelles and Mauritius, as well as coordinated patrols (CORPATs) with Bangladesh, Thailand and Indonesia.

The Indian Navy has participated in 13 bilateral and multilateral exercises so far this year.

Besides improving inter-operability between friendly navies, the joint drills are aimed at strengthening mutual confidence, developing standard procedures and enhancing overall maritime security.

<https://www.indiatoday.in/india/story/indian-navy-participate-french-naval-exercise-la-perouse-quad-allies-1783239-2021-03-24>

Science & Technology News



Thu, 25 March 2021

ISRO's Chandrayaan-3 launch next year: Govt

The space agency earlier planned to launch the Chandrayaan 3 mission either in late 2020 or early 2021. However, most missions were rescheduled due to the Covid-19 pandemic

New Delhi: The Indian Space Research Organisation (Isro) plans to launch its third mission to the Moon next year, the government said on Wednesday. In a written response to a question in the Lok Sabha, minister of state for the department of space, Jitendra Singh, said that the Chandrayaan-3 mission will carry only a lander and a rover.

The space agency earlier planned to launch the Chandrayaan 3 mission either in late 2020 or early 2021. However, most missions were rescheduled due to the Covid-19 pandemic.

"The integrated spacecraft is being realised for planned launch during 2022," Singh said, adding that the spacecraft is in "advanced stages" of realisation, with the propulsion system already built and undergoing tests. The lander structure has also been built and is currently being fitted with its propulsion system, he said.

India's second mission to the Moon, Chandrayaan-2, lost contact with Earth just 2.1km away from the surface of the Moon in 2019. While the lander, Vikram, made a hard landing on the lunar surface, the orbiter is expected to remain in position for seven years.

"There was a problem at the very last leg of the journey of the lander. For the third mission, we have to ensure -- one, there is no problems with the thrusters; two, the system is fault tolerant so that even if there is some issue, for example thrusters not working, the system can automatically course correct; three, we have to ensure that the Chandrayaan-2 orbiter communicates with the lander throughout the powered decent because it is capable of giving last-minute commands if necessary," said Dr M Annadurai, former director of the Isro satellite centre in Bengaluru.

The Vikram lander and Pragyan rover aboard the Chandrayaan-2 were to land near the lunar south pole, where the mission was expected to observe water molecules frozen in the darker regions of the Moon.

This year, Isro has planned two missions in December – the first unmanned flight under the Gaganyaan mission, and India's first solar mission.

The unmanned flight will bring India's human spaceflight programme one step closer to sending humans to low earth orbit; the final mission will be undertaken after a successful second unmanned flight scheduled for next year.

The solar mission, Aditya L1, will see the space agency send a satellite 1.5 million kilometres away to the Lagrangian point, between the Earth and the Sun, which is where the gravitational pull of both the bodies on the satellite is equal to the centripetal force needed to keep the satellite in orbit. These points are like parking spots in space from where a satellite can make observations without expending much fuel. This point between the Earth and the Sun allows an uninterrupted view of the Sun.

The mission will carry six scientific payloads that will study the visible surface of the sun (photosphere), the irregular layer over it called the chromosphere, and the layer of plasma called corona that extends for thousands of kilometers and has a temperature of around 6,000 Kelvin (5726.85 degrees Celsius), according to ISRO.

<https://www.hindustantimes.com/india-news/isros-chandrayaan-3-launch-next-year-govt-101616619292766.html>



Thu, 25 March 2021

Optical fiber could boost power of superconducting quantum computers

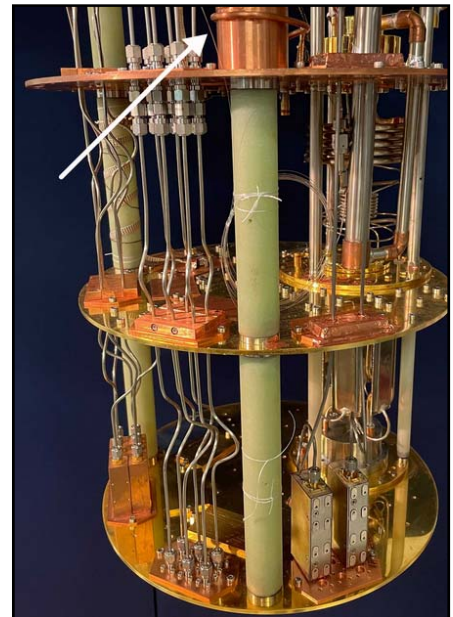
The secret to building superconducting quantum computers with massive processing power may be an ordinary telecommunications technology—optical fiber.

Physicists at the National Institute of Standards and Technology (NIST) have measured and controlled a superconducting quantum bit (qubit) using light-conducting fiber instead of metal electrical wires, paving the way to packing a million qubits into a quantum computer rather than just a few thousand. The demonstration is described in the March 25 issue of *Nature*.

Superconducting circuits are a leading technology for making quantum computers because they are reliable and easily mass produced. But these circuits must operate at cryogenic temperatures, and schemes for wiring them to room-temperature electronics are complex and prone to overheating the qubits. A universal quantum computer, capable of solving any type of problem, is expected to need about 1 million qubits. Conventional cryostats—supercold dilution refrigerators—with metal wiring can only support thousands at the most.

Optical fiber, the backbone of telecommunications networks, has a glass or plastic core that can carry a high volume of light signals without conducting heat. But superconducting quantum computers use microwave pulses to store and process information. So the light needs to be converted precisely to microwaves.

To solve this problem, NIST researchers combined the fiber with a few other standard components that convert, convey and measure light at the level of single particles, or photons,



NIST physicists measured and controlled a superconducting qubit using light-conducting fiber (indicated by arrow) instead of metal electrical cables like the 14 shown here. Credit: Lecocq/NIST

which could then be easily converted into microwaves. The system worked as well as metal wiring and maintained the qubit's fragile quantum states.

"I think this advance will have high impact because it combines two totally different technologies, photonics and superconducting qubits, to solve a very important problem," NIST physicist John Teufel said. "Optical fiber can also carry far more data in a much smaller volume than conventional cable."

Normally, researchers generate microwave pulses at room temperature and then deliver them through coaxial metal cables to cryogenically maintained superconducting qubits. The new NIST setup used an optical fiber instead of metal to guide light signals to cryogenic photodetectors that converted signals back to microwaves and delivered them to the qubit. For experimental comparison purposes, microwaves could be routed to the qubit through either the photonic link or a regular coaxial line.

The "transmon" qubit used in the fiber experiment was a device known as a Josephson junction embedded in a three-dimensional reservoir or cavity. This junction consists of two superconducting metals separated by an insulator. Under certain conditions an electrical current can cross the junction and may oscillate back and forth. By applying a certain microwave frequency, researchers can drive the qubit between low-energy and excited states (1 or 0 in digital computing). These states are based on the number of Cooper pairs—bound pairs of electrons with opposite properties—that have "tunneled" across the junction.

The NIST team conducted two types of experiments, using the photonic link to generate microwave pulses that either measured or controlled the quantum state of the qubit. The method is based on two relationships: The frequency at which microwaves naturally bounce back and forth in the cavity, called the resonance frequency, depends on the qubit state. And the frequency at which the qubit switches states depends on the number of photons in the cavity.

Researchers generally started the experiments with a microwave generator. To control the qubit's quantum state, devices called electro-optic modulators converted microwaves to higher optical frequencies. These light signals streamed through optical fiber from room temperature to 4K (minus 269 C or minus 452 F) down to 20 milliKelvin (thousandths of a Kelvin) where they landed in high-speed semiconductor photodetectors, which converted the light signals back to microwaves that were then sent to the quantum circuit.

In these experiments, researchers sent signals to the qubit at its natural resonance frequency, to put it into the desired quantum state. The qubit oscillated between its ground and excited states when there was adequate laser power.

To measure the qubit's state, researchers used an infrared laser to launch light at a specific power level through the modulators, fiber and photodetectors to measure the cavity's resonance frequency.

Researchers first started the qubit oscillating, with the laser power suppressed, and then used the photonic link to send a weak microwave pulse to the cavity. The cavity frequency accurately indicated the qubit's state 98% of the time, the same accuracy as obtained using the regular coaxial line.

The researchers envision a quantum processor in which in which light in optical fibers transmits signals to and from the qubits, with each fiber having the capacity to carry thousands of signals to and from the qubit.

More information: Control and readout of a superconducting qubit using a photonic link, *Nature* (2021). DOI: [10.1038/s41586-021-03268-x](https://doi.org/10.1038/s41586-021-03268-x)

Journal information: *Nature*
<https://phys.org/news/2021-03-optical-fiber-boost-power-superconducting.html>

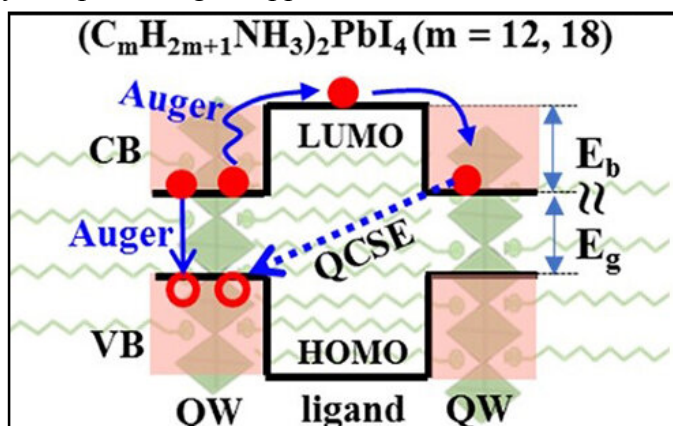
Study reveals auger-assisted electron transfer mechanism between adjacent quantum wells in 2D layered perovskites

By Li Yuan

Two-dimensional (2D) perovskites are multiple quantum well (QW) structures formed by alternating inorganic and organic layers. They are promising in applications of solar cells, LEDs, and photodetectors.

However, due to the energy barrier exerted by the insulating organic ligands between QWs, the photogenerated excitons are usually confined in the perovskite QW plane and exhibit poor interlayer (QW-to-QW) carrier transport. This limits further application of 2D perovskites in optoelectronic devices.

Recently, a research group led by Prof. Jin Shengye from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS) revealed a new mechanism of Auger-assisted interlayer



Auger-assisted electron transfer between adjacent quantum wells in 2D layered perovskites. Credit: YIN Zixi and LENG Jing

electron transfer in two-dimensional layered perovskites. It offers a new guideline to design 2D perovskites with an optically tunable QW-to-QW charge transport property.

This work was published in *Journal of the American Chemical Society* on March 18.

The scientists conducted pump-intensity dependent transient absorption experiments on a series of $(C_mH_{2m+1}NH_3)_2PbI_4$ 2D layered perovskites with different ligand alkyl chain lengths ($m = 8, 10, 12, 18$).

A longer ligand chain (larger m) led to an increased QW band gap energy (E_g) as well as a lower energy barrier (E_b) of electron transfer between the layers. When $m \geq 12$, where the value of E_b approaches E_g , a long-lived and derivative-like feature in the transient absorption (TA) spectra was observed. The similar TA spectral feature did not present in short-chain 2D perovskites with $m \leq 12$.

The scientists proposed a new Auger-assisted QW-to-QW electron transfer mechanism to explain the experimental results. When $E_g \approx E_b$, the Auger recombination of an exciton could pump the electron in another exciton to transfer towards a neighboring QW through the barrier ligands. The separated electrons and holes built up an internal electric field and caused the derivative-like transient spectral feature through a quantum confined Stark effect.

This Auger-assisted electron transfer mechanism can be used to design novel layered 2D perovskites with either improved interlayer charge mobility or tunable optical properties, which may be finally utilized in photoelectronic and optical modulation devices.

More information: Zixi Yin et al. Auger-Assisted Electron Transfer between Adjacent Quantum Wells in Two-Dimensional Layered Perovskites, *Journal of the American Chemical Society* (2021). [DOI: 10.1021/jacs.1c00424](https://doi.org/10.1021/jacs.1c00424)

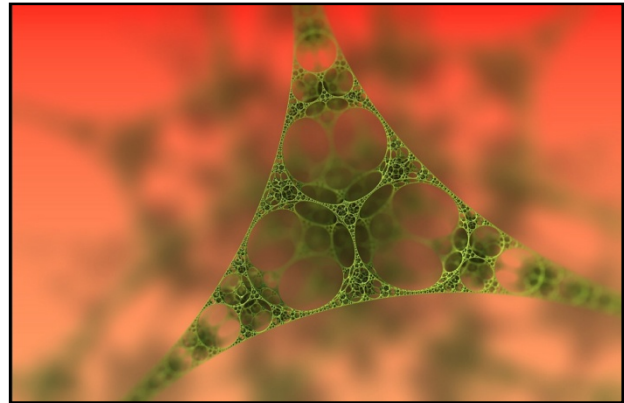
Journal information: [Journal of the American Chemical Society](https://phys.org/news/2021-03-reveals-auger-assisted-electron-mechanism-adjacent.html)
<https://phys.org/news/2021-03-reveals-auger-assisted-electron-mechanism-adjacent.html>

New automated process makes nanofiber fabrication assessment 30% more accurate

Imbued with special electric, mechanical and other physical properties due to their tiny size, nanofibers are considered leading-edge technology in biomedical engineering, clean energy and water quality control, among others. Now, researchers in Italy and the UK have developed an automatic process to assess nanofiber fabrication quality, producing 30% more accurate results than currently used techniques.

Details were published on January 2021 in *IEEE/CAA Journal of Automatica Sinica*, a joint publication of the IEEE and the Chinese Association of Automation.

"In recent years, nanostructured materials have gained continuously growing interest both in scientific and industrial contexts, because of their research appeal and versatile applications," said paper author Cosimo Ieracitano, research fellow in the Neurolab Group, Department of Civil Engineering, Energy, Environment and Materials, University Mediterranea of Reggio Calabria. "Nanofiber applications success requires special care be paid to the quality of nanomaterial and the generation process."



Credit: CC0 Public Domain

Nanofibers are produced by applying a high voltage to a syringe containing a polymer solution and a spinning collector. The solution, powered by the electric charge, jets out onto the collector and results in nanofibers. For a product that requires uniformity—for example, a nanofiber intended as scaffolding to grow cells will result in uneven growth if it contains a lump or a hole, or it might not be able to grow any if it has a film on it—the current production process is quite messy.

To prevent anomalies, technicians monitor the fiber production using a scanning electron microscope that can precisely determine the topography of the fibers, as well as their composition. They then visually inspected the images. According to Ieracitano, it is a time-consuming process that depends on humans, who can become fatigued and make mistakes.

"In the production chain of nanomaterials, a crucial step is to practically implement automation in the defect-identification process to reduce the number of laboratory experiments and the burden of the experimentation phase," Ieracitano said.

The research team designed a two-part automatic process to homogenous nanofibers. An autoencoder, a type of machine-learning software, chops the scanning electron microscope images into smaller pieces and translates them into code. That code is rendered into more basic versions of the original images, reducing computing power but still highlighting any anomalies. Another machine-learning processor assess the image, looking for any structural flaws. If it finds one, it dismisses the nanofiber as defective.

"Notably, the proposed system outperforms other standard machine-learning techniques, as well as other recent state-of-the art methods, reporting an accuracy of up to 92.5%," Ieracitano said. Currently used techniques are typically 64 to 66% accurate.

More information: Cosimo Ieracitano et al. A novel automatic classification system based on hybrid unsupervised and supervised machine learning for electrospun nanofibers, *IEEE/CAA Journal of Automatica Sinica* (2021). DOI: [10.1109/JAS.2020.1003387](https://doi.org/10.1109/JAS.2020.1003387)
<https://phys.org/news/2021-03-automated-nanofiber-fabrication-accurate.html>

Covid antibodies may last from days to years, depending on infection severity: Study

- *The presence of T-cell immunity provides hope of longer-term protection*
- *Since antibodies wane faster in some individuals, the scientists believe re-infection may occur in subsequent waves of infection*

Antibodies against the novel coronavirus wane at different rates, lasting for mere days in some individuals, while persisting in others for decades, according to a new study which says Covid-19 severity could be a deciding factor in having longer-lasting protection against reinfection.

The research, published in *The Lancet Microbe* journal, noted that recovered patients with low levels of neutralising antibodies may still be protected from reinfection if they have robust immunity in the form of the body's T cells.

In the study, scientists, including those from Duke-NUS Medical School in Singapore, followed 164 Covid-19 patients for six to nine months, analysing their blood for neutralising antibodies against the SARS-CoV-2 virus, their T cells and immune system signalling molecules.

They then used this information to train a machine learning algorithm to predict the trajectories of people's neutralising antibodies over time.

Based on the analysis, the researchers categorised people into five groups depending on how long their antibodies lasted.

The first group, they said, included those who never developed detectable neutralising antibodies -- also called the 'negative' group -- and comprised 11.6 per cent of the patients in the study.

The 'rapid waning' group, which included 26.8 per cent of the patients, had varying early levels of antibodies that waned quickly, the scientists said.

According to the researchers, the 'slow waning' group, which included 29 per cent of the participants, tested mostly positive for antibodies at six months.

The 'persistent' group, comprising 31.7 per cent of the individuals, showed little change in their antibody levels up to 180 days and, they said, adding that the 'delayed response' group (1.8 per cent) showed a significant rise in neutralising antibodies during late convalescence.

"The key message from this study is that the longevity of functional neutralising antibodies against SARS-CoV-2 can vary greatly and it is important to monitor this at an individual level," said Professor Wang Linfa, from Duke-NUS' Emerging Infectious Diseases (EID) Programme, a corresponding author of the study.

"This work may have implications for immunity longevity after vaccination, which will be part of our follow-up studies," Linfa added.



A healthcare worker holds a small bottle of Covid-19 vaccine (REUTERS)

According to the study, patients, including those from the 'negative group', displayed sustained T-cell immunity six months after initial infection, indicating that individuals may still be protected if they have a robust T-cell immunity when the neutralising antibody level is low.

"Our study examines neutralising antibodies which are important in protection from Covid-19. We found that antibodies against SARS-CoV-2 wane in different people at different rates," said study corresponding author David Lye from the National Centre for Infectious Diseases (NCID), Singapore.

Based on the results, the scientists emphasised the importance of public health and social measures in ongoing pandemic outbreak response.

They said the presence of T-cell immunity provides hope of longer-term protection, adding that more studies are needed to confirm the findings.

Since antibodies wane faster in some individuals, the scientists believe re-infection may occur in subsequent waves of infection.

They said if immunity provided via vaccinations also wanes like naturally-produced antibodies, annual vaccine administration could be necessary to prevent future outbreaks of Covid-19.

However, the researchers said further research is needed to clarify the findings as vaccine programmes are rolled out across the world.

<https://www.livemint.com/science/health/covid-antibodies-may-last-from-days-to-years-depending-on-infection-severity-study-11616571580902.html>

