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Thu, 22 Oct 2020

DRDO revisits manual for India's 'self-reliant' vision, facilitate indigenous defence industry

The revised manual has been aimed at promoting and encouraging even more participation by Indian industry, including start-ups and MSMEs, in R&D to help achieve self-reliance

New Delhi: With China and Pakistan both on our nerves, putting up a two-pronged resistance requires a system to ensure India also has a self-reliant mechanism in place to meet the country's defence demands.

In line with this same thought, Union Defence Minister Rajnath Singh on Tuesday released the 'Procurement Manual 2020' for the Defence Research and Development Organisation (DRDO), India's premier agency for military research and development (R&D).

This has been aimed at promoting and encouraging even more participation by Indian industry, including start-ups and Micro, Small and Medium Enterprises, in R&D to help achieve self-reliance.

"The new DRDO procurement manual will facilitate the indigenous defence industry by simplifying the processes and ensure their participation in design and development activities," the Defence Minister said.

He acknowledged the contribution of DRDO officials and the finance wing of the Defence Ministry in bringing out the revised manual.

The procurement manual is expected to facilitate faster execution of R&D programmes and projects. The modified features of the manual will go a long way to facilitate participation of industry in various R&D projects.

Bidding security declaration option for earnest money deposit, increasing threshold limit for advance payment, placing orders on second lowest bidder in case the first lowest bidder backs out – these are some of the salient features of the new manual, which will assist the industry in the speedy execution of projects.

The other actions laid out in the manual are exemption of bid security and performance security up to Rs 10 lakh, no negotiations for commercial off-the-shelf items or services, wherever price discovery happens through market forces.

"Performance security for service contracts is linked to the payment cycle instead of contract value. Procurement of stores from development partners, safeguarding free issue material through insurance cover instead of bank guarantee are the other facilitating measures adopted to help the industry," the Defence Ministry said in a statement.

Furthermore, the liquidated damage rate for development contracts has also been reduced. The delivery period extension process has been simplified for faster decision-making. Many of the



Defence Research and Development Organisation.

internal procedures have been simplified further for faster engagement with industry. The previous procurement manual of the DRDO was last modified in 2016.

<https://www.timesnownews.com/india/article/drdo-revisits-manual-for-india-self-reliant-vision-facilitate-indigenous-defence-industry/670403>

THE TIMES OF INDIA

Thu, 22 Oct 2020

New DRDO procurement manual to boost domestic industry participation

By Rajat Pandit

New Delhi: Defence minister Rajnath Singh on Tuesday released a new Defence Research and Development (DRDO) procurement manual to encourage more participation of the Indian industry, including start-ups and MSMEs.

“The new DRDO manual will facilitate the indigenous defence industry by simplifying the processes and ensure their participation in design and development activities. It will help towards realizing PM Narendra Modi’s dream of ‘Atmanirbhar Bharat’,” said Singh.

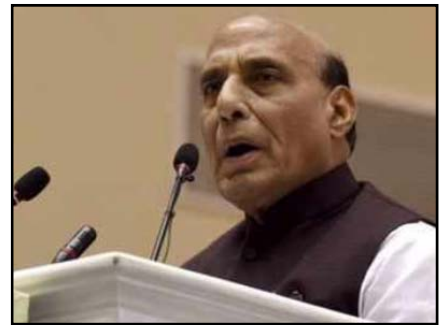
DRDO Chief Dr G Satheesh Reddy, in turn, said, “The manual will be a boon to the indigenous industry and also ensure swift procurement processes with lots of simplifications. It will also facilitate faster execution of R&D projects and programmes.”

The new measures in the manual include bid security declaration option for earnest money deposit, increase of threshold limit for advance payment and placement of order on lowest bidder-2 (L-2) if the L-1 backs out.

“Other enabling measures are exemption of bid security and performance security up to Rs 10 lakh, no negotiations for commercial off-the-shelf items and services wherever price discovery happens through market forces,” said an officer.

The liquidated damages (LD) rate for development contracts has also been reduced in the manual, while the delivery period extension process has been simplified for faster decision making. “Many of the internal procedures have also been further simplified for faster engagement with industry,” he added.

<https://timesofindia.indiatimes.com/india/new-drdo-procurement-manual-to-boost-domestic-industry-participation/articleshow/78780446.cms>



Rajnath Singh

Anti-tank missile with 10km range to be tested in 2 months

The indigenous missile -- named stand-off anti-tank missile (Sant) -- is expected to be mated to the Indian Air Force's Russian-origin Mi-35 attack helicopters to arm them with the capability to destroy enemy armour from an improved stand-off range, one of the officials cited above said, asking not to be named

By Rahul Singh

New Delhi: India is developing a new air-launched missile capable of knocking out enemy tanks from a stand-off distance of more than 10km, and a crucial test of the weapon will be conducted in two months at a time when the country is locked in border tensions with China in the Ladakh theatre, top officials familiar with the developments said on Wednesday.

The indigenous missile -- named stand-off anti-tank missile (Sant) -- is expected to be mated to the Indian Air Force's Russian-origin Mi-35 attack helicopters to arm them with the capability to destroy enemy armour from an improved stand-off range, one of the officials cited above said, asking not to be named.

The existing Russian-origin Shturm missile on the Mi-35 can target tanks at a range of 5km. The other weapons on the gunship include rockets of different calibre, 500kg bombs, 12.7mm guns, and a 23mm cannon.

Sant -- being developed by the Defence Research and Development Organisation (DRDO) -- will be launched from a Mi-35 helicopter gunship for the first time in December, in what is being seen as a developmental milestone.

"Preparations are being made for the maiden test-firing of the missile from a Mi-35 gunship. A series of air-launched tests will follow next year after which the missile will be ready for induction," said a second official on condition of anonymity, adding that the missile will have lock-on after launch and lock-on before launch capability. A lock-on means the target has been detected and the missile will hit it irrespective of any change in the target's position.

The plan is to test the new missile from the attack helicopter eight to 10 times before it is declared operational by the end of 2021, the second official said.

"An improved stand-off capability -- from 5km to 10km -- to target tanks will be a good capability enhancement for the Mi-35. If the helicopter can engage enemy armour from a distance of 10km, it is unlikely to take a hit from ground fire," said former IAF chief Air Chief Marshal Fali H Major (retd).

The existing anti-tank missiles developed by DRDO -- the Nag and Helina -- have an effective range of under 5km. While the Nag missile is launched from a modified infantry combat vehicle (called the Nag missile carrier or Namica) and has a range of 4km, the Helina or helicopter-based Nag is for mounting on the Dhruv advanced light helicopter and can strike targets up to 5km away.

The Sant missile was successfully tested from a ground launcher on Monday off the coast of Odisha -- the 13th test-firing of a missile by India in less than two months in the midst of the border stand-off with China and deadlocked talks to reduce tensions along the contested Line of Actual Control (LAC). Neither the defence ministry nor DRDO made any public announcement on the October 19 test.

The key tests recently conducted by India include the supersonic missile-assisted release of torpedo (SMART) to target submarines at long ranges, a new version of the nuclear-capable hypersonic Shaurya missile with a range of 750km and the anti-radiation missile launch to take down enemy radars and surveillance systems.

India is also developing a new class of ultra-modern weapons that can travel six times faster than the speed of sound (Mach 6) and penetrate any missile defence. In early September, DRDO carried out a successful flight test of the hypersonic technology demonstrator vehicle (HSTDV) for the first time from a launch facility off the Odisha coast.

Only the United States, Russia and China have developed technologies to field fast-maneuvring hypersonic missiles that fly at lower altitudes and are extremely hard to track and intercept.

India could develop hypersonic cruise missiles powered by air-breathing scramjet engines in about four years. Mach 6 translates into a speed of 7,408 kmph.

<https://www.hindustantimes.com/india-news/anti-tank-missile-with-10km-range-to-be-tested-in-2-months/story-Lrc3BOKUNxX1tjtRwg8ckJ.html>



Thu, 22 Oct 2020

Explained: Why DRDO has conducted a flurry of missile tests

A look at what goes into conducting missile tests, what it means in terms of strategic posturing in the context of the stand-off with China along the LAC, and how COVID-19 restrictions have played a role in it

By Sushant Kulkarni

Pune: Over the last one and half months, the Defence Research and Development Organisation (DRDO) has conducted at least 12 tests of missiles or systems for missiles belonging to a vast spectrum of ranges and purposes. Some more tests are said to be in the pipeline. These tests have taken place at the time when there is an ongoing stand-off between the Indian and Chinese forces along the Line of Actual Control (LAC) in the Ladakh region.

A look at arguably one of the most action packed times for the DRDO, what goes into conducting these tests, what it means in terms of strategic posturing in the context of the stand-off along the LAC, and how COVID-19 restrictions played a role in it.

What are the various tests that the DRDO conducted recently?

On September 7, the DRDO successfully flight tested the Hypersonic Technology Demonstrator Vehicle (HSTDV), which is an unmanned scramjet vehicle with a capability to travel at six times the speed of sound. The flight test of the vehicle is looked at as a boost to the development of the systems built with hypersonic vehicles including both offensive and defensive hypersonic cruise missiles and also in the space sector. The test was conducted at the Dr APJ Abdul Kalam Launch Complex at Wheeler Island, off the coast of Odisha.

On September 22, a flight test of Abhyas, a High-speed Expendable Aerial Target (HEAT), was conducted from the Integrated Test Range (ITR) Balasore in Odisha when two demonstrator vehicles were test flown. Abhyas has been developed to be used as a target for evaluation of various missile systems.

In another test on September 22, the Laser-Guided Anti Tank Guided Missile (ATGM) was test fired from Main Battle Tank (MBT) Arjun at a field range in Maharashtra where it hit a target at a



DRDO conducts flight-tests of the indigenously-designed Abhyas High-speed Expendable Aerial Target (HEAT) in Balasore. (Source: drdo.gov.in)

3-km range. The test was repeated for a slightly longer range on October 1. Laser Guided ATGM is a boost to the Armoured Warfare capabilities.

On September 24, a successful night flight test of nuclear capable Prithvi-II missile with a range of around 400 kilometres was tested at the ITR. The test was executed by the Strategic Forces Command of India and monitored by the DRDO and other defence forces.

On September 30, BrahMos surface-to-surface supersonic Land-Attack Cruise Missile (LACM) featuring an indigenous booster and airframe section along with many other 'Made in India' sub-systems was flight tested from ITR. On October 17, the Naval version of the BrahMos was successfully test fired from Indian Navy's indigenously-built stealth destroyer INS Chennai, hitting a target in the Arabian Sea.

On October 3, DRDO tested another nuclear capable missile Shaurya, which is a land-based version of the Submarine Launched Ballistic Missile Sagarika or K-15 with a range of around 800 km.

On October 5, DRDO tested the Supersonic Missile Assisted Release of Torpedo (SMART) system. It's an indigenously developed mechanism by which the torpedo is launched from an existing supersonic missile system — by making complex modifications — which takes the torpedo to a much longer range than its own.

On October 9, India's first indigenous anti-radiation missile named Rudram, developed for the Air Force (IAF), was successfully flight tested from a Sukhoi-30 MKI fighter jet off the east coast.

After the series of successful trials, a flight test of intermediate range cruise missile on October 12, reported a snag and had to be aborted.

On October 19, the DRDO conducted a test of Stand-Off Anti Tank Missile (SANT) off the coast of Odisha.

What goes behind these tests?

Senior DRDO scientists whom *The Indian Express* spoke with have said this is arguably one of the highest numbers of tests in such a short span. A large spectrum of missiles of different purposes, types, ranges are currently being developed primarily for the three armed forces. Some of the systems are at their various stages of development where they undergo development trials, validation trials, user trials etc. Some others have been already inducted and undergoing upgrades or are tested for different parameters.

A senior DRDO scientist, who has been part of such development projects, said the development of missiles, of any range, is a very complex and elaborate process. Even before the firing tests, the numerous sub systems have to be tested separately, he said, adding there are failures and snags on the way. "The warheads, flight systems, guidance systems, softwares, electronics, communication systems, high energy fuels, various motors, stage separators in multi-stage missiles, all have to be tested. There are Standard Operating Procedures in place. In almost all the cases, missiles are developed in collaboration with various DRDO facilities. There are course corrections, user feedback that have to be incorporated."

Another scientist said the tests are part of a well-charted development process and most planned well in advance. "For these tests, particularly ones with long range systems, multiple clearances are required including those from the Ministry of Defence, Ministry of External Affairs and PMO. A Notice to Airmen — NOTAM is issued by the Airport Authority of India for the flight path of projectiles. In many cases, one more armed forces or the Strategic Forces Command are part of the tests. In the case of tests that are conducted off the coast, the Navy and Coast Guard are involved in the process," he explained.

Reasons behind series of tests and the strategic posturing

Senior DRDO office-bearers say the timing of this tests series is significant considering the present stand-off with China. However, one key reason behind so many tests being done back to back is the fact many of these tests, scheduled for earlier this year, had to be put on hold due to COVID restrictions, while preparations for them were all in place.

“Because of the COVID lockdown, the movement of Scientists from various DRDO facilities for the purposes of tests were put on hold even though these facilities were functioning as per the norms laid down from time to time. In the initial COVID period, we all were a little apprehensive of what was going to happen. But as the time passed, we all got used to the new normal. As the easing of travel restrictions started, the tests got the required push. In many cases, we were 80 to 90 per cent ready, just a go-ahead was needed.” said a senior DRDO scientist.

The missiles tested during this period are crucial for land attack capability and some for Air and maritime security and testing them is a strong signal. At a time when there is a stand off with China which also has rising interests in the strategically crucial Indian Ocean Region, strategic signalling of this volume ‘can not happen without a deliberate push from the government even if the COVID factor is considered’ said a senior scientist. Officials said some more tests of the strategically important weapons systems are in the pipeline for at least a month ahead.

<https://indianexpress.com/article/explained/drdo-missile-tests-india-china-border-dispute-coronavirus-6821114/>



Thu, 22 Oct 2020

Offset policy: Changed for the worse

By Priyan R Naik

A key financial tool that encourages indigenous manufacture in the defence sector was removed in the new Defence Acquisition Procedure (DAP), 2020. Henceforth, in the case of Government-to-Government (G2G) or Inter-Government Agreements (IGA) or ab-initio single vendor situations, the vendor would not have to discharge any offset obligation.

That India has the dubious distinction of being the world’s second-biggest importer of military hardware, only behind Saudi Arabia, is well known. To neutralise this, the defence offset policy, first made in 2005, introduced an ‘offset’ clause for foreign companies that won defence deals. They would need to invest a part of the contract value in the country, thereby developing skills, bringing in technology and generating employment in India. The offset obligation was meant to boost India’s domestic defence industry and help the country gain in terms of technology.



Representative image/Credit: AFP Photo

Since the last 15 years, this offset policy partially compensated for the huge outflow of India’s resources, facilitated induction of technology and added capabilities and capacities to domestic industry whenever the foreign supplier made reverse purchases of Indian goods, invested in local industry or in India’s R&D. This is not unique to India, most defence buyers the world over leverage their buying power by contracting a vendor to discharge offset obligations to augment the purchasing country’s capacity for research, design and development of military products and services and even of aerospace and internal security industries.

The foreign vendor has multiple avenues to fulfill his offset obligations. The supplier may directly buy eligible products or services from an Indian enterprise, bring in FDI in joint ventures with Indian enterprises, invest in providing transfer of technology (TOT) to Indian enterprises, or assist in technology acquisition by the Defence Research and Development Organisation (DRDO) in areas of high technology. The Defence Procurement Procedure also provides for offset banking and multipliers. The vendor could bank “offset credits” or take an MSME unit as an “Indian Offset

Partner” and get his credit multiplied by 1.5 times or even up to four times where DRDO is the beneficiary.

So, why did the government remove this obligation for G2G, IGA and single vendor categories? The government belatedly discovered that vendors would load the contract with an extra cost to pay for the offset obligation. Further, “administrative costs” had to be incurred in implementing the offset obligations. Furthermore, the CAG has criticized the failure to implement the offset policy. Apparently only 59% of the offset obligations had been discharged by the target dates, and there was little hope of other obligations being met by the contracted date. Apparently, foreign vendors made offset commitments to qualify for the supply contract but were never really earnest about fulfilling their commitments.

Offsets are, unfortunately, made for controversy – they allegedly distort trade, are non-transparent and riddled with corruption. Nevertheless, they are increasingly adopted in defence purchases. The offset clause in the contract for the 36 Rafale fighter jets, an IGA, for example, was signed between the Indian and French governments in 2016, with 50% of contract value to be offset and executed by the French company Dassault Aviation and its partners. Political controversy arose over their choice of the main Indian Offset Partner and the non-transparent arrangements for the discharge of offset obligations. Waivers with respect to arbitration and access to books of accounts of the industrial suppliers were sanctioned at the highest level. Obligations were heavily loaded on to the last two years of a seven-year period.

Despite these concessions, Dassault Aviation and missile-maker MBDA have not progressed on transfer of technology to DRDO under the offset clause. Of the new technologies desired by DRDO and to be obtained from the firms under the offset obligations, the vendors did not agree to transfer a majority of them, claiming that they were not within the vendor’s core competence.

A country with a huge military hardware requirement needs offset policies to empower the Indian domestic industry and through the “Make in India” initiative, to turn India’s defence production clusters into global manufacturing hubs. If offset clause result in controversy or the vendor is lax, or an auditor criticises the performance of the policy, the logical solution for defence ministry mandarins is to demonstrate intellectual heft, universalise credit multipliers, give additional incentives for offset discharge, even use the Ministry of External Affairs to convince the foreign government concerned to make G2G concessions. It is very naive to remove the offset clause itself and expect a vendor to reduce costs! Hopefully, this will not be a prelude to further dilutions of offset obligations for other categories of defence deals as well.

An offset clause serves the purposes of boosting India’s defence manufacturing ecosystem, providing technological inputs and contributing to uplifting the country’s private defence industry, DRDO, defence PSUs and the Ordnance Factories. Isn’t this critical to ushering in Atmanirbhar Bharat?

(The writer is a former Executive Director on the Board of BEML)

<https://www.deccanherald.com/opinion/in-perspective/offset-policy-changed-for-the-worse-905366.html>

THE ECONOMIC TIMES

Thu, 22 Oct 2020

Indian soldiers have done 'miraculous job' on China border: Rajnath Singh

Synopsis

Addressing an election rally here, the senior BJP leader also said he salutes mothers of the Bihar Regiment bravehearts who sacrificed their lives during a violent standoff with Chinese soldiers at the Galwan Valley.

Barhara (Bihar): Defence Minister Rajnath Singh on Wednesday said Indian soldiers have done a "miraculous job" in their standoff with the Chinese troops along the LAC in Ladakh and asserted that no power can capture even an inch of Indian land under Prime Minister Narendra Modi's strong leadership.

Referring to the situation along the Line of Actual Control in eastern Ladakh, Singh said he cannot divulge operational details of the Indian Army's actions there, but asserted that people will not just clap but start jumping with joy if they get to know about their valour.

Addressing an election rally here, the senior BJP leader also said he salutes mothers of the Bihar Regiment bravehearts who sacrificed their lives during a violent standoff with Chinese soldiers at the Galwan Valley in eastern Ladakh along the Line of Actual Control (LAC).

"I salute and bow in front of the mothers of bravehearts of Galwan valley who not only made the Bihar but the entire country proud," Singh said.

He further said, "I want to assure you that no power can take an inch of our land under the strong leadership of Prime Minister Narendra Modi. I can't divulge details about the situation there and what our soldiers have done, but if you get to know about that, you all wouldn't not only clap, but start jumping with joy. They have done such a miraculous job," Singh said.

"Let's give a standing ovation to all our soldiers for their miraculous job," Singh told the audience.

He also attacked Congress and the opposition party leader Rahul Gandhi on the China issue, saying that they should introspect on the records of their own governments in the past before making tall claims that a Congress government could have pushed out Chinese soldiers within two or three days.

"I don't want to say anything, but what did happen in 1962. I don't want to make any disclosure about the then prime minister, but I want to tell the youth of the country that they should read the history of 1962 and the time after that. I don't want to take the support of the people by telling any lies," Singh said.

Singh said it is unfortunate that the opposition party is spreading lies and indulging in propaganda on the issue of standoff at the LAC.



"Opposition is running a propaganda on this issue. Rather than doing politics by misguiding people, Rahul Gandhi should do politics by looking into their eyes and speaking truth," Singh said.

He said credibility is the most essential asset in politics.

Singh is scheduled to address at least 18 rallies in Bihar in six days spanning over all three phases of the assembly elections.

Polls for the 243-member Bihar assembly will be held in three phases -- October 28, November 3 and November 7 -- and the counting of votes will take place on November 10.

The BJP-JD(U) combine is pitted against the grand alliance of the RJD, the Congress and Left parties. Some other smaller parties are also in the fray.

<https://economictimes.indiatimes.com/news/defence/indian-soldiers-have-done-miraculous-job-on-china-border-rajnath-singh/articleshow/78790228.cms>



Thu, 22 Oct 2020

Integration of armed forces is inevitable, says Army Chief MM Naravane

The Army said in a statement that General Naravane "spoke on a number of issues concerning integration, theaterisation and modernisation of the armed forces in general and the Indian Army in particular"

New Delhi: Addressing the officers of the Higher Defence Management Command at the College of Defence Management (CDM), Army Chief General M M Naravane called the creation of the Department of Military Affairs (DMA) and appointment of the Chief of Defence Staff (CDS) a "momentous" decision and said the next logical step would be the creation of integrated theatre commands.

The Army said in a statement that General Naravane "spoke on a number of issues concerning integration, theaterisation and modernisation of the armed forces in general and the Indian Army in particular".

According to the statement, he called the government's decision to appoint the CDS and create the DMA "momentous" and said the services needed to "demonstrate great wisdom and statesmanship in enabling the CDS, a long-standing demand of the Armed Forces".



Army Chief General M M Naravane. (Express Photo: Tashi Tobgyal)

Naravane said the next logical step in the process of defence reforms was the "formation of Integrated Theatre Commands to synergise the capabilities and combat potential of the three services during war and peace" and advised that this process will be "deliberate, thoughtful and well considered" and its fruition will take a "number of years".

The statement mentioned that he said there was a need for everyone to work in a spirit of togetherness and trust with the national security interests being paramount, and cautioned that there might be a requirement for "mid-course corrections".

Sounding an optimistic note about the future of integration of the armed forces, the statement said, he called it an "inevitability" as it would lead to "tri-services synergy" and optimisation of resources. The Army Chief also spoke about the current security scenario and focused on the geo-strategic implications on capability development and force utilisation of the Army in pursuit of national interests, the statement said.

The Army Chief visited the Bison Division in Secunderabad and was briefed by Major General Alok Joshi, General Officer Commanding, Bison Division on security and operational preparedness of the formation.

He “commended the formation for their high level of operational preparedness and exhorted all ranks to continue training hard”.

<https://indianexpress.com/article/india/integration-of-armed-forces-is-inevitable-says-army-chief-mm-naravane-6825479/>

Outlook

Thu, 22 Oct 2020

Theaterisation of armed forces next logical step in military reforms after appointment of CDS: Army Chief

New Delhi: Setting up of integrated theatre commands to synergise the capabilities of the three services would be the next logical move in military reforms after the "momentous" step of appointment of the Chief of Defence Staff (CDS), Army Chief Gen MM Naravane said on Wednesday.

Asserting that the process to set up the theatre commands will be "deliberate, thoughtful and well considered", Gen Naravane said its fruition will take a "number of years."

Speaking at an event at the College of Defence Management in Secunderabad, the chief of the 1.3 million-strong Indian Army said there was a need for everyone to work in a spirit of togetherness and trust with the national security interests being of paramount importance.

He also added a note of caution and said that there might be a requirement for "mid course corrections," according to a release by the army here.

The comments by the army chief comes at a time India has been adopting a "unified" military approach in eastern Ladakh to deal with the border row with China with the Indian Air Force working in tandem with the army to bolster the combat capability in the high-altitude region.

Gen Naravane spoke on a number of issues concerning integration, theaterisation and modernisation of the armed forces in general and the Indian Army in particular.

He said he was optimistic about the future of integration of the armed forces, which he said was "an inevitability" as it would lead to "tri-services synergy" and optimisation of resources.

The remarks by the army chief reflected the thinking as well as readiness of the force to support the mega theaterisation plan being undertaken by Chief of Defence Staff Gen Bipin Rawat to enhance combat capabilities of the armed forces.

Referring to the appointment of the CDS, the army chief said it was "a momentous one" and that the services needed to "demonstrate great wisdom and statesmanship" in enabling the CDS, a long standing demand of the armed forces.

"The next logical step in the process of defence reforms was the "formation of Integrated Theatre Commands to synergise the capabilities and combat potential of the three services during war and peace", the army chief was quoted as saying in the release.

Gen Naravane also spoke about the current security scenario and focused on the geo-strategic implications on capability development of the Indian Army.

The government appointed Gen Rawat as CDS on December 31 to bring in convergence among the three services and restructure military commands to effectively deal with future security challenges.

Theaterisation means putting specific number of personnel from the three services —army, navy and air force— under a common commander for a unified military approach through rationalisation of manpower and resources.

As per plan, each of the theatre commands will have units of the army, the navy and the air force, and all of them will work as a single entity looking after security challenges in a specified geographical territory under an operational commander. At present, these forces have separate commands.

In February, the CDS had said that the air defence command, to be helmed by the Indian Air Force, would be rolled out by the beginning of next year.

He had also said the proposed peninsula command, to be formed by merging the Indian Navy's eastern and western commands, is likely to take shape by the end of 2021.

During his visit to Secunderabad, Gen Naravane also visited the Bison division where he was briefed by top commanders on security and operational preparedness of the formation.

The army chief commended the formation for their high level of operational preparedness and exhorted all ranks to continue training hard with zeal and be prepared for any future operational challenges, the Army said.

He also visited the TATA Boeing Aerospace Limited (TBAL) at Hyderabad which is a joint venture facility of Boeing and Tata Advanced Systems.

(Disclaimer: This story has not been edited by Outlook staff and is auto-generated from news agency feeds. Source: PTI)

<https://www.outlookindia.com/newscroll/theaterisation-of-armed-forces-next-logical-step-in-military-reforms-after-appointment-of-cds-army-chief/1959807>



Thu, 22 Oct 2020

Indian Army more experienced at higher altitudes than PLA: Lt Gen Hooda

Was speaking during a virtual meet on “The future of Indo-China Relations” organised by Chandigarh University, Gharuan

Chandigarh: During a virtual meet on “The future of Indo-China Relations” organised by Chandigarh University, Gharuan, on Wednesday, Lt General Deependra Singh Hooda (retired) said the Indian Army has more experience operating at higher altitudes than the People’s Liberation Army (PLA) of China.

Hooda, former General officer commanding-in-Chief of the Indian Army’s northern command, said, “Both India and China have deployed huge number of army personnel who are prepared for long term eyeball to eyeball situation. But, the Indian Army has a tactical advantage, as they have been operating at higher altitudes and hilly terrains in harsh winters for a long time.”

“Although a series of military, diplomatic and ministerial level talks have taken place between the two countries, PLA has refused to disengage at ground level and maintain status-quo at Line-of-Actual Control (LAC). Both nuclear powers cannot afford to have a full-fledged war,” he added

The virtual meet was also attended by national security experts and senior administrative officials of the Punjab Government.

Bharat Karnad, national security expert and emeritus professor,



Lt General Deependra Singh Hooda

centre for policy research, said, "India needs to increase its defence spending as the gap between China and India's defence budget will touch \$500 billion by 2030 as per studies."

Rahul Bhandari, secretary of higher education, water resources, mines and geology, government of Punjab, said, "Currently, there is huge trade imbalance between India and China which can be ascertained from the fact that Chinese products have 2.7% penetration in Indian markets while Indian goods have merely 0.1% penetration in China. 68% of pharmaceutical formulations and 90% of antibiotic medicines in India are currently being sourced from China."

<https://www.hindustantimes.com/chandigarh/indian-army-more-experienced-at-higher-altitudes-than-pla-lt-gen-hooda/story-rJf7gyYMxYEDh0In6Lke9N.html>



Thu, 22 Oct 2020

Army Chief to commission four indigenously built INS Kavaratti tomorrow

Indian Army Chief General MM Naravane will commission the last of four indigenously built Anti-Submarine Warfare (ASW) stealth corvettes INS Kavaratti under Project 28 in Vishakhapatnam on Thursday

New Delhi: Indian Army Chief General MM Naravane will commission the last of four indigenously built Anti-Submarine Warfare (ASW) stealth corvettes INS Kavaratti under Project 28 in Vishakhapatnam on Thursday. According to official release, "The last of four indigenously built Anti-Submarine Warfare (ASW) stealth corvettes INS Kavaratti under Project 28 (Kamorta class) is scheduled to be commissioned into the Indian Navy by General Manoj Mukund Naravane, PVSM, AVSM, SM, VSM, ADC, Chief of the Army Staff at Naval Dockyard, Visakhapatnam on Thursday."

Kavaratti has a state-of-the-art weapons and sensor suite capable of detecting and prosecuting submarines. In addition to its anti-submarine warfare capability, the ship also has a credible self-defence capability and good endurance for long-range deployments. "INS Kavaratti is indigenously designed by the Indian Navy's in-house organisation, Directorate of Naval Design(DND), and built by Garden Reach Shipbuilders and Engineers (GRSE), Kolkata and has been touted as a potent Stealth ASW Corvette," it added.

The ship will be commissioned into the Navy as a combat-ready platform as the ship and has completed sea trials of all the systems fitted onboard. Kavaratti takes her name from erstwhile INS Kavaratti which was an Arnala class missile corvette. The older Kavaratti distinguished herself by operating in Bangladesh's liberation war in 1971. (ANI)

<https://www.devdiscourse.com/article/law-order/1269849-third-kisan-rail-leaves-andhra-pradesh-for-new-delhi>



Indian Army Chief General MM Naravane.
Image Credit: ANI

दुश्मनों को मिलेगा करारा जवाब, आईएनएस कावारत्ती आज नौसेना के बेड़े में होगा शामिल, जानें इसकी खूबियां

सेना प्रमुख (Indian Army Chief) जनरल मनोज मुकुंद नरवाने (General MM Naravane) बारूदी सुरंग रोधी प्रणाली से लैस स्वदेशी स्टील्थ युद्धपोत आईएनएस कवराती (INS Kavaratti) को गुरुवार को नौसेना के बेड़े में शामिल करेंगे। यह बेहद खतरनाक युद्धपोत प्रोजेक्ट 28 के तहत निर्मित हुआ है।

By Krishan Bihari Singh

नई दिल्ली: सेना प्रमुख (Indian Army Chief) जनरल मनोज मुकुंद नरवाने (General MM Naravane) बारूदी सुरंग रोधी प्रणाली से लैस स्वदेशी स्टील्थ युद्धपोत आईएनएस कावारत्ती (INS Kavaratti) को गुरुवार को नौसेना के बेड़े में शामिल करेंगे। यह बेहद खतरनाक युद्धपोत प्रोजेक्ट 28 के तहत निर्मित हुआ है। इसका निर्माण आत्मनिर्भर भारत की दिशा में एक अभूतपूर्व कदम है... साथ ही देश की बढ़ती नौसैन्य क्षमता का भी प्रतीक है।

समाचार एजेंसी पीटीआई के मुताबिक, पोत को भारतीय नौसेना के संगठन डायरेक्टोरेट ऑफ नेवल डीजाइन ने डिजाइन किया है। यही नहीं इसे कोलकाता के गार्डन रीच शिपबिल्डर्स एंड इंजीनियर्स ने बनाया है। नौसेना अधिकारियों ने बताया कि आईएनएस कवराती में अत्याधुनिक हथियार प्रणाली है। इस युद्धपोत में ऐसे सेंसर लगे हैं जो पनडुब्बियों का पता लगाने और उनका पीछा करने में सक्षम हैं।

प्राप्त जानकारी के मुताबिक, इस युद्धपोत में इस्तेमाल की गई 90 फीसद चीजें स्वदेशी हैं। यह अत्याधुनिक सेंसर और हथियारों से लैस है। यह समुद्री सुरंगों का पता लगाने और उन्हें विफल करने में सक्षम है। आईएनएस कवराती के शामिल होने से भारत की समुद्री ताकत को बढ़ावा मिलेगा। साल 2017 में तत्कालीन केंद्रीय रक्षा मंत्री निर्मला सीतारमण ने विशाखापत्तनम के नौसेना डॉकयार्ड में चार स्वदेशी निर्मित एंटी-सबमरीन वारफेयर में से तीसरे आईएनएस किल्लान को कमीशन किया था।

कोलकाता स्थित जीआरएसई ने प्रोजेक्ट 28 के तहत चार पनडुब्बी रोधी टोही युद्धपोत (एसडब्ल्यूसी) की श्रृंखला में अंतिम युद्धपोत कवराती का निर्माण किया है। इससे पहले श्रृंखला के तीन युद्धपोतों की आपूर्ति की जा चुकी है जो भारतीय नौसेना के ईस्टर्न फ्लीट का हिस्सा हैं। प्रोजेक्ट 28 को 2003 में मंजूरी दी गयी थी। युद्धपोत कावारत्ती प्रोजेक्ट 28 के तहत निर्मित भारतीय नौसेना का एक पनडुब्बी रोधी जहाज है।

इस युद्धपोत का नाम केंद्रशासित प्रदेश लक्षद्वीप की राजधानी कवराती के नाम पर रखा गया है। इसके INS कावारत्ती का उत्तराधिकारी कहा जा रहा है। INS कवराती ने ऑपरेशन ट्राइडेंट में भी हिस्सा लिया था। इसको 1986 में डिकमीशन कर दिया गया था। यह परमाणु, जैविक और रासायनिक वातावरण में लड़ने में सक्षम है। यह देश का पहला युद्धपोत है जिसको कार्बन फाइबर कंपोजिट सामग्री का इस्तेमाल करके बनाया गया है। इस पर 3300 टन की सामग्री ले जाई जा सकती है।

<https://www.jagran.com/news/national-indian-army-chief-general-mm-naravane-to-commission-ins-kavaratti-in-vishakhapatnam-tomorrow-20924019.html>

Kalaikunda airbase to play vital role in eastern theatre airspace

n the wake of the IndoChina conflict, the Eastern Theatre is increasing its operational preparedness

By Soumyadip Mullick

Kolkata: What was set up during World War II and designed to serve as an airbase for the B-24 Liberator American heavyweight bombers, the Kalaikunda airbase in West Bengal will play a key role in thwarting possible attacks by China in the Eastern Theatre airspace of the Indian Air Force (IAF).

Located few kilometres from Kolkata, the airbase served as a major airfield in the supply route for the nationalist Army of China in its fight against the Japanese forces.

Aircraft of both the US Air Force and Royal Air Force flew regularly to China via Chabua, Jorhat and Vijaynagar across the Hump route over Arunachal Pradesh and East Tibet.

In the wake of the IndoChina conflict, the Eastern Theatre is increasing its operational preparedness.

“Kalaikunda will play a key role in air operations during a conflict in the Eastern Theatre. It has excellent infrastructure to house several operational units, especially fighter aircraft. It is located far from the border and hence enjoys ‘defence-indepth’. It is currently used for training with friendly air forces from across the world, besides fighter flying training for newly inducted combat pilots, as well as armament training for fighter fleets”, the former IAF chief Arup Raha told The Statesman.

“The IAF has a large number of air bases in the Eastern Theatre including Kalaikunda, Panagarh, Bagdogra and Hashimara in West Bengal. Civil aviation airports like Kolkata, Patna, Guwahati etc. would be available for air operations by IAF should the need arise, providing dispersal and flexibility in deployment of air assets” said the former IAF Chief.

IAF sources highlighted that Kalaikunda’s finest moment came in 1971 IndoPak war where it survived two air raids by the Pakistan Air Force. An IAF Hunter aircraft shot down an F-86 Sabre of PAF.

The Kalaikunda base was then home to Gnats, Vampires and Canberra aircraft and later housed the MiG-27 squadrons. Commenting on whether the IAF should now base fighter squadrons in Kalaikunda, Air Chief Marshal Raha (retd.) said, “It is not necessary to permanently deploy several fighter squadrons in a base during peacetime. In a conflict situation, combat force levels are enhanced based on the need since rapid deployment of combat assets from one theatre to another is an intrinsic characteristic of air power. Obviously, Kalaikunda is expected to be augmented with additional fighters and combat assets during a war-fighting contingency.”

<https://www.thestatesman.com/bengal/kalaikunda-airbase-to-play-vital-role-in-eastern-theatre-airspace-1502930759.html>



(Representational Image: iStock)

Thu, 22 Oct 2020

India and Sri Lanka complete bilateral Naval exercise

The latest iteration comes amid Indian concerns around Chinese naval presence in the Indian Ocean – and China’s foothold in Sri Lanka

By Abhijnan Rej

India and Sri Lanka concluded the latest iteration of their three-day naval exercise on October 21. The eighth edition of the bilateral SLINEX was held this year off the coast of Trincomalee, Sri Lanka. An Indian defense ministry statement notes that Sri Lanka fielded an offshore patrol vessel and a training ship, while India brought two indigenously built corvettes, INS Kamorta and Kiltan, along with onboard helicopters, and a Dornier 228 short-range maritime reconnaissance aircraft, also built in India, to the exercise. The statement went on to add that “SLINEX-20 aims to enhance inter-operability, improve mutual understanding and exchange *best practices and procedures for multi-faceted maritime operations between both navies* [emphasis in original].”

The INS Kamorta, inducted by the Indian Navy in 2014, and the Kamorta-class Kiltan, in the navy’s service since 2017, are anti-submarine warfare (ASW) corvettes. But they can also be used for anti-surface and anti-air warfare missions. Previously in The Diplomat, Franz-Stefan Gady had noted that:

[Kiltan] has been fitted with a modern 16-cell vertical launching system (VLS) for firing Barak surface-to-air missiles or locally produced long-range surface-to-air missiles system (LRSAM). The INS Kiltan also features four heavyweight torpedo tube launchers, a pair of 12-barreled RBU6000 rocket depth-charge launchers, and a 76-millimeter medium range gun, as well as two multi-barrel 30 mm guns as close-in-weapon system (CIWS).



INS Kamorta during trials at sea

Last year, SLINEX was held off the coast of Vishakhapatnam, India. During that exercise, India had fielded INS Khukri and Sumedha along with accompanying helicopters. While missile corvette Khukri ostensibly has an ASW role, unlike Kamorta and Kiltan, it does not possess torpedo tube launchers or sonars; Sumedha is an offshore patrol vessel.

The Indian navy in 2018 had announced that the Kamorta-class corvettes would be fitted with imported low frequency Active Towed Array Sonar (ACTAS) systems, making them true ASW platforms.

The latest edition of SLINEX – and India’s fielding of two ASW corvettes, albeit in other roles – comes amid growing concern over China’s naval forays in the Indian Ocean. In particular, the People’s Liberation Army Navy’s submarine activity in Indian Ocean has considerably increased in the recent past, leading India to redouble on its ASW efforts. In 2014, Sri Lanka allowed two Chinese submarines to dock in the Colombo port, setting off alarm bells in New Delhi. At that time, current Sri Lankan Prime Minister Mahinda Rajapaksa was the president of that country. Sri Lanka also leased the Hambantota port to China in 2017, a move many in India and the U.S. maintain has strategic consequences given the dual use potential of the facility.

Since coming back to power in 2019, the Rajapaksa brothers (the current president is Mahinda’s younger brother, Gotabaya) have attempted to recalibrate their country’s relations with India. New Delhi, on its part, considers Sri Lanka an integral component of Prime Minister Narendra Modi’s counter-China Security and Growth for All in the Region (SAGAR) initiative.

“Interaction between the SLN [Sri Lankan Navy] and IN [Indian Navy] has also grown significantly in recent years, in consonance with India’s policy of ‘Neighbourhood First’ and Hon’ble PM’s vision of ‘Security and Growth for all in the Region (SAGAR)’,” the Indian defense ministry statement announcing SLINEX-20 noted.

The United States too seeks to rope Sri Lanka in for its Free and Open Indo-Pacific Strategy. Secretary of State Michael Pompeo is scheduled to visit Colombo next week as a side-trip to his India tour. The U.S. and Sri Lanka have a military-logistics Acquisition and Cross-Servicing Agreement in place since 2007 and both countries are negotiating a new Status of Forces Agreement (which is, however, unlikely to be finalized any time soon).

Last April the U.S and Sri Lankan navies carried out a week-long joint exercise off the China-controlled Hambantota port; the U.S. fielded a guided-missile destroyer, an expeditionary fast transport ship – and a submarine hunting P-8A maritime surveillance aircraft. The exercise was part of the 25th edition of the annual Cooperation Afloat Readiness and Training (CARAT) exercise the U.S. holds with nine countries in Southeast and South Asia. Other than a CARAT exercise with Brunei already held earlier this month and two others scheduled, with Bangladesh in November and Singapore in December, all others – including one with Sri Lanka — have been deferred.

<https://thediplomat.com/2020/10/india-and-sri-lanka-complete-bilateral-naval-exercise/>

Science & Technology News



Thu, 22 Oct 2020

ISRO releases draft policy to regulate space communication by private players

Comments on the draft policy have been sought, with the last date of submission being November 4. The policy will come into effect once the Union cabinet clears it

By Anonna Dutt

In line with its mandate to open up the space sector for private players, the Indian Space Research Organisation (ISRO) has released the draft of a new Spacecom Policy 2020 to govern the commercial use of orbital slots, satellites, and ground stations for communication needs. The policy details how private players can get authorisation for setting up new communication satellites and ground stations.

Comments on the draft policy have been sought, with the last date of submission being November 4. The policy will come into effect once the Union cabinet clears it.

Allowing private players in the space communication sector will also enable India to keep pace with the growing demand for satellite-based broadcasting, network connectivity, and global mobile personal communication. This will also establish India as a significant player in the global space communication sector, the document states.

The policy will allow only Indian entities to seek authorisation for orbital slots for new satellites, services based on existing satellites and setting up new ground stations. However, any company sending a communication satellite in space will also be liable for any damages to other objects in space and the environment. To cover this, companies will have to provide a financial guarantee or insurance cover at the time of seeking authorisation from the department of space and later from Indian National Space Promotion and Authorisation Centre (IN-SPACE).

The policy will also protect India's orbital resources or slots. Getting designated orbital slots is a long-drawn process that needs a lot of technical coordination and negotiations with other satellite operators of multiple countries to ensure interference-free operation of all satellites.

The private players will be able to acquire these orbital slots from the department of space PSUs at a cost. However, there is an international time-stipulation for launching a satellite into the designated orbit and continued occupancy is essential. So, to protect the orbital slot, the private companies will have a timeline for operationalising satellites. And, if any company is unable to replace a satellite, the slot will be allocated to another. India has brought in 32 indigenous operational communication satellites since 1980s.

In addition, all existing ISRO -operated satellites—such as INSAT and GSAT—will be handed over to the PSUs, like the New Space India Limited, at “no or notional cost” which can then charge as deemed fit for commercialisation.

“Although I haven't gone through the policy yet, it is a step in the right direction. However, what we really need is a comprehensive space policy that will map out how will the government's announcement of opening up the space sector be actually executed, and the policy and regulatory framework that would be needed. Such a policy will also map out the scientific missions that will be undertaken by ISRO, while leaving the routine missions to the private sector. It should clearly detail the needs of India's space sector and allow for a fair competition for the private space sector to deliver,” said Rajeswari Rajagopalan, head of Nuclear and Space policy at the Observer Research Foundation.

<https://www.hindustantimes.com/india-news/isro-releases-draft-policy-to-regulate-space-communication-by-private-players/story-hcrBIxAKZDFNOdi0y4GatJ.html>



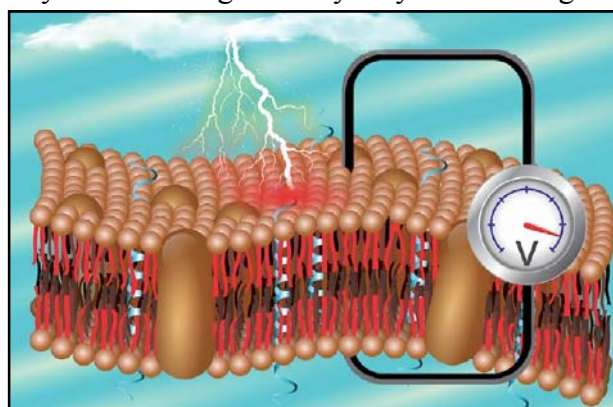
Thu, 22 Oct 2020

Thermal vision of snakes inspires soft pyroelectric materials

Converting heat into electricity is a property thought to be reserved only for stiff materials like crystals. However, researchers—inspired by the infrared (IR) vision of snakes—developed a mathematical model for converting soft, organic structures into so-called "pyroelectric" materials. The study, appearing October 21 in the journal *Matter*, proves that soft and flexible matter can be transformed into a pyroelectric material and potentially solves a long-held mystery surrounding the mechanism of IR vision in snakes.

When a material can convert heat into an electric impulse it is called "pyroelectric," a property typically only found in hard, inflexible substances. The mystery is how IR sensing snakes can achieve this heat-to-electricity conversion despite having naturally soft anatomy.

"People thought we could explain the IR sensing of snakes if there was a hard, pyroelectric material in their pit organ, but nobody ever found one," says Pradeep Sharma, the M.D. Anderson Professor and Chair of Mechanical Engineering at the University of Houston. "So, we wondered whether just as we are trying to make these soft materials pyroelectric, maybe nature is doing the same thing."



An Illustration of a 2D membrane subjected to heat radiation and the consequent change in electrical field across its thickness. Credit: Darbaniyan et al. /*Matter*

Pit vipers and other snakes, like the aliens in the Predator series, are well-known for their heat sensing. In fact, the IR vision of pit vipers is so acutely sensitive that "if an animal appears in pitch black darkness, even for a half a second 40 centimeters away, the pit viper will be able to detect it," Sharma says.

This ability is achieved by a structure called a pit organ—a hollow chamber close to the snake's nostrils containing a thin, flexible membrane. "The pit organ plays an important role in processing heat into a signal they can detect," says Sharma. "However, the missing part of the equation was how the neuron cells within the pit organ membrane convert a heat signature into electricity to create that signal."

Using the physiology of the pit organ membrane as inspiration, Sharma and his team were able to construct a mathematical model to explain how this conversion from heat to electricity could be possible in a soft organic material. "Our solution is deceptively simple," says Sharma. "Apart from more advanced design elements, to make a pyroelectric soft material all you need is to embed static, stable charges into the material and ensure they don't leak out. Then you must make sure the material is soft enough that its capable of large deformation in shape and size and has a sensitivity to temperature. If you do that, they will act pyroelectric, and that's what we've been able prove in our model. And we believe that's what exactly nature is using because this process is simple and robust."

Lab experiments using soft materials have already begun to authenticate the model, though further research is needed to confirm whether this proposed mechanism is taking place in the neuron cells of the snake's pit organ membrane. Earlier work had implicated TRPA1 protein channels located within the membrane's neuron cells as playing an important role; however, the relation of those channels to the proposed mechanism in the paper is yet unknown.

"Using this model, I can confidently create an artificial soft material with pyroelectric properties—of that there is no doubt. And we are fairly confident that we have uncovered at least part of the solution of how these snakes are able to see in the dark, says Sharma. "Now that we've developed the model, other scientists can come forward and start doing the experiments to confirm or deny whether our theory about snake IR sensing is correct."

Next, Sharma wishes to continue his research into soft matter, exploring how to manipulate them to generate electricity solely from a magnetic field. With enough research Sharma hopes to inspire the development of pyro, piezo, and magnetoelectric soft materials, expanding the possibilities of how we generate electricity.

More information: *Matter*, Darbaniyan et al.: "Soft matter mechanics and the mechanisms underpinning the infrared vision of snakes" [www.cell.com/matter/fulltext/S2590-2385\(20\)30521-X](http://www.cell.com/matter/fulltext/S2590-2385(20)30521-X) , DOI: [10.1016/j.matt.2020.09.023](https://doi.org/10.1016/j.matt.2020.09.023)

Journal information: [Matter](https://phys.org/news/2020-10-thermal-vision-snakes-soft-pyroelectric.html)
<https://phys.org/news/2020-10-thermal-vision-snakes-soft-pyroelectric.html>

Magic fibers: A researcher's work to create 'smart fabrics' that can change color

By Emi Endo

Imagine using a cleaning wipe that could detect the presence of a bacteria or pathogen and change to a different color, or an N95 respirator mask that could detect the presence of the novel coronavirus and respond in a way that alerts the wearer, so they would know when they had to change it.

Christina Tang, Ph.D., an assistant professor in the Department of Chemical and Life Science Engineering at Virginia Commonwealth University, is testing new ways to bring these scenarios to life by spinning liquid crystals into fibers that change color at different temperatures.

Tang and students on her Vertically Integrated Projects team have been working on a project with the U.S. Army to make fibers with these seemingly magical—or thermochromic—properties. Instead of a spinning wheel, Tang's lab uses an electrospinning instrument in a process that she compared to making cotton candy. A nozzle generates the material, which is then pulled into a fiber and rolled into sheets.



Credit: Pixabay/CC0 Public Domain

Tang's group is determining how the fiber and liquid crystals can be processed so that a rise or drop in temperature will result in a change "so we can still get color, but then also fundamentally understand how that processing affects the phase change."

These "smart fabrics" are made of soft, lightweight and elastic materials and could be used in clothing such as camouflage or for other applications such as detecting the presence of a pathogen like a virus. They have also been used to create wearable sensors and devices.

Tang works at the nanoscale, where one nanofiber is 1,000 times smaller than the width of a human hair. Her research areas include functional polymer nanomaterials and nanoparticles.

Polymer nanomaterials are made of plastics such as nylon or polyethylene—the same kind of material used to make plastic soda bottles. Tang's lab makes nonwoven nanofibers, similar to a reusable shopping bag, which can be easily mass produced.

"We like to think about how we can add function to these materials," she said.

In the case of the N95 mask, she said, a wearer would know "when you had to change it, instead of just guessing." With the cleaning wipes, "you could keep wiping until it didn't change color anymore."

In her investigation into understanding the fundamental properties of these materials, Tang is testing how to make thermochromic fibers by incorporating liquid crystal formulations into electrospun nanofibers.

Aaron Wimberly, a junior majoring in chemical and life science engineering, began working on the project the summer before his sophomore year.

"When I first came into the lab and Dr. Tang was showing me some of the samples of electrospun woven mats and polymer solutions, it was really, really cool," he said. He has since helped make samples that can change color.

Tang said some researchers in the field focus on liquids while others on polymers. Her approach, at the intersection of the two, applies methods typically used for liquids to these materials.

The liquid crystals, which are in between liquid and solid phases, have the optical property of reflected color—"the same principle that gives butterfly wings their color instead of dyes that absorb color," Tang said.

Provided by [Virginia Commonwealth University](https://phys.org/news/2020-10-magic-fibers-smart-fabrics.html)

<https://phys.org/news/2020-10-magic-fibers-smart-fabrics.html>



Thu, 22 Oct 2020

Reimagining the shape of noise leads to improved molecular models

By Greta Lorge

Tenacity comes naturally to a guy who hails from the "mule capital of the world." That trait has stood Columbia, Tennessee, native Elliot Perryman in good stead as an intern at Lawrence Berkeley National Laboratory (Berkeley Lab). Last fall, he began working with staff scientist Peter Zwart in the Center for Advanced Mathematics for Energy Research Applications (CAMERA) through the Berkeley Lab Undergraduate Research program.

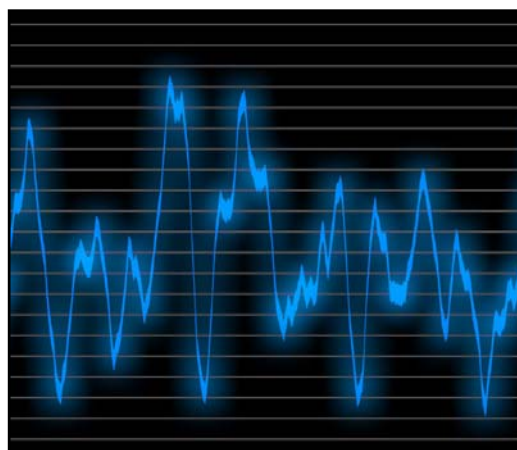
CAMERA aims to identify areas in experimental science that can be aided by new applied mathematical insights. These interdisciplinary researchers develop the necessary algorithmic tools and deliver them as user-friendly software. Zwart put Perryman, a computer science and physics major at the University of Tennessee, on a project he likened to "going around in a dark room trying to find a cat."

The elusive feline in this case was a mathematical problem that has bedeviled the experimental crystallography community for some time: how to model the presence of noise in data in a more realistic way.

Crystallography is an indispensable tool for determining the atomic structures of molecules—which in turn give researchers insights into their behavior and function. When a focused beam of light is aimed at a purified, crystalline sample, the light diffracts off of the atoms and a detector records the diffracted light. As the sample is rotated, two-dimensional images of the diffraction patterns are captured in various orientations. Algorithms are then applied to the diffraction data to reconstruct a three-dimensional map of the arrangement of atoms in the sample.

When you determine, or solve, a structure from diffraction data, you need to relate the model to your observations, explained Zwart, who is part of Berkeley Lab's Molecular Biophysics and Integrating Bioimaging Division. The target functions that are used to do this are called maximum likelihood functions. They work really well if your data are good, he notes, but when the amount of noise in the data increases—which becomes the case at higher resolutions—the current methods are not able to provide the best possible answer.

The reason target functions fall short in such cases is that there is one step in the calculation, an integration, that can't be done analytically—that is to say, with pencil-and-paper math that gives



Credit: CC0 Public Domain

you an expression you can turn into code. Previous attempts to deal with this problem have either simply ignored the integration step, or come up with approximations that only work in experiment- or technique-specific scenarios. So Zwart and Perryman went back to basics, trying a multitude of different machine learning approaches to numerically derive as exact an approximation as possible in the most efficient way.

Three-quarters of the way through Perryman's 16-week internship, the two arrived at the conclusion that most of the paths that had seemed promising at the outset were actually blind alleys. "I would try things and it took a while just to figure out whether something is a success or a failure because, with a totally new problem, you just don't know," said Perryman. Things finally clicked when they realized that a common assumption people have been making for 30 years could be improved upon.

The assumption has to do with the shape of the noise in the data. The widely accepted view has been that experimental errors fall into a classic normal distribution, like the Gaussian bell curve, where nearly 100 percent of observations fall within 3.5 standard deviations. But a more realistic curve has thicker "tails" owing to rare but predictable events. "Including these slightly more realistic error models in crystallographic target functions allows us to model the presence of what normally might be called outliers in a more realistic way," Zwart said.

Their method, which they published in the journal *Acta Crystallographica Section D: Structural Biology*, is broadly applicable across the experimental crystallography field and will enable researchers to make better use of marginal or low-quality diffraction data. This research was supported by National Institutes of Health and CAMERA is funded by the U.S. Department of Energy's Office of Science.

A postdoctoral researcher in Zwart's lab is now working to turn the mathematical concept framework into an application that can eventually be implemented in the Phenix software suite. MBIB Director Paul Adams leads the development of Phenix, a collection of tools for automated structure solution that is widely used by the crystallography community.

"Elliot spent a lot of time and energy on approaches that ultimately did not pan out, but were crucial to the total effort because he was able to learn a lot himself and educate me at the same time," Zwart added. And the experience Perryman gained helped him land a follow-up internship working with Tess Smidt, a postdoc in the Computational Research Division, and ultimately a student assistant position working with CAMERA postdoc Marcus Noack on machine-assisted decision-making for experimental sciences.

The project Perryman and Noack have been working on aims to turn traditional methods of automated image sampling on their head. They propose using a random approach that is orders of magnitude more efficient and will give a prediction of how the image could look at some location, as well as an indication of the uncertainty of that prediction. Perryman has been working on a distributed optimisation approach, named HGDL (Hybrid Global Deflated Local), to improve a critical optimization function.

There are a lot of challenging computational problems in the biosciences that can be addressed with approaches that have already been developed by applied mathematicians, Zwart noted. "Certain ideas just take a longer time to percolate into other areas," he said. "That's why working within CAMERA is so great: mathematicians have a different view on the world, a different set of skills, and read different papers. But they don't know the experimental fields like structural biologists do. It's important to bring these people together so that we can identify problems within the biosciences and find solutions within math and computing."

"That's been one of the big benefits of this internship," said Perryman. "I started out in nuclear physics, so I was just familiar with the types of problems in that field. But after working with Peter, or working with Tess this past spring, or Marcus, I realize there are so many analogous problems. Like, if you have the same problem, Marcus would frame it in terms of some sort of geophysics thing, and Tess would say that it's a geometry problem, but it's probably also a biology problem."

In the end, Perryman has not been deterred by any of these stubborn challenges: "There're so many interesting projects, it's hard not to get excited about them."

More information: Petrus H. Zwart et al. Evaluating crystallographic likelihood functions using numerical quadratures, *Acta Crystallographica Section D Structural Biology* (2020). DOI: [10.1107/S2059798320008372](https://doi.org/10.1107/S2059798320008372)
<https://phys.org/news/2020-10-reimagining-noise-molecular.html>



Thu, 22 Oct 2020

The highest heat-resistant plastic ever is developed from biomass

The use of biomass-derived plastics is one of the prime concerns to establish a sustainable society, which is incorporated as one of the Sustainable Development Goals. However, the use of most of the biomass-derived plastics is limited due to their low heat resistance. Collaborative research between JAIST and U-Tokyo has successfully developed the white-biotechnological conversion from cellulosic biomass into the aromatic polymers having the highest thermodegradation of all the plastics reported ever.

Developing novel energy-efficient materials using biomass is frontiers to establish a sustainable environment. Plastics lightweight in nature produced from renewable biomass are prerequisites for developing a circular economy. However, currently available bioplastics are mostly aliphatic (e.g.; PLA, PHA, PA11, etc.) and thus consists of poor thermostability, which restricts their further applications. Aromatic backbone-based polymers are widely considered for their high heat-resistance (e.g; Zylon, Celazole, Kapton, etc.) but developing aromatic heterocyclic monomers from biomass are rare due to difficulty in controlling their structure.

Two specific aromatic molecules, 3-amino-4-hydroxybenzoic acid (AHBA) and 4-aminobenzoic acid (ABA) were produced from kraft pulp, an inedible cellulosic feedstock by Prof. Ohnishi and his research team in U-Tokyo. Recombinant microorganisms enhanced the productivity of the aromatic monomers selectively and inhibited the formation of the side products. Prof. Kaneko and his research team in JAIST have chemically converted AHBA into 3,4-diaminobenzoic acid (DABA); which was subsequently polymerized into poly(2, 5-benzimidazole) (ABPBI) via polycondensation and processed into thermoresistant film. Also, incorporating a very small amount of ABA with DABA dramatically increases the heat-resistance of the resulting copolymer and processed film attributes to the highest thermostable plastic on record (Figure 1). Density functional theory (DFT) calculations confirmed the small ABA incorporation strengthened the interchain hydrogen bonding between imidazoles although π -conjugated benzene/heterocycle repeats have been considered as the most ideal thermoresistant plastics for around 40 years.

Organic plastic superior in thermostability (over 740 °C), was developed from inedible biomass feedstocks without using heavy inorganic fillers and thus lightweight in nature. Such an innovative

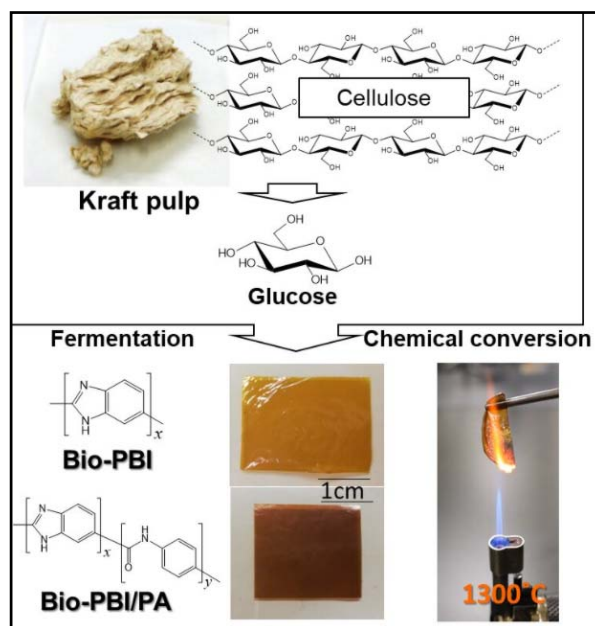


Figure 1. Development strategy for cellulose-derived PBI and PBI/PA film having ultra-high thermoresistance and flame retardance. Credit: Japan Advanced Institute of Science and Technology

molecular design of ultra-high thermoresistance polymers by controlling π -conjugation can contribute to establishing a sustainable carbon negative society, and energy conservation by weight saving.

More information: Aniruddha Nag et al. Ultrahigh Thermoresistant Lightweight Bioplastics Developed from Fermentation Products of Cellulosic Feedstock, *Advanced Sustainable Systems* (2020). DOI: [10.1002/adsu.202000193](https://doi.org/10.1002/adsu.202000193)

<https://phys.org/news/2020-10-highest-heat-resistant-plastic-biomass.html>



Thu, 22 Oct 2020

This white paint keeps surfaces cooler than surroundings, even under direct sunlight

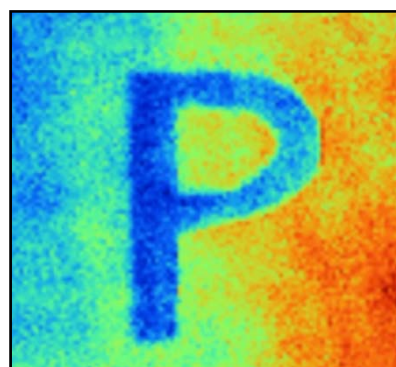
Scientists have developed a white paint that cools below the temperature of its ambient surroundings even under direct sunlight. Their research, published October 21 in the journal *Cell Reports Physical Science*, demonstrates a radiative cooling technology that could be used in commercial paints, that could be less expensive to manufacture, and that passively reflects 95.5% of sunlight that reaches its surface back into outer space. In contrast, commercial "heat rejecting paints" currently on the market only reflect 80%-90% of solar irradiation and cannot achieve below-ambient temperatures.

During the summer months and in regions with warm climates, most buildings rely on conventional air conditioning systems to transfer heat from the inside environment to the outdoors. These systems require energy, emit excess heat that transforms cities into "heat islands," and contribute to the climate crisis. But while scientists have sought to develop radiative cooling paints since the 1970s, previously developed paints have not been capable of reflecting enough sunlight to function as viable, commercializable alternatives to traditional air conditioners.

"It is a persistent task to develop a below-ambient radiative cooling solution that offers a convenient single-layer particle-matrix paint form and high reliability," says Xiulin Ruan, a professor at the School of Mechanical Engineering at Purdue University in Indiana and an author of the study. "This is critical to the wide application of radiative cooling and to alleviate the global warming effect."

To develop a commercially applicable radiative cooling paint, Ruan and colleagues used calcium carbonate fillers, an earth-abundant compound, instead of standard titanium dioxide particles, since the fillers have large band gaps (energy differences between the valence electron band and the bottom of the conduction electron band) that help minimize the amount of ultraviolet light the paint absorbs. The researchers also leverage a high particle concentration of 60%, which boosts sunlight scattering, as well as a broad particle size distribution instead of a single particle size for efficient broadband scattering.

To demonstrate how well these modifications enhanced the paint's radiative cooling abilities, the researchers performed cooling tests in West Lafayette, Indiana over a two-day period. The paint sample remained 10 C below ambient temperature at night and at least 1.7 C below the temperature of the ambient surroundings when the Sun was at its zenith. (The cooling power was shown to exceed 37W/m² under direct sun.) Ruan and his team then performed a second test in which part of



This infrared image shows that the P pattern painted with the Purdue radiative cooling paint is much cooler than the background painted with commercial paint. Credit: Xiangyu Li, PhD student of the School of Mechanical Engineering at Purdue University

a pattern was painted with the novel paint while another part was painted using a commercial white paint of the same thickness. An infrared camera revealed that the calcium carbonate-based acrylic paint was able to maintain a lower temperature under direct sunlight than its commercial counterpart.

Ruan expects that the technology may benefit a wide range of industries, including residential and commercial buildings, data centers, warehouses, food storage, automobile, outdoor electrical equipment, military infrastructures, and utility vehicles. The paint may be applied directly to buildings to reducing cooling costs. Since the paint lacks metallic components, telecommunication companies may use it to prevent outdoor equipment from overheating, an important step toward enabling a 5G network.

"This paint may even be used to combat climate change since it rejects sunlight and radiates heat into space," says Ruan.

Next, the researchers plan to perform long-term reliability studies to test the paint's resistance to ultraviolet light exposure, dust, surface adhesion, water, and detergent in order to ensure its function as a commercial product.

"Our paint is compatible with the manufacturing process of commercial paint, and the cost may be comparable or even lower," says Ruan. "The key is to ensure the reliability of the paint so that it is viable in long-term outdoor applications."

More information: *Cell Reports Physical Science*, Li et al.: "Full Daytime Sub-ambient Radiative Cooling in Commercial-like Paints with High Figure of Merit" [www.cell.com/cell-reports-phys ... 2666-3864\(20\)30236-8](http://www.cell.com/cell-reports-phys...2666-3864(20)30236-8) , DOI: [10.1016/j.xcrp.2020.100221](https://doi.org/10.1016/j.xcrp.2020.100221)

<https://phys.org/news/2020-10-white-surfaces-cooler-sunlight.html>

COVID-19 Research News

ThePrint

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Russia's Sputnik vaccine to first be tested on 100 Indians before conducting a larger trial

Dr Reddy's, which will supply the vaccine in India, has been asked to distribute the clinical trial sites geographically to increase participation from different states in India

By Himani Chandana

New Delhi: Russia's Sputnik vaccine will be tested on 100 participants in India before proceeding for a larger trial, the government expert panel told Dr Reddy's, the pharma company that will supply the vaccine in the country.

The Russian Direct Investment Fund (RDIF), Moscow's sovereign wealth fund, tied up with the Indian drug maker last month to supply 100 million doses of Sputnik V — the vaccine which has been found to produce an immune response with no serious adverse effects — in India after receiving the necessary regulatory clearances.

On Saturday, the company along with RDIF, announced that they have received approval from the Drug Control General of India (DCGI) to conduct phase 2 and 3 human clinical trials.



The approval is based on the recommendations of the Subject Expert Committee (SEC) on Covid-19 vaccines and drugs.

“The firm should generate safety and immunogenicity data on 100 subjects in Phase II clinical trial and submit for evaluation before proceeding to Phase III clinical trial,” the SEC decided in a meeting on 16 October, according to the minutes uploaded on the Central Drugs Standard Control Organisation’s (CDSCO) website.

The CDSCO is the health ministry arm that regulates the quality of drugs and vaccines in India.

The objective of the trial is to establish the safety of the vaccine among Indian participants along with establishing “immunogenicity”, which means that the vaccine generates an immune response in the participant’s body.

The SEC gave its approval 10 days after it had rejected Dr Reddy’s proposal to evaluate the vaccine in a bigger phase 3 trial.

The panel, in a meeting dated 5 October, had recommended phase 2 trial, which is held among a smaller number of participants.

Other recommendations in the revised proposal

After facing rejection, the Hyderabad-based drug maker presented a revised protocol to conduct phase 2 and 3 clinical trials in India in line with the recommendations of the committee.

The expert panel, after a “detailed deliberation”, said participants enrolling in the trial should first undergo RT-PCR testing — the gold standard test for diagnosing Covid-19 — within 72 hours prior to enrolment.

The panel also said that “Th1 Vs Th2 optimization may be assessed as an exploratory objective”.

Exploratory objective means the outcome of the trial could be used in future research. The committee has suggested looking for a scenario where participants could produce a balanced “Th1 and Th2 response” — the hormonal messengers responsible for most of the biological effects in the immune system.

The company has also been asked to distribute the clinical trial sites geographically to increase the representation of participants from different states in India.

Sputnik V the first registered Covid vaccine

According to the Sputnik V website, the vaccine became “the first registered Covid-19 vaccine on the market”.

It is an adenovirus vector-based vaccine, which is one where a part of the coronavirus is inserted into another virus and delivered to the body, following which the inserted coronavirus part, usually the spike protein molecule, is discharged. The body then recognises this as a foreign pathogen and mounts an immune response.

The vector used here is the human adenovirus, a group of respiratory viruses that cause common cold and flu-like illnesses in humans and animals.

“Adenoviral vectors are considered extremely safe, and are some of the easiest to engineer,” the website claims.

<https://theprint.in/health/russias-sputnik-vaccine-to-first-be-tested-on-100-indians-before-conducting-a-larger-trial/528249/>

