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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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**Press Information Bureau  
Government of India**

**Prime Minister's Office**

*Sun, 14 Feb 2021 3:09PM*

## **PM Inaugurates and lays foundation stones of key projects in Tamil Nadu**

**Hands over Arjun Main Battle Tank (MK-1A) to the Army**

**Pays homage to the Pulwama attack martyrs**

**Focus on making India Aatmanirbhar in the defence sector**

**These projects are symbols of Innovation and Indigenous development.**

**These projects will further the growth of Tamil Nadu: PM**

**The Budget gives special importance to the development of India's coastal areas: PM**

**Devendrakula Velalar community will now be known by their heritage name, long pending demand met**

**Government has always taken care of the welfare and aspirations of our Tamil brothers and sisters in Sri Lanka: PM**

**It is our honour to work towards preserving and celebrating the culture of Tamil Nadu. The culture of Tamil Nadu is popular globally: PM**

The Prime Minister, Shri Narendra Modi inaugurated and laid the foundation stones for several key projects and handed over the Arjun Main Battle Tank (MK-1A) to the Army, at Chennai today.

Speaking in the occasion, the Prime Minister said “these projects are symbols of Innovation and Indigenous development. These projects will further the growth of Tamil Nadu.” He said Thanjavur and Pudukkottai will be specially benefitted as the foundation to modernise the six hundred and thirty six kilometres long Grand Anicut Canal System was laid today. The impact of this is going to be very big. It will improve irrigation facilities for 2.27 lakh acres of land. Shri Modi lauded the farmers of Tamil Nadu for record food grain production and good use of water resources. He said that “the Grand Anicut is a living testimony to our glorious past. It is also an inspiration to our Nation’s “Aatmnirbhar Bharat” goals.” Quoting Tamil poet Avvaiyar, the Prime Minister stressed the need to conserve water as it is not just national issue but a global subject. He emphasized the need to remember mantra of Per Drop More Crop,

Speaking about the nine kilometre stretch of the Chennai Metro Rail Phase One, that was inaugurated today. The Prime Minister informed that the project has been completed on schedule despite the pandemic. The project is in line with the boost to Aatmnirbhar Bharat as the rolling stock has been procured locally and civil construction activities were done by Indian Contractors.

Shri Modi mentioned that in this year's budget, over Rupees Sixty Three thousand crore have been set aside for a hundred and nineteen kilometres of Phase two of the project. This is one of the largest projects sanctioned for any city in one-go. The focus on urban transport will boost 'Ease of Living' for citizens here, Shri Modi pointed out.

The Prime Minister said that improved connectivity brings convenience. It also helps commerce. The Chennai Beach, Ennore Attipattu stretch of Golden Quadrilateral

is a high traffic density route. He said there is a need to ensure faster freight movement between Chennai Port and Kamarajar Port and expressed the confidence that the fourth line between Chennai Beach and Attipattu will help in this respect. He also noted that the electrification of Villupuram Thanjavur Thiruvavur project will be a great boon to the delta districts.

The Prime Minister paid homage to the Pulwama attack martyrs on the anniversary of the attack today. He said "We pay homage to all the martyrs we lost in that attack. We are proud of our security forces. Their bravery will continue to inspire generations."

The Prime Minister said India has undertaken a massive effort to become self-reliant in the defence sector. He said this is inspired by what Mahakavi Subramaniya Bharathi Writing in the oldest language in the world, Tamil, said Let us make weapons; let us make paper. Let us make factories; let us make schools. Let us make vehicles that can move and fly. Let us make ships that can shake the world. Shri Modi said that One of the two defence corridors is in Tamil Nadu. The corridor has already received investment commitments over Rupees Eight thousand one hundred crores.

The Prime Minister noted that Tamil Nadu is already the leading automobile manufacturing hub of India. Now, The Prime Minister saw Tamil Nadu evolving as the Tank manufacturing hub of India. On MBT Arjun Mark 1A, the Prime Minister declared "I am proud to handover the indigenously designed and manufactured "Main Battle Tank Arjun Mark 1A". It also uses indigenous ammunition. A tank made in Tamil Nadu will be used in our northern borders to keep the nation safe. This showcases India's united spirit – Bharat's Ekta Darshan"

The Prime Minister said that the focus on making India Aatmanirbhar in the defence sector will keep moving with full speed.

Our armed forces signify India's ethos of courage. They have shown time and again that they are fully capable of protecting our Motherland. Time and again they have also shown India believes in peace. However, India will protect our sovereignty at all costs, the Prime Minister said.

The Prime Minister expressed the hope that The Discovery Campus of IIT Madras with 2-lakh square metre infrastructure to house world-class research centres will be a leading centre of discovery and draw the best talent from all over India.

Shri Modi said that this year's Budget has once again showcased the reform commitment of the Government. The Budget gives special importance to the development of India's coastal areas. Extra credit mechanisms for fishermen communities, upgradation of Infrastructure relating to fishing with modern fishing harbours in five centres including Chennai and seaweed farming. will improve lives of coastal communities. He also informed that for seaweed cultivation, a multi-purpose sea-weed park will come up in Tamil Nadu.

The Prime Minister announced that The Central Government has accepted their long-standing demand of Devendrakula Velalar community to be known as Devendrakula Velalar They will now be known by their heritage name and not the six to seven names listed in the Schedule to the Constitution. The draft Gazette to amend the Constitutional schedule to correct their name as Devendrakula Velalar has been approved by the central government. It will be placed before the Parliament before the start of the next session. He thanked the Government of Tamil Nadu for the detailed study done on this demand. Shri Modi said, this decision is more than a change of name. It is about justice, dignity and opportunity. "It is our honour to work towards preserving and celebrating the culture of Tamil Nadu. The culture of Tamil Nadu is popular globally", said Shri Modi

Prime Minister asserted that the Government has always taken care of the welfare and aspirations of our Tamil brothers and sisters in Sri Lanka. Shri Modi is the only Indian Prime Minister to visit Jaffna. The resources provided by this Government for Tamils have been much more than in the past. The projects include: Fifty thousand houses for displaced Tamils in North-Eastern Sri Lanka. Four thousand houses in the plantation areas. On the health side, we financed a free ambulance service which is widely used by the Tamil community. A hospital has been built in Dickoya. To boost connectivity, the railway network to Jaffna and to Mannar is being re-built. Flights have been established from Chennai to Jaffna. India has built the Jaffna Cultural Centre which will open soon. "The issue of Tamil rights has also been taken up by us consistently with Sri Lankan leaders. We are always committed to ensuring that they live with equality, justice peace and dignity" said the Prime Minister.

The Prime Minister also assured that the Government will always protect the rightful interests of fishermen and has always ensured early release whenever fishermen are apprehended in Sri Lanka. More than sixteen hundred fishermen have been released during the tenure of the current Government and there is no Indian fishermen in Sri Lankan custody. Similarly, three hundred and thirteen boats have also been released, informed the Prime Minister.

The Prime Minister inaugurated the Chennai Metro Rail Phase-I extension, fourth Railway line between Chennai Beach and Attipattu, Railway Electrification of single line section in Villupuram - Cuddalore - Mayiladuthurai - Thanjavur and Mayiladuthurai-Thiruvavur. Prime Minister laid the foundation stone for the extension, renovation and modernization of the Grand Anicut Canal System and Discovery Campus of IIT Madras.

Governor of Tamil Nadu, Chief Minister of Tamil Nadu, Deputy Chief Minister, Speaker of Tamil Nadu Assembly Industries Minister of Tamil Nadu were present on the occasion.

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1697914>



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Sun, 14 Feb 2021 5:51PM*

## **Flag off ceremony of final production batch of LRSAM Missiles**

Final production batch of Long Range Surface to Air Missiles (LRSAM), designed and developed by DRDO in collaboration with various industry partners and integrated by BDL, was flagged off on 14 Feb 2021 at DRDL, APJ Abdul Kalam Missile Complex, Hyderabad in the presence of Dr. G Satheesh Reddy, Secretary, DDR&D and Chairman DRDO and Rear Admiral V Rajasekhar, VSM Director, Defence Machine Design Establishment (DMDE).

LRSAM is jointly developed by DRDO and IAI Israel to equip latest ships of Indian Navy. This LRSAM Missile system can provide point and area defence against various aerial targets including fighter aircraft, subsonic & supersonic cruise missiles. The Missile is powered by indigenously developed dual-pulse rocket motor and dual control system to impart required manoeuvrability at the terminal phase. This state of art weapon system is designed with active Radio Frequency (RF) seeker to identify, track, engage and destroy the target with high kill probability.

LRSAM system end to end performance has been successfully demonstrated through number of user flight trials from Indian Naval ships. This weapon system has been successfully productionised and has been delivered to Indian Navy.

Secretary, DDR&D highlighted the importance of indigenous production efforts and complemented the industries that have established the manufacturing facilities and successfully executed the production orders in achieving the goal towards 'Make in India'. He also commended

the efforts of Missile System Quality Assurance Agency (MSQAA), DG (NAI) in streamlining the production activities at various industries across India, leading to delivery of missiles with aerospace quality standards.

Rear Admiral V Rajasekhar, VSM of Indian Navy appreciated the efforts of DRDO for successfully completing the production order and strengthening air defence capability of Indian Navy. He also urged DRDO to design and develop similar advanced weapon systems meeting futuristic warfare.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1697942>



Mon, 15 Feb 2021

## LRSAM मिसाइलों का अंतिम उत्पादन बैच शुरू, लंबी दूरी तक सतह से हवा में मार करने में सक्षम

हैदराबाद, प्रेट्र। लंबी दूरी तक सतह से हवा में मार करने वाली मिसाइल (Long Range Surface-to-Air Missile) का अंतिम उत्पादन बैच रविवार को यहां ए पी जे अब्दुल कलाम मिसाइल परिसर (A P J Abdul Kalam Missile Complex) के डीआरडीएल में शुरू किया गया। रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) ने औद्योगिक साझेदारों के साथ मिलकर इसका डिजायन तैयार किया है और इसे विकसित किया है तथा बीडीएल द्वारा एकीकृत किया गया है।

एक रक्षा विज्ञप्ति के अनुसार रविवार को इस मौके पर रक्षा अनुसंधान एवं विकास विभाग के सचिव एवं डीआरडीओ के अध्यक्ष जी सतीश रेड्डी तथा डिफेंस मशीन डिजायन प्रतिष्ठान के निदेशक रियर एडमिरल वी राजशेखर भी मौजूद थे। डीआरडीओ ने नौसेना के नवीनतम जहाजों को लैस करने के लिए मेसर्स एयरोस्पेस के साथ मिलकर इसे विकसित किया है। एलआरएसएम मिसाइल प्रणाली जंगी विमानों, सबसोनिक और सुपरसोनिक क्रूज मिसाइलों समेत हवा में लक्ष्यों के विरुद्ध बचाव प्रदान कर सकती है।

किसी भी बड़े उत्पाद को अलग-अलग हिस्सों में तैयार किया जाता है, जिसे उत्पादन बैच कहते हैं। इसमें किसी हिस्से में खराबी आने पर उसे सुधारना आसान होता है। अंतिम उत्पादन बैच का मतलब है कि अब मिसाइल कोई पार्ट तैयार करना शेष नहीं रहेगा।

<https://www.jagran.com/news/national-final-production-batch-of-lrsam-missiles-flagged-of-21370182.html>



## एलआरएसएम मिसाइलों का अंतिम उत्पादन खेप शुरू किया गया

हैदराबाद, 14 फरवरी (भाषा) लंबी दूरी तक सतह से हवा में मार करने वाली मिसाइल (एलआरएसएम) का अंतिम उत्पादन खेप रविवार को यहां ए पी जे अब्दुल कलाम मिसाइल परिसर के डीआरडीएल में शुरू किया गया। डीआरडीओ ने औद्योगिक साझेदारों के साथ मिलकर इसका डिजायन तैयार किया है और इसे विकसित किया है तथा बीडीएल द्वारा समेकन किया गया है। एक रक्षा विज्ञप्ति के अनुसार रविवार को इस मौके पर रक्षा अनुसंधान एवं विकास विभाग के सचिव एवं डीआरडीओ के अध्यक्ष जी सतीश रेड्डी तथा डिफेंस मशीन डिजायन एस्टैब्लिशमेंट के निदेशक रियर एडमिरल वी राजशेखर भी मौजूद थे। डीआरडीओ ने नौसेना के नवीनतम जहाजों को लैस करने के लिए मेसर्स एयरोस्पेस के साथ मिलकर विकसित किया है। एलआरएसएम मिसाइल प्रणाली जंगी विमानों, सबसोनिक और सुपरसोनिक क्रूज मिसाइलों समेत वायुमंडलीय लक्ष्यों के विरुद्ध बचाव प्रदान कर सकती है।

<https://navbharattimes.indiatimes.com/state/other-states/hyderabad/final-production-consignment-of-lrsam-missiles-commenced/articleshow/80912172.cms>

## अमरउजाला

Sun, 14 Feb 2021

## प्रधानमंत्री मोदी ने सेना को सौंपी अचूक निशाने वाले अर्जुन टैंक की चाबी, जानें इसकी खासियत

दीप्ती मिश्रा

प्रधानमंत्री नरेंद्र मोदी रविवार को तमिलनाडु की राजधानी चेन्नई पहुंचे हैं। यहां प्रधानमंत्री मोदी ने सेना को और ताकतवर बनाने के लिए सेनाध्यक्ष जनरल एमएम नरवणे को युद्धक टैंक अर्जुन (एमके-1ए) की चाबी सौंपी है। इसी के साथ सेना में 118 उन्नत अर्जुन टैंक शामिल किए जाएंगे। आइए बताते हैं कि अचूक निशाने वाले स्वदेश में निर्मित अर्जुन टैंक की खासियत...

तमिलनाडु की राजधानी चेन्नई में आयोजित एक समारोह में उन्होंने इस अत्याधुनिक टैंक की सलामी भी स्वीकार की। रक्षा अनुसंधान विकास संगठन (डीआरडीओ) के यहां स्थित युद्धक वाहन अनुसंधान एवं विकास प्रतिष्ठान द्वारा निर्मित इस अत्याधुनिक टैंक का डिजाइन देश में ही तैयार और विकसित किया गया है। पूरी तरह स्वदेश में निर्मित



सेनाध्यक्ष को अर्जुन टैंक की चाबी देते हुए पीएम मोदी- फोटो : ANI

अर्जुन टैंक के इस उन्नत संस्करण का निशाना अचूक बताया जा रहा है, जिससे भारतीय सेना की जमीन पर मारक क्षमता को और ज्यादा मजबूती मिलेगी।

### **डिजाइन तैयार करने वाले रेड्डी ने की प्रशंसा**

अर्जुन टैंक का डिजाइन तैयार करने वाले रक्षा अनुसंधान व विकास संगठन (डीआरडीओ) के चेयरमैन जी. सतीश रेड्डी ने प्रधानमंत्री मोदी की तरफ से अर्जुन एमके-1ए को देश को समर्पित करने का फैसला लेने की प्रशंसा की है। रक्षा शोध व विकास सचिव की भी जिम्मेदारी संभाल रहे रेड्डी ने बताया कि नए संस्करण में 71 अतिरिक्त फीचर जोड़े गए हैं, जो इसे दुनिया के सभी श्रेष्ठ टैंकों के समकक्ष खड़ा करते हैं। बता दें कि हाल ही में रक्षा मंत्रालय की बैठक में 118 उन्नत अर्जुन टैंक सेना में शामिल करने को मंजूरी दी गई थी।

### **अर्जुन टैंक की खासियत**

डीआरडीओ ने अर्जुन टैंक की फायर पावर क्षमता को काफी बढ़ाया है। अर्जुन टैंक में नई टेक्नोलॉजी का ट्रांसमिशन सिस्टम है। इससे अर्जुन टैंक आसानी से अपने लक्ष्य को ढूंढ लेता है। अर्जुन टैंक युद्ध के मैदान में बिछाई गई माइंस हटाकर आसानी से आगे बढ़ने में सक्षम है। अर्जुन टैंक में केमिकल अटैक से बचने के लिए स्पेशल सेंसर लगे हैं।

### **2012 में मंजूरी, 2021 में मिलेगा पहला टैंक**

118 उन्नत अर्जुन टैंक खरीदने को 2012 में मंजूरी दी गई थी और 2014 में रक्षा खरीद समिति ने इसके लिए 6600 करोड़ रुपये भी जारी कर दिए थे। लेकिन इसकी फायर क्षमता समेत कई पक्षों पर सेना ने सुधार की मांग की थी। इस बीच सेना ने 2015 में रूस से 14000 करोड़ रुपये में 464 मध्यम वजन के टी-90 टैंक की खरीद का सौदा कर लिया था। सेना की मांग के आधार पर उन्नत किए जाने के बाद अर्जुन टैंक मार्क-1ए को 2020 में हरी झंडी मिली थी।

### **पहले से 124 अर्जुन टैंक हैं सेना में**

भारतीय सेना के बेड़े में 124 अर्जुन टैंकों की एक रेजीमेंट पहले से ही साल 2004 में शामिल की जा चुकी है, जो पश्चिमी रेगिस्तान में तैनात है। लेकिन ये अर्जुन टैंक पुराने मॉडल के हैं, जिनमें करीब 72 तरह के सुधार की आवश्यकता भारतीय सेना ने जताई थी। इसके बाद डीआरडीओ ने नए संस्करण को तैयार किया है। अब शामिल किए जा रहे 118 अर्जुन टैंक अतिरिक्त फीचर वाले हैं और पहले से ज्यादा मारक क्षमता वाले हैं। इनके लिए एक और बख्तरबंद रेजीमेंट बनाई जाएगी।

### **अर्जुन सीरीज का आखिरी बैच**

118 अर्जुन मार्क-1ए टैंक इस सीरीज का आखिरी बैच होंगे। दरअसल अर्जुन टैंक के करीब 68 टन वजनी होने को भारतीय सेना समस्या मानती है। खासतौर पर चीन के खिलाफ लद्दाख व अरुणाचल प्रदेश के दुर्गम क्षेत्रों में इस टैंक को तैनात नहीं किया जा सकता है। वहां के लिए सेना 20 से 25 टन के हल्के और 30 से 50 टन वजन के मध्यम टैंक की आवश्यकता जता चुकी है।

<https://www.amarujala.com/india-news/pm-narendra-modi-hands-over-indigenous-arjun-tank-to-indian-army-chief-general-mm-naravane-tamilnadu-chennai>



## अर्जुन मेन बैटल टैंक की चाबी पीएम मोदी ने सेना प्रमुख को सौंपी, पूरी तरह से है देसी

डीआरडीओ (Defence Research & Development Organisation) पिछले कुछ समय से अर्जुन मार्क 1A युद्धक टैंक का विकास कर रहा है। इस टैंक का डिजाइन डीआरडीओ के लड़ाकू वाहन अनुसंधान और विकास प्रतिष्ठान (Combat Vehicle Research and Development Establishment) ने तैयार किया है।

चेन्नई: पीएम नरेंद्र मोदी (PM Narendra Modi) केरल और तमिलनाडु के दौरे पर हैं। दौरे के पहले चरण में पीएम मोदी चेन्नई पहुंचे। यहां पर पीएम ने स्वदेशी (Made In India) अर्जुन मेन बैटल टैंक (Arjun Main Battle Tank) सेना प्रमुख जनरल एमएम नरवणे (MM Naravane) को सौंपा।

### पूरी तरह से स्वदेशी है अर्जुन मार्क 1A

डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (Defence Research & Development Organisation) ने इस टैंक का निर्माण किया है। इस टैंक को पूरी तरह भारत में ही बनाया गया है। ये टैंक सेना के पहले बैच में शामिल होंगे। अर्जुन टैंक से सेना में बख्तरबंद कोर में दो रेजिमेंट बनाई जाएगी।

### DRDO ने किया है विकसित

डीआरडीओ (Defence Research & Development Organisation) पिछले कुछ समय से अर्जुन मार्क 1 A युद्धक टैंक का विकास कर रहा है। इस टैंक का डिजाइन डीआरडीओ के लड़ाकू वाहन अनुसंधान और विकास प्रतिष्ठान (Combat Vehicle Research and Development Establishment) ने तैयार किया है। करीब ढाई साल पहले अर्जुन टैंक ने नए संस्करणों की सप्लाई के लिए कांटेक्ट साइन किया गया था।



<https://zeenews.india.com/hindi/india/pm-narendra-modi-handed-over-the-battle-tank-to-the-arjuna-army/848467>

## आर्मी को मिलेगा अर्जुन टैंक मार्क-1 ए नोट, DRDO चीफ ने प्रधानमंत्री के फैसले को बताया अहम

By Monika Minal

**MK 1A to the nation भारतीय सेना को मजबूत करने के लिए प्रधानमंत्री नरेंद्र मोदी ने 118 अर्जुन टैंक सेना को देने का फैसला किया है जिसकी तारीफ रक्षा अनुसंधान और विकास संगठन (DRDO) प्रमुख सतीष रेड्डी ने की।**

नई दिल्ली: भारतीय सेना को और ताकतवर बनाने की दिशा में अर्जुन टैंक के नवीनतम संस्करण को सौंपने का फैसला किया गया है। रक्षा अनुसंधान और विकास संगठन (DRDO) ने आज इस बात के लिए प्रधानमंत्री नरेंद्र मोदी की सराहना की। DRDO प्रमुख सतीष रेड्डी (Satheesh Reddy) ने शनिवार को कहा, 'आर्मी को MK-1A सौंपने का ऐलान कर प्रधानमंत्री नरेंद्र मोदी ने देश के लिए काफी अहम फैसला लिया है। इसके जरिए यह संदेश दिया जा रहा है कि भारत अपने स्वदेशी सिस्टम के साथ है और यह काफी व्यापक तरीके से प्रोत्साहित किया जाएगा।' DRDO ने बताया है कि प्रधानमंत्री नरेंद्र मोदी 14 फरवरी को चेन्नई में अर्जुन टैंक के नवीनतम संस्करण मार्क-1 ए को भारतीय सेना को सौंपेंगे।



DRDO प्रमुख ने प्रधानमंत्री के फैसले की तारीफ की

DRDO प्रमुख ने बताया, 'अर्जुन मार्क 1 ए में अत्याधुनिक फीचर्स हैं। इसमें कई पाइपलाइन लगे हैं जैसे वायुसेना और नौसेना के लिए एयर टू एयर मिसाइल अस्त्र, स्मार्ट एंटी एयरफील्ड वीपन, एयर इंडिपेंडेंट प्रपल्सन, ATAGS guns, एयरक्राफ्ट व मीडियम पावर रडाल आदि हैं। रक्षा मंत्रालय की ओर से दी गई जानकारी के अनुसार भारतीय सेना को मजबूत करने के लिए 118 अर्जुन टैंक सेना को दिए जाएंगे। इनकी कीमत 8400 करोड़ रुपये है। इसके लिए मंजूरी दे दी गई है। प्रधानमंत्री कार्यालय की ओर से बताया गया है कि प्रधानमंत्री तमिलनाडु और केरल में कई परियोजनाओं का शिलान्यास और उद्घाटन करेंगे। इसी दौरान वो चेन्नई में सेना को अर्जुन मुख्य युद्धक टैंक भी सौंपेंगे।

हाल में ही रक्षा मंत्रालय ने भारतीय सेना में 118 अर्जुन मार्क 1ए टैंक को शामिल करने की मंजूरी दी है। DRDO ने टैंक को पूरी तरह से डिजाइन और विकसित किया है। 124 अर्जुन टैंकों में से फ्लीट के पहले बैच में 118 अर्जुन टैंक शामिल किए जाएंगे और भारतीय सेना पहले ही इनकी तैनाती कर चुकी है। इन टैंकों पाकिस्तान से लगी सीमा पर पश्चिमी रेगिस्तानी इलाकों में तैनात किया गया है। यह 118 अर्जुन टैंक भारतीय सेना की दो रेजिमेंट बनाएंगे।

<https://m.jagran.com/news/national-it-is-a-great-decision-by-pm-narendra-modi-to-dedicate-mk-1a-to-the-nation-by-handing-it-over-to-army-21364523.html>

Mon, 15 Feb 2021

## PM Modi hands over 'Made-In-India' Arjun battle tank to Army in Chennai

By Shreya

Chennai: Prime Minister Narendra Modi on Sunday handed over the homemade Arjun Main Battle Tank (MK-1A) to Army Chief General MM Naravane in Chennai.

At a function, he also accepted a salute by the state-of-the-art tank, indigenously designed, developed, and manufactured by DRDO's Combat Vehicles Research and Development Establishment here.

Fifteen academic institutions, eight labs and several MSMEs were also involved in the project.

The Defence Ministry had recently cleared the induction of 118 Arjun Mark 1A tanks into the Indian Army, costing around Rs 8,400 crore.



"Today I am proud to dedicate to the country one more warrior to protect our frontiers. I am proud to hand over the indigenously designed and manufactured Arjun MK-1A."

"It also uses indigenous ammunition. Tamil Nadu is already the leading auto manufacturing hub of India. Now I see Tamil Nadu evolving as a tank manufacturing hub of India," he said.

"A tank made in Tamil Nadu will be used in our northern border to keep our nation safe. This showcases India's united spirit--Bharat's ekta darshan," Modi added.

According to reports, the Heavy Vehicles Factory (HVF) at Avadi here, has been placed with a Rs 8,500 crore order for manufacturing 118 of these tanks.

Arjun MK 1 Alpha is a "contemporary tank in the world with battle winning efficacy," officials said.

It is 'infused' with 71 new features and would ensure effortless mobility in all terrains, besides precise target engagement during day and night.

The production order opens up a large avenue in defence manufacturing for over 200 Indian companies and scores of Micro, Small & Medium Enterprises (MSMEs) with employment opportunities to 8,000 people, they said.

The tank is a "shining example" of the Centre's much touted "atmanirbhar bharat," a concept of attaining self-reliance in various sectors including the defence.

Quoting from revolutionary Tamil poet and freedom fighter Mahakavi Subramanya Bharathi, Modi said that inspired by the former's vision, "India has taken a massive effort to become self-reliant in the defence sector."

Of the two defence corridors in the country, the one in Tamil Nadu has already received investment commitments of over Rs 8,100 crore, Modi said.

"We will continue working to make our armed forces one of the most modern forces in the world. At the same time the focus on making India Atmanirbhar in the defence sector moves with full speed," he said.

Later, in a tweet, he said it was "a special day in our journey to become Aatmanirbhar in the defence sector," referring to Arjun Main Battle Tank (MK-1A).

Fifteen academic institutions, eight labs and several MSMEs were also involved in the Arjun MK 1A.

<https://www.oneindia.com/amphtml/india/pm-modi-hands-over-made-in-india-arjun-battle-tank-to-army-in-chennai-3216795.html>

## ThePrint

Sat, 13 Feb 2021

### India will be atmanirbhar when state-of-the-art defence systems are developed — DRDO Chief

*Speaking at IIT-Bhubaneswar, Dr G Satheesh Reddy urged students to learn next-generation tech related to artificial intelligence and cyber security, to help India grow*

Bhubaneswar: DRDO chairman Dr G Satheesh Reddy said here on Friday that India will become self-reliant when all state-of-the-art defence equipment and systems are designing, developed and produced in the country.

Reddy, while addressing students and teachers at IIT-Bhubaneswar during its 13th Foundation Day ceremony, said the institute could significantly contribute to the country's development with its technological innovations and expertise in various fields.

The Defence Research and Development Organisation (DRDO) chairman urged students to devote their energy and time to learning next-generation technology related to artificial intelligence, and cyber security, thereby paving the roadmap for growth of India.

“India will really become Atmanirbhar (self-reliant) when design, development and production of state-of-the-art systems required by the defence are done within the country, he said.

Several teachers and students were felicitated at the ceremony.

<https://theprint.in/defence/india-will-be-atmanirbhar-when-state-of-the-art-defence-systems-are-developed-drdo-chief/604424/>



## THE NEW INDIAN EXPRESS

Mon, 15 Feb 2021

### Corridors in UP, TN will boost defence industries: DRDO Chief

*Many schemes have been launched by the government to also help the start-ups*

Chennai: Defence Research and Development Organisation (DRDO) Chairman G Satheesh Reddy said on Saturday that the upcoming defence corridor projects in Uttar Pradesh and Tamil Nadu will give a fillip to the defence sector and it will create an eco-system for the defence-related industries to flourish in the country. Speaking at the Business Excellence Award, organised by Andhra Chamber of Commerce (ACC), Reddy said the government has been taking initiatives to support the industries in a big way and encouraging them to come up with different innovative products.





Many schemes have been launched by the government to also help the start-ups. The DRDO chief noted that during such a time, the role of organisations like ACC becomes more important as they help in creating awareness. The Chamber organised the fifth edition of the programme virtually and five people were awarded for their contribution in the business field.

These include Ponni Concessao for his contribution in the field of architecture, VMM Prasad (rural education), Pullela Gopichand (sports), Vinayak C. Hegana, founder and CEO of Shivar Naturals, (MSME category) and Suchitra Ella, joint MD Bharat Biotech International (Pharmaceuticals).

### **Parliament panel flags manpower shortage**

The DRDO's current manpower is grossly insufficient for committed research and development (R&D) projects, stated a report of the Parliamentary Standing Committee on Defence on Friday. In its reply to the committee, the Defence Ministry said the Ministry of Finance had on April 24 last year already approved the proposal to augment the manpower in DRDO by 436 posts.

<https://www.newindianexpress.com/business/2021/feb/14/corridors-in-up-tn-will-boost-defence-industries-2263682.html>



Mon, 15 Feb 2021

## **Explained: What is the Arjun Main Battle Tank MK-1A?**

*The Arjun Main Battle Tank project was initiated by DRDO in 1972 with the Combat Vehicles Research and Development Establishment (CVRDE) as its lead laboratory*

New Delhi: Prime Minister Narendra Modi on Sunday handed over the indigenously developed Arjun Main Battle Tank (MK-1A) to the Indian Army at a ceremony in Chennai. The army will get 118 units of the Main Battle Tank, indigenously designed, developed and manufactured by CVRDE and DRDO along with 15 academic institutions, eight labs and several MSMEs.

### **What is the Arjun Main Battle Tank?**

The Arjun Main Battle Tank project was initiated by DRDO in 1972 with the Combat Vehicles Research and Development Establishment (CVRDE) as its lead laboratory. The objective was to create a "state-of-the-art tank with superior fire power, high mobility, and excellent protection". During the development, the CVRDE achieved breakthroughs in the engine, transmission, hydropneumatic suspension, hull and turret as well as the gun control system. Mass production began in 1996 at the Indian Ordnance Factory's production facility in Avadi, Tamil Nadu.

### **What are the features of the Arjun tank?**

The Arjun tanks stand out for their 'Fin Stabilised Armour Piercing Discarding Sabot (FSAPDS)' ammunition and 120-mm calibre rifled gun. It also has a computer-controlled integrated fire control system with stabilised sighting that works in all



Prime Minister Narendra Modi on Sunday handed over the indigenously developed Arjun Main Battle Tank (MK-1A) to the Indian Army at a ceremony in Chennai. (Twitter/@narendramodi)



Prime Minister Narendra Modi in Chennai on Sunday. (Twitter/@narendramodi)

lighting conditions. The secondary weapons include a co-axial 7.62-mm machine gun for anti-personnel and a 12.7-mm machine gun for anti-aircraft and ground targets.

### **How many Arjun tanks have been inducted so far?**

The Indian Army received the first batch of 16 tanks in 2004 and they were inducted as a squadron of the 43 Armoured Regiment. In 2009, the first Arjun regiment of the Indian Army had 45 tanks. By 2011, over 100 tanks had been delivered. In 2010, the Indian army ordered another 124 Arjuns. The Ministry of Defence ordered another 118 units of the Arjun Mk-1A. These are the units being inducted now at a revised cost of over Rs 8,400 crore.

### **How is the Mk-1A different?**

The Mk-1A version has 14 major upgrades on the earlier version. It is also supposed to have missile firing capability as per the design, but this feature will be added later as final testing of the capability is still on. However, the biggest achievement with the latest version is 54.3 per cent indigenous content against the 41 per cent in the earlier model.

<https://indianexpress.com/article/explained/explained-what-is-the-arjun-main-battle-tank-mk-1a-7188226/>

## **The Telegraph online**

Sat, 13 Feb 2021

# **DRDO to tie up with IIT Bhubaneswar on research**

*The organisation is planning to release funds under Technological Development Funds up to Rs 10 crore to promote start-ups*

*By Subhashish Mohanty*

Bhubaneswar: The Defence Research and Development Organisation (DRDO) is keen to tie up with the Indian Institute of Technology (IIT) Bhubaneswar to take up various kinds of research in the field of defence and turn the institution into a centre of excellence. It has asked the prestigious institute to come out with innovative plans to develop long-term partnership with DRDO.

Addressing the students of the IIT, Bhubaneswar on its 13th Foundation Day in the virtual mode on Friday, chairman, DRDO and scientific advisor to defence minister Dr G. Satheesh Reddy said: “We need to promote research, put up start-ups and have a synchronisation with the industries to make the country prosperous.”

Reddy said: “The DRDO wants to actively make partnership with IIT, , in many specific research areas. We want to develop it as a centre of excellence in the field of defence research like other prominent organisations like IIT Delhi, Mumbai and Chennai. It would support their innovation by giving funds to make it a reality.”

The head of the country’s premier defence research organisation said, “DRDO is releasing funds under Technological Development Funds up to Rs 10 crore to promote start-ups. Besides we have a plan to give Rs 1 crore to the passing out students to set up start-ups if they come up with a plan that is feasible. We are ready to promote such start-ups in large numbers. Lots of youngsters are entering the defence research field.”

The DRDO Chairman said, “With the collaboration of the Ministry of Higher Education, the DRDO plans to involve more and more students from the reputed institutes in various fields of research. We need to decentralize. We are generally technology followers. Now we have to change the trend and have to be the frontrunners in the field of technology. If the country has to prosper,



**IIT Bhubaneswar director R.V. Raja Kumar at the 13th Foundation Day on Friday**



we have to be technologically advanced. Lots of research and innovation work is to be done. The academic institution should do the fundamental research and then only specialised institutions will take it further.”

He said DRDO is working with around 295 academic institutions on different research projects and more than Rs 10,000 crore is involved in these projects.

Stating that India has matured and become self-reliant in many areas of defence like making ballistics of inter-continental range, radar, sonar technology, tanks, fighter planes and even space technology, Reddy said, “The Prime Minister will soon dedicate a newer version of Arjun tank.”

Director IIT, Prof R.V. Raja Kumar said: “Covid-19 has thrown up many challenges. We need to rise to the occasion. We have decided to open courses on bio-engineering and generate human resources on bio engineering.”

Expressing serious concern on the flash flood disaster in Uttarakhand, Raja Kumar said, “There is a serious gap in the field of disaster studies.”

Commenting on the current education system, Raja Kumar said, “The coaching system that we subject our children to in order to achieve success in various entrance exams like JEE is not healthy for the nation. Students miss out on a lot of things in their most formative years. Now we are planning to offer them things like sporting activities that they miss once they enter the IITs.”

<https://www.telegraphindia.com/india/drdo-to-tie-up-with-iit-bhubaneswar-on-research/cid/1806496#>



Sat, 13 Feb 2021

## DRDO, IIT Bhubaneswar to strengthen defence research ties

*The trend of students going to the field of information technology has changed in the last five years*

Bhubaneswar: The Defence Research and Development Organisation (DRDO) will strengthen its ties with the IIT Bhubaneswar (IIT-BBS) further to develop it as a centre of excellence for promoting defence research.

"The DRDO Technology and Extramural Research and Intellectual Property Rights (ER&IPR) wings will be encouraged to work with IIT Bhubaneswar in different areas to see that the institute becomes part of our centres of excellence and works in specific fields of defence research," said DRDO Chairman G Satheesh Reddy in his virtual address on the 13th foundation day of IIT-BBS on Friday.



IIT Bhubaneswar. (Photo| Facebook/ IIT Bhubaneswar)

The DRDO has partnered with IIT-BBS in running research projects worth Rs 1.3 crore in several fields which include stress-corrosion cracking-related studies, online corrosion monitoring in naval structures, improving the damping capacity of materials like nickel, aluminium and bronze, and development of formal verification tools for proactive assessment and prevention of security threats in enterprise networks.

"We will have many more projects for IIT-BBS in the coming days. There are around 295 academic institutions where the DRDO is having investment of more than Rs 1,000 crore. The DRDO is also ready to fund start-ups in a big way," Reddy said.

The DRDO's centres of excellence have been established in different institutes of national repute which include IIT Delhi, IIT Mumbai, IIT Chennai, Hyderabad Central University and Jammu University.

"The trend of students going to the field of information technology has changed in the last five years. Many youngsters are now coming up with start-ups especially in the defence sector. The government is also encouraging them. DRDO with its Technology Development Fund scheme promises funding of up to Rs 10 crore to start-ups," Reddy said.

Reddy added that they also have schemes to fund up to Rs 1 crore to newly passed out students for start-ups in the field of defence. "It is the technology that helps a country prosper. We have to be a technologically-advanced nation. We should be coming out with many first-of-its-kind technological products and innovations," he said.

Reddy also praised IIT-BBS Director Prof RV Raja Kumar for his contribution to the field of defence and thanked him for his role he played in DRDO projects in the field of Sonar, Signal processing as well as risk processor related applications, CDMA communication for Prithvi missile.

<https://www.newindianexpress.com/cities/bhubaneswar/2021/feb/13/drdo-iit-bhubaneswar-to-strengthen-defence-research-ties-2263485.html>

INDIA  
TODAY

Sat, 13 Feb 2021

## After Tejas LCA, huge atmanirbhar push for Arjun tanks

*Army will place order for final batch of Arjun Mark 1A tanks  
which would pave way for self-sufficiency in armored vehicles*

*By Sandeep Unnithan*

New Delhi: Prime Minister Narendra Modi will symbolically hand over the first 118 Arjun Mark 1A main battle tanks (MBT) to army chief General MM Naravane at a function in Chennai on Sunday. This will clear the path for the army to formally place orders for the production of the final batch of Arjun MBTs worth Rs 6,600 crore.

The political push for the Arjun tanks follows the February 3 award of a contract for 83 LCA Tejas aircraft to Hindustan Aeronautics Ltd (HAL). The contract is worth Rs 48,000 crore- the largest placed on any Indian defence firm and was cleared by the Cabinet Committee on Security on January 13. The government has identified indigenous contracts as being a key to jump start indigenous industry and achieve self-sufficiency in defence, the Atmanirbhar Bharat initiative launched last April.

Defence Minister Rajnath Singh said at Aero India last week that the government would reduce imports by \$2 billion (Rs 14,000 crore) by the end of 2022.

The Arjun has been designed by the DRDO's Combat Vehicles Research and Development Establishment (CVRDE) and DRDO Chairman Satheesh Reddy will hand the first Arjun Mark 1A to Prime Minister Modi. The tanks will be produced by the OFB's Heavy Vehicles Factory Avadi and the first batch of five MBTs will be handed over to the army within 30 months of signing of the contract.



Prime Minister Narendra Modi riding an Army tank at Longewala in Jaisalmer, Rajasthan on November 14, 2020 (Photo Credits: PTI)

The Army currently operates two regiments of 124 Arjun Mark 1s which are positioned in Rajasthan. In November, Prime Minister Modi symbolically rode an Arjun tank in Longewala, where he celebrated Diwali with the troops.

The CVRDE swiftly completed development of the Arjun Mark-2 in two years, by 2012. The Rs 6,600 crore order for 118 tanks was cleared by the DAC in 2014 but the order was not placed. The project was in a limbo since 2015 as the army focused on ordering more T-90 medium tanks from Russia. In 2019, the army ordered an additional 464 T-90s worth close to Rs 14,000 crore.

The Arjun Mark-2 was renamed the Arjun Mark 1A in 2018 because the army said it was yet to meet all its requirements like the ability to fire a missile from its main gun and a battlefield management system. The Arjun Mark 1A finally cleared all trials in 2020 and has been awaiting an order since then. These tanks are also being assembled at the HVF Avadi.

### **End of the Arjun series**

DRDO officials believe this order of 118 tanks will be the last orders for the 68-ton Arjun. The army's refocus on the northern borders with China following the ten-month standoff with the PLA will mean a diminished appetite for heavy tanks like the 68-ton Arjun.

The army wants light tanks that weigh between 20-25 tons and medium tanks that weigh between 30 and 50 tons to equip its armored forces.

"Light and medium tanks have an advantage in multi-spectrum deployability, employability and capability in the varied terrain that the army operates in," says Lt General AB Shivane, former Director General mechanised forces.

The Indian Army had already set its sights on acquiring light and medium tanks even before the PLA moved into eastern Ladakh with its mechanised columns including tanks and infantry combat vehicles. Army officials cite the Arjun's 68-ton weight as the reason it has limited mobility along roads and bridges along the rugged northern areas. The requirement for light tanks which could operate in the mountains is at least a decade old, it was revived more recently after the PLA's Type 15 light tanks appeared on the Tibetan plateau.

Armored vehicle experts say the experience gained from the production of 118 Arjun Mark 1As will help the development of future armored vehicles. "Over the next five years Indian defence industry will be entirely self-sufficient in all aspects of armored vehicles, from engines to transmissions and gunner sights and electro-hydraulic gun control systems. This will allow us to roll out future combat vehicles at a much faster rate," says S Sivakumar, former Director, CVRDE.

The test case for this would be army programs like the Future Ready Combat Vehicle (FRCV) and the Future Infantry Combat Vehicle (FICV). The FRCV is to replace the Indian army's fleet of nearly 3000 T-72 and T-90 tanks while the FICV will replace the nearly 1600 Russian BMP-2 Infantry Combat Vehicles in service.

<https://www.indiatoday.in/india/story/after-lca-huge-push-for-arjun-tanks-1768667-2021-02-12>

**THE TIMES OF INDIA**

*Sat, 13 Feb 2021*

## **Uttarakhand: Satellite images confirm new lake near Rishiganga 'growing'**

*By Rohan Dua Ishita Mishra and Kautilya Singh*

New Delhi/Dehradun: About 5km from where a peak broke off and triggered the floods on Sunday and 17km from the Tapovan rescue site, a new lake is growing by the Rishiganga every day. Satellite images from NDRF and a spot visit by DRDO confirmed its presence and the CWC is running simulations to pre-empt the possibility of another round of floods.

So far, about 0.7 million cubic metre (70 crore litre) water has accumulated in the new lake. It is about 350m long, thrice the size of a football field, and the natural ‘dam’ about 60m deep with a 10° slope. If the lake were to be breached at that angle from that height (2,383m above sea level), it could be dangerous. “The size of the lake is increasing with every passing day. However, some of the water is also flowing out. It doesn’t look alarming as of now,” NDRF director general SN Pradhan told TOI.

On Thursday, geologists from the Hemvati Nandan Bahuguna Garhwal University had released a video of a lake that had formed near the Rishiganga. The department of science and technology-run Wadia Institute of Himalayan Geology (WIHG) had then confirmed the accumulation of water but could not immediately say if the lake was new. Now, satellite images captured by the NDRF have validated Thursday’s findings — that it’s a new lake — and triangulated the spot where it has been formed.

At the same time, DRDO scientists visited the site and submitted a report to the Central Water Commission (CWC), which corroborated the findings as well. WIHG director Kalachand Sain said, “The new lake also looks like it was formed after the disaster. Our scientists are working to figure out the causes behind its formation.”

Uttarakhand Chief minister Trivendra Singh Rawat said the government has taken this into account. “We are alert. In the morning, the lake opened up naturally and the water started flowing out. It looks like snow had accumulated in the area, was covered in debris and, later, took the form of a lake,” he told TOI. “I had spoken to the Air Force on Thursday. They had confirmed NDRF and SRDF personnel, and experts would visit the spot.” DRDO drones, meanwhile, are collecting images every hour and sending them across to the Terminal Ballistics Research Laboratory in Chandigarh. And the IMD has predicted 1cm rainfall and 10cm snowfall on Sunday and Monday.


The plan, now, is to use all this information and map out flood possibilities, vulnerable zones and response times. The CWC is running simulations based on the maximum discharge rate of water from the lake, estimated to be 891 cubic metre (8.9 lakh litre) per second. “And it can take nine minutes for the water to travel 2.5km downstream and 53 minutes to reach Joshimath. There is no immediate concern, we are taking all precautions,” Sharad Chandra, director of flood forecasting at CWC, told TOI. But in case of a breach, the water can travel up to 53km in three hours at a rate of 418 cubic metre (about 4.2 lakh litres) per second.

Union Jal Shakti minister Gajendra Singh Shekhawat told TOI that besides monitoring the water level, “a strategy is being worked out to drain collected water” in flood-hit areas. “Our men in CWC earlier had immediately conceived a model to find the possible levels of water at Joshimath, Karnprayag, Devprayag. We shared that model on what situation would look like with all other agencies. This information forecast helped us mitigate the damage” he added. He also said that scientists and other agencies were quick to ascertain the cause of Uttaranchal tragedy to a rock that fell on glacier, causing avalanche. “And our agencies under MHA such as NDRF and ITBP and even Air Force under defence ministry coordinated with Uttarakhand government for a timely response to further damage. I hope the Opposition must never do any politics over a tragedy” he added.

[https://timesofindia.indiatimes.com/city/dehradun/satellite-images-confirm-new-lake-near-rishiganga-growing/articleshow/80886693.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cpst&from=mdr](https://timesofindia.indiatimes.com/city/dehradun/satellite-images-confirm-new-lake-near-rishiganga-growing/articleshow/80886693.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cpst&from=mdr)

**NEW WATER BODY CAUSING WORRY**

- Spot visit by DRDO officials & sat images confirm presence of new lake near Rishiganga, 5km downstream of spot where peak broke off, triggered avalanche
- Lake 350m long, has 70 crore litre of water. Levels rising
- A natural ‘dam’ holding back the water is about 60m deep and has a 10° slope
- Ready with plan to evacuate personnel from Tapovan dam site within seconds if need be, says Union jal shakti minister Gajendra Singh Shekhawat



Aerial shot of the new lake near Rishiganga



## Chennai Defence Expo: A showcase for MSMEs with a special focus on *atmanirbharta*

### Snapshot

- *A main aim of the defence expo is to link MSMEs working in the defence sector with end-users in the services.*

A defence expo is being organised in Chennai next month to empower the micro, small and medium enterprises (MSMEs) in India's defence sector and promote *atmanirbharta*.

Swatantra Foundation, a Chennai-based think-tank, and the Aerospace Industry Development Association of Tamil Nadu, the nodal agency for the Tamil Nadu Defence Corridor, are organising the expo.

The event called 'Defence Expo Empowering MSME 2021' will take place between 19 and 21 March 2021 at Chennai Trade Centre Complex, Nandambakkam. It has been approved by the Ministry of Defence, and the Department of Defence Production, which is responsible for developing infrastructure for the defence sector, is also taking part in the event as a partner.

One of the main aims of the event, organisers say, is to link MSMEs working in the defence

sector to end-users in the services, major defence manufacturers and the labs and institutions in the country working on defence-related research, including the Defence Research and Development Organisation (DRDO).

Organisers say the event is aimed at building the capabilities and capacity of the MSMEs to cater to the needs of the defence sector at a time when India is looking to build more and more defence equipment indigenously.

Opportunities for MSMEs in the defence sector have grown considerably over the last few years as a result of the government's indigenisation push.

For example, the signing of the Rs 48,000 crore deal between Hindustan Aeronautics Limited and the Indian Air Force for 83 Tejas Mark 2 fighters will give a push to a large number of MSMEs in the defence sector. A large number of MSMEs are part of supply chains built for indigenous equipment, including the Tejas fighter.

Opportunities such as these are only set to increase as India seeks *atmanirbharta* in defence. Towards this, the Ministry of Defence has already announced that it will ban the import of 101 types of weapons and ammunition over the next five years. These weapons and ammunition will be produced indigenously in India, by the private sector, which includes MSMEs, and the Defence Public Sector Undertakings.

"We plan to move from a \$11 billion defence base to \$25 billion by 2025," Defence Minister Rajnath Singh had said at Aero India earlier this month.

A large number of foreign defence equipment manufacturers are also investing in India to grow their footprint and comply with offset requirements, and have tied up with the local industry, including MSMEs, to build subsystems.

The government also plans to export defence equipment to friendly countries. Over 150 defence systems including Tejas fighter, artillery guns, tanks and missiles and ammunition, have been approved for exports. The Ministry of Defence has set a target of Rs 35,000 crore (\$5 billion)



annually for defence exports, and this too will generate opportunities of MSMEs in the defence sector.

This Defence Expo, its organisers say, will also provide a forum for micro, small and medium enterprises and defence sector buyers so as to interact and identify mutually beneficial areas of cooperation and business opportunities.

“The aim is to create a broad and sustainable supply chain base for a vibrant MSME sector. The event will be a great platform for Tier-1 & Tier-2 companies to meet up with their potential supply chain partners,” the organisers say.

“The main aim of this event is to connect MSMEs that have the capacity and the capability to cater to the aerospace and defence sector. A conference and seminar on opportunities for MSMEs in Indian Defence Sector – Building an Atma-Nirbhar EcoSystem is also being planned concurrently with the Expo,” they add.

Exclusive business to business sessions will also be organised, during which potential supply chain partners can exchange business ideas and information.

“Large defence industries such as Larsen & Toubro, Bharat Forge, HAL, BEL, DGQA, DRDO, Super Auto Forge, Hindustan Shipyard, LMW, LCC, Ordnance Board Factories, Ashok Leyland, Mahindra, Adani, TATA Aerospace, TITAN, Carborandum Universal and other DPSUs and private industries are expected to participate,” organisers say.

“The Army, Navy, Air Force and BSF direct procurement and maintenance depots are also expected to participate, and many have confirmed so far,” they add.

Representatives of the Ministry of Defence will present a seminar on the Purchase Preference for Indian MSMEs in defence procurement, off-set policies, defence export opportunities and indigenisation opportunities. The nodal officers in-charge of indigenisation are expected to be present at the event.

Industries from the Tamil Nadu Defence Corridor will also participate in the event.

“We also expect participation of Overseas Defence manufacturing industries/through their Indian representatives. Foreign Embassies and their trade departments are expected to participate which will be useful for the participating Indian MSMEs to find out potential export opportunities and also joint ventures and investment opportunities from overseas companies,” organisers say.

“Several industries associations, such as TANSTIA, Laghu Udyog Bharathi, CODISSIA, AIEMA, etc, are keen to join us and exhibit their capabilities,” they add.

<https://swarajyamag.com/announcements/chennai-defence-expo-a-showcase-for-msmes-with-a-special-focus-on-atmanirbharta>



## **Atmarnirbhar Bharat: Indian Army sends out fresh RFIs for Close Quarter Carbines**

*In the page long RfI, the Indian Army is looking for the specifications as it was before --- chambered for the 5.56x45 mm cartridge. The procurement will be through FTP*

*By Huma Siddiqui*

In line with the government's focus on 'Atmanirbhar Bharat' in defence, a fresh Request for Information (RFI) has been issued by the Indian Army for procuring 93,895 Close Quarter Carbines (CQB).

The RFIs issued earlier this month have been sent to several companies including Colt (US), SiG Sauer (US), Beretta (Italy), Thales of France, Caracal (UAE) and Adani Defence. The RFIs for the CQB to be procured under the Fast Track Procedure (FTP) have come five months after the Ministry of Defence cancelled plans of procuring from Caracal of UAE.

Financial Express Online has been following the Caracal story from the time it was down selected in 2018 as the lowest bidder in the FTP procurement for the CAR 816 carbine. The Indian Army is planning to replace the 9 mm 1A1 'Sterling' Carbine. The UAE based company had completed all the laid down procedures to sign the contract last year. However, the deal was cancelled and the company leadership had several rounds of meetings with the Indian side and had also met with external affairs minister Dr S Jaishankar and the Indian Army Chief Gen MM Naravane when they had visited UAE in 2020.

### **What is the Indian Army looking for?**

In the page long RfI, the Indian Army is looking for the specifications as it was before — chambered for the 5.56×45 mm cartridge. The procurement will be through FTP.

Should have Effective Range not less than 200 metres; Accuracy less than equal to MoA; Picatinny Rails: MIL Standard 1913 compliant; Weight should not be more than 3.3 kg and this should be minus the magazine and other accessories; Reliability while firing 2000 rounds it should not suffer more than three 'Class-1' or 'Class-II' and no Class-III stoppages. Most importantly it should be able to operate in Minus 20 Degrees Celsius to plus 45 Degrees Celsius.

### **Why was the acquisition from Caracal shelved?**

Last year in September the decision was taken by Defence Secretary Ajay Kumar, who heads the Defence Procurement Board (DPB). And the reasons cited included: more expensive than the SiG 716 Assault Rifles India had procured from the US and lack of indigenous content in the CQB from UAE.

Following the cancellation, the UAE based company had announced its plans to manufacture the CQB in India with Indian components.

### **Made in India options on offer to the Indian Army**

As has been reported earlier, carbines designed by Defence Research and Development Organisation (DRDO) had in December last year cleared the final phase of trials for the Joint Venture Protective Carbine (JVPC).

The 5.56×30 Protective Carbine is a gas operated Semi Bull-pup automatic weapon and comes with more than 700 rpm rate of fire.

A statement issued by the Ministry of Defence stated that during trials all the GSQR parameters were met with. And the trials were carried out in extreme temperatures including summer and high altitudes during winter.

The DRDO made Protective Carbine comes with a Range of more than 100 m, and weighs about 3.0 kg. And it has features like — high reliability, single hand firing capability, low recoil, retractable Butt, ergonomic design and multiple Picatinny rails etc.

The DRDO Carbine has been designed based on the Indian Army's GSQR by one of its labs Armament Research and Development Establishment (ARDE), based in Pune.

While this will be manufactured at the Smalls Arms Factory in Kanpur to fulfil orders for the Para Military forces, the ammunition for this will be manufactured at ammunition Factory, Kirkee Pune.

### **Ordnance Factory Board (OFB) too has offered CQB to the Indian Army**

In 2017, the OFB had failed to provide a carbine to the Indian Army, and this led to the decision of importing these carbines through FTP route. However, in 2020, the Rifle Factory Ishapore (RFI), under OFB has decided to jump in the race to make these in India.

Located on the outskirts of Kolkata, the RFI has developed an advanced 5.56 mmx45 mm carbine. This carbine is undergoing evaluation.

<https://www.financialexpress.com/defence/atmarnirbhar-bharat-indian-army-sends-out-fresh-rfis-for-close-quarter-carbines/2194739/>



*Mon, 15 Feb 2021*

## **Prime Minister Modi opens IIT-Madras satellite campus**

*It will house major research centres, besides academic blocks and hostels*

Chennai: Prime Minister Narendra Modi on Sunday inaugurated the satellite campus of the Indian Institute of Technology-Madras coming up at Thaiyur in Chengalpattu district.

“Friends, the Discovery Campus of IIT-Madras will have a 2-lakh square metre infrastructure to house world-class research centres. I am sure that very soon, the Discovery Campus...will be a leading centre of discovery. It will draw the best talent from all over India,” Mr. Modi said.

The campus will host not only major stand-alone research centres that require large and dedicated facilities but also academic blocks, hostels and other amenities. The provision of 163 acres of land was approved by former Chief Minister Jayalithaa around 36 km from the main campus at Guindy, IIT-Madras said in a release.

The research centres will have their own support infrastructure, besides common instrumentation laboratories and conference facilities. IIT officials said various Ministries, besides industry sponsors, are funding the research centres. IIT-Madras expects two research centres to start functioning by year-end.

The National Technology Centre for Ports, Waterways and Coasts, funded by the Union Ministry of Ports, Shipping and Waterways, will house India's first large shallow water basin, measuring 95m x 65m, for coastal and estuarine research and industrial applications. The basin can emulate the Gulf of Kutch or the mouth of the Hooghly.

The Centre will also have a 360-degree ship's bridge simulator dedicated to studies involving operations at all major ports. The solid propellant combustion modelling facility of the Centre of Propulsion Technology, funded by DRDO, will be the first to be established under the Centre of Propulsion Technology. These facilities are expected to receive a steady stream of international scientists and students.

<https://www.thehindu.com/news/national/tamil-nadu/prime-minister-modi-opens-iit-madras-satellite-campus/article33837432.ece>

## **DRDO's current manpower grossly insufficient for committed R&D projects: Parliamentary panel**

New Delhi: The DRDO's current manpower is grossly insufficient for committed research and development projects and the Defence Ministry should take effective measures to augment the workforce, stated a report of the Parliamentary Standing Committee on Defence on Friday.

In its reply to the committee, the Defence Ministry said the Finance Ministry on April 24 last year had approved the proposal to augment the manpower in the Defence Research and Development Organisation (DRDO) by 436 posts.

The report also said the Finance Ministry has advised the Defence Ministry to take fresh approval from the Cabinet Committee on Security (CCS) on creation of two senior posts -- chief executive and chief construction engineer -- at the DRDO.

While the Standing Committee expressed its happiness about approval regarding 436 posts and proposal on creation of two new posts, the panel said it has not been "clearly apprised" about the progress made on increasing manpower.

"The issue of augmentation of manpower especially of scientists in the Defence Research and Development Organisation is of vital importance given that DRDO has been managing with same authorisation in spite of more than six-fold increase in outlay from 9th to 13th plan," said the committee's report tabled in Lok Sabha on Friday.

Presently, the authorised strength of scientists in DRDO is 7,353 while their existing strength 7,068, the report noted.

"The percentage of scientists in DRDO is 30 per cent of the total strength of DRDO... The committee note that the current manpower is grossly insufficient for committed R&D projects," it said.

The DRDO works under the Defence ministry only.

The committee said more effective measures should be taken by the Defence Ministry to augment the workforce in the DRDO.

*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/drds-current-manpower-grossly-insufficient-for-committed-rd-projects-parliamentary-panel/2028962>



Press Information Bureau  
Government of India

Ministry of Defence

Fri, 12 Feb 2021 6:13PM

### Indian Navy signs contract for acquisition of five Diving Support Craft (DSC)

Adding another milestone to the Make in India initiative of the Government of India, a Contract for construction of five Diving Support Craft (DSC) has been signed by Indian Navy with M/s Titagarh Wagons Ltd, Kolkata on 12 Feb 21. The contract envisages construction of five DSCs. Once commissioned, the DSC will meet the mission needs of Command Clearance Diving Teams (CCDTs) which are involved in providing diving assistance to all ships inside and close to harbour for underwater repair, maintenance and salvage. Fitted with state of the art diving equipment and tools for performing diving operations, Diving Support Craft will be a game changer in conducting diving operations and will serve an ideal platform for conducting training of Indian Navy's diving cadre.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1697480>



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Fri, 12 Feb 2021 6:13PM

### भारतीय नौसेना ने पांच डाइविंग सपोर्ट क्राफ्ट (डीएससी) के अधिग्रहण के लिए अनुबंध पर हस्ताक्षर किए

भारत सरकार की मेक इन इंडिया पहल में एक और मील का पत्थर जोड़ते हुए भारतीय नौसेना ने दिनांक 12 फरवरी 2021 को कोलकाता के मैसर्स टीटागढ़ वैगन लिमिटेड के साथ पांच डाइविंग सपोर्ट क्राफ्ट (डीएससी) के निर्माण के लिए एक अनुबंध पर हस्ताक्षर किए हैं। इस अनुबंध के अंतर्गत पांच डाइविंग सपोर्ट क्राफ्ट (डीएससी) के निर्माण की परिकल्पना की गई है। एक बार कमीशन होने के बाद डाइविंग सपोर्ट क्राफ्ट (डीएससी) कमांड क्लियरेंस डाइविंग टीमों (सीसीडीटी) के



अभियान की ज़रूरतों को पूरा करेंगी जो सभी जहाजों को पानी की सतह के भीतर मरम्मत, रख-रखाव और बचाव के लिए बंदरगाह के अंदर और बंदरगाह के निकट गोताखोरी सहायता प्रदान करने का काम करती हैं। डाइविंग ऑपरेशन करने के लिए अत्याधुनिक डाइविंग उपकरण और पुर्जों के साथ फिट डाइविंग सपोर्ट क्राफ्ट डाइविंग परिचालनों के संचालन में एक गेम चेंजर साबित होगा और भारतीय नौसेना के डाइविंग केंद्र के प्रशिक्षण के संचालन के लिए एक आदर्श मंच के रूप में कार्य करेगा।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1697560>



**Press Information Bureau**  
**Government of India**

**Ministry of Defence**

*Fri, 12 Feb 2021 6:21PM*

## **BRO working on a 200-ft bailey bridge at deluge affected Chamoli area in Uttarakhand to re-establish connectivity with Niti border**

A portion of the Nanda Devi glacier broke off in Uttarakhand's Chamoli district on February 07, 2021, triggering an avalanche and deluge in the Alaknanda river system that washed away hydroelectric stations and trapped many workers. The sudden flood in the middle of the day in the Dhauli Ganga, Rishi Ganga and Alaknanda rivers, all intricately linked tributaries of the Ganga, triggered widespread panic and large-scale devastation in the high mountain areas.

The flash flood also washed away a 90-metre span RCC bridge on Joshimath-Malari road located just downstream of the Rishi Ganga Hydel project and approximately two kilometres upstream of the Tapovan Hydel project, which was the only link to Niti border. Washing away of the bridge has stranded more than 13 border villages in Chamoli district of Uttarakhand.

Border Roads Organisation (BRO) has quickly swung into action for rescue and rehabilitation work by inducting more than 100 Vehicles/Equipment and plants which include about 15 Heavy Earth Moving Equipment like Hydraulic Excavators, Dozers, JCBs, Wheel Loaders, etc. The BRO has also Air inducted critical equipment with the help of Indian Air Force. Almost 200 personnel of 21 BRTF of Project Shivalik have been deployed for rescue and rehabilitation purposes.

After initial recce, the BRO has started work for re-establishing connectivity on all required fronts. The site is very challenging due to steep cliff on far bank and 25-30-metre-high debris/muck on the other side, however, the BRO has overcome these challenges and on the 4<sup>th</sup> day has cleared and established a path for construction of bridge abutment. The BRO is working round the clock to re-establish connectivity at the earliest by launching a bailey bridge of 200 feet. The BRO is also assisting Indo-Tibetan Border Police (ITBP) & National Disaster Response Force (NDRF) in rescue operations, several BRO teams part of Project Shivalik are deployed in the area for relief operations.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1697487>





पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

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## सीमा सड़क संगठन उत्तराखंड के नीति सीमा के साथ संपर्क पुनर्स्थापित करने के लिए चमोली के बाढ़ प्रभावित इलाके में 200 फीट के एक बैली पुल का निर्माण कर रहा है

7 फरवरी, 2021 को उत्तराखंड के चमोली जिले में नंदा देवी के ग्लेशियर का एक हिस्सा टूट गया जिससे हिमस्खलन हुआ और अलकनंदा नदी प्रणाली में बाढ़ आ गई जिसमें हाइड्रोइलेक्ट्रिक स्टेशन बह गए और कई कर्मचारी फंस गए। गंगा नदी की बड़ी सहायक नदियों में शामिल धौली गंगा, ऋषि गंगा और अलकनंदा नदी में अचानक दिन में आई बाढ़ से इस उच्च पर्वतीय क्षेत्र में बड़े पैमाने पर तबाही हुई और भय का माहौल बना।

इस आकस्मिक बाढ़ में ऋषि गंगा हाइड्रल परियोजना के ठीक नीचे और तपोवन हाइड्रल परियोजना के लगभग दो किलोमीटर ऊपर जोशीमठ-मलारी रोड पर स्थित 90 मीटर में फैला आरसीसी पुल भी बह गया जो कि नीति सीमा तक पहुंचने का एकमात्र रास्ता था। इस पुल के बह जाने से उत्तराखंड के चमोली जिले के 13 से अधिक सीमावर्ती गांवों में लोग फंस गए हैं।

इस स्थिति में सीमा सड़क संगठन (बीआरओ) ने बचाव और पुनर्वास के लिए 100 से अधिक वाहनों/उपकरणों और संयंत्रों के साथ तुरंत कार्रवाई शुरू की। इनमें पृथ्वी पर चलने वाले लगभग 15 भारी उपकरण शामिल हैं जैसे कि हाइड्रॉलिक उत्खनक, बुलडोजर, जेसीबी, व्हील लोडर्स आदि। सीमा सड़क संगठन ने भारतीय वायु सेना की मदद से भी महत्वपूर्ण हवाई उपकरणों को अपनी कार्रवाई में शामिल किया। प्रोजेक्ट शिवालिक के 21 बीआरटीएफ के लगभग 200 जवान इस बचाव और पुनर्वास कार्य के लिए तैनात किए गए हैं।

प्रारंभिक रेकी के बाद, बीआरओ ने सभी आवश्यक मोर्चों पर संपर्क पुनर्स्थापित करने के लिए कार्य शुरू कर दिया। दूर के किनारों पर खड़ी चट्टानों और दूसरी ओर 25-30 मीटर ऊंचे मलबे/ढेर के कारण यह स्थल काफी चुनौतीपूर्ण था। हालांकि बीआरओ ने इन चुनौतियों पर जीत हासिल कर ली है और चौथे दिन पुल के आधार-निर्माण के लिए रास्ता साफ कर लिया है। बीआरओ जल्द से जल्द 200 फीट बैली पुल को बनाकर दोबारा संपर्क स्थापित करने के लिए चौबीसों घंटे काम कर रहा है। बीआरओ बचाव अभियान में भारत-तिब्बत सीमा पुलिस और राष्ट्रीय आपदा मोचन बल (एनडीआरएफ) की सहायता भी कर रहा है। बीआरओ की शिवालिक परियोजना की कई टीमों इस क्षेत्र में बचाव अभियानों के लिए तैनात हैं।

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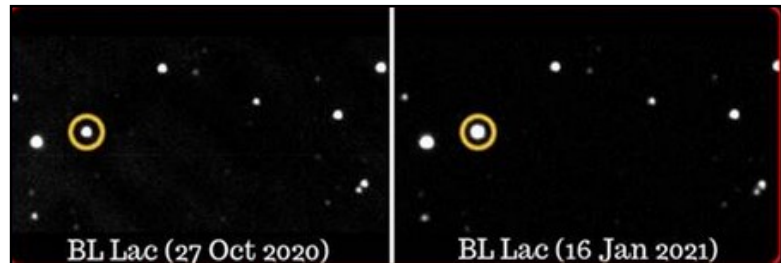
## Indian astronomers detect huge optical flare in one of the oldest astronomic objects

Indian Astronomers have reported one of the strongest flares from a feeding supermassive black hole or blazar called BL Lacertae. Analysis of the flare from this blazar, one of the oldest astronomical objects, can help trace the mass of the black hole and the source of this emission. Such analysis can provide a lead to probe into mysteries and trace events at different stages of evolution of the Universe.

Blazars or feeding supermassive black holes in the heart of distant galaxies receive a lot of attention from the astronomical community because of their complicated emission mechanism. They emit jets of charged particles traveling nearly at the speed of light and are one of the most luminous and energetic objects in the Universe.

BL Lacertae blazar is 10 million light-years away and is among the 50 most prominent blazars that can be observed with the help of a relatively small telescope. It was among the 3 to 4 blazars that was predicted to be experiencing flares by the Whole Earth Blazar Telescope (WEBT), an international consortium of astronomers.

A team of astronomers led by Dr. Alok Chandra Gupta from Aryabhata Research Institute of Observational Sciences (ARIES), an autonomous institute of the Department of Science & Technology, Government of India who had been following the blazar since October 2020 as part of an international observational campaign detected the exceptionally high flare on January 16, 2021, with the help of Sampurnanand Telescope (ST) and 1.3m Devasthal Fast Optical Telescopes located in Nainital.



The luminosity of BL Lac observed on 27 October 2020 (left panel of figure) was around  $2.95 * 10^{12} L_{\odot}$  and after 80 days, i.e., 16 January 2021 (right panel of figure) was  $\sim 7.25 * 10^{12} L_{\odot}$ , i.e.,  $\sim 250\%$  increase in the luminosity which is equivalent to more than 4 trillion  $L_{\odot}$  (here  $L_{\odot}$  = luminosity of the Sun).



The data collected from the flare observed will help calculation of the black hole mass, size of emission region, and mechanism of the emission from one of the oldest astronomical objects known, hence opening a door to the origin and evolution of the Universe.

The link to Astronomical Telegram #14343 with the announcement of blazar BL Lacertae's luminosity record: <http://www.astronomerstelegam.org/?read=14343>.

For more details, Dr. Alok Chandra Gupta (Scientist-F) (+91-7895966668, [alok@aries.res.in](mailto:alok@aries.res.in)) can be contacted.

<https://pib.gov.in/PressReleaseDetail.aspx?PRID=1697649>

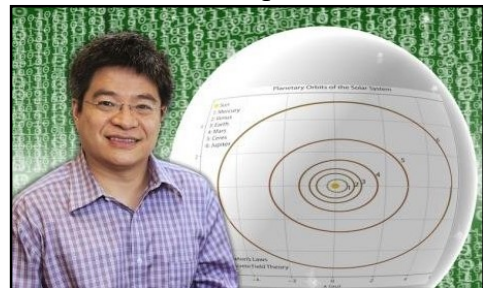


Sat, 13 Feb 2021

## New machine learning theory raises questions about nature of science

A novel computer algorithm, or set of rules, that accurately predicts the orbits of planets in the solar system could be adapted to better predict and control the behavior of the plasma that fuels fusion facilities designed to harvest on Earth the fusion energy that powers the sun and stars.

The algorithm, devised by a scientist at the U.S. Department of Energy's (DOE) Princeton Plasma Physics Laboratory (PPPL), applies machine learning, the form of artificial intelligence (AI) that learns from experience, to develop the predictions. "Usually in physics, you make observations, create a theory based on those observations, and then use that theory to predict new observations," said PPPL physicist Hong Qin, author of a paper detailing the concept in *Scientific Reports*. "What I'm doing is replacing this process with a type of black box that can produce accurate predictions without using a traditional theory or law."



PPPL physicist Hong Qin in front of images of planetary orbits and computer code. Credit: Elle Starkman

Qin (pronounced Chin) created a computer program into which he fed data from past observations of the orbits of Mercury, Venus, Earth, Mars, Jupiter, and the dwarf planet Ceres. This program, along with an additional program known as a 'serving algorithm,' then made accurate predictions of the orbits of other planets in the solar system without using Newton's laws of motion and gravitation. "Essentially, I bypassed all the fundamental ingredients of physics. I go directly from data to data," Qin said. "There is no law of physics in the middle."

The program does not happen upon accurate predictions by accident. "Hong taught the program the underlying principle used by nature to determine the dynamics of any physical system," said Joshua Burby, a physicist at the DOE's Los Alamos National Laboratory who earned his Ph.D. at Princeton under Qin's mentorship. "The payoff is that the network learns the laws of planetary motion after witnessing very few training examples. In other words, his code really 'learns' the laws of physics."

Machine learning is what makes computer programs like Google Translate possible. Google Translate sifts through a vast amount of information to determine how frequently one word in one language has been translated into a word in the other language. In this way, the program can make an accurate translation without actually learning either language.

The process also appears in philosophical thought experiments like John Searle's Chinese Room. In that scenario, a person who did not know Chinese could nevertheless 'translate' a Chinese sentence into English or any other language by using a set of instructions, or rules, that would

substitute for understanding. The thought experiment raises questions about what, at root, it means to understand anything at all, and whether understanding implies that something else is happening in the mind besides following rules.

Qin was inspired in part by Oxford philosopher Nick Bostrom's philosophical thought experiment that the universe is a computer simulation. If that were true, then fundamental physical laws should reveal that the universe consists of individual chunks of space-time, like pixels in a video game. "If we live in a simulation, our world has to be discrete," Qin said. The black box technique Qin devised does not require that physicists believe the simulation conjecture literally, though it builds on this idea to create a program that makes accurate physical predictions.

The resulting pixelated view of the world, akin to what is portrayed in the movie *The Matrix*, is known as a discrete field theory, which views the universe as composed of individual bits and differs from the theories that people normally create. While scientists typically devise overarching concepts of how the physical world behaves, computers just assemble a collection of data points.

Qin and Eric Palmerduca, a graduate student in the Princeton University Program in Plasma Physics, are now developing ways to use discrete field theories to predict the behavior of particles of plasma in fusion experiments conducted by scientists around the world. The most widely used fusion facilities are doughnut-shaped tokamaks that confine the plasma in powerful magnetic fields.

Fusion, the power that drives the sun and stars, combines light elements in the form of plasma—the hot, charged state of matter composed of free electrons and atomic nuclei that represents 99% of the visible universe—to generate massive amounts of energy. Scientists are seeking to replicate fusion on Earth for a virtually inexhaustible supply of power to generate electricity.

"In a magnetic fusion device, the dynamics of plasmas are complex and multi-scale, and the effective governing laws or computational models for a particular physical process that we are interested in are not always clear," Qin said. "In these scenarios, we can apply the machine learning technique that I developed to create a discrete field theory and then apply this discrete field theory to understand and predict new experimental observations."

This process opens up questions about the nature of science itself. Don't scientists want to develop physics theories that explain the world, instead of simply amassing data? Aren't theories fundamental to physics and necessary to explain and understand phenomena?

"I would argue that the ultimate goal of any scientist is prediction," Qin said. "You might not necessarily need a law. For example, if I can perfectly predict a planetary orbit, I don't need to know Newton's laws of gravitation and motion. You could argue that by doing so you would understand less than if you knew Newton's laws. In a sense, that is correct. But from a practical point of view, making accurate predictions is not doing anything less."

Machine learning could also open up possibilities for more research. "It significantly broadens the scope of problems that you can tackle because all you need to get going is data," Palmerduca said.

The technique could also lead to the development of a traditional physical theory. "While in some sense this method precludes the need of such a theory, it can also be viewed as a path toward one," Palmerduca said. "When you're trying to deduce a theory, you'd like to have as much data at your disposal as possible. If you're given some data, you can use machine learning to fill in gaps in that data or otherwise expand the data set."

**More information:** Hong Qin, Machine learning and serving of discrete field theories, *Scientific Reports* (2020). DOI: [10.1038/s41598-020-76301-0](https://doi.org/10.1038/s41598-020-76301-0)

**Journal information:** [Scientific Reports](https://www.nature.com/scientificreports/)  
<https://phys.org/news/2021-02-machine-theory-nature-science.html>

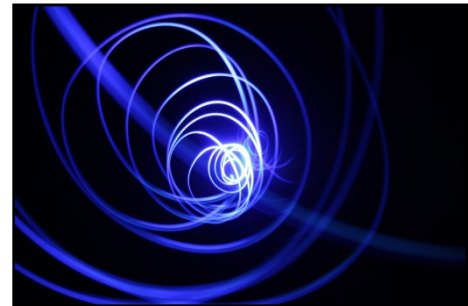
# Electron refrigerator: Ultrafast cooling mechanism discovered in novel plasma

By Ingeborg Adler

Researchers from the Cluster of Excellence "CUI: Advanced Imaging of Matter" have achieved a breakthrough—creating a completely new type of plasma by combining state-of-the-art technologies using ultrashort laser pulses and ultracold atomic gases. They report on a novel electron cooling mechanism occurring in such plasmas in the journal *Nature Communications*.

Matter exists in four states—solid, gas, liquid, and plasma—with plasma being the most abundant state in the visible universe. It consists of free charged particles such as ions and electrons. Plasmas can exist over a tremendous range of temperatures and densities, from the sun's core to lightning or flames. The challenges to understand plasma dynamics are first to identify universal mechanisms and then compare them to a controlled laboratory experiment. "With the presented work, we hope to contribute to a broader understanding of fundamental processes occurring in extreme plasma systems, which are not directly accessible for experimental research," first author Tobias Kroger from the research group of Prof. Dr. Markus Drescher in the Department of Physics states.

At the Center for Optical Quantum Technologies at Universität Hamburg, the researchers cool and trap atoms with laser light. They use the intense light field of an ultrashort laser pulse to break up atoms into electrons and ions within 200 femtoseconds. A femtosecond is one millionth of one billionth of a second. Because of the extremely low initial temperature of the atoms, the ions have temperatures lower than 40 millikelvin, which is only a fraction above the lowest possible temperature in the universe (0 Kelvin or minus 273 degree on the Celsius scale). In contrast, the electrons are initially very hot with temperatures of 5250 Kelvin, close to the ones found at the surface of the sun.



Credit: CC0 Public Domain

Hot electrons directly created by the ultrashort laser pulse begin to escape and leave behind a positively charged region that traps some of the electrons in an ultracold plasma. "Such a plasma state has never been observed before," Kroger says. The researchers from the groups of Prof. Dr. Markus Drescher and Prof. Dr. Klaus Sengstock observed that the trapped electrons in the plasma are cooled on ultrafast timescales and measured the final electronic temperature. In addition, they observed that the plasma is stable over a few hundred nanoseconds, which is a very long time for such systems.

Such ultracold plasmas provide benchmarks for theoretical models and can shed light on extreme conditions present in inertial confinement fusion or astronomical objects such as white dwarfs. Furthermore, the resulting ultracold electrons are interesting by themselves as a bright source for imaging biological samples.

**More information:** Tobias Kroger et al. Ultrafast electron cooling in an expanding ultracold plasma, *Nature Communications* (2021). DOI: [10.1038/s41467-020-20815-8](https://doi.org/10.1038/s41467-020-20815-8)

**Journal information:** *Nature Communications*  
<https://phys.org/news/2021-02-electron-refrigerator-ultrafast-cooling-mechanism.html>



# Applying quantum computing to a particle process

By Glenn Roberts Jr.

A team of researchers at Lawrence Berkeley National Laboratory (Berkeley Lab) used a quantum computer to successfully simulate an aspect of particle collisions that is typically neglected in high-energy physics experiments, such as those that occur at CERN's Large Hadron Collider.

The quantum algorithm they developed accounts for the complexity of parton showers, which are complicated bursts of particles produced in the collisions that involve particle production and decay processes.

Classical algorithms typically used to model parton showers, such as the popular Markov Chain Monte Carlo algorithms, overlook several quantum-based effects, the researchers note in a study published online Feb. 10 in the journal *Physical Review Letters* that details their quantum algorithm.

"We've essentially shown that you can put a parton shower on a quantum computer with efficient resources," said Christian Bauer, who is Theory Group leader and serves as principal investigator for quantum computing efforts in Berkeley Lab's Physics Division, "and we've shown there are certain quantum effects that are difficult to describe on a classical computer that you could describe on a quantum computer." Bauer led the recent study.

Their approach meshes quantum and classical computing: It uses the quantum solution only for the part of the particle collisions that cannot be addressed with classical computing, and uses classical computing to address all of the other aspects of the particle collisions.

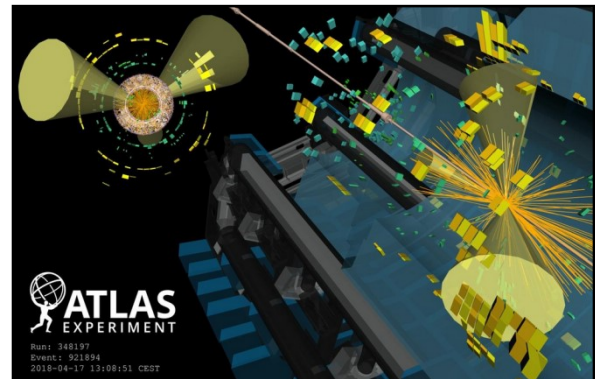
Researchers constructed a so-called "toy model," a simplified theory that can be run on an actual quantum computer while still containing enough complexity that prevents it from being simulated using classical methods.

"What a quantum algorithm does is compute all possible outcomes at the same time, then picks one," Bauer said. "As the data gets more and more precise, our theoretical predictions need to get more and more precise. And at some point these quantum effects become big enough that they actually matter," and need to be accounted for.

In constructing their quantum algorithm, researchers factored in the different particle processes and outcomes that can occur in a parton shower, accounting for particle state, particle emission history, whether emissions occurred, and the number of particles produced in the shower, including separate counts for bosons and for two types of fermions.

The quantum computer "computed these histories at the same time, and summed up all of the possible histories at each intermediate stage," Bauer noted.

The research team used the IBM Q Johannesburg chip, a quantum computer with 20 qubits. Each qubit, or quantum bit, is capable of representing a zero, one, and a state of so-called superposition in which it represents both a zero and a one simultaneously. This superposition is what makes qubits uniquely powerful compared to standard computing bits, which can represent a zero or one.



An ATLAS particle collision event display from 2018, showing the spray of particles (orange lines) emanating from the collision of protons, and the detector readout (squares and rectangles). Credit: ATLAS Collaboration

Researchers constructed a four-step quantum computer circuit using five qubits, and the algorithm requires 48 operations. Researchers noted that noise in the quantum computer is likely to blame for differences in results with the quantum simulator.

While the team's pioneering efforts to apply quantum computing to a simplified portion of particle collider data are promising, Bauer said that he doesn't expect quantum computers to have a large impact on the high-energy physics field for several years—at least until the hardware improves.

Quantum computers will need more qubits and much lower noise to have a real breakthrough, Bauer said. "A lot depends on how quickly the machines get better." But he noted that there is a huge and growing effort to make that happen, and it's important to start thinking about these quantum algorithms now to be ready for the coming advances in hardware.

Such quantum leaps in technology are a prime focus of an Energy Department-supported collaborative quantum R&D center that Berkeley Lab is a part of, called the Quantum Systems Accelerator.

As hardware improves it will be possible to account for more types of bosons and fermions in the quantum algorithm, which will improve its accuracy.

Such algorithms should eventually have broad impact in the high-energy physics field, he said, and could also find application in heavy-ion-collider experiments.

**More information:** Benjamin Nachman et al. Quantum Algorithm for High Energy Physics Simulations, *Physical Review Letters* (2021). [DOI: 10.1103/PhysRevLett.126.062001](https://doi.org/10.1103/PhysRevLett.126.062001)

**Journal information:** [Physical Review Letters](https://phys.org/news/2021-02-quantum-particle.html)  
<https://phys.org/news/2021-02-quantum-particle.html>



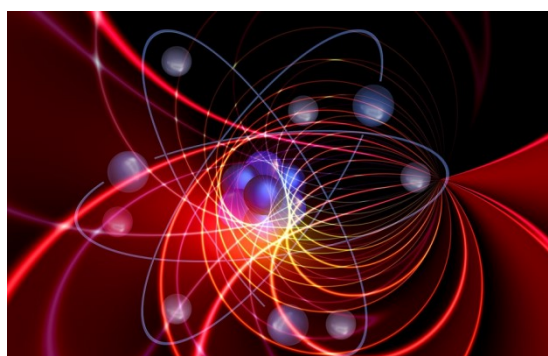
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## New research tackles a central challenge of powerful quantum computing

To build a universal quantum computer from fragile quantum components, effective implementation of quantum error correction (QEC) is an essential requirement and a central challenge. QEC is used in quantum computing, which has the potential to solve scientific problems beyond the scope of supercomputers, to protect quantum information from errors due to various noise.

Published by the journal *Nature*, research co-authored by University of Massachusetts Amherst physicist Chen Wang, graduate students Jeffrey Gertler and Shruti Shirol, and postdoctoral researcher Juliang Li takes a step toward building a fault-tolerant quantum computer. They have realized a novel type of QEC where the quantum errors are spontaneously corrected.

Today's computers are built with transistors representing classical bits (0's or 1's). Quantum computing is an exciting new paradigm of computation using quantum bits (qubits) where quantum superposition can be exploited for exponential gains in processing power. Fault-tolerant quantum computing may immensely advance new materials discovery, artificial intelligence, biochemical engineering and many other disciplines.



Credit: CC0 Public Domain



Since qubits are intrinsically fragile, the most outstanding challenge of building such powerful quantum computers is efficient implementation of quantum error correction. Existing demonstrations of QEC are active, meaning that they require periodically checking for errors and immediately fixing them, which is very demanding in hardware resources and hence hinders the scaling of quantum computers.

In contrast, the researchers' experiment achieves passive QEC by tailoring the friction (or dissipation) experienced by the qubit. Because friction is commonly considered the nemesis of quantum coherence, this result may appear quite surprising. The trick is that the dissipation has to be designed specifically in a quantum manner. This general strategy has been known in theory for about two decades, but a practical way to obtain such dissipation and put it in use for QEC has been a challenge.

"Although our experiment is still a rather rudimentary demonstration, we have finally fulfilled this counterintuitive theoretical possibility of dissipative QEC," says Chen. "Looking forward, the implication is that there may be more avenues to protect our qubits from errors and do so less expensively. Therefore, this experiment raises the outlook of potentially building a useful fault-tolerant quantum computer in the mid to long run."

Chen describes in layman's terms how strange the quantum world can be. "As in German physicist Erwin Schrödinger's famous (or infamous) example, a cat packed in a closed box can be dead or alive at the same time. Each logical qubit in our quantum processor is very much like a mini-Schrödinger's cat. In fact, we quite literally call it a 'cat qubit.' Having lots of such cats can help us solve some of the world's most difficult problems.

"Unfortunately, it is very difficult to keep a cat staying that way since any gas, light, or anything leaking into box will destroy the magic: The cat will become either dead or just a regular live cat," explains Chen. "The most straightforward strategy to protect a Schrodinger's cat is to make the box as tight as possible, but that also makes it harder to use it for computation. What we just demonstrated was akin to painting the inside of the box in a special way and that somehow helps the cat better survive the inevitable harm of the outside world."

**More information:** Jeffrey M. Gertler et al, Protecting a bosonic qubit with autonomous quantum error correction, *Nature* (2021). DOI: [10.1038/s41586-021-03257-0](https://doi.org/10.1038/s41586-021-03257-0)

**Journal information:** *Nature*  
<https://phys.org/news/2021-02-tackles-central-powerful-quantum.html>

## Dogs can detect covid-19 more accurately than tests: research

*Trained dogs can sniff out Coronavirus. The magic lies in the canine sense of smell, which gives dogs the ability to detect molecules in tiny concentrations*

*Edited By Anjali Thakur*

Dogs are human's best friends for ages. They never fail to put smiles on faces by doing cute little things, whether they are begging for food, or convincing you to take them out for a walk, dogs are always there for their human. Dogs cannot just sniff their treat but also COVID-19. As per new research, trained dogs can detect Coronavirus 94 % of the time. And interestingly they can do it more rapidly and accurately.

Tommy Dickey from the University of California, Santa Barbara in the US is also part of the research. He said, "The most striking result is that studies have already demonstrated that dogs can identify people who are Covid-19 positive. Not only that, they can do it non-intrusively, more rapidly, and with comparable or possibly better accuracy than our conventional detection tests."

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Dogs can sniff out COVID-19 (Picture credit: IANS)

The magic lies in the canine sense of smell, which gives dogs the ability to detect molecules in tiny concentrations — "one part in a quadrillion compared with one part in one billion for humans," according to the paper published in the Journal of Osteopathic Medicine.

Further, with 125-300 million olfactory cells and a third of their brains devoted to interpreting odours, dogs are well equipped with the ability to sniff out the volatile organic compounds that indicate the presence of Covid, the researchers said.

Although the virus itself has no odor, metabolic products excreted by Covid-positive individuals through their sweat glands were detected by the 18 dogs selected for the study with an accuracy rate of 83-100 percent after only four days of training.

Meanwhile, a German research group employed eight scent detection dogs in a randomized, double-blind controlled pilot study. The group trained the dogs for a week and then set them to sniffing 1,012 samples of saliva or tracheobronchial secretions.

They returned an average detection rate of 94 percent with a sensitivity (ability to detect a true positive) of 67.9 percent to 95.2 percent and specificity (ability to detect a true negative) of 92.4 percent to 98.9 percent.

<https://www.india.com/lifestyle/dogs-can-detect-covid-19-more-accurately-than-tests-research-4418777/>

