

June  
2021

# 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

खंड : 46      अंक : 112      09 जून 2021

Vol.: 46      Issue : 112      09 June 2021



रक्षा विज्ञान पुस्तकालय  
Defence Science Library  
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र  
Defence Scientific Information & Documentation Centre  
मेटकॉफ हाउस, दिल्ली - 110 054  
Metcalf House, Delhi - 110 054

## CONTENTS

S. No.	TITLE	Page No.
<b>DRDO News</b>		<b>1-17</b>
<b>DRDO Technology News</b>		<b>1-9</b>
1.	Indian Armed Forces require a 'positive import list' for defence equipment	1
2.	Gaganyaan mission: The why and how of ISRO'S ambitious project to send Indians to space	3
3.	Exoskeleton Suit for Indian Army by DRDO: Here's all you need to know	5
4.	24 Chinese jets fly close to LAC	6
5.	Noida Scientist gets top DRDO prize for concept to identify people in dark	7
6.	BIT student wins DRDO's innovation contest	8
7.	'Dare to Dream 2.0': Veer Surendra Sai University of Technology's 'HIMAT' bags third position	9
<b>COVID 19: DRDO's Contribution</b>		<b>10-17</b>
8.	DRDO Chief speaks to Republic, Says PM has ordered 850 oxygen plants to be set up by July	10
9.	Battling Covid-19: DRDO to share 2-DG formula with private companies for mass production	12
10.	Access to DRDO drug 2-DG will improve in weeks: Dr. Reddy's	13
11.	DRDO-developed Covid drug 2-DG to cost Rs 990 per sachet	14
12.	अब डीआरडीओ लगाएगा आक्सीजन प्लांट	15
13.	DRDO installs much-needed oxygen plant at ESI hospital	16
14.	New Oxygen Generation Plant sanctioned to AMU from PM cares fund	17
<b>Defence News</b>		<b>18-23</b>
<b>Defence Strategic: National/International</b>		<b>18-23</b>
15.	Raksha Mantri invites Swedish firms to invest in defence corridors in Uttar Pradesh & Tamil Nadu;	18
16.	रक्षा मंत्री ने उत्तर प्रदेश और तमिलनाडु में रक्षा गलियारों में निवेश के लिए स्वीडन की कंपनियों को आमंत्रित किया	20
17.	Two women army officers selected to train as combat pilots	22
<b>Science &amp; Technology News</b>		<b>23-27</b>
18.	Early endeavors on the path to reliable quantum machine learning	23
19.	From burglar alarms to black hole detectors: Super sensors as possible outputs of a quantum gravity experiment	25
<b>COVID-19 Research News</b>		<b>27-27</b>
20.	ICMR study finds Covaxin effective against Covid variants	27

Wed, 09 June 2021

## Indian Armed Forces require a ‘positive import list’ for defence equipment

*The list designated 101 defence products and a time frame beyond which there would be an import ban on the equipment that could thereafter only be manufactured domestically*

*By Captain Vikram Mahajan (Retd)*

In May 2020, the Prime Minister Narendra Modi gave a clarion call for an ‘Atma Nirbhar Bharat’ or a ‘self-reliant India’. The announcement found favour in all sectors, including defence. Following the announcement, a ‘negative import list’ of defence equipment last year was released. The list designated 101 defence products and a time frame beyond which there would be an import ban on the equipment that could thereafter only be manufactured domestically. The ‘list’ also found mention in the new Defence Acquisition Procedure (DAP), which was released in October 2020. A second list containing 108 items, rechristened as ‘positive indigenisation list’ was released this month.



The DAP therefore gives priority to the ‘capability development’ over ‘indigenous procurement’ specifically if time is a constraint and security cannot be compromised. (Representational image: IE)

The scope of Atma Nirbharta has expanded to segregate the defence budget into ‘equipment mandated to be manufactured domestically’ vs ‘equipment that will be imported.’ According to the defence capital budget, the allocations for domestic manufacturing has been increased from 58% amounting to Rs 51930 crore (\$ 7 Billion)} for the year 2020-21, to 63% {amounting to Rs 71438 crores(around \$10 billion)} for the year 2021-2022.

Many other initiatives have been undertaken in the defence sector since the call for Atma Nirbharta, including, the draft ‘Defence Production and Export Promotion Policy’ (DPEPP) mentioning the doubling the share of ‘domestic procurement’ over a period of five years. The Defence Research and Development Organisation (DRDO) released a separate list of 108 systems and subsystems which will be designed and developed exclusively by the Indian industry. The government and defence experts have held seminars and webinars on ‘Atma Nirbhar Bharat’ to discuss the impact. Additionally, the AeroIndia 2021 held earlier this year focused on the ‘vibrant defence manufacturing ecosystem in India.’

As the government and its agencies focus on the concept of self-reliance, two critical areas have taken a back seat: overall capability development of the armed forces and the role played by the 40 percent of the defence material that will still be procured from abroad.

Capability development of the Indian armed forces comes from the Integrated Capability Development Plan (ICDP), a document that lays down the planned procurement of desired equipment over a span of 10 years. ICDP lays down the military equipment that the Indian Army,

Navy and Air Force requires, but does not define the ‘source of procurement’. The prioritisation of the source of procurement is summed up in Chapter 2 of DAP 2020, as:

“Preference will be given to indigenous design, development and manufacturing of defence equipment. The time required for the procurement and delivery from foreign sources vis-à-vis the time required for making it within India, along with the urgency and criticality of the requirement will be examined before deciding to proceed on categorisation. Therefore, wherever Indian Industry is capable of manufacturing the required equipment within the timelines required by the Services, the procurement will be made from indigenous sources....”

The DAP therefore gives priority to the ‘capability development’ over ‘indigenous procurement’ specifically if time is a constraint and security cannot be compromised.

Let us take a step back and identify the products that were procured through emergency powers, or were being expedited, after the Balakot skirmish in 2019 and during the Indo-China standoff in 2020. Other than speeding up the purchase of 21 MIG-29, 12 SU-30 fighters, there were BVR missiles, precision bombs, anti-radiation missiles, anti-tank missiles, Sig Sauer rifles and light tanks amongst others. All were procured from foreign countries. Procurement of the equipment was in immediate response to the threats at the border. However, as the threat subsided, the acquisition of indigenous equipment has taken priority over capability development.

This change is evident from the signing of the six Pinaka Rocket Launcher regiments and 118 Arjun MK-1 tanks for the Indian Army, 83 Tejas Mark 1A fighters for the Indian Air Force, and the SDR radio for the Indian Navy. However, any major procurement from 42% of the balance budget has been conspicuous by its absence. The last big contract signed from the balance budget was the 24 MRH in February 2020.

The only other induction of significance is the ‘leasing’ of two Sea Guardian drones by the Indian Navy. The decision on the purchase of around 30 drones, 10 for each service, has been pending for over two years. It is pertinent to mention that a similar request for purchase of 18 MQ-9Bs by UAE (a country one fourth the size of the state of Maharashtra) was approved by the U.S. Government earlier this year.

There is no doubting the skill of the Indian citizens, or the capability of Indian industry to develop equipment with advanced technology. After all, when the U.S. downgraded the Indian request for a supercomputer for weather prediction from CRAY XMP-24 to CRAY XMP-14 in 1987, India built its own supercomputer PARAM. However, high technology equipment takes time to develop, and the Indian armed forces need to always be equipped given the current geo-political and strategic challenges at its borders.

It is imperative that the equipment that falls under critical requirements should be identified and when needed imported without delay to enhance the capability of the Indian Armed Forces. Just like the ‘negative import list’, a ‘positive import list’ with a timeline should be released to ensure Indian forces have what they need for other near-term contingencies. This would provide foreign vendors foresight of the procurement plan, requirements, and will prevent situations where the Indian Armed Forces has to resort to emergency purchases or leasing defence equipment. While it is critical that procurement and production of military equipment in India should continue, it is key that a balance between domestic manufacturing and import of weapons is maintained, to keep up with the required ‘capability development’ which is decided by the technological prowess of the adversary.

*(The author is Director, Aerospace and Defence, USISPF. Views expressed are personal and do not reflect the official position or policy of Financial Express Online.)*

<https://www.financialexpress.com/defence/indian-armed-forces-require-a-positive-import-list-for-defence-equipment/2267248/>

# Gaganyaan mission: The why and how of ISRO'S ambitious project to send Indians to space

*The Gaganyaan mission could propel India to the centre of human space exploration, which is dominated by the US and Russia. The manned mission is the biggest ISRO venture in the new decade*

*By Siby Tripathi*

New Delhi: The Gaganyaan Mission, India's foray into independent human space exploration, is moving ahead with plans to send an uncrewed mission into orbit. Scheduled for December, a final call on the launch will be taken post-assessment of the situation once lockdown is lifted in Bengaluru. The mission is part of the three-stage Gaganyaan project.

While the first unmanned flight is likely to be launched this year, the second demonstration launch could happen in 2022-23 before the astronauts finally take to the skies in a full-scale, crewed mission.

Despite the coronavirus pandemic impacting the pace of the mission, the Defence Research and Development (DRDO) organisation and the Indian Space Research Organisation (ISRO) are now conducting impact studies on the crew module.

Being developed by the Hindustan Aeronautics Limited, the Gaganyaan crew module will be the first indigenous spacecraft to take Indian astronauts into space and return them safely to Earth.



A final call on the December launch is likely to be taken soon. (Photo: Isro)

## What is Gaganyaan Mission?

The Rs 10,000-crore mission aims to send a three-member Indian crew to space for a period of five to seven days and safely return them to Earth. Announced by Prime Minister Narendra Modi during his Republic Day speech from the Red Fort in 2018, the Gaganyaan mission was initially scheduled for 2022, when India completes 75 years of independence. However, several delays have led to the deferment of the final crew mission.

The initial timeline was set for 40 months since the date of before which two uncrewed launches are to take place to demonstrate and test key technologies and capabilities.

"The human spaceflight programme will provide a unique micro-gravity platform in space for conducting experiments and test-bed for future technologies," the Union Cabinet had said in a statement while approving the project.

## Why do we need Gaganyaan mission?

After land, sea and air, the next frontier of global dominance is space as countries rush to explore the vastness of the cosmos, discover new resources on the Moon, and look for signs of microbial life beyond our orbit. With the US and Russia dominating space exploration, China is slowly cruising ahead with plans to build its own space station, return samples from asteroids, and trundle on the surface of the Red Planet. An indigenous crew mission will put India at the centre of this race, shaping the already changing geopolitics.

India so far has reached the Moon and Mars with extremely cost-efficient missions apart from its Polar Satellite Launch Vehicle (PSLV) catering to the global demand of putting satellites into Low Earth Orbit (LEO).

Even before the Gaganyaan mission was announced, Isro had been busy with developing technologies to support a human spaceflight mission and had tested several key technologies

critical for such a mission. These include a re-entry and recovery technology for the module, a cryogenic engine to carry the payload, and critical life support systems. The airdrop test of the Space-capsule Recovery Experiment (SRE) was successfully conducted way back in 2004.

Isro will also launch a data relay satellite that will help maintain contact with the Gaganyaan mission ahead of the final manned flight.

### **Boosting global collaboration**

India has managed to bring together countries for its ambitious plans to send humans to space. Russia and France are providing key training and equipment needed to carry out the mission. Four Indian Air Force pilots are undergoing training in Russia with the Russian space agency. While the names of the selected pilots are yet to be released, the Russian space agency ROSCOSMOS had in August said that the astronauts were doing well and determined to continue with their training. The training had been earlier impacted due to the Covid-19 induced global lockdown.

Apart from the training being conducted at the Gagarin Cosmonaut Training Center, Zvezda, a Russian company is also manufacturing space suits for Indian astronauts. The astronauts had in September visited the facility, where their anthropometric parameters were measured to begin designing the customised spacesuits. The company will also be providing individual seats for the astronauts and custom-made couch liners.

India recently signed an agreement with the French space agency National Centre for Space Studies (CNES) to provide equipment it has developed for the International Space Station. The agency will supply fireproof carry bags made in France to shield equipment from shocks and radiation. "Under the terms of the agreement, CNES will train India's flight physicians and CAPCOM mission control teams in France at the CADMOS centre for the development of microgravity applications and space operations at CNES in Toulouse and at the European Astronaut Centre (EAC) in Cologne, Germany," the CNES had said.

India is also in talks with Australia to set up a ground station at Cocos Island for smooth monitoring of the mission.

While the Gaganyaan plans are to be relooked once Karnataka reopens, the manned missions will push India further in exploration beyond Earth's orbit as countries vie to control the next space race, which has the potential to trigger major changes in the global order.

<https://www.indiatoday.in/science/story/gaganyaan-mission-isro-human-space-exploration-iaf-nasa-k-sivan-1812352-2021-06-08>

# Exoskeleton Suit for Indian Army by DRDO: Here's all you need to know

*DRDO has been doing RD on exoskeleton technology for several years now and is yet to field any operational technology in this field*

*By Arfa Javaid*

In a bid to make the lives of soldiers safer and conducive, DRDO has been doing R&D on the exoskeleton technology for several years now. However, it is yet to field any operational technology in this field.

While China, amid the border tensions, came out with military-grade exoskeleton suits which are powered and used for carrying ammunition. In late 2020, non-powered exoskeletons were used by the Chinese border defence troops for supporting operations like supply delivery, patrol etc.

This article precisely describes the rapidly emerging exoskeleton technology, its benefits, and India's position.

## What are exoskeletons?

Exoskeletons or exo-suits are the gadgets worn by a soldier over a regular uniform to augment his strength. The gadget comes with powered special devices and AI to enhance the capabilities of a soldier. They can either be made up of rigid materials such as metal and carbon fibre or soft and elastic materials.



Exoskeleton Suit for Indian Army by DRDO

## Benefits of exoskeleton

1. An exo-suit rigged up on a soldier is expected to enhance his additional load carrying capacity by 100kg for a minimum of 8 hours of operational time and has 3-5 hours of battery backup.
2. Soldiers who patrol in high altitude terrains wear a leg-gear that assists them in walking in the snow.
3. It also reduces fatigue and exhaustion faced by the soldiers in a thin oxygen climate.
4. They relieve more than 50% of the load burden, thereby reducing the injury to the soldiers.

## India's position on Exoskeletons

Multiple R&D in bio-engineering and electro-medical technology is underway in DRDO Lab to augment the strength of the Indian soldiers. DEBEL, the nodal lab doing R&D on the exoskeleton, is using in-house expertise in disciplines of Biomedical or Biomechanics, actuators and control systems.

**Financial Express** quoted a senior officer on the condition of anonymity as saying, "In any case, user feedback after operational deployment is usually an important aspect in any development work, and wishes to be seen as a chance to enhance the likelihood of supporting the Indian Troops, especially before the onset of harsh winters in the Galwan Valley."

**DRDO in a response to Financial Express on the current status of Exoskeletons stated,** "DRDO has been entrusted with a requirement to augment the soldier's capability during logistics activities performed by the military. Therefore, the biomechanical characteristics of the soldier during various logistics activities such as transportation of goods, ration, ammunition etc., through diverse terrain, for long distances with their complete military gear has been systematically captured and analyzed."

"Exoskeleton systems are being designed and developed for specific military logistic applications involving bending, lifting of payload, walking with payload anterior to the body, and unloading the same. Various concepts and configurations are being designed and developed currently. DRDO has been progressing on the different design approaches to build an augmentative exoskeleton for the Indian Army. There have mainly been two schools of thought/approaches for the design of augmentative exoskeletons, namely passive/unpowered augmentative exoskeleton and powered augmentative exoskeleton. The passive exoskeletons use passive elements such as springs, dampeners etc., to transfer the payload to the ground, however active exoskeletons not only transfer the payload to the ground but also impart energy through the actuators resulting in reduced energy consumption by the soldier," DRDO further added.

<https://www.jagranjosh.com/general-knowledge/exoskeleton-suit-for-indian-army-by-drdo-1623137006-1>

## DECCAN Chronicle

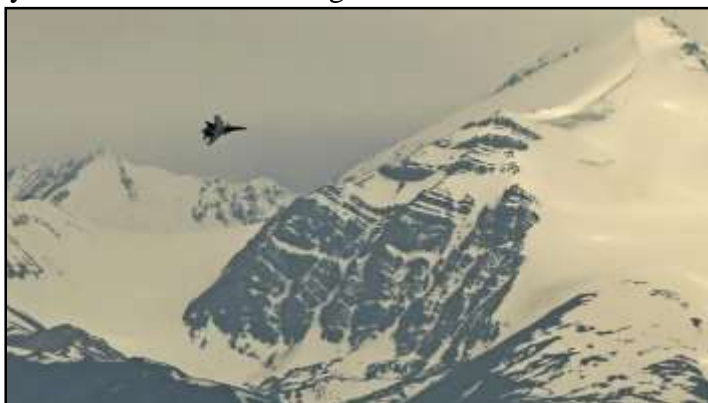
Wed, 09 June 2021

### **24 Chinese jets fly close to LAC**

*Several Chinese airbases, including Hotan, Gar Gunga and Kashgar, were used for these exercises*

New Delhi: Around 24 Chinese fighter jets, including J-11s and J-16s, recently held exercises near eastern Ladakh amid the heavy deployment of forces on the ground at the Line of Actual Control (LAC) by both countries. The exercises come when both sides have been engaged in a military standoff for over a year now at the LAC in Ladakh.

Reports said that several Chinese airbases, including Hotan, Gar Gunga and Kashgar, were used for these exercises. The use of these bases is significant as they were used to support the People's Liberation Army's incursions into Ladakh last year. All these bases have been upgraded to carry out operations by all types of Chinese fighter aircraft. Besides these, four other bases -- Shigatse, Lhasa Gongkar, Nyingchi and Chamdo Pangta -- were also used. All seven bases are located in Tibet and Xinjiang.



An Indian fighter jet flies over Leh, the joint capital of the union territory of Ladakh, on June 24, 2020. (Representational Photo:AFP)

While none of the Chinese warplanes crossed over into Indian airspace, the Indian Air Force remained on high alert and closely watched the Chinese exercises. The Indian security agencies also kept a close watch, with the help of satellites and other forms of surveillance.

China has already deployed its air defence system, including HQ-9 and HQ-16, in the sector, which can target aircraft at long range.

India has also deployed air defence missiles, including the Akash missile system, which can take down fast-moving combat aircraft and drones in a few seconds.

The IAF's Rafale fighters also conduct sorties over Ladakh in a boost to Indian capabilities all along the LAC. The IAF now has 24 Rafales, which are armed with the most advanced beyond visual range Meteor air-to-air missiles with a range of upto 150 km and can hit intruding aircraft.

The Indian Air Force has a geographical advantage over the PLA Air Force in Ladakh as the Chinese jets have to fly and take off from very high altitudes, while the Indian warplanes can take



off from the plains and reach the mountainous region swiftly. Since the air is thin at those heights, the Chinese jets are forced to carry a lighter load, which affects their operational capabilities.

The IAF has also deployed Sukhoi-30MKI, Mirage 2000 and Jaguar fighter aircraft in advanced positions.

<https://www.deccanchronicle.com/nation/politics/090621/24-chinese-jets-fly-close-to-lac.html>



Wed, 09 June 2021

## Noida Scientist gets top DRDO prize for concept to identify people in dark

*Dr Shivani Verma submitted her concept - "AI-based detection of a person based on physiological parameters" - which won the award in the DRDO's "Dare To Dream 2.0" contest*

New Delhi: A scientist of a private university in Noida has been awarded the first prize in a contest organised by the Defence Research and Development Organisation (DRDO) for her concept that could help detect a person's identity based on physiological parameters even if the face is covered or in a dark space, her university said Tuesday.

Dr Shivani Verma of the Amity Institute of Space Science and Technology (AISST) submitted an innovative concept "AI-based detection of a person based on physiological parameters" which won the award in the DRDO's "Dare To Dream 2.0" innovation contest.

Dr Verma is one of the five top prize winners in the individual category of the contest, according to the recently announced results available on the DRDO website, which is charged with the research and development of the country's defence forces.

Her concept develops on an intelligent inferencing recognition system based on physiological parameters of a person with built-in high accuracy of recognition, giving it an edge in conditions where biometric and facial recognition technologies are found inadequate.

"It is an innovative solution considering fusion of parameters such as skeletal data, gait, occluded face recognition and movement parameters where in even if the person is moving in dark space his identity can be identified," the Amity University said.

"Any type of disguise, be it a deliberate limp, covering face or manipulating fingerprints won't help the anti-social elements to escape. This would be a very accurate inferencing approach for identifying a person by intelligence agencies, defence organisations, police, etc.," it added.

Dr Verma, under the guidance of Dr MS Prasad, Director (AISST), said now the Technology Development Fund (TDF) Scheme executed by the DRDO has sought details of the project proposal within four weeks for consideration for further development support of the idea into technology grant-in-aid.

"Once that is approved, the DRDO will provide 90 per cent grant-in-aid on accelerated technology development or project value of up to ₹ 10 crore in 24 months," she said.

Started on the fifth death anniversary of former President APJ Abdul Kalam, the DRDO's "Dare To Dream" innovation scheme was launched for emerging technologies to promote individuals and startups for innovation in defence and aerospace technologies in the country.

<https://www.ndtv.com/india-news/noida-scientist-gets-top-drdo-prize-for-concept-to-identify-people-in-dark-2459507>



Dr Shivani Verma is one of the five top prize winners in the individual category of the contest

## BIT student wins DRDO's innovation contest

Erode: A third-year student of Bannari Amman Institute of Technology (BIT), Sathyamangalam, has won the third prize in the Defence Research and Development Organisation's (DRDO) innovation contest 'Dare to Dream 2.0' and received a cash award of ₹ 3 lakh.

The contest was launched for emerging technologies to promote individuals and start-ups for innovation in defence and aerospace technologies in the country after the call of 'Atmanirbhar Bharat' given by Prime Minister Narendra Modi. This year, the contest was organised to commemorate the fifth death anniversary of former President Dr. A.P.J. Abdul Kalam

N. Pravin and his team of Bioprocess and Bioproducts special lab, Department of Biotechnology, submitted the idea entitled 'Flame retardant nanoparticles coated Natural fibre Reinforced Biobased epoxy resin composite' under the problem domain of 'Materials and Technologies for Fire Suppression/ Protection' in October 2020. The team was guided by M. Kirupa Sankar, Professor of the Department of Biotechnology.

Of the 65,000 individual participants, he had cleared three rounds and received a third prize of ₹ 3 lakh in the individual category. The idea was also approved by jury members of the contest for proposal submission under Technology Development Funding (scheme for a funding of upto ₹10 crore. M.P. Vijayakumar, Trustee, C. Palanisamy, Principal, and K. Sivakumar, Dean, Planning and Development, congratulated him.

<https://www.thehindu.com/news/cities/Coimbatore/bit-student-wins-drds-innovation-contest/article34764396.ece>

## 'Dare to Dream 2.0': Veer Surendra Sai University of Technology's 'HIMAT' bags third position

*The VSSUT, Burla added another feather to its cap after a team from the Idea Innovation Cell bagged the 2nd Runners Up position for developing HIMAT*

Sambalpur: The Veer Surendra Sai University of Technology (VSSUT), Burla added another feather to its cap after a team from the Idea Innovation Cell bagged the 2nd Runners Up position for developing HIMAT, an AI based human detection model, in second season of the "Dare to Dream 2.0", a pan-India innovation contest.

Organised by Defence Research and Development Organisation (DRDO), the contest was launched last year in June on the fifth death anniversary of former president of India, Dr APJ Abdul Kalam with an objective to achieve the purpose of "Atma Nirbhar Bharat". It was held virtually on March 23 this year and results were announced on Monday.



Veer Surendra Sai University of Technology (Photo | EPS)

The team comprised five members, including Prasanjit Ghose, Suparna Biswal from the pre-final year, and Saharsh Panda, Punyaslok Swain and Jyotsana Kumari Gupta from the second year.

Their project "HIMAT- Human Identification Model Artificially Trained" was based under the problem statement, "Artificial Intelligence-based detection of a person based on physiological parameters".

The contest aimed to create an ecological system to foster innovation and support development of new technology in the sector of Defence and Aerospace along with promoting start-ups and individual projects which have the potential for future adaptations in the sphere.

Students from all across the country, participated in the contest and demonstrated their innovative ideas on problem statements from domains such as eco-friendly explosive waste management system and AI-based detection.

<https://www.newindianexpress.com/states/odisha/2021/jun/09/dare-to-dream-20-veer-surendra-sai-university-of-technologys-himat-bags-third-position-2313677.html>

# COVID 19: DRDO's Contribution

**R. REPUBLICWORLD.COM**

Wed, 09 June 2021

## DRDO Chief speaks to Republic, Says PM has ordered 850 oxygen plants to be set up by July

*DRDO Chief, Dr Satheesh Reddy opens up on enhancing health infrastructure & setting up additional oxygen generation plants in the country to fight COVID-19*

*By Bhavyata Kagrana*

Amid the second wave of the COVID-19 virus, several government organizations came out in support to get the nation out of the crisis, one such organization is Defence Research and Development Organisation (DRDO) that has worked tirelessly to enhance India's health infrastructure. DRDO Chairman spoke exclusively to Republic Media Network on Tuesday morning and spoke about the organization's complete hustle against the COVID-19 pandemic and steps taken to augment the strength of the defence force. DRDO under the PM Cares fund has procured 1.5 lakhs portable cylinders and 850 oxygen plants which will be functional by July end.



Image: RepublicWorld

Dr Satheesh Reddy highlighted that the PM Cares fund has sanctioned funds for several medical facilities required to fight the COVID-19 pandemic.

"Under the directions of the Government, we have established hospitals in several Uttar Pradesh, Gujarat, and capital Delhi cities, and currently one project is underway in Assam. PM has sanctioned, through PM Care fund, 1.5 lakhs portable cylinders which are of small 10-liter cylinder with both manual and automatic regulator in which oxygen can be automatically adjusted," added Dr Reddy.

The chairman further added that the project is currently under development, which will be of great use for COVID patients at their homes, in quarantine centres, COVID care centres, and even in hospitals for a long time.

### **Hospitals established by DRDO through PM cares fund**

According to G. Satheesh Reddy, DRDO has till now established hospitals in Delhi, Jammu, Ahmedabad, Lucknow Varanasi Gandhinagar, Rishikesh, and Haridwar within a short period of time while the hospital in Guwahati is expected to start functioning in a day or two. The first hospital was established in Delhi with 500 ICU beds and all the COVID facilities, detailed the chairman.

### **2-Deoxy-D-glucose (2-DG) advancement**

While speaking about 2-DG's advancement by DRDO, the chairman revealed that Dr. Reddy's laboratories where clinical trials were held have ramped up the production and about 10 to 12000 sachets are now getting produced each day with plans of taking the manufacturing unit to lakhs this month. Post-that the drug will be sent to the hospitals across the country. The new COVID drug 2-DG which has been approved by DCGI in May after clinical trials on 330 patients has proved the signs of improvements including fast recovery and fewer oxygen requirements, mentioned DRDO Chairman.

### **On Oxygen generation plants**

The DRDO Chief enlightened that under PM Cares fund 850 oxygen plants have been set up and the Prime Minister has ordered the project to be ready by July end. These plants carry a capacity of 960 litres per minute and also 500 litres per minute, both developed by DRDO industries and CSIR development industries. The funding for the side preparation process including a decision on platform, location, and shelter has also been provided by PM Cares.

### **New techniques for defence force**

Apart from the COVID assistance, the organization is also developing many technologies whether it is aircraft, missiles, torpedos, radars, sonars, and guns, added Dr Reddy. He also hinted upon soon to be launched world's longest-range gun that is being developed for the Indian Army and manufactured by Bharat Forge and Tata Power SED. Lastly, the Chairman expressed happiness over Tejas light combat aircraft (LCA) 83 orders that have come as a major boost for aeronautics in the country and it will also pave a way for future aeronautics development.

<https://www.republicworld.com/india-news/general-news/drdo-chief-speaks-to-republic-says-pm-has-ordered-850-oxygen-plants-to-be-set-up-by-july.html>

## **Battling Covid-19: DRDO to share 2-DG formula with private companies for mass production**

*In an interview given to Republic TV, DRDO Chairman talked about ramped production of 2-DG and private companies will be given formula for mass production*

*By Shivani Sharma*

The Defence Research and Development Organisation (DRDO) that primarily spearheads the indigenous development of defence systems and technologies has played a significant role in the Covid-19 pandemic. As the pandemic hit the nation in 2020, the DRDO met the requirements of N-95 masks, PPE kits, sanitizers, and ventilators. The scientists across the nation in various DRDO labs have been relentlessly contributing to battle out the Coronavirus. In an Exclusive interview with Republic, Dr. G. Satheesh Reddy, the Chairman of DRDO, shared about the endeavors of the organisation. Dr. Reddy said, "The DRDO established Covid hospitals across the country in just 10 to 15 days. Hospitals set up by DRDO in Delhi, Jammu, Ahmedabad, Haldwani, Varanasi, and many other cities have been treating thousands of Covid-19 patients."

The technology that was developed for aircraft like LCA and for meeting the Oxygen requirements of soldiers in high altitude areas is being used to give high-pressure oxygen to Covid patients.

DRDO has enormously contributed to the Oxygen requirements of the nation during the worst surge of the pandemic. DRDO is making 1.5 lakhs portable Oxygen cylinders with automatic control after the Prime Minister sanctioned the same under the PM Cares fund. These cylinders can be used by patients in homes, hospitals, and Covid care centers.

The development of the miracle Covid drug 2DG by the INMAS lab of DRDO is another milestone achievement in treatment of Covid patients. The drug formula will be shared by DRDO with more private companies so that mass production can be done. As of now, 10 to 12 thousand doses of 2DG are being produced each day and by the end of this month, the production would be in lakhs.

The DRDO is Installing higher capacity Oxygen Generation plants under PM cares funds. 850 such plants for DRDO and CSIR industries have been sanctioned and will be installed by end of July.

Along with the contribution in the Covid fight, DRDO is also developing many state-of-the-art technologies for the Defence forces. The longest-range gun system developed by DRDO, ATAGS is undergoing trials and soon will be inducted into the Army.

LCA production is also going on at full pace. Radars, Torpedoes, communication systems, AVAC systems are also being developed to strengthen the armed forces indigenously.

According to Dr. G. Satheesh Reddy, "We are working very closely with armed forces to indigenize the forces. There is a perfect synergy between the DRDO and the defence forces."

Reacting to PM Modi's announcement of free vaccines for all above 18, Dr. Reddy said, "Every citizen should be responsible. Wearing masks, distancing must be followed and PM's declaration to give free vaccine to all will make a difference."

<https://www.republicworld.com/india-news/general-news/battling-covid-19-drdo-to-share-2-dg-formula-with-private-companies-for-mass-production.html>

## Access to DRDO drug 2-DG will improve in weeks: Dr. Reddy's

*DRDO invites more pharma firms to take up its production*

Hyderabad: Availability of 2-Deoxy-D-Glucose (2-DG), the drug developed by DRDO lab INMAS and approved for use as adjunct in treatment of moderate to severe COVID-19 patients, is set to improve in the weeks ahead with drug maker Dr. Reddy's Laboratories ramping up production.

"I expect a very significant ramp up in the second half of June and subsequently in July," said Deepak Sapra, CEO (API and Services) of Dr. Reddy's.

Stating that the company is licensee of DRDO, for the product launched last month following emergency use authorisation from the Drugs Controller General of India, he said in a matter of weeks the capacity will be enhanced to meet requirements of lakhs of patients.

### **MRP ₹990 per sachet**

Mr.Sapra, who was speaking at a webinar on 2-DG organised by the Federation of Telangana Chambers of Commerce and Industry on Tuesday, said the drug, however, would continue to be made available only on prescription and used in a hospital setting. The MRP of the drug is ₹990 per sachet (oral powder 2.34 g).

Defence Research and Development Organization (DRDO) Chairman G. Satheesh Reddy said defence R&D is not just about arms and equipment but also about working on soldier support systems and the drug is the result of such efforts.

### **EoI for tech transfer**

Mr. Reddy said the DRDO has issued an expression of interest (EoI) seeking participation of more players from the pharma industry, including to take the product to international markets. According to the EoI document, it is proposed to offer transfer of technology (ToT) of 2-DG to Indian pharmaceutical firms for production. A ToT fee of ₹25 lakh is payable by industry to DRDO at the time of signing of licensing agreement.

Senior Scientist and Lead Developer-2DG at the Institute of Nuclear Medicine and Allied Sciences Anant Narayan Bhatt said 2-DG is an anti-viral and anti-inflammatory drug developed by INMAS. In the mid-1990's it was conceived as an adjuvant to radio-therapy and the phase I and II clinical trials were conducted in reputed cancer hospitals. In 2004, the technology of 2-DG synthesis was transferred to Dr. Reddy's, while in 2014 DCGI recommended the drug for manufacturing and marketing by the pharma major for use in the treatment of patients with Glioblastoma Multiforme.

FTCCI president Ramakanth Inani stressed on efforts to make the country self sufficient in pharmaceuticals and engineering products.

<https://www.thehindu.com/news/cities/Hyderabad/access-to-drdo-drug-2-dg-will-improve-in-weeks-dr-reddys/article34764140.ece>

## DRDO-developed Covid drug 2-DG to cost Rs 990 per sachet

By Swati Bhardwaj

Hyderabad: Contrary to promises that the indigenously developed Covid-19 drug 2-deoxy-D-glucose (2-DG) would be priced affordably to ensure it reaches as many patients as possible, the wonder drug has been priced at a steep Rs 990 per sachet. The drug was developed by scientists at Institute of Nuclear Medicine and Allied Sciences (INMAS), a Defence Research & Defence Organisation lab, and is being commercialised by pharma major Dr Reddy's Laboratories.

What makes the pricing a surprise is that Dr Reddy's Laboratories had, last month, issued a statement that the pricing of the drug was "being determined with a view to making it accessible and affordable to as many patients as possible".

INMAS-DRDO had also said that being a generic molecule and an analogue of (similar to) glucose, 2-DG can be easily produced and made available in plenty in the country. The pricing of 2-DG was announced by a top Dr Reddy's Labs at an interactive session organised by Telangana's apex trade and industry body Federation of Telangana Chambers of Commerce and Industry (FTCCI) on Tuesday.

While announcing the price tag, Deepak Sapra, CEO, API & Services, Dr Reddy's Laboratories, said: "The goal at Dr Reddy's is to maximise production and make it accessible as much as possible to patients all over the country in as short a time-frame as possible."

Sapra said that the months of June and July were extremely important for ramp-up of 2-DG production and ensure it reaches the last mile and ensure that every patient that needs it has access to it. He did not mention any production quantum details.

The drug comes in a powder form in a sachet and has to be taken orally by dissolving it in water. It works by accumulating in the virus infected cells and prevents growth of the virus by stopping viral synthesis and energy production.

It is an inhibitor of glucose transport and glycolysis and was originally being developed for cancer as it cuts the supply of glucose molecules to cancer cells, which require higher glucose than normal cells to survive, thereby killing them.

DRDO had said clinical trials conducted on Covid-19 patients had showed that 2-DG helped in faster recovery of hospitalised patients and reduced their dependence on supplemental oxygen.

<https://timesofindia.indiatimes.com/city/hyderabad/drdo-developed-covid-drug-2-dg-to-cost-rs-990-per-sachet/articleshow/83352558.cms>



The drug comes in a powder form in a sachet and It works by accumulating in the virus infected cells and prevents growth of the virus by stopping viral synthesis and energy production.



## अब डीआरडीओ लगाएगा आक्सीजन प्लांट

सिविल अस्पताल में आक्सीजन प्लांट लगाने की जिम्मेदारी अब डीआरडीओ

(रक्षा अनुसंधान एवं विकास संगठन) को सौंप दी गई है।

पठानकोट: सिविल अस्पताल में आक्सीजन प्लांट लगाने की जिम्मेदारी अब डीआरडीओ (रक्षा अनुसंधान एवं विकास संगठन) को सौंप दी गई है। हालांकि प्लांट लगाने के लिए जगह अभी भी फाइनल नहीं हो सकी है। इससे पहले एनएचएआरआइ (राष्ट्रीय राजमार्ग प्राधिकरण) को प्लांट लगाने की जिम्मेदारी दी गई थी। टीम के अधिकारी दो बार सिविल अस्पताल में मौका मुआयना भी कर चुके हैं। मगर जगह तय न होने से प्रस्ताव अधर पर लटक गया। हालांकि, इसमें डीआरडीओ की सहायता एनएचएआरआइ की टीम ही करेगी। अधिकारियों के मानें तो प्लांट काम जून के आखिरी सप्ताह तक पूरा हो जाएगा। प्लांट की क्षमता एक हजार सिलेंडर की होगी।



सरकार ने 12 जिलों में प्लांट लगाने का लिया था फैसला गौर हो कि कोरोना के दूसरे लहर में आक्सीजन और वेंटीलेटर के लिए पूरे देश में हाहाकार मचा हुआ था। प्रशासनिक अधिकारी भी इसको लेकर परेशान थे। जालंधर की तरफ से पठानकोट के लिए आक्सीजन की सप्लाई भी रोक दी गई थी, ऊपर से हिमाचल प्रदेश से भी सप्लाई में कटौती होने लगी थी। ऐसी समस्या आगे न आए इसलिए सरकार ने पूरे राज्य में 12 आक्सीजन प्लांट लगाने फैसला लिया था। इसमें मंडीगोबिंदगढ़, मुक्तसर, बठिंडा, लुधियाना और फतेहगढ़ साहिब के साथ पठानकोट भी शामिल है। प्लांट की क्षमता 20 मीट्रिक टन की होगी। इसे इंडस्ट्रियल व मेडिकल दोनों में उपयोग किया जा सकता है। सरकार के फैसले के बाद इसपर काम शुरू हो गया। प्राइवेट अस्पताल भी प्लांट लगाने को आ रहे आगे

प्राइवेट अस्पतालों को भी आक्सीजन प्लांट लगाने के लिए लगातार जागरूक किया जा रहा है। इसी कड़ी में कुछ प्राइवेट अस्पतालों ने इसमें रुचि भी ली है। गौरतलब है कि चौहान अस्पताल और अमनदीप अस्पताल के पास अपना आक्सीजन प्लांट है, जिनकी क्षमता बढ़ाने पर जोर दिया जा रहा है। इंडस्ट्रियल डिपार्टमेंट के जीएमडीईसी सिमरजोत सिंह का कहना है कि हम प्राइवेट अस्पतालों को लगातार आक्सीजन प्लांट लगाने के लिए जागरूक कर रहे हैं। कुछ प्राइवेट अस्पतालों ने रुचि दिखाते हुए एजेंसी का नंबर मांगा है। उसे हमने उपलब्ध करवा दिया है। लक्ष्य यह है कि सभी अस्पताल आक्सीजन मामले में आत्मनिर्भर हो जाए। इसको लेकर काम किया जा रहा है।

आक्सीजन का सप्लाई मैप

ओजेएस प्लांट से 400, कांगड़ा से 250 और फतेहगढ़ साहिब से 80 आक्सीजन सिलेंडरों की सप्लाई कोरोना काल में हो रही थी। यहां से आक्सीजन की आपूर्ति मिलिट्री, प्राइवेट और सिविल अस्पताल को की जा रही थी।

प्लांट लगने के बाद आक्सीजन की कमी नहीं होगी

सिविल अस्पताल में आक्सीजन प्लांट लगाया जाना है। इसकी क्षमता हजार सिलेंडर की होगी। प्लांट लगने के बाद आक्सीजन की जिले में किसी भी प्रकार की कमी नहीं आएगी। इसको लेकर काम शुरू कर दिया गया है। उम्मीद है कि इसी माह यह प्लांट लग जाए।- गुरसिमरन सिंह ढिल्लो, एसडीएम, पठानकोट

<https://www.jagran.com/punjab/pathankot-responsibility-for-setting-up-oxygen-plant-entrusted-to-drdo-21719542.html>

## THE TIMES OF INDIA

Wed, 09 June 2021

### **DRDO installs much-needed oxygen plant at ESI hospital**

Margao: The Defence Research and Development Organisation (DRDO) has set up an oxygen concentrator plant at ESI hospital Margao, a Covid care facility. The plant will be made functional soon.

ESI Hospital medical superintendent Dr Vishwajit Faldessai told TOI that the DRDO has already completed installation of the plant and that a trial run will be held in a day or two.

Sources said that once the 1000 lt/min capacity plant is commissioned, the hospital's dependency on outside supply of oxygen will end.

The DRDO has set up oxygen plants, under the PM CARES fund, in various hospitals across the country with a view to augmenting oxygen supply in hospitals dealing with an unprecedented surge in Covid-19 cases.

Sources, however, said that following a significant reduction in new admissions at the ESI hospital, coupled with an equally remarkable recovery rate, the pressure on the hospital has now eased considerably.

Following the recent surge in Covid-19 cases, the upper two floors of the ESI hospital, with a total of 84 beds, were converted into a Covid Care facility on April 2.

During the first phase of the pandemic too, the ESI hospital, was designated as a Covid hospital.

<https://timesofindia.indiatimes.com/city/goa/drdo-installs-much-needed-oxygen-plant-at-esi-hospital/articleshow/83352148.cms>

*Wed, 09 June 2021*

## **New Oxygen Generation Plant sanctioned to AMU from PM cares fund**

Aligarh: One new Oxygen Generation Plant has been sanctioned to JNMC Hospital from PM CARES Fund. The National Highway Authority and DRDO (Defence Research and Development Organisation) have been given the responsibility of executing this project. The new oxygen generation plant will have a capacity of producing 1000 litre/minute.

DRDO (Defence Research and Development Organisation), the executing agency for the project will connect outlet of the plant to the Hospital Oxygen Network. The Oxygen generation plant comes with a warranty of one year of the system from the date of completion. The University will have to provide Electricity Transformer, Stand by Generator Set (125 KVA) and other infrastructure.

This new Oxygen generation plant will cater to the needs of the CCW (Critical Care Ward), CCU (Coronary Care Unit), Respiratory ICU, Paediatric ICU and Medicine Wards. The Civil work for this plant is going on in full swing.

The University Administration has deputed Dr Obaid Ahmed Siddiqui, Deputy Medical Superintendent as Nodal Officer for facilitating the construction of new Oxygen Generation Plant. The Registrar, AMU Mr Abdul Hamid is coordinating with NHAI and DRDO for early execution of this project.

The Vice-Chancellor, AMU Prof Tariq Mansoor has thanked the Prime Minister of India for providing one Oxygen generation plant from PM CARES Fund and he hoped that this will go a long way in fulfilling the Oxygen requirement of the JNMC Hospital and will benefit the patients especially those belonging to the economically weaker sections of the society as well as members of the AMU community.

The Vice-Chancellor also welcomed the new vaccination policy under which Central Government will provide vaccines free of cost to states for vaccinating the population in the age group of 18-45 years.

<https://indiaeducationdiary.in/new-oxygen-generation-plant-sanctioned-to-amu-from-pm-cares-fund/>

# Defence Strategic: National/International



Press Information Bureau  
Government of India  
Ministry of Defence

Tue, 08 June 2021 4:08PM

## Raksha Mantri invites Swedish firms to invest in defence corridors in Uttar Pradesh & Tamil Nadu;

*Addresses Webinar on India-Sweden defence industry cooperation*

*‘AatmaNirbhar Bharat’ focuses on manufacturing cost-effective quality products for India and the world, says Shri Rajnath Singh*

A webinar on India-Sweden Defence Industry Cooperation, with the theme ‘Capitalizing Opportunities for Growth and Security’, was organised on June 08, 2021. It was organised under the aegis of Department of Defence Production, Ministry of Defence through Society of Indian Defence Manufacturers (SIDM) and Swedish Security and Defence Industry (SOFF). Raksha Mantri Shri Rajnath Singh was the Chief Guest, while the Defence Minister of Sweden Mr Peter Hultqvist was the Guest of Honour. Ambassador of India to Sweden Shri Tanmaya Lal; Ambassador of Sweden to India Mr Klas Molin; Defence Secretary Dr Ajay Kumar, Secretary (Defence Production) Shri Raj Kumar; other senior officers of Defence Ministries of the two countries; representatives of Indian & Swedish Defence Industries and officials of SIDM & SOFF also attended the webinar.

In his inaugural address, Shri Rajnath Singh listed out several progressive policy and procedural reforms undertaken by the Government, under the leadership of Prime Minister Shri Narendra Modi, that have transformed the defence industry to meet domestic as well as global demand. The motto of ‘AatmaNirbhar Bharat Abhiyaan’ is ‘Make in India’ and ‘Make for the World’, he said, adding that the campaign envisages the defence sector to play a major role in India’s economic growth and focuses on manufacturing cost-effective quality products for India and for the world.

On the Defence Acquisition Procedure (DAP) 2020, the Raksha Mantri said it encourages domestic manufacturing and has provided a strong foundation for India to emerge as the defence manufacturing hub. He highlighted that policy decisions such as FDI liberalisation and improved ease of doing businesses are attracting top defence companies of the world and have Joint Ventures establishments in India. Ease of FDI regulations and introduction of Buy (Global – Manufacture in India) in Defence Acquisition Procedure (DAP) 2020 invite foreign OEMs to participate in the opportunities offered by the Indian Defence industry. “Foreign OEMs can set up manufacturing



facilities individually or partner with Indian companies through a joint venture or technology agreement to capitalise on the 'Make in India' opportunity," he said.

Shri Rajnath Singh invited Swedish firms to invest in Defence Corridors in Uttar Pradesh and Tamil Nadu, saying that they can benefit from the unique incentives being offered by the state governments and the availability of a highly-skilled workforce in India. Stressing that there is a huge potential for more India-Sweden partnerships, he highlighted the strong capabilities of Indian defence industry in various fields and their willingness to collaborate with Swedish companies for co-development and co-production in areas of mutual interest.

"Swedish firms already have a major presence in India. There is a lot of scope for Swedish and Indian defence Industries for co-production and co-development. Indian industry can also supply components to Swedish Industries. Technology-centric FDI policy will enable Indian industries to collaborate with Swedish companies in the field of niche and proven military technologies," stated Shri Rajnath Singh.

The Raksha Mantri said India has a vast Defence Industrial Base with 41 Ordnance factories, nine Defence Public Sector Undertakings and expanding private sector Industries supported by an ecosystem of over 12,000 Micro, Small and Medium Enterprises, adding that Indian Defence Industries possess expertise on a wide range of high-tech defence systems for air, land, sea and space applications. "India has a robust shipbuilding industry. The ships constructed by Indian shipyards are of global standards and extremely cost effective. India and Sweden can collaborate in the shipbuilding industry for mutual benefit," he said. Shri Rajnath Singh lauded the continuous efforts of SIDM, Confederation of Indian Industry (CII) and SOFF to strengthen the industrial cooperation between the two countries.

On the occasion, an MoU was signed between SIDM and SOFF to promote bilateral defence industrial relations wherein a dedicated Joint Working Group will be formed to take forward mutual objectives.

Shri Rajnath Singh also released the first edition of the 'SIDM Members Directory 2020-21' – A 360° Overview of the Indian Defence and Aerospace Sector'. The Directory captures the capabilities of 437 companies in the Defence and Aerospace sector, facilitates ease of access to information on the Indian Industry and serves as a one-stop reference for the global defence community. The Directory also contains the latest 108 item 2nd Positive Indigenisation List.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1725332>



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Tue, 08 June 2021 4:08PM

## रक्षा मंत्री ने उत्तर प्रदेश और तमिलनाडु में रक्षा गलियारों में निवेश के लिए स्वीडन की कंपनियों को आमंत्रित किया

भारत-स्वीडन रक्षा उद्योग सहयोग पर वेबिनार को संबोधित किया

'आत्मनिर्भर भारत' भारत एवं दुनिया के लिए लागत प्रभावी गुणवत्ता वाले उत्पादों के निर्माण पर केंद्रित है: श्री राजनाथ सिंह

भारत-स्वीडन रक्षा उद्योग सहयोग पर 'कैपिटलाइजिंग अपॉर्च्युनिटीज़ फॉर ग्रोथ एंड सिक्योरिटी' विषय पर एक वेबिनार का आयोजन 08 जून, 2021 को किया गया। इसका आयोजन रक्षा उत्पादन विभाग, रक्षा मंत्रालय के तत्वावधान में सोसाइटी ऑफ इंडियन डिफेंस मैनुफैक्चरर्स (एसआईडीएम) और स्वीडिश सिक्योरिटी एंड डिफेंस इंडस्ट्री (एसओएफएफ) के माध्यम से किया गया था। इस कार्यक्रम में रक्षा मंत्री श्री राजनाथ सिंह मुख्य अतिथि थे जबकि स्वीडन के रक्षा मंत्री श्री पीटर हल्टक्विस्ट विशिष्ट अतिथि थे। स्वीडन में भारत के राजदूत श्री तन्मय लाल, भारत में स्वीडन के राजदूत श्री क्लस मोलिन, रक्षा सचिव डॉ. अजय कुमार, सचिव (रक्षा उत्पादन) श्री राज कुमार, दोनों देशों के रक्षा मंत्रालयों के अन्य वरिष्ठ अधिकारी, भारतीय और स्वीडिश रक्षा उद्योगों के प्रतिनिधि एवं एसआईडीएम और एसओएफएफ के अधिकारियों ने भी वेबिनार में भाग लिया।



अपने उद्घाटन भाषण में श्री राजनाथ सिंह ने प्रधानमंत्री श्री नरेन्द्र मोदी के नेतृत्व में सरकार द्वारा शुरू की गई अनेक प्रगतिशील नीतियों तथा प्रक्रियागत सुधारों को सूचीबद्ध किया, जिन्होंने घरेलू और वैश्विक मांग को पूरा करने के लिए रक्षा उद्योग का रूपांतरण कर दिया है। उन्होंने कहा कि 'आत्मनिर्भर भारत अभियान' का आदर्श वाक्य 'मेक इन इंडिया' और 'मेक फॉर द वर्ल्ड' है, साथ में उन्होंने जोड़ा कि इस अभियान में रक्षा क्षेत्र की परिकल्पना भारत के आर्थिक विकास में प्रमुख भूमिका निभाने के लिए की गई है और यह भारत और दुनिया के लिए लागत प्रभावी गुणवत्ता वाले उत्पादों के निर्माण पर केंद्रित है।

रक्षा अधिग्रहण प्रक्रिया (डीएपी) 2020 पर, रक्षा मंत्री ने कहा कि यह घरेलू विनिर्माण को प्रोत्साहित करता है और भारत को रक्षा विनिर्माण केंद्र के रूप में उभरने के लिए एक मजबूत आधार प्रदान करता है। उन्होंने इस बात पर प्रकाश डाला कि एफडीआई उदारीकरण और कारोबार करने में सुगमता जैसे नीतिगत फैसले दुनिया की शीर्ष रक्षा कंपनियों को आकर्षित कर रहे हैं और भारत में संयुक्त उद्यम प्रतिष्ठान हैं। एफडीआई नियमों में आसानी और रक्षा अधिग्रहण प्रक्रिया (डीएपी) 2020 में खरीद (ग्लोबल - मैनुफैक्चर

इन इंडिया) की शुरुआत विदेशी ओईएम को भारतीय रक्षा उद्योग द्वारा पेश किए गए अवसरों में भाग लेने के लिए आमंत्रित करती है। उन्होंने कहा, "विदेशी ओईएम व्यक्तिगत रूप से विनिर्माण सुविधाएं स्थापित कर सकते हैं या 'मेक इन इंडिया' अवसर को भुनाने के लिए एक संयुक्त उद्यम या प्रौद्योगिकी समझौते के माध्यम से भारतीय कंपनियों के साथ साझेदारी कर सकते हैं।"

श्री राजनाथ सिंह ने स्वीडन की कंपनियों को उत्तर प्रदेश और तमिलनाडु में रक्षा गलियारों में निवेश करने के लिए आमंत्रित करते हुए कहा कि वे राज्य सरकारों द्वारा दिए जा रहे अनूठे प्रोत्साहनों और भारत में अत्यधिक कुशल कार्यबल की उपलब्धता से लाभान्वित हो सकते हैं। इस बात पर जोर देते हुए कि भारत-स्वीडन साझेदारियों की अधिक संभावनाएं हैं, उन्होंने विभिन्न क्षेत्रों में भारतीय रक्षा उद्योग की मजबूत क्षमताओं और पारस्परिक हित के क्षेत्रों में सह-विकास और सह-उत्पादन हेतु स्वीडिश कंपनियों के साथ सहयोग करने की भारतीय रक्षा उद्योग की इच्छा पर प्रकाश डाला।

"स्वीडिश फर्मों की पहले से ही भारत में प्रमुख उपस्थिति है। स्वीडिश और भारतीय रक्षा उद्योग में सह-उत्पादन और सह-विकास हेतु काफी गुंजाइश है। भारतीय उद्योग स्वीडिश उद्योगों को पुर्जों की आपूर्ति भी कर सकता है। प्रौद्योगिकी केंद्रित एफडीआई नीति से भारतीय उद्योग स्वीडिश कंपनियों के साथ आला और सिद्ध सैन्य प्रौद्योगिकियों के क्षेत्र में सहयोग कर सकेंगे।

रक्षा मंत्री ने कहा कि भारत के पास 41 आयुध कारखानों, नौ रक्षा सार्वजनिक क्षेत्र के उपक्रमों और 12,000 से अधिक सूक्ष्म, लघु और मध्यम उद्यमों के पारिस्थितिकी तंत्र द्वारा समर्थित निजी क्षेत्र के उद्योगों के विस्तार के साथ एक विशाल रक्षा औद्योगिक आधार है, साथ ही उन्होंने कहा कि भारतीय रक्षा उद्योगों के पास हवा, भूमि, समुद्र और अंतरिक्ष अनुप्रयोगों के लिए उच्च तकनीक वाली रक्षा प्रणालियों की एक विस्तृत श्रृंखला पर विशेषज्ञता है। "भारत में एक मजबूत जहाज निर्माण उद्योग है। भारतीय शिपयार्डों द्वारा निर्मित जहाज वैश्विक मानकों के हैं और अत्यंत लागत प्रभावी हैं। उन्होंने कहा कि भारत और स्वीडन पारस्परिक लाभ के लिए जहाज निर्माण उद्योग में सहयोग कर सकते हैं। श्री राजनाथ सिंह ने दोनों देशों के बीच औद्योगिक सहयोग को मजबूत करने के लिए एसआईडीएम, भारतीय उद्योग परिसंघ (सीआईआई) और एसओएफएफ के निरंतर प्रयासों की सराहना की।

इस अवसर पर द्विपक्षीय रक्षा औद्योगिक संबंधों को बढ़ावा देने के लिए एसआईडीएम और एसओएफएफ के बीच एक समझौता ज्ञापन पर हस्ताक्षर किए गए जिसमें आपसी उद्देश्यों को आगे ले जाने के लिए एक समर्पित संयुक्त कार्य समूह का गठन किया जाएगा।

श्री राजनाथ सिंह ने 'एसआईडीएम सदस्य निर्देशिका 2020-21' के पहले संस्करण का विमोचन भी किया- जो भारतीय रक्षा और एयरोस्पेस क्षेत्र का 360° कोण से अवलोकन है। निर्देशिका में रक्षा और एयरोस्पेस क्षेत्र में 437 कंपनियों की क्षमताओं का उल्लेख है, यह भारतीय उद्योग के बारे में जानकारी पाने की पहुंच को आसान बनाती है और वैश्विक रक्षा समुदाय के लिए एक ठोस संदर्भ के रूप में कार्य करती है। निर्देशिका में नवीनतम 108 वस्तुओं की खरीद की दूसरी सकारात्मक स्वदेशीकरण सूची को भी शामिल किया गया है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1725440>

## Two women army officers selected to train as combat pilots

*The development comes months after army Chief General Manoj Mukund Naravane cleared a proposal for allowing women officers to opt for the army's aviation wing*

*By Rahul Singh*

New Delhi: Two women army officers have for the first time been selected to train as helicopter pilots at the force's premier Combat Army Aviation Training School at Nashik in Maharashtra, officials familiar with the development said on Tuesday.

The development comes months after army Chief General Manoj Mukund Naravane cleared a proposal for allowing women officers to opt for the army's aviation wing. While women officers in the Indian Air Force and the Indian Navy fly helicopters, the Army Aviation Corps only inducted male officers until now. Pilots have to go through a stringent selection process.

"Fifteen women officers volunteered to join army aviation. But only two were selected after the Pilot Aptitude Battery Test (PABT) and medicals," said one of the officials cited above, asking not to be named.

The two women are among the 47 army officers who began their training at the Nashik training school on Monday, said a second officer. They will join front-line flying duties on completion of their training in July 2022.

Until now, women officers were assigned only ground duties in the Army Aviation Corps.

Raised in November 1986, the Army Aviation Corps operates the Dhruv advanced light helicopter, Chetaks, Cheetahs and Cheetal helicopters. It carries out an important role in supporting the army's deployment in high altitude areas, including the Siachen Glacier.

The headcount of women in the military has increased almost three-fold over the last six years, with more avenues being opened to them at a steady pace, government figures show.

There are 9,118 women currently serving the army, navy and air force, with the services giving them more opportunities for career progression, the government told Parliament in February 2021.

"It's wonderful to see the armed forces open new avenues for women. It will encourage more women to join the military," said Rajeshwari Kori, deputy controller of Civil Defence (Maharashtra) and a former lieutenant commander who was part of a short-lived Indian Navy experiment to deploy women on warships in 1997.

One of the turning points for women in the military came in 2015 when IAF decided to induct them into the fighter stream. Earlier this year, the Indian Navy deployed four women officers on warships after a hiatus of almost 25 years. India's only aircraft carrier INS Vikramaditya and fleet tanker INS Shakti are the warships that have been assigned their first women crews since the late 1990s.

In May 2021, the army inducted the first batch of women into the Corps of Military Police, the first time that women joined the military in the non-officer cadre. Women have been serving as officers in select branches of the three services since the early 1990s.

Tanks and combat positions in infantry are still no-go zones for women, who were allowed to join the armed forces outside the medical stream for the first time in 1992



The two women are among the 47 army officers who began their training at the Nashik training school on Monday, said a second officer.(HT Photo)



Excluding the medical wing in which women have been serving for decades, the army as of February 2021 accounted for 6,807 women officers, the IAF (1,607) and the navy, 704. In percentage terms, women still form a small part of the military -- 0.56% of the army, 1.08% of the air force and 6.5% of the navy

<https://www.hindustantimes.com/india-news/two-women-army-officers-selected-to-train-as-combat-pilots-101623180458434.html>

## Science & Technology News



Wed, 09 June 2021

# Early endeavors on the path to reliable quantum machine learning

By Florian Meyer

Anyone who collects mushrooms knows that it is better to keep the poisonous and the non-poisonous ones apart. In such "classification problems," which require distinguishing certain objects from one another and to assign the objects we are looking for to certain classes by means of characteristics, computers already provide useful support.

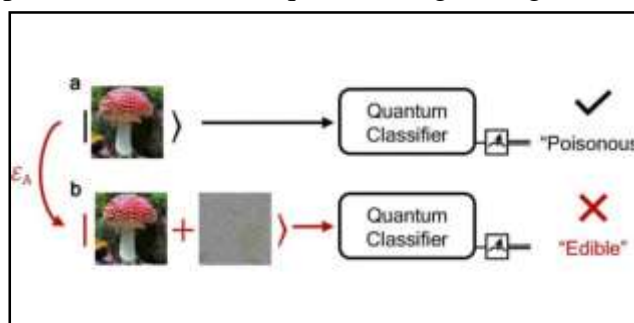
Intelligent machine learning methods can recognize patterns or objects and automatically pick them out of data sets. For example, they could pick out those pictures from a photo database that show non-toxic mushrooms. Particularly with very large and complex data sets, machine learning can deliver valuable results that humans would not be able to determine without much time and effort.

However, for certain computational tasks, even the fastest computers available today reach their limits. This is where the great promise of quantum computers comes into play—one day, they could perform super-fast calculations that classical computers cannot solve in a useful period of time. The reason for this "quantum supremacy" lies in physics: Quantum computers calculate and process information by exploiting certain states and interactions that occur within atoms or molecules or between elementary particles.

The fact that quantum states can superpose and entangle creates a basis that allows quantum computers the access to a fundamentally richer set of processing logic. For instance, unlike classical computers, quantum computers do not calculate with binary codes or bits, which process information only as 0 or 1, but with quantum bits or qubits, which correspond to the quantum states of particles. The crucial difference is that qubits can realize not only one state—0 or 1—per computational step, but also a superposition of both. These more general methods of information processing in turn allow for a drastic computational speed-up in certain problems.

### Translating classical wisdom into the quantum realm

These speed advantages of quantum computing are also an opportunity for machine learning applications—after all, quantum computers could compute the huge amounts of data that machine



A reliable quantum classification algorithm correctly classifies a toxic mushroom as "poisonous" while a noisy, perturbed one classifies it faultily as "edible". Credit: npj Quantum Information / DS3Lab ETH Zurich

learning methods need to improve the accuracy of their results much faster than classical computers.

However, to really exploit the potential of quantum computing, it is necessary to adapt classical machine learning methods to the peculiarities of quantum computers. For example, algorithms, i.e., the mathematical rules that describe how a classical computer solves a certain problem, must be formulated differently for quantum computers. Developing well-functioning quantum algorithms for machine learning is not entirely trivial, because there are still a few hurdles to overcome along the way.

On the one hand, this is due to the quantum hardware. At ETH Zurich, researchers currently have quantum computers that work with up to 17 qubits (see "ETH Zurich and PSI found Quantum Computing Hub" of 3 May 2021). However, if quantum computers are to realize their full potential one day, they might need thousands to hundreds of thousands of qubits.

### **Quantum noise and the inevitability of errors**

One challenge that quantum computers face concerns their vulnerability to error. Today's quantum computers operate with a very high level of noise, as errors or disturbances are known in technical jargon. For the American Physical Society, this noise is "the major obstacle to scaling up quantum computers." No comprehensive solution exists for both correcting and mitigating errors. No way has yet been found to produce error-free quantum hardware, and quantum computers with 50 to 100 qubits are too small to implement correction software or algorithms.

To a certain extent, errors in quantum computing are in principle unavoidable, because the quantum states on which the concrete computational steps are based can only be distinguished and quantified with probabilities. What can be achieved, on the other hand, are procedures that limit the extent of noise and perturbations to such an extent that the calculations nevertheless deliver reliable results. Computer scientists refer to a reliably functioning calculation method as "robust," and in this context, also speak of the necessary "error tolerance."

This is what the research group led by Ce Zhang, ETH computer science professor and member of the ETH AI Center, has recently explored, somehow "accidentally" during an endeavor to reason about the robustness of classical distributions for the purpose of building better machine learning systems and platforms. Together with Professor Nana Liu from Shanghai Jiao Tong University and with Professor Bo Li from the University of Illinois at Urbana, they have developed a new approach that proves the robustness conditions of certain quantum-based machine learning models, for which the quantum computation is guaranteed to be reliable and the result to be correct. The researchers have published their approach, which is one of the first of its kind, in the scientific journal *npj Quantum Information*.

### **Protection against errors and hackers**

"When we realized that quantum algorithms, like classical algorithms, are prone to errors and perturbations, we asked ourselves how we can estimate these sources of errors and perturbations for certain machine learning tasks, and how we can guarantee the robustness and reliability of the chosen method," says Zhikuan Zhao, a postdoc in Ce Zhang's group. "If we know this, we can trust the computational results, even if they are noisy."

The researchers investigated this question using quantum classification algorithms as an example—after all, errors in classification tasks are tricky because they can affect the real world, for example if poisonous mushrooms were classified as non-toxic. Perhaps most importantly, using the theory of quantum hypothesis testing—inspired by other researchers' recent work in applying hypothesis testing in the classical setting—which allows quantum states to be distinguished, the ETH researchers determined a threshold above which the assignments of the quantum classification algorithm are guaranteed to be correct and its predictions robust.

With their robustness method, the researchers can even verify whether the classification of an erroneous, noisy input yields the same result as a clean, noiseless input. From their findings, the researchers have also developed a protection scheme that can be used to specify the error tolerance

of a computation, regardless of whether an error has a natural cause or is the result of manipulation from a hacking attack. Their robustness concept works for both hacking attacks and natural errors.

"The method can also be applied to a broader class of quantum algorithms," says Maurice Weber, a doctoral student with Ce Zhang and the first author of the publication. Since the impact of error in quantum computing increases as the system size rises, he and Zhao are now conducting research on this problem. "We are optimistic that our robustness conditions will prove useful, for example, in conjunction with quantum algorithms designed to better understand the electronic structure of molecules."

**More information:** Maurice Weber et al, Optimal provable robustness of quantum classification via quantum hypothesis testing, *npj Quantum Information* (2021). DOI: [10.1038/s41534-021-00410-5](https://doi.org/10.1038/s41534-021-00410-5)  
<https://phys.org/news/2021-06-early-endeavors-path-reliable-quantum.html>



Wed, 09 June 2021

## From burglar alarms to black hole detectors: Super sensors as possible outputs of a quantum gravity experiment

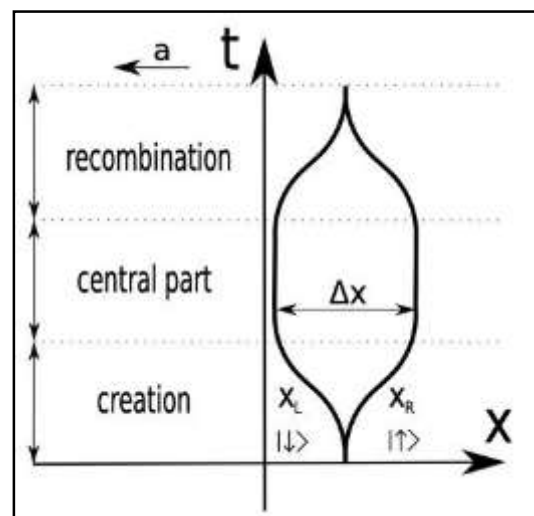
Last year, Anupam Mazumdar, a physicist from the University of Groningen, together with colleagues from the UK proposed an experiment that could conclusively prove whether gravity is a quantum phenomenon. This experiment would focus on observing two relatively large, entangled quantum systems in free fall. In a new article, published on 4 June in *Physical Review Research*, the scientists describe in more detail how two types of noise could be reduced. They suggest that quantum interference could be applied in the production of a sensitive instrument that could detect movements of objects ranging from butterflies to burglars and black holes.

Central to this experiment is a minuscule diamond, just a few nanometers in size, in which one of the carbon atoms has been replaced by a nitrogen atom. According to quantum physics, the extra electron in this atom would either absorb or not absorb the photon energy of a laser.

### Diamond

Absorption of the energy would alter the electron's spin value, a magnetic moment that can be either up or down. "Just like Schrödinger's cat, which is dead and alive at the same time, this electron spin does and does not absorb the photon energy, so its spin is both up and down," Mazumdar explains. This process results in quantum superposition of the entire diamond. By applying a magnetic field, it is possible to separate the two quantum states. When these quantum states are brought together again by turning off the magnetic field, they will create an interference pattern.

This diamond is small enough to sustain this superposition, but it is also sufficiently large to be affected by the pull of gravity. When two of these diamonds are placed next to each other under conditions of free fall, they only interact via the gravity force between them. The experiment was originally designed to test whether gravity itself is a quantum phenomenon. Simply put, as



Schematic of the proposed experiment: A beam is split into two (bottom) and subsequently recombined, creating an interference pattern (top). Credit: Anupam Mazumdar

entanglement is a quantum phenomenon, the entanglement of two objects that interact only through gravity would serve as proof that gravity is a quantum phenomenon.

### **Collision**

Any moving mass will have an effect on this very sensitive quantum system. In their latest paper, Mazumdar and colleagues describe how these disturbances can be reduced. However, it is also apparent that this system could be used to detect moving masses. The first source of noise is the collision of gas with the experimental capsule in free fall. Even the impact of photons can create a disturbance. "Our calculations show that these effects are minimized by placing the experimental capsule inside a larger container, which creates a controlled environment," Mazumdar explains.

Inside such an outer container, this noise is negligible at a pressure of  $10^{-6}$  Pascal, even at room temperature. Requirements for conditions within the experimental capsule are more stringent. Currently, the scientists estimate a required pressure of  $10^{-15}$  Pascal at around 1 Kelvin. Given the current state of technology, this is not yet feasible, but Mazumdar expects it could well be possible within around 20 years.

### **Space debris**

Moving objects, even as small as a butterfly, located near the experimental site constitute a second source of noise. Calculations reveal that this noise can also be mitigated relatively easily by limiting access to the experimental site. People should maintain a distance of at least 2 meters from the experimental site, and cars should maintain a minimum distance of 10 meters from the site. Passing planes at a distance of more than 60 meters from the experimental site would not pose a problem. All of these requirements can be accomplished easily.

Once the experiment is up and running, its scope could be extended beyond an investigation of quantum gravity, according to Mazumdar. "You could put it in a spacecraft, where it is in free fall all the time. Then, you could use it to detect incoming space debris. By using several systems, it would even be possible to get the trajectory of the debris." Another option is to place such a system in the Kuiper belt, where it would sense the movement of our solar system in space. "And it could detect any nearby black holes," Mazumdar adds.

Back on Earth, the quantum system would be capable of detecting tectonic movements and perhaps providing early warnings of earthquakes. And, of course, the quantum system's sensitivity to any movement occurring in proximity to it would make it an ideal, if somewhat complex, movement sensor and burglar alarm. But for now, the focus over the next few decades is on determining whether gravity is a quantum phenomenon.

**More information:** Marko Toroš et al, Relative acceleration noise mitigation for nanocrystal matter-wave interferometry: Applications to entangling masses via quantum gravity, *Physical Review Research* (2021). DOI: [10.1103/PhysRevResearch.3.023178](https://doi.org/10.1103/PhysRevResearch.3.023178)  
<https://phys.org/news/2021-06-burglar-alarms-black-hole-detectors.html>

# ICMR study finds Covaxin effective against Covid variants

*The indigenously developed Covaxin vaccine is effective against variants of the SARS-CoV-2 virus that causes Covid-19, including the delta variant that was first sequenced in India, a study by the Indian Council of Medical Research has found*

*By Anonna Dutt*

The indigenously developed Covaxin vaccine is effective against variants of the SARS-CoV-2 virus that causes Covid-19, including the delta variant that was first sequenced in India, a study by the Indian Council of Medical Research has found.

The research, which is yet to be peer reviewed, also discovered that the vaccine is thrice as effective in creating antibodies as a previous Covid infection. To be sure, other research has shown that a previous infection does confer stronger immunity.

The research found out that Covaxin creates 2.7 times less neutralising titre against the delta variant and three times less neutralising titre against the beta variant of the virus first reported from South Africa. The neutralising titre refers to the level of antibodies created.

But the vaccine remained effective against both strains.

“Our study demonstrated that despite a reduction in neutralisation titres with BBV152 (Covaxin) sera against B.1.351 (beta) and B.1.617.2 (delta), its neutralisation potential is well established. Lastly, the broad epitope (large number of binding sites) coverage of an inactivated vaccine decreases the magnitude of reduced neutralisation against emerging variants,” the study concluded.

Dr Pragya Yadav, senior scientist at the National Institute of Virology-Pune and the lead author of the paper, said, “Although there is a minor reduction in the neutralisation titre, it (Covaxin) will still be able to protect the vaccinated individual and eventually lessen the severity of the disease.”

Epidemiologist and vaccine expert Dr Chandrakant Lahariya said the antibody titres are not predictive of the efficacy of a vaccine. “Even if the antibody level is 1, the person is thought to be seroconverted and protected from the infection. That is what the researchers have shown: despite the reduction in antibody titres, the vaccine works,” he said.

Lahariya said that one likely impact of the lower titres could be that the antibodies might diminish sooner. “But, with Covid-19, protection against the virus is complex. Studies have shown that even after the decline in antibody levels, there is T-cell immunity. A study from the University of Washington has said that this immunity might be life-long for those who had mild infection.”

Covaxin, which was developed by Bharat Biotech in association with ICMR, is one of the three vaccines that have so far been approved for Covid-19 immunisation in India, the other two being Covishield made by Serum Institute of India and Sputnik V of Russia. Covaxin uses an inactivated whole virus to elicit an immune response.

Covaxin accounts for at least 11% of the vaccine shots given in the country so far, according to data on the government’s CoWIN platform. The company is in the process of scaling up its production, including by licensing its technology, and is likely to contribute a higher share of immunisation in the future.

<https://www.hindustantimes.com/india-news/icmrstudy-finds-covaxin-effective-against-covid-variants-101623178067041.html>

