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# समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

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Ministry of Defence

Wed, 30 Dec 2020 3:50PM

## **Cabinet approves export of Akash missile system and creates a committee for faster approval of exports**

Under the Atma Nirbhar Bharat, India is growing in its capabilities of manufacturing wide variety of Defence platforms and missiles. Akash is country's important missile with over 96 percent indigenisation.

Akash is a Surface to Air Missile with a range of 25 Kms. The missile was inducted in 2014 in IAF and in 2015 in Indian Army.

After its induction in the Services, interest is shown in Akash missile by many friendly countries during International Exhibitions/Def Expo/Aero India. The Cabinet approval will facilitate Indian manufactures to participate in RFI/RFP issued by various countries.

So far, Indian defence exports included parts/components etc. The export of big platforms was minimal. This initiative of the Cabinet would help the country to improve its defence products and make them globally competitive.

The export version of Akash will be different from System currently deployed with Indian Armed Forces.

Besides Akash, there is interest coming in other major platforms like Coastal Surveillance System, Radars and Air platforms. To provide faster approvals for export of such platforms, a Committee comprising of Raksha Mantri, External Affairs Minister and National Security Advisor has been created.

This Committee would authorise subsequent exports of major indigenous platforms to various countries. The Committee would also explore various available options including the Government-to-Government route.

Government of India intends to focus on exporting high value defence platforms, to achieve target of 5 Billion USD of defence export and improve strategic relations with friendly foreign countries.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1684630>



पत्र सूचना कार्यालय  
भारत सरकार  
मंत्रिमण्डल

Wed, 30 Dec 2020 5:06PM

## मंत्रिमंडल ने आकाश मिसाइल प्रणाली के निर्यात को मंजूरी दी और निर्यातों की त्वरित मंजूरी के लिए एक समिति गठित की

आत्मनिर्भर भारत के तहत, भारत विभिन्न प्रकार के रक्षा प्लेटफार्मों और मिसाइलों के निर्माण में अपनी क्षमताओं में वृद्धि कर रहा है। आकाश देश की महत्वपूर्ण मिसाइल है, जिसका 96 प्रतिशत से अधिक स्वदेशीकरण किया गया है।

आकाश सतह से हवा में मार करने वाली एक मिसाइल है, जिसकी मारक क्षमता 25 किलोमीटर तक है। इस मिसाइल को 2014 में भारतीय वायु सेना तथा 2015 में भारतीय सेना में शामिल किया गया था।

रक्षा सेवाओं में इसके शामिल होने के बाद, अंतर्राष्ट्रीय प्रदर्शनियों/रक्षा प्रदर्शनी/एयरो इंडिया के दौरान कई मित्र देशों ने आकाश मिसाइल में अपनी रुचि दिखाई। मंत्रिमंडल की मंजूरी से विभिन्न देशों द्वारा जारी आरएफआई/आरएफपी में भाग लेने के लिए भारतीय निर्माताओं को सुविधा मिलेगी।

अब तक, भारतीय रक्षा निर्यातों में पुर्जे/घटक आदि शामिल थे। बड़े प्लेटफार्मों का निर्यात न्यूनतम था। मंत्रिमंडल की इस पहल से देश को अपने रक्षा उत्पादों को बेहतर बनाने और उन्हें विश्व स्तर पर प्रतिस्पर्धी बनाने में मदद मिलेगी।

आकाश का निर्यात संस्करण वर्तमान में भारतीय सशस्त्र बलों में तैनात सिस्टम से भिन्न होगा।

आकाश के अलावा, अन्य प्रमुख प्लेटफार्मों जैसे तटीय निगरानी प्रणाली, रडार और एयर प्लेटफार्मों में भी रुचि दिखाई जा रही है। ऐसे प्लेटफार्मों के निर्यात के लिए तेजी से अनुमोदन प्रदान करने के लिए, रक्षा मंत्री, विदेश मंत्री और राष्ट्रीय सुरक्षा सलाहकार की एक समिति गठित की गई है।

यह समिति विभिन्न देशों के लिए प्रमुख स्वदेशी प्लेटफार्मों के निर्यात को अधिकृत करेगी। समिति एक सरकार से दूसरी सरकार द्वारा खरीद सहित विभिन्न उपलब्ध विकल्पों का भी पता लगाएगी।

भारत सरकार ने 5 बिलियन अमेरिकी डॉलर के रक्षा निर्यात के लक्ष्य को प्राप्त करने और मित्रदेशों के साथ रणनीतिक संबंधों को बेहतर बनाने के लिए उच्च मूल्य वाले रक्षा प्लेटफार्मों के निर्यात पर ध्यान केंद्रित करने का विचार किया है।

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1684711>



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**Ministry of Defence**

*Wed, 30 Dec 2020 7:41PM*

## **Maiden flight trial of SAHAYAK-NG, air droppable container**

Defence Research and Development Organisation (DRDO) along with Indian Navy conducted the successful maiden test trial of 'SAHAYAK-NG' India's first indigenously designed and developed Air Dropped Container from IL 38SD aircraft (Indian Navy) off the coast of Goa.

The trial was conducted by Indian Navy to enhance its operational logistics capabilities and provide critical engineering stores to ships which are deployed more than 2000 km from the coast. It reduces the requirement of ships to come close to the coast to collect spares and stores.

Two DRDO laboratories i.e. NSTL, Visakhapatnam and ADRDE, Agra were involved in the development of SAHAYAK-NG container along the industry partner M/s Avantel for GPS integration. SAHAYAK-NG is an advanced version of SAHAYAK Mk I. The newly developed GPS aided air dropped container is having the capability to carry a payload that weighs upto 50 kg and can be dropped from heavy aircraft.

Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy congratulated DRDO scientists, Indian Navy and the associated industry partners involved in the successful maiden trial.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1684799>



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Government of India**

**Ministry of Defence**

*Wed, 30 Dec 2020 5:08PM*

## **Induction of Indigenous Bridging System into the Indian Army**

In continuation of efforts towards Atmanirbharta and in close coordination with the private industry and DRDO, the Indian Army has inducted three sets of 10-metre short span bridges, which were formally handed over on 29 December 2020 at the Talegaon facility of Larsen & Toubro Limited.

The equipment will meet the important requirement of providing mobility to own forces by speedy bridging of gaps during operations.

This accomplishment is a step towards weaning away our armed forces from foreign manufactured equipment with the the Bridge indigenously designed, developed and delivered as per schedule. All stakeholders have put in concerted efforts to overcome challenges and realise the 'Make in India' initiative of the Government, which aims to ensure self reliance and self sufficiency in meeting the defence needs of the Indian Army.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1684670>

## Govt okays export of Akash missile system, aims to hit \$5 bn defence export

*The move also aims to improve strategic relations with friendly foreign countries, said Defence Minister Rajnath Singh*

The Cabinet on Wednesday approved the export of Akash Missile System aiming to achieve the target of USD 5 billion of defence export and improve strategic relations with friendly foreign countries, said Defence Minister Rajnath Singh.

The Union Cabinet was chaired by Prime Minister Narendra Modi. Akash is country's important missile with over 96 per cent indigenisation. Akash is a Surface-to-Air Missile with a range of 25 Kms. The missile was inducted in 2014 in Indian Air Force (IAF) and in 2015 in Indian Army.

Singh said a committee for faster approvals for the export of such platforms has been created.

"Under the #AtmaNirbharBharat, India is growing in its capabilities of manufacturing wide variety of Defence platforms & missiles. The Cabinet chaired by PM @narendramodi ji today approved the export of Akash Missile System and a Committee for faster approvals has been created," Singh said in a tweet.

The decision by the Cabinet would help the country to improve its defence products, he said.

"So far, Indian defence exports included parts/components etc. The export of big platforms was minimal. This decision by the Cabinet would help the country to improve its defence products and make them globally competitive," Singh said.

"The Government of India intends to focus on exporting high value defence platforms, to achieve target of 5 Billion USD of defence export and improve strategic relations with friendly foreign countries," he added.

Besides Akash, there is interest coming in other major platforms like Coastal Surveillance System, Radars and Air platforms, said an official statement.

"To provide faster approvals for export of such platforms, a Committee comprising of Defence Minister, External Affairs Minister and National Security Advisor has been created. This Committee would authorise subsequent exports of major indigenous platforms to various countries. The Committee would also explore various available options including the Government-to-Government route," the statement added.

*(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)*

[https://www.business-standard.com/article/current-affairs/govt-okays-export-of-akash-missile-system-aims-to-hit-5-bn-defence-export-120123000779\\_1.html](https://www.business-standard.com/article/current-affairs/govt-okays-export-of-akash-missile-system-aims-to-hit-5-bn-defence-export-120123000779_1.html)



File Photo: The Akash Missile system moves past the saluting dais during the 70th Republic Day Parade



# As India opens export of DRDO-developed Akash missile, 9 countries express interest

*This comes after the Union Cabinet approved the export of indigenously-developed Akash missile, setting up a panel to ensure faster approvals for acquisition*

*By Ananya Varma*

In a major boost to India's Defence Industry, nine countries from Southeast Asia and Africa expressed interest in the acquisition of Defence Research and Development Organisation (DRDO) developed Akash Air Defence Missile, as per government sources.

This comes hours after the Union Cabinet on Wednesday approved the export of indigenously-developed Akash missile, setting up a panel to ensure faster approvals for acquisition proposals by various countries. The Centre has been working towards achieving a target of USD 5 billion in defence exports through exporting domestically-designed high-value defence platforms.

While tweeting on the development, Union Defence Minister Rajnath Singh revealed that the export version of Akash will be different from the System currently deployed with the Indian Armed Forces. He also called Akash 'an important missile' since it is 96 per cent indigenously made. "So far, Indian defence exports included parts/components etc. The export of big platforms was minimal. This decision by the Cabinet would help the country to improve its defence products and make them globally competitive," he stated.

## **Centre boosts domestic Defence Industry**

Earlier this month, the Defence Acquisition Council (DAC) headed by Rajnath Singh had approved proposals worth Rs 27,000 cr centred at procuring defence equipment from Indian manufacturers. Out of the seven proposals worth Rs 28,000 cr, six proposals valued at Rs 27,000 cr were granted to the Indian industry in a boost to both the 'Make In India' and the 'Atmanirbhar Bharat' initiative.

Back in October, the Defence Minister had approved the new DRDO Procurement Manual-2020 to facilitate the indigenous Defence Industry. In August, Rajnath Singh in a massive statement had announced that the Ministry of Defence would embargo imports of 101 items to boost indigenous defence production.

After a successful year for the DRDO, Chief G Satheesh Reddy in October had revealed that India had actually gained complete self-reliance in the area of missiles. "We are now able to develop any type of missile system what armed forces want," he said.

<https://www.republicworld.com/india-news/general-news/as-india-opens-export-of-drdo-developed-akash-missile-9-countries-express-interest.html>



Credit: ANI

## केंद्रीय कैबिनेट का फैसला: भारत अब रक्षा उपकरण एक्सपोर्ट करेगा, आकाश मिसाइल सिस्टम में 9 देशों ने दिखाई दिलचस्पी

नई दिल्ली: भारत अब आकाश मिसाइल सिस्टम को एक्सपोर्ट करेगा। केंद्रीय कैबिनेट ने बुधवार को इस प्रपोजल को मंजूरी दे दी है। आकाश एयर डिफेंस सिस्टम को रक्षा अनुसंधान एवं विकास संगठन (DRDO) ने विकसित किया है। केंद्रीय कैबिनेट का यह फैसला आत्मनिर्भर भारत की दिशा में नया कदम है, क्योंकि आकाश मिसाइल सिस्टम को पूर्वी एशिया और अफ्रीका के 9 देशों ने खरीदने में दिलचस्पी दिखाई है।

### आत्मनिर्भर भारत मिशन की ओर बढ़ा रहे कदम

कैबिनेट के इस फैसले की जानकारी देते हुए रक्षा मंत्री राजनाथ सिंह कहा कि आत्मनिर्भर भारत मिशन के तहत देश रक्षा के क्षेत्र में अपनी मैनुफैक्चरिंग क्षमताएं बढ़ा रहा है, अब मिसाइल बनाने की क्षमता भी बढ़ रही है। इसी के मद्देनजर प्रधानमंत्री नरेंद्र मोदी की अध्यक्षता में हुई कैबिनेट बैठक में आकाश मिसाइल सिस्टम को निर्यात करने का फैसला लिया गया है।

उन्होंने बताया कि आकाश मिसाइल का जो वर्जन एक्सपोर्ट किया जाएगा, वह भारतीय सेना के बेड़े में शामिल मिसाइल से अलग होगा।

### 2015 में भारतीय सेना में शामिल किया गया था

भारत के लिहाज से आकाश महत्वपूर्ण मिसाइल है। इसका 96 फीसदी हिस्सा भारत में ही तैयार किया गया है। यह जमीन से आसमान तक 25 किलोमीटर की रेंज में मार कर सकता है। इस मिसाइल को 2014 में भारतीय वायु सेना में और 2015 में भारतीय सेना में शामिल किया गया था।

### 2025 तक 35 हजार करोड़ के रक्षा उपकरण एक्सपोर्ट होंगे

भारत सरकार ने 2025 तक 35 हजार करोड़ रुपए के रक्षा उत्पाद निर्यात करने का लक्ष्य रखा है। रक्षा उत्पादन निर्यात संवर्धन नीति 2020 का मकसद रक्षा निर्यात के जरिए मित्र देशों के साथ रणनीतिक संबंधों को बेहतर बनाना है।

<https://www.bhaskar.com/national/news/9-countries-interested-in-acquisition-of-drdo-developed-akash-air-defence-missile-system-128069615.html>



आकाश एयर डिफेंस सिस्टम को रक्षा अनुसंधान एवं विकास संगठन (DRDO) ने विकसित किया है। अब भारत इसे निर्यात करने की योजना बना रहा है। (फाइल फोटो)



## Navy, DRDO conduct maiden trial of 1st indigenous air-droppable container

*Defence Research and Development Organisation (DRDO) along with the Indian Navy conducted the successful maiden test trial of India's first indigenously designed and developed Air Dropped Container*

Defence Research and Development Organisation (DRDO) along with the Indian Navy conducted the successful maiden test trial of 'SAHAYAK-NG' India's first indigenously designed and developed Air Dropped Container from IL 38SD aircraft (Indian Navy) off the coast of Goa on Wednesday.

As per an official statement, the trial was conducted by the Indian Navy to enhance its operational logistics capabilities and provide critical engineering stores to ships that are deployed more than 2000 kilometers from the coast.

"It reduces the requirement of ships to come close to the coast to collect spares and stores," it stated.

Two DRDO laboratories--Naval Science and Technological Laboratory, Visakhapatnam and Aerial Delivery Research and Development Establishment, Agra-- were involved in the development of the SAHAYAK-NG container along with the industry partner M/s Avantel for GPS integration.

"SAHAYAK-NG is an advanced version of SAHAYAK Mk I. The newly developed GPS aided air dropped container is having the capability to carry a payload that weighs up to 50 kilograms and can be dropped from heavy aircraft," it added.

*(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)*

[https://www.business-standard.com/article/current-affairs/navy-drdo-conduct-maiden-trial-of-1st-indigenous-air-droppable-container-120123100094\\_1.html](https://www.business-standard.com/article/current-affairs/navy-drdo-conduct-maiden-trial-of-1st-indigenous-air-droppable-container-120123100094_1.html)



## DRDO, Indian Navy conduct successful maiden test trial of SAHAYAK-NG

Defence Research and Development Organisation, DRDO along with Indian Navy conducted the successful maiden test trial of SAHAYAK-NG India's first indigenously designed and developed Air Dropped Container from IL 38SD aircraft of Indian Navy off the coast of Goa.

The trial was conducted by Indian Navy to enhance its operational logistics capabilities and provide critical engineering stores to ships which are deployed more than 2000 kilometres from the coast. It reduces the requirement of ships to come close to the coast to collect spares and stores.

Two DRDO laboratories, NSTL, Visakhapatnam and ADRDE, Agra were involved in the development of SAHAYAK-NG container along the industry partner M/s Avantel for GPS integration. SAHAYAK-NG is an advanced version of SAHAYAK Mk I. The newly developed

GPS aided air dropped container is having the capability to carry a payload that weighs upto 50 kg and can be dropped from heavy aircraft.

Chairman DRDO Dr G Satheesh Reddy has congratulated DRDO scientists, Indian Navy and the associated industry partners involved in the successful maiden trial.

<http://newsonair.com/Main-News-Details.aspx?id=407001>

# अमर उजाला

Thu, 31 Dec 2020

## डीआरडीओ ने हवा से गिराने वाले सहायक-एनजी कंटेनर का पहला सफल परीक्षण किया

नई दिल्ली: रक्षा अनुसंधान विकास संगठन ने नौसेना के साथ मिलकर हवा से गिराये जाने वाले कंटेनर सहायक-एनजी का पहला सफल परीक्षण किया है। रक्षा मंत्रालय के एक अधिकारी ने बताया, इस कंटेनर को गोवा के तट पर आईएल-38एसडी विमान से गिराया गया।

सहायक-एनजी भारत का पहला स्वदेशी कंटेनर है। यह जीपीएस से लैस है और 50 किलो भार के साथ विमान से गिराया जा सकता है। डीआरडीओ और निजी कंपनी एवांटेल की दो प्रयोगशालाओं में इसका विकास हुआ है। हवा से गिराया जाने वाला सहायक-एनजी कंटेनर सहायक एमकेआई का एडवांस वर्जन है।



<https://www.amarujala.com/india-news/drdo-successfully-tested-air-assisted-auxiliary-ng-container>

TIMESNOWNEWS.COM

Thu, 31 Dec 2020

## Indian Army receives bridges developed by DRDO and L&T

*The equipment will meet the important requirement of providing mobility to forces by speedy bridging of gaps during operations, he said*

Pune: The Indian Army has received three sets of 10-metre short span bridges developed and manufactured by the DRDO in collaboration with Larsen & Toubro Ltd (L&T), a defence official said on Wednesday.

The bridges were formally handed over to the Army on Tuesday at L&T's facility in Talegaon here, the official said.

The equipment will meet the important requirement of providing mobility to forces by speedy bridging of gaps during operations, he said.

"This accomplishment is a step towards weaning away our armed forces from foreign manufactured equipment with the bridges indigenously designed, developed and delivered as per schedule," the official said.

"All stakeholders have put in concerted efforts to overcome



Indian Army receives bridges developed by DRDO and L&T | Photo Credit: ANI

challenges and realise the Make in India initiative of the Government, which aims to ensure self reliance and self sufficiency in meeting the defence needs of the Indian Army," he said.

<https://www.timesnownews.com/india/article/indian-army-receives-bridges-developed-by-drdo-and-lt/701156>

# ThePrint

Thu, 31 Dec 2020

## DRDO's new quantum device can generate random numbers using light particles

*The Quantum Random Number Generator relies on a fundamental property of light — the fact that light behaves like a wave and a particle at the same time*

By Mohana Basu

New Delhi: A team of scientists at the Defence Research and Development Organisation (DRDO) have created a quantum device that can generate a truly random sequence of numbers by tracking single particles of light.

Generating a string of truly random numbers — no correlation between two successive numbers — has been a mathematical challenge since 1890, when the English polymath Francis Galton described the humble dice as the most superior random number generating device.

But in today's world, where unique 6-digit authentication codes are expected to appear on phones in a matter of seconds, far more sophisticated computer programmes are required to generate random numbers.

While a number of computer programs currently exist that can generate random passwords and PINs within seconds, these systems are not truly random. At some point, the systems start repeating the sequence of numbers, which could compromise the security of the system.

The new device by the Mumbai-based DRDO Young Scientist Laboratory for Quantum Technologies relies on a fundamental property of light — the fact that light behaves like a wave and a particle at the same time.

### How the device works

In the device created by DRDO, researchers use attenuators on a source of laser light such that the intensity of the laser is reduced to just one photon — that is, the elementary particle of light. These photons then enter a branched beam splitter, which has two exit points.

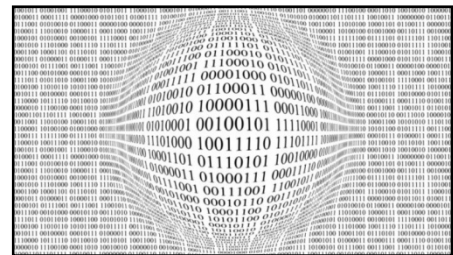
At the end of the two branches are detectors that can pick the photon signals. Each time a photon is detected, the system sends an electrical pulse to a recording unit.

The device registers a 0 if it detects a pulse from one branch, and '1' if the detection is made from the other branch. This way the system continuously generates a string of random binary digits.

Since the photons take random paths in nature, it is not possible for any existing system to predict what code these photons may generate.

In a press statement Tuesday, DRDO researchers said random numbers have essential roles in many fields, such as quantum communication, cryptography, scientific simulations, lotteries and fundamental physics experiments.

"Based on the encouraging results obtained, it can be stated that the developed Quantum Random Number Generator (QRNG) passes the global randomness testing standards," the statement said.



Representational image. | Photo: Pixabay

In addition, the generated random numbers are also verified using DRDO's indigenously developed Randomness Testing Statistical Test Suite.

<https://theprint.in/science/drdo-new-quantum-device-can-generate-random-numbers-using-light-particles/576900/>

**INDIA  
TODAY**

Thu, 31 Dec 2020

## Why the successful trials of a desi carbine is such a big deal | **India Today Insight**

*The first indigenously designed and produced carbine to pass trials will reduce India's humiliating dependence on imported small arms*

*By Sandeep Unnithan*

New Delhi: In mid-June this year, a Belgian arms manufacturer walked out of a contract to supply small arms to India's covert paramilitary, the Special Frontier Force (SFF). FN Herstal had signed a contract worth around Rs 70 crore to supply its P90 personal defence weapons and two variants of its SCAR assault rifles to the SFF, a unit made up of ethnic Tibetans. The exact reasons for FN's refusal to supply the arms are unclear, but sources say it had to do with the firm's concerns that their products would be used in Jammu and Kashmir. The SFF—deployed by the government in late August to occupy strategic heights in eastern Ladakh along the LAC with China—is now believed to be looking to acquire US-made assault rifles. This would not be the first time a global firm has expressed reservations about supplying small arms to India. Nor is it the first time that the lack of indigenously-developed weapons have been the cause of national embarrassment for India.

After the 26/11 Mumbai terror attacks over a decade ago, several state police forces looked for imports to replace their World War-II vintage small arms arsenal. The German government denied the sale of their popular Heckler & Koch MP5 sub-machine to states like Andhra Pradesh, Maharashtra, Gujarat, Manipur, Odisha and Jammu and Kashmir, questioning their human rights record.

In early 2011, at least one chief minister, Narendra Modi, had raised the issue of this blacklist at a meeting of CMs in the national capital. The MHA then explored creative ways to circumvent the ban, including importing MP5s and re-distributing it to the states or advising states to shop from countries like Russia, the US and Italy.

This is why the successful trials of a DRDO designed carbine this year, is such a big deal. The Joint Venture Protective Carbine (JVPC) is the first ever indigenously designed and produced Indian carbine to be cleared for induction into the Indian armed forces and the central police and paramilitary forces. The JVPC has a 30-round box magazine with a rate of fire of 800 rounds per minute.

The carbine, produced in collaboration with the state-owned Ordnance Factory Board (OFB), successfully completed its user trials on December 7, meeting all the army's General Staff Qualitative Requirements. These were the last set of the trials which were carried out in extreme temperature conditions in summer and winter—the weapon performed with zero stoppages. In August this year, the JVPC also passed MHA trials presided by a full board of the MHA headed by the National Security Guard (NSG) and including representatives from all the Central Armed Police Forces (CAPFs). The weapon designed by the DRDO's Pune-based Armaments Research



**The Joint Venture Protective Carbine (JVPC) was cleared for induction into the Indian armed forces after successful user trials**



and Development Establishment (ARDE) is being produced at the OFB's Small Arms Factory in Kanpur and ammunition made by the Ammunition Factory Kirkee.

It has ended the conundrum of a country which, despite developing its own ballistic missiles and nuclear-powered submarines, has been struggling to develop a low-technology carbine—a compact weapon firing a pistol cartridge. Over the past 70 years, India has imported these weapons—building the British-designed Sterling under license at the Small Arms Factory Kanpur in the early 1960s. The lack of an indigenous alternatives to this World War-II era weapon meant that police, paramilitary and armed forces special units had to import alternatives. The arrival of the JVPC, government source say, has the potential to end the monopoly enjoyed by the MP5, first imported by elite units like the Special Group and the NSG in the early 1980s. The DRDO-designed weapon that fires a 5.56x30 mm cartridge out to 200 metres is far more effective than the 9 mm subsonic cartridge fired by the MP5. Its 5.56x30 bullets can penetrate a 3.5 mm mild steel plate and Level III body armour. NSG personnel during the 26/11 attacks noted that their MP5's subsonic 9 mm cartridge was useless against well entrenched terrorists.

The JVPC's success comes after a decade of languishing in development hell. The collaborative effort between the DRDO and OFB came as a result of the Army's 15-year quest to replace the World War-II vintage 9 mm Sterling carbine. The Indian National Small Arms Systems (INSAS) project, which began in March 1982, aimed to give the army a standard assault rifle, a carbine and a light machine gun. The rifle was inducted into service in 1996 but the carbine failed trials owing to problems of firing a larger 5.56x45 cartridge from a smaller barrel—high sound and a 'high jump in automatic burst'. The OFB and DRDO began to develop competing successor carbines—the MSMC and the 'Amogh', both chambered to fire a smaller 5.56x30 MINSAS cartridge. The OFB-developed 'Amogh' carbine failed to enter army service but saw limited induction into the Coast Guard and state police units. The DRDO and OFB teamed up five years ago, basing their joint efforts on the more promising DRDO carbine, renamed the JVPC. While it underwent trials, the weapon saw limited sales to state police units, including Delhi, Punjab and Chhattisgarh.

The non-standard pattern of JVPC ammunition could however be problematic. While the army will buy 5,000 JVPCs, it wants the bulk of its carbines to be chambered for the bigger NATO 5.56x45 cartridge. The army's acquisition of 93,895 such carbines from Caracal of the UAE is stuck pending defence ministry approval. The army has a still bigger requirement for 3.5 lakh carbines which will be procured domestically. The OFB and DRDO have fielded another carbine for this requirement. It remains to be seen whether this product will have the JVPC's resilience.

<https://www.indiatoday.in/india-today-insight/story/why-the-successful-trials-of-a-desi-carbine-is-such-a-big-deal-1754618-2020-12-30>

## ThePrint

Thu, 31 Dec 2020

### **Missiles, drones, defence shield — India has a series of military trials planned for 2021**

*A shot in the arm will be the full-fledged trial of the indigenous Rustom 2 Unmanned Aerial Vehicle, which is scheduled to begin in the first half of 2021, after much delay*

*By Snehash Alex Philip*

New Delhi: India has a series of military tests and trials planned for 2021, including that of the Ballistic Missile Defence (BMD) shield, an Air-Independent Propulsion (AIP) system for submarines, and drones, besides a number of missiles, including a BrahMos with an 800-km range.

Sources in the defence and security establishment said one of the key systems to go under trial in the coming year would be the AIP, which is aimed for integration with India's fleet of six Scorpene submarines during refit.

The trials for the indigenous AIP, which will allow conventional submarines to stay under water for a longer duration, is to begin in the first quarter of the new year, the sources added.

Another important trial that will take off is the one for phase 2 of the BMD, which aims to secure the country from all kinds of incoming missiles, including nuclear, and flying objects, through a multi-tier defence system. Phase 1 of the programme was completed last year.

Also on the agenda is the full-fledged trial of the indigenous Rustom 2 Unmanned Aerial Vehicle (UAV), which is scheduled to begin in the first half of 2021, after much delay.

Capable of carrying the synthetic aperture radar, electronic intelligence systems and situational awareness systems, depending on mission objectives, the UAV is a medium-altitude long-endurance system.

The current stand-off with China in eastern Ladakh has brought to light India's dire need for indigenous drone systems against a country that has become one of the world's largest exporters of armed UAVs.

The early part of 2021 will also witness fresh trials of the Indigenous Technology Cruise Missile (ITCM) Nirbhay, which has a range of 800-1,000 km.

The maiden trial of the 800-km range BrahMos supersonic cruise missile, meanwhile, is scheduled for mid-2021. The 400-km variant of this missile was successfully tested earlier this year.

Even as developmental trials take place, the services will continue with their firing exercises and re-validation of the missiles in their arsenal, the sources said.

### **Many trials in 2020 after Covid lull**

The year gone by also witnessed a number of key tests.

The coronavirus pandemic led to a lull, but the pace picked up after September. Among the major tests in 2020 was that of the Hypersonic Technology Demonstrator Vehicle (HSTDV) on 7 September.

India is only the fourth country in the world after the US, China and Russia to have the technology. The successful trial paved the way for India to develop missiles that can travel at six times the speed of sound.

This was followed by a test-firing of the nuclear-capable 'Shaurya' missile on 3 October, and the supersonic missile-assisted release of a torpedo on 5 October.

The Defence Research and Development Organisation (DRDO) also successfully conducted three flight tests of its indigenously developed anti-tank guided missile (ATGM) Dhruvastra from the Integrated Test Range at Chandipur in Odisha, in July. This is one of the most advanced anti-tank weapons in the world.

Meanwhile, the indigenous Active Electronically Scanned Array (AESA) radar, Uttam, has completed 100 hours of testing with additional 25 hours on Tejas aircraft for air-to-air mode and its sub-parameters.

On 9 October, the new-generation Anti-Radiation Missile (RUDRAM) was successfully tested on a radiation target located off the coast of Odisha. The missile was launched from a Su-30MKI fighter aircraft.

The year 2020 also saw the Quick Reaction Surface-to-Air Missile (QRSAM) achieve a major milestone on 13 November, with a direct hit onto a Banshee pilotless target aircraft at medium range and medium altitude.


<https://theprint.in/defence/missiles-drones-defence-shield-india-has-a-series-of-military-trials-planned-for-2021/575840/>



File image of a BrahMos supersonic cruise missile | ANI



## DRDO on Twitter

 **Rajnath Singh** ✓  
@rajnathsingh

Akash is country's important missile with over 96 percent indigenisation. Akash is a Surface to Air Missile with a range of 25 Kms.

The export version of Akash will be different from System currently deployed with Indian Armed Forces.

 **A. Bharat Bhushan Babu** ✓ @SpokespersonMoD · 15h

Induction of Indigenous Bridging System into the Indian Army  
@DefenceMinIndia @rajnathsingh @RajnathSingh\_in @IAF\_MCC  
@drajaykumar\_ias @indiannavy @adgpi @PIB\_India @DRDO\_India  
[pib.gov.in/PressReleasePa...](http://pib.gov.in/PressReleasePa...)



2 42 225

 **A. Bharat Bhushan Babu** ✓ @SpokespersonMoD · 15h

In continuation of efforts towards Atmanirbharta and in close coordination with the private industry and @DRDO\_India, the Indian Army has inducted three sets of 10-metre short span bridges, which were formally handed over on 29 Dec 2020 at Talegaon facility of Larsen & Toubro Ltd



Thu, 31 Dec 2020

## India cannot accept any unilateral change of LAC: Rajnath on continuing border standoff with China

*Asserting that India has always been in favour of peace, Singh also said the country can never compromise on its dignity and self-respect*

New Delhi: As the over seven-month-long border standoff with China showed no signs of solution, Defence Minister Rajnath Singh on Wednesday said India cannot accept any unilateral change of the Line of Actual Control (LAC), and hoped the Ladakh deadlock will be resolved through talks.

Asserting that India has always been in favour of peace, Singh also said the country can never compromise on its dignity and self-respect.

The defence minister said there was a possibility of more talks at the military and diplomatic levels.

India and China are locked in a military standoff in eastern Ladakh since early May and have held multiple rounds of diplomatic and military parleys without any concrete outcome.

"No, how can this happen? The situation will remain the same as before.

India cannot accept unilateral change," Singh told PTI-Bhasha when asked whether China was trying to change the LAC to make it a permanent one.

Nearly 50,000 troops of the Indian Army are deployed in a high state of combat readiness in various mountainous locations in eastern Ladakh in sub-zero temperatures.

China has also deployed an equal number of troops, according to officials.

"The talks are going on. There is a possibility of more talks at the military and diplomatic levels. India has always been in favour of peace. So, we hope a solution will be found out through talks," Singh said.

The defence minister also said India wants to maintain good relations with all the neighbouring countries.

"China is our neighbour and there should be no aggression on their part. We want to maintain good relations with neighbouring countries. The history of India has also been that we have never attacked any country or occupied one inch of land of others. But it is also a fact that India can never compromise on its dignity and self-respect," he said.

The face-off began on May 5 following violent clashes between the armies of India and China in the Pangong lake area.

The incident in Pangong Tso was followed by a similar incident in north Sikkim on May 9.



Defence Minister Rajnath Singh (Photo/ Twitter)

India and China held the last round of diplomatic talks on December 18 during which they agreed to continue work towards ensuring complete disengagement of troops in all friction points along the LAC in eastern Ladakh at the "earliest".

It was agreed at the talks that the next round of military dialogue should be held at an early date so that both sides can work towards an early and complete disengagement of troops in accordance with the existing bilateral agreements and protocols.

However, dates for the ninth round of military talks are yet to be finalised.

<https://www.newindianexpress.com/nation/2020/dec/30/india-cannot-accept-any-unilateral-change-of-lac-rajnath-on-continuing-border-standoff-with-china-2243287.html>



*Thu, 31 Dec 2020*

## **China deployed underwater drones in Indian Ocean, says report**

China has deployed a fleet of underwater drones called Sea Wing (Haiyi) glider in the Indian Ocean, which can operate for months on end and make observations for naval intelligence purposes, according to defence analyst HI Sutton.

Writing for the Forbes magazine, Sutton said that these sea gliders, which the Chinese are deploying "en masse", are a type of Uncrewed Underwater Vehicle (UUV) which were launched in mid-December 2019 and recovered in February after making over 3,400 observations.

Citing the government sources, Sutton in his report said that these gliders are similar to those deployed by the US Navy, one of which was seized by Beijing in 2016 to ensure "safe navigation of passing ships."

"Taken at face value, it may be surprising that China is now deploying these types of UUV en masse in the Indian Ocean. China has also deployed the Sea Wing from an ice breaker in the Arctic," Sutton wrote.

According to the defence expert, reports from December last year suggested that 14 would be employed in the Indian Ocean mission but only 12 were used. Sutton said that these gliders are unpowered with large wings to glide that can run for long periods of time, adding that they are not fast or agile, however, they are employed for long-range missions.



Furthermore, the defence analyst said these Chinese gliders that are placed in the Indian Ocean were reportedly gathering oceanography data, which "sounds innocuous" however, is commonly gathered for naval intelligence purposes."

Noting the rising challenges in the Indo-Pacific region, Chief of Defence Staff General Bipin Rawat earlier this month had said the world is witnessing a race for strategic bases in the Indian Ocean Region (IOR), adding that it is only going to gain momentum in the times to come.

"Of late along with geostrategic competition in the Indo-Pacific, we are also witnessing a race for strategic places and bases in the Indian Ocean region which is only going to gain momentum in the times to come," General Rawat had said while delivering a keynote address at the Global Dialogue Security Summit.

CDS Rawat had said, "In the military field, technology must be a means of deterrence not a source of destruction. Our approach to security hence needs to shift from unilateral to the multilateral mode which mandates increasing training engagements with partner nations in order to fortify the future."

He said that based on the challenges that India face, "we require structured long term planning for capacity building and capability development of our defence forces."

<https://www.defencenews.in/article/China-deployed-underwater-drones-in-Indian-Ocean,-says-report-1033269>



Thu, 31 Dec 2020

## And, God gets a co-pilot in AVM Ajit Lamba

*By Anantha Krishnan M*

Bengaluru: On January 20, 2021, Air Vice Marshal Ajit Lamba (Retd) would have turned 85. And, as during several birthdays especially in the last few years, he had planned to gift himself some special moments. Doing something he was passionate about — flying.

His son Neil Lamba, a commercial pilot, said his father had booked a slot at Jakkur Aerodrome for his birthday flight. This time AVM Lamba wanted to take his granddaughter Nanki Lamba with him. Nanki too is a pilot, making it three generations of aviators in the Lamba family.

In fact, when Nanki obtained her commercial pilot licence from Australia this year, AVM Lamba was very excited to share the news.

"So that's a third generation of pilots! Wanted to share with you! Regards, Ajit," he had messaged along with a photo of his granddaughter next to a plane.

In 2017 February, just before Aero India, AVM Lamba had called to say that he would be flying at the show. He was 81 then.

"Perhaps I will be youngest pilot at the Yelahanka Air Base ying. Hope to catch up with you there," he had chuckled. He flew the Hansa-3 of National Aerospace Laboratories (NAL) at the show, creating a record of sorts in an international air show.

Despite his advancing age, he kept fit so that he could fly. His flying licence updated. His medicals done. Passion sky-high.

AVM Lamba had probably own over 100 different types of aircraft while serving in the Indian Air Force (IAF), including ghters, trainers, transport planes and helicopters.

He was locked on to anything that could fly. And he was ever ready with reams of priceless stories from the skies.

In 2010, at his 70th birthday, his wife had gifted him a microlight named Pegasus.

"That was something special. But I had to sell the plane for want of parking space. A friend was ready to buy it, and one day I flew to his home in Coorg," he had recalled.

His near four decades of service with the IAF were action-packed, with, among other events, one ejection from a Gnat and over half-a-dozen engine-off landings. He joined the IAF in 1953, was commissioned two years later and retired in 1991, after 38 years of service.

He had to his credit over 7,000 hours of flying while in service, virtually on every platform of IAF. And then there were the flying hours he had logged in the last 29 years, after retirement.

For the record, AVM Lamba had a flying career spread over 65 years — a rare feat.

"Perhaps, I was born to fly," he said while receiving the Lifetime Achievement Award instituted by Inspired Indian Foundation, for his contributions to military aviation, in 2017. The legendary





aviator received the award from India's first and only man to have gone to space, Wg Cdr Rakesh Sharma (Retd).

When not flying or not thinking of flying, AVM Lamba kept busy catching up with friends and family. Sundays at the golf course. Then a glass of beer, Books, Travel, Adventure. That was the life of this aviator.

With his son Neil being an avid biker, the veteran aviator too never missed a date with any modern bike that threatened to fly!

A couple of years ago, a photo of him astride a new Triumph bike at its Mumbai showroom had gone viral on social media. And, post this he had a small story to share.

"I had bought a second-hand Triumph Thunderbird in 1955 soon after getting commissioned into the IAF. I had paid Rs 1,500 then and now a brand-new bike would cost over Rs 18 lakh," he had said.

Another photo of his checking out a brand new Honda Goldwing too was a hit with avid aviators and bikers.

In 2003, during the centenary celebrations of the Wright Brothers' first flight, I had the opportunity to fly with AVM Lamba on the Light Canard Research Aircraft (LCRA). I remember him giving virtually a commentary-of-sorts as we flew over the (then) Bangalore skies, banking left and right.

"You can't do much on these planes, apart from ying," he had said wryly, probably hinting that I was lucky to have landed safe, minus some aerial stunts!

A year later, when he volunteered to give a flying experience to visually-impaired children, the ace pilot said it was a moving experience.

"I am lucky to have own these children. I am blessed to have answered all their queries while flying. To see for them and to fly them is an unforgettable experience," he would often say.

Recalling his association with Marshal of IAF (MAF) Arjan Singh a few years back, AVM Lamba said the duo first met during the Indo-Pak War of 1965.

"The MAF had visited our No 7 Squadron as the then IAF Chief. Seeing 'LAMB' written on my flying overalls, he remarked: 'You got to be a LION in air and not a LAMB'," he said.

The highlight of AVM Lamba's career in IAF was his tenure as the Commandant of the prestigious Aircraft and Systems Testing Establishment (ASTE) in Bengaluru between 1986 and 1991.

Among all the quotes and thoughts of India's ace aviator, the one on Test Pilots he shared in 2013, stands out.

"Test flying can, without doubt, be the most satisfying professional experience for a yer. The Test crews at ASTE are a very elite group, almost never in limelight and are truly the unsung heroes of the IAF. Due to the tremendous responsibility they shoulder, they mature faster, grow grey, bald and denitely, more handsome," AVM Lamba had said.

It is impossible to capture the life and times of a legendry aviator in just one article. Even if it's an obituary like this.

On Wednesday morning in Bengaluru, the city that has shaped the lives of many planes and pilots, AVM Ajit Lamba left on a solo ight to the unknown. He had been fighting leukaemia for a while.

This January, Jakkur will miss the 'little boy' who would have otherwise landed there all set to fly.

But sources say God's co-pilot has already started to throttle up there!

*(The writer is an independent aerospace and defence journalist, who blogs at Tarmak007 and tweets @writetake.)*

<https://www.onmanorama.com/news/india/2020/12/30/and-god-gets-a-co-pilot-in-avm-ajit-lamba.html>

## Business Standard

Thu, 31 Dec 2020

### ISRO to launch first satellite developed entirely by Brazil's space agency

*Emirates SkyCargo brings the satellite from Brazil to Chennai*

*By T E Narsimhan*

The Indian Space Research Organisation (Isro) is set to launch Amazonia-1, the first satellite to have been developed completely in Brazil by the National Institute for Space Research (INPE), the Latin American nation's apex space research body.

Emirates SkyCargo, the freight division of Emirates airline, has executed a cargo charter to transport Amazonia-1 from Sao Jose dos Campos, Brazil to Chennai. This is the first time that Emirates SkyCargo has transported a space satellite from South America.

The earth Observation has been designed, assembled and tested in Brazil and took eight years to be developed. Once launched into space, it will help monitor the ecosystem of the Amazon rainforest, the world's largest tropical rainforest. The satellite is due to be sent to space in February 2021 from the Satish Dhawan Space Centre on the East coast of India.

The Amazonia series satellites are composed of two independent modules: a Service Module, which is the Multi-Mission Platform (MMP), and a Payload Module, which houses image cameras and equipment for recording and transmitting image data.

Amazonia-1 is a Sun synchronous (polar) orbiting satellite that can generate images of any part of the world every five days. For this, it has a wide-view optical imager (camera with 3 visible frequency bands - VIS - and 1 near infrared band - Near Infrared or NIR) with swath of 850 km and 60 meters of resolution

India and Brazil signed a Framework Agreement for cooperation in the field of outer space in January 2004. Apart from this, an agreement on the programme of cooperation between the two space agencies was also signed. Under this, Brazil received data from ISRO's remote sensing satellite ResourceSAT-1.

The two countries, in July 2014, also signed an agreement on cooperation to alter a Brazilian earth station to receive and process data from the Indian Remote Sensing satellites (IRS) series.

The agreements also meant that ISRO is obliged to make data from its projects available to the National Institute for Space Research (INPE), the Brazilian executive agency receiving earth observation data, and remote sensing data from areas under the INPE's domain.

[https://www.business-standard.com/article/current-affairs/isro-to-launch-first-satellite-developed-entirely-by-brazil-s-space-agency-120123000801\\_1.html](https://www.business-standard.com/article/current-affairs/isro-to-launch-first-satellite-developed-entirely-by-brazil-s-space-agency-120123000801_1.html)



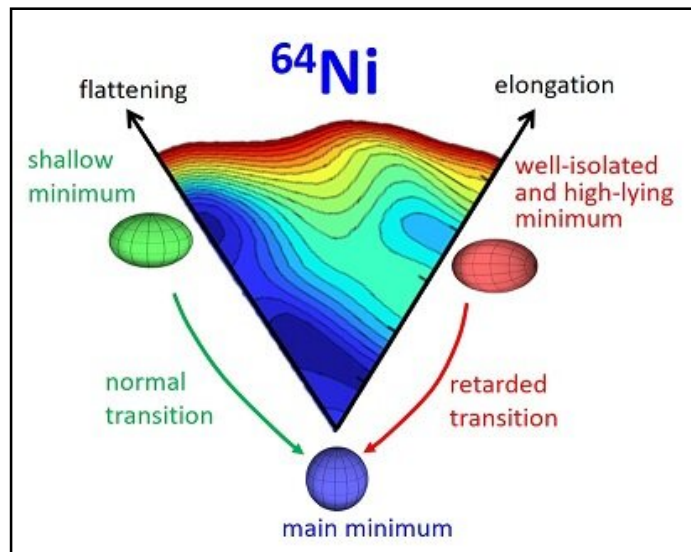
Once launched into space, it will help monitor the ecosystem of the Amazon rainforest, the world's largest tropical rainforest | Representative Image



## The map of nuclear deformation takes the form of a mountain landscape

Until recently, scientists believed that only very massive nuclei could have excited zero-spin states of increased stability with a significantly deformed shape. Meanwhile, an international team of researchers from Romania, France, Italy, the USA and Poland showed in their latest article that such states also exist in much lighter nickel nuclei. Positive verification of the theoretical model used in these experiments allows describing the properties of nuclei unavailable in Earth laboratories.

More than 99.9 per cent of the mass of an atom comes from the atomic nucleus, the volume of which is over a trillion times smaller than the volume of the entire atom. Hence, the atomic nucleus has an amazing density of about 150 million tons per cubic centimeter. This means that one tablespoon of nuclear matter weighs almost as much as a cubic kilometer of water. Despite their very small size and incredible density, atomic nuclei are complex structures made of protons and neutrons. One may expect that such extremely dense objects would always take spherical form. In reality, however, the situation is quite different: most nuclei are deformed—they exhibit shape flattened or elongated along one or even two axes, simultaneously. To find the favorite form of a given nucleus, it is customary to construct a landscape of the potential energy as a function of deformation. One may visualize such landscape by drawing a map on which the plane coordinates are the deformation parameters, i.e. degrees of elongation or flattening along the two axes, while the color indicates the amount of energy needed to bring the nucleus to a given shape. Such a map is a full analogy to a geographical map of mountain terrain.



Deformation landscape of the nickel-64 nucleus. Prolate, oblate local minima and main spherical minimum are indicated by red, green and blue ellipsoids, respectively. (Source: IFJ PAN) Deformation landscape of the nickel-64 nucleus. Prolate, oblate local

If a nucleus is formed in the nuclear reaction, it appears at a given point of the landscape—it takes specific deformation. It then starts to slide (change deformation) towards the lowest energy point (stable deformation). In some cases, however, before reaching the ground state, it may be stopped for a while in some local minimum, a trap, which corresponds to metastable deformation. This is very similar to water that springs in a particular location in the mountain area and flows downward. Before it reaches the lowest valley, it may be trapped in local depressions for some time. If a stream connects the local depression to the lowest point of the landscape, water will flow down. If the depression is well isolated, the water will stay there for a very long time.

Experiments have shown that local minima in the nuclear deformation landscape at spin zero exist only in massive nuclei with atomic numbers larger than 89 (actinium) and a total number of protons and neutrons well above 200. Such nuclei can be trapped in these secondary minima at metastable deformation for a period even tens of millions of times longer than the time needed to reach the ground state without being slowed down by the trap. Until a few years ago, an excited zero-spin state associated with metastable deformation had never been observed among nuclei of lighter elements. The situation changed a few years ago when a state with sizeable deformation

characterized by increased stability was found in nickel-66, the nucleus with 28 protons and 38 neutrons. This identification was stimulated by calculations performed with the sophisticated Monte Carlo shell model developed by Tokyo University theorists, which predicted this deformation trap.

"The calculations performed by our Japanese colleagues also provided another unexpected result," says Prof. Bogdan Fornal (IFJ PAN). "They showed that a deep, local depression (trap) associated with sizeable deformation should be present also in the potential energy landscape of nickel-64, the nucleus with two neutrons less than nickel-66, which until now was considered to have only one main minimum with a spherical shape. The problem was that in nickel-64 the depression was predicted at high excitation energy—at high altitude in the mountain terrain analogy—and it was extremely difficult to find an experimental method to place the nucleus in this trap."

A tour de force took place involving four complementary experiments, jointly conducted by a collaboration lead by experimentalists from Romania (IFIN-HH in Bucharest), France (Institut Laue-Langevin, Grenoble), Italy (University of Milan), USA (the University of North Carolina and TUNL) and Poland (IFJ PAN, Krakow). Measurements were performed at four different laboratories in Europe and the USA: Institut Laue-Langevin (Grenoble, France), IFIN-HH Tandem Laboratory (Romania), Argonne National Laboratory (Chicago, USA) and the Triangle Universities Nuclear Laboratory (TUNL, North Carolina, USA). Different reaction mechanisms were employed including proton and neutron transfer, thermal-neutron capture, Coulomb excitation and nuclear-resonance fluorescence, in combination with state-of-the-art gamma-ray detection techniques.

All the data taken together allowed to establish the existence of two secondary minima in the potential energy landscape of nickel-64, corresponding to oblate (flattened) and prolate (elongated) ellipsoidal shapes, with the prolate one being deep and well isolated as indicated by the significantly retarded transition to the main spherical minimum.

"The extension of time which the nucleus spends when trapped in the prolate minimum of the Ni-64 nucleus is not as spectacular as that of the heavy nuclei, where it reaches tens of millions of times. We recorded the increase of only a few tens of times; yet the fact that this increase is close to the one provided by the new theoretical model, is a great achievement," states Prof. Fornal.

A particularly valuable outcome of the study is identifying a previously unconsidered component of the force acting between nucleons in complex nuclear systems, the so-called tensor monopole, which is responsible for the multifaceted landscape of deformation in the nickel isotopes. Scientists expect that this interaction is accountable to a large extent for shaping the structure of many nuclei that have not yet been discovered.

In a broader perspective, the presented investigation indicates that the theoretical approach applied here, being able to adequately predict the unique characteristics of the nickel nuclei, has great potential in describing the properties of hundreds of nuclear systems which are not accessible in the laboratory on the Earth today, but continually produced in stars.

**More information:** N. Mărginean et al, Shape Coexistence at Zero Spin in Ni64 Driven by the Monopole Tensor Interaction, *Physical Review Letters* (2020). DOI: [10.1103/PhysRevLett.125.102502](https://doi.org/10.1103/PhysRevLett.125.102502)

**Journal information:** [Physical Review Letters](https://phys.org/news/2020-12-nuclear-deformation-mountain-landscape.html)  
<https://phys.org/news/2020-12-nuclear-deformation-mountain-landscape.html>

# Scientists further improve accuracy of directional polarimetric camera

By Zhang Nannan

Recently, researchers from the Optical Remote Sensing Center of the Anhui Institute of Optics and Fine Mechanics (AIOFM), Hefei Institutes of Physical Science (HFIPS) have successfully improved the accuracy of directional polarimetric camera (DPC) laboratory polarization calibration via new methods.

DPC, which has been successfully launched on GaoFen-5 Satellite, is a satellite-borne sensor with multi-angle, multi-spectrum and polarization detection capability for the characterization of atmospheric aerosols and clouds. High accuracy laboratory calibration of the radiation and polarization characteristics of DPC are the key factors to ensure accuracy.

This time, the researchers systematically analyzed the influence of each parameter on the polarization measurement error of DPC before putting forward a series of schemes.

They increased the sampling points to obtain the diattenuation of the optics corresponding with each pixel, established the objective equation for optimal solution of absolute azimuth angles, and calculated the relative transmission of each pixel so that the original relative transmission to central field of view could be replaced.

In this way, they finally achieved higher polarization measurement accuracy on DPC.

In order to verify the effect of the improved measurement scheme, two experiments based on an integrating sphere non-polarized radiation source and a polarizing system were carried out in the laboratory respectively.

The results showed that the polarization measurement errors of the two verification experiments were less than 0.01 and 0.005 respectively when the parameters obtained by the new calibration scheme were used to calculate the degree of linear polarization, which was greatly improved compared with the original calibration scheme.

These methods, which can be applied to polarization calibration of DPC, as well as other similar polarization optical instruments with large field of view, are important progress in the field of multi-angle polarization remote sensing detection.

**More information:** Chan Huang et al. Polarization measurement accuracy analysis and improvement methods for the directional polarimetric camera, *Optics Express* (2020). DOI: [10.1364/OE.405834](https://doi.org/10.1364/OE.405834)

Chan Huang et al. Pre-flight calibration of a multi-angle polarimetric satellite sensor directional polarimetric camera, *Optics Express* (2020). DOI: [10.1364/OE.391078](https://doi.org/10.1364/OE.391078)

Chan Huang et al. Geometric calibration method based on a two-dimensional turntable for a directional polarimetric camera, *Applied Optics* (2019). DOI: [10.1364/AO.59.000226](https://doi.org/10.1364/AO.59.000226)

Chan Huang et al. Directional polarimetric camera stray light analysis and correction, *Applied Optics* (2019). DOI: [10.1364/AO.58.007042](https://doi.org/10.1364/AO.58.007042)

**Journal information:** [Optics Express](https://phys.org/news/2020-12-scientists-accuracy-polarimetric-camera.html)

<https://phys.org/news/2020-12-scientists-accuracy-polarimetric-camera.html>

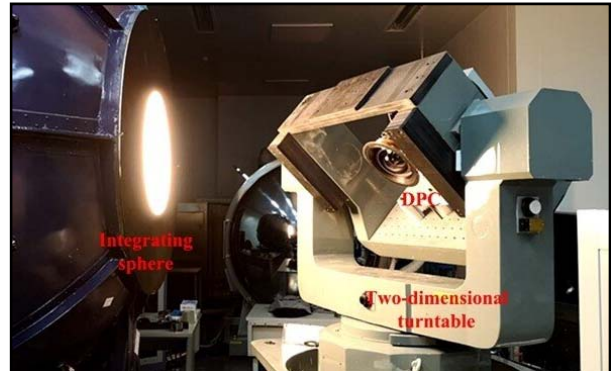
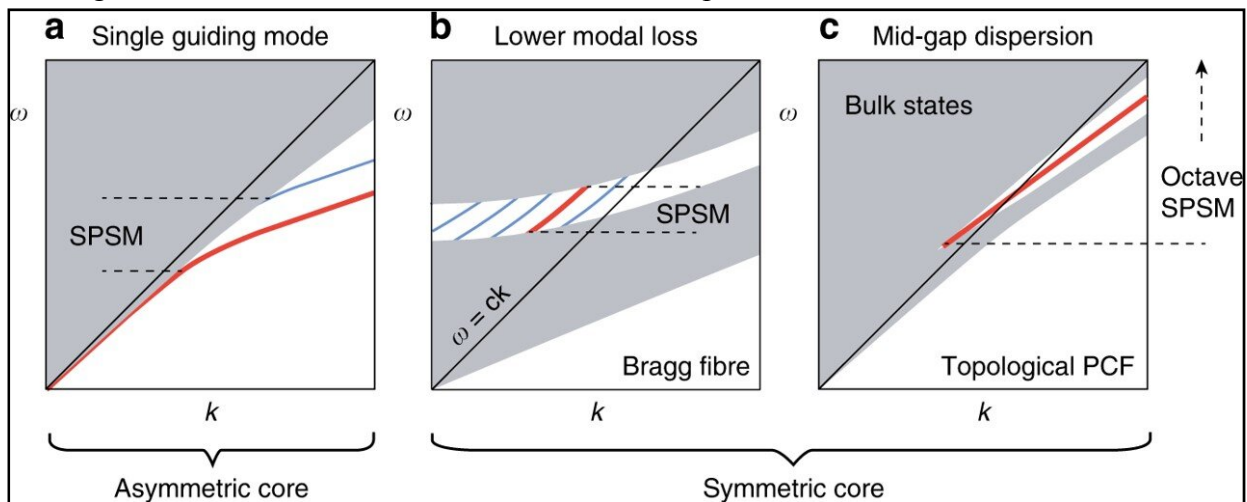


Fig.1. DPC all field of view response acquisition system.  
Credit: HUANG Chan

# Designing Dirac vortex topological photonic crystal fibres

By Thamarasee Jeewandara

Optical fibres made of topological photonic crystals allow improved versatility and control across the modes and polarization of light they transmit. Compositionally, photonic crystals contain bandgaps to prevent the passage of light relative to specific wave energies and momenta much like an on/off switch. In a new report now published on *Nature Light: Science & Applications*, Hao Lin, and Ling Lu at the Institute of Physics at the Chinese Academy of Sciences transmitted pure "single mode" light across a large frequency range via a topological feature known as a "Dirac vortex." The concept can lead to applications that transmit light signals more stably across long distances. While the work is theoretical at present, the researchers suggest the use of fibers made from silica based on stack-and-draw methods or three-dimensional (3-D) printing technologies to fabricate and test these theoretical concepts.



Asymmetric and symmetric approaches to an SPSM. (a) Dominant approach to split the degenerate fundamental modes by structural asymmetry. (b) Proposed Bragg fibre design to guide light by a singly degenerate mode with lower loss than other modes. (c) The topological PCF provides singlet mid-gap dispersion for a broadband SPSM. Credit: *Light: Science & Applications*, doi:10.1038/s41377-020-00432-2

## Understanding the nodal lines and Weyl points in a photonic crystal fibre.

Photonic crystal fibres rely on the endless variety of two-dimensional (2-D) crystals for their functionality. The concept of topological photonics based on robust waveguides can inspire new fibre concepts including the development of a one-way fibre inside a magnetic, 3-D photonic crystal. In this work, Lin and Lu introduced a topological photonic crystal fibre (PCF) resembling the Dirac vortex topological cavity in its cross-section using 2-D photonic crystals. The Dirac vortex fibre is an ideal design to develop ultrabroadband single-polarization single-mode (SPSM) fibres due to the singlet mid-gap dispersion within the bandgap. The scientists eased the fabrication step by introducing a simplified design of only four capillary silica tubes to finally achieve an octave-spanning SPSM.

The team began with the most common photonic crystal fibre, a silica photonic crystal with a triangular lattice of air holes. The material contained two nodal lines of 2-D Dirac points in the Brillouin zone. If they broke the inversion symmetry of the photonic crystal fibre by adding an extra small air hole into the primitive cell, each nodal line of the construct could gap into Weyl points or topological charges on the material. Weyl particles are elusive fermionic particles with vanishing mass and are not found as an elementary particle in nature. They are found instead to



emerge in solid-state materials where 3-D bands can develop a topologically protected point-like crossing, known as a Weyl point. Photonic Weyl points can be realized in 3-D photonic crystals with complex structures.

### **Developing a generalised Kekulé structure**

The topological bound state examined in this work can also be realized in honeycomb lattices with alternating single and double-bond representations of organic compounds known as Kekulé structures, named after the German chemist August Kekulé, who originally proposed the representation to develop the benzene organic compound. The researchers next coupled the two nodal lines of Dirac points in an enlarged supercell and annihilated them into a bandgap. Each supercell had three primitive cells labelled as an artificial 'atom' containing three struts. They moved each atom in the structure by shifting its centre of mass in any direction by adjusting the thickness of the three struts without changing the total mass of the atom. The scientists developed Kekulé modulations of the lattices and plotted their corresponding band structure.

The stability of the Dirac vortex photonic crystal fibre remained in the design itself since the corresponding topological defect was not formed by adding or removing material locally. The topological defect was formed by gently perturbing the whole lattice to create small local imperfections. A defining topological feature of the Dirac vortex fibre was the ease of creating multiple near degenerate modes by increasing the winding number – i.e. an integer representing the number of times that curves travel counterclockwise around a point, of the vortex. In principle, the researchers can practically fabricate a continuous, single-mode or multimode Dirac vortex photonic crystal fibre either from 3-D printed preforms (a form or shape), or via the stack-and-draw method used to develop optical fibres with more than a hundred tubes with different tube thicknesses. However, neither of these methods were convenient, therefore Lin and Lu et al. presented a discrete version of fibre design.

### **Fibre design with four tubes to form single-polarization single-mode fibres**

The researchers only required four tubes to stack and draw the Dirac vortex photonic crystal fibre, which was very reasonable for fabrication. The four silica tubes used in the process had the same outer diameter to maintain the lattice, but different inner diameters for modulation. The researchers plotted the resulting discrete Dirac vortex fibre and its bound structure in which structural nonuniformity was present at six identical interfaces. They also noted the presence of index-guided modes within the Dirac vortex fibre that occurred wherever a sharp local maximum of the strut thickness was present. These were equivalent to a local rise of the effective refractive index. The scientists also noted the fibre cross-section with the vortex size and the corresponding band structure.

The Dirac vortex photonic crystal fibre with a finite vortex diameter maintained a single-polarization single-mode (SPSM). Lin and Lu et al. tested their potential performance relative to the confinement loss, dispersion and effective area and bending loss. They plotted the modes with the lowest confinement loss and noted the loss of the topological mode to be the lowest for the whole wavelength range across [one octave](#). The specifications of the Dirac vortex photonic crystal fibre detailed here were similar to those in previous studies, although with the key difference of a single-polarization mode, used in this work.

### **Outlook for photonic crystal fibres**

In this way, Hao Lin and Ling Lu numerically investigated the Dirac vortex topological photonic crystal fibre relative to its principle, construction and potential performance. They proposed developing this fibre using the standard stack-and-draw process using silica glass tubes or 3-D printed preforms. The method is advantageous compared to previous fibres due to its ability to guide any number of near-degenerate modes at will. The single-mode design provided the single-polarization, single-mode fibre with an octave bandwidth to easily tune the effective mode area by changing the vortex size in the material. The work suggests using photonic crystal fibres as a new platform for topological photonics.

<https://phys.org/news/2020-12-dirac-vortex-topological-photonic-crystal.html>

## Business Standard

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### CEPI to contribute \$5M for manufacturing Bio E's Covid vaccine

*CEPI will contribute up to \$5 million toward the cost of scaling up the process for manufacturing of Biological E. Limited's Covid-19 subunit vaccine*

The Coalition for Epidemic Preparedness Innovations (CEPI) will contribute up to \$5 million toward the cost of scaling up the process for manufacturing of Biological E. Limited's Covid-19 subunit vaccine.

CEPI will also explore providing additional funding to Biological E (Bio E) with the goal of potentially enabling the production of 100 million doses in 2021.

Last month, Bio E initiated a Phase 1/2 clinical trial to evaluate the safety and immunogenicity of the vaccine candidate in India. The Hyderabad-based vaccines and pharmaceutical company expects interim data from the trial to be available in Q1 of 2021.

CEPI and Bio E said in a joint statement that they are committed to global equitable access of Covid-19 vaccines. They agreed that vaccine output funded by CEPI's investment will be made available for procurement and allocation, if proven to be safe and effective, through the Covid-19 Vaccine Global Access (COVAX) Facility. The COVAX Facility aims to ensure equitable access to Covid-19 vaccines for all countries, at all levels of development, that wish to participate.

Bio E's Covid-19 vaccine candidate is based on classical vaccine technology of a protein antigen, SARS-CoV-2 Spike RBD, adsorbed to the adjuvant Alhydrogel (Alum), in combination with another approved adjuvant, CpG 1018. The RBD of S1 subunit binds to the Angiotensin Converting Enzyme-2 (ACE2) receptor on host cell membrane and facilitates virus entry.

Potential advantages of this vaccine candidate include scalability and thermostability, which could make it suitable for deployment at scale in low-resource settings, says Bio E.

"The world has made huge strides in developing vaccines against Covid-19, but there is still much work ahead of us and it is absolutely critical that vaccine R&D continues at pace. To end the acute phase of the pandemic, and control the virus in the longer term, we will need a range of safe and effective vaccines that can be manufactured at scale to meet global demand for billions of doses, and deployed to a wide range of populations and settings so that nobody is left behind," said Dr Richard Hatchett, CEO of CEPI.

"Bio E's vaccine candidate has the potential to be produced at scale, and characteristics which could make it suitable for broad distribution in developing countries," he added.

"This collaboration with CEPI validates the technology platform BioE is working on for developing an effective Covid-19 vaccine candidate. The initial investment from CEPI comes on the heels of investments from the Bill & Melinda Gates Foundation and the Government of India's Biotechnology Industry Research Assistance Council (BIRAC), and provides the impetus for accelerated efforts towards a successful and scalable outcome for global access," said Mahima Datla, Managing Director, Biological E.



Representational image of a Covid-19 vaccine



CEPI is supporting the research and development of a diverse portfolio of vaccine candidates based on a range of vaccine approaches. Including Bio E, CEPI has invested in 11 vaccine candidates, nine of which are still in development, and seven of which are in clinical trials.

CEPI has raised \$1.3 billion in support of Covid-19 vaccine research and development, but urgently needs \$800m in additional funds to achieve its aim of developing three safe and effective vaccines which can be made globally available through COVAX.

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[https://www.business-standard.com/article/current-affairs/cepi-to-contribute-5m-for-manufacturing-bio-e-s-covid-vaccine-120123000592\\_1.html](https://www.business-standard.com/article/current-affairs/cepi-to-contribute-5m-for-manufacturing-bio-e-s-covid-vaccine-120123000592_1.html)

