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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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**ThePrint**

Fri, 18 June 2021

## China-backed hackers RedFoxtrot targeted defence research, telecom in India, US firm finds

*US cybersecurity firm Recorded Future's report says hacker group targeted Indian establishments for six months while border tensions between India, China were high*

*By Regina Mihindukulasuriya, Edited by Manasa Mohan*

New Delhi: A Chinese state-backed hacker group is targeting Indian defence research and other Indian organisations, according to the latest research from an American cybersecurity firm.

In a report released on 16 June, cybersecurity firm Recorded Future, headquartered near Boston, said it found links between a “suspected” Chinese state-sponsored threat activity group and the People’s Liberation Army’s Unit 69010, a Chinese military intelligence unit.

“The unit (69010) also likely has multiple subordinate offices primarily responsible for monitoring military activity along China’s western border,” the report said.

Recorded Future has nicknamed the hacker group ‘RedFoxtrot’.

The same cybersecurity firm had in March said another China-linked hacker group, nicknamed ‘RedEcho’, was targeting India’s power sector, including state-owned NTPC, India’s largest energy conglomerate.

RedFoxtrot has been active since at least 2014, according to Recorded Future. The hacker group’s predominant targets are sectors like government, defence, and telecommunications across Central Asia, India, and Pakistan.

Within the past six months, Recorded Future research detected RedFoxtrot targeting “3 Indian aerospace and defense contractors; major telecommunications providers in Afghanistan, India, Kazakhstan, and Pakistan; and multiple government agencies across the region”, the report said.

The report, however, does not mention the names of the targeted organisations. ThePrint emailed Recorded Future for more details of the target, but is yet to receive a response.

### **DRDO may have been a target**

Recorded Future’s report noted that the choice of targets shows that RedFoxTrot “is likely interested in gathering intelligence on military technology and defense”.

The Chinese hacker group had paid special attention to Indian targets during this 6-month period. “Activity over this period showed a particular focus on Indian targets, which occurred at a time of heightened border tensions between India and the People’s Republic of China (PRC),” the report said.



Representational image | Photographer: Chris Ratcliffe | Bloomberg

Following a clash in the Galwan Valley in June 2020 between Indian and Chinese soldiers, relations have been tense between the two countries.

RedFoxtrot is gaining access to targeted organisations, likely by sending phishing emails containing malware to employees in the targeted organisation, said Atul Kabra, cofounder of a Bengaluru-based cybersecurity firm PolyLogyx, which was acquired by a Netherlands-based firm.

An unsuspecting victim clicking on an attached document in a phishing email could unknowingly download malware on to a system, giving hackers remote access of the computer.

According to Kabra, the report suggests India's Defence Research and Development Organisation (DRDO) could have been a target though the report does not explicitly say so.

However, the firm's research did include a document referencing DRDO.

According to the report, the document name — 'DYSL-QT\_Slide\_DMC\_090719.doc' — "likely corresponds to the 'Defence Research and Development Organisation (DRDO) Young Scientist Laboratory for Quantum Technologies' (DYSL-QT) located in Hyderabad, India. Additionally, DMC is likely in reference to the DRDO Management Council (DMC), suggesting the group used this lure in activity targeting Indian defense research".

Recorded Future research found that the document contained a variant of a malware called Poison Ivy.

Poison Ivy malware is a 'remote access tool' (RAT) that gives the hacker remote access to a victim computer and is able to get "key logging, screen capturing, video capturing, file transfers, system administration, password theft, and traffic relaying".

Traffic relaying occurs when the infected computer is used to transmit data back to the hacker.

<https://theprint.in/india/china-backed-hackers-redfoxtrot-targeted-defence-research-telecom-in-india-us-firm-finds/679807/>

## Principal GMC reviews ongoing works at MCH, DRDO Hospital

Jammu: Dr Shashi Sudhan Sharma, Principal and Dean, Government Medical College Jammu visited Maternal Child Health Hospital (MCH) Gandhi Nagar, Defence Research and Developmental Organization (DRDO) Hospital Baghwati Nagar to review ongoing works.

During her visit to MCH Gandhi Nagar, concerned Medical Superintendent stressed upon the Principal for posting permanent staff to the Hospital to improve its functioning. She was apprised about the working of Air conditioners of fourth floor of the Hospital. The Principal directed the concerned XEn to complete the work before 30th June.

She also visited, New Oxygen Plant, Neonatal Intensive Care Unit (NICU), Pediatric Intensive Care Unit (PICU), 4 Operation theatres and 4 Labors room and instructed the XEn Civil to complete the flooring of the these sections of the Hospital.

It was also decided to periodically exchange the staff of the MCH Hospital with SMGS Hospital and DRDO Hospital for the training of the staff. During her visit it was stressed upon to buy Dual Mode ventilators (used for both Adult and Pediatric) from Corporation. It was also decided to fully establish the office of Medical Superintendent, Nodal Officer, HOD Anesthesia, HOD Gynae and HOD Pediatrics.

During her visit to DRDO hospital, Dr Shashi appreciated the work done by the staff of the hospital in tackling COVID pandemic. It was decided to exchange staff of DRDO hospital with GMC and vice versa in order to keep the staff in ready mode to treat COVID Patients. Later on, she visited old emergency block of GMC Jammu and reviewed the repair and renovation work there. She also inspected the oxygen gas plant, repairing of boundary wall and upgradation works of R N Chopra Nursing Home.

Dr Sudhan also visited AMT School. She was accompanied by Dr Arun Sharma, Medical Superintendent MCH Gandhi Nagar Hospital, Dr Narendra Butyal Medical Superintendent DRDO Hospital and others during her visit.

<https://www.dailyexcelsior.com/principal-gmc-reviews-ongoing-works-at-mch-drdo-hospital/>



Principal, GMC Jammu, Dr Shashi Sudhan Sharma during visit to MCH Hospital, Gandhi Nagar, Jammu.

*Fri, 18 June 2021*

## **DGP SDRF Visits DRDO Hospital Jammu**

Jammu: Director General Police, Commandant General Home Guards/Civil Defence and SDRF, J&K, V K Singh today visited DRDO Hospital, Bhagwati Nagar Jammu.

DG was accompanied by Medical Superintendent DRDO Hospital, Dr. Narinder Singh Bhatial, Deputy Medical Superintendents, Dr. Manoj Bhagat and Dr. Sanjay Bhat, Commandant SDRF 2nd Battalion Jammu, Nisha Nathyal and territorial police officers.

DG interacted with the 20 SDRF personnel deployed for Covid duty in the hospital and lauded their exemplary services during these challenging times.

He announced grant of Commendation Certificates Class-I along with cash reward of Rs 2000 each to the SDRF personnel to boost their morale.



<https://www.crosstownnews.in/post/65349/dgp-sdrf-visits-drdo-hospital-jammu-.html>



## एसडीआरएफ के डायरेक्टर जनरल ने कोविड अस्पताल का दौरा किया

*डायरेक्टर जनरल पुलिस कमांडेंट जनरल होम गार्ड सिविल डिफेंस और एसडीआरएफ वीके सिंह ने वीरवार को जम्मू के भगवती नगर स्थित डीआरडीओ के कोविड अस्पताल का दौरा किया। अस्पताल में कोविड ड्यूटी के लिए तैनात एसडीआरएफ के बीस जवानों के साथ मुलाकात की और इस चुनौतीपूर्ण समय में उनकी सराहना की।*

*By Vikas Abrol*

जम्मू: डायरेक्टर जनरल पुलिस, कमांडेंट जनरल होम गार्ड, सिविल डिफेंस और एसडीआरएफ वीके सिंह ने वीरवार को जम्मू के भगवती नगर स्थित डीआरडीओ के कोविड अस्पताल का दौरा किया।

उनके साथ अस्पताल के मेडिकल सुपरिटेण्डेंट डा. नरेंद्र सिंह भूटेयाल, डिप्टी मेडिकल सुपरिटेण्डेंट डा. मनोज भगत, डा. संजय भट तथा एसडीआरएफ दूसरी बटालियन की कमांडेंट निशा नथेयाल भी थीं। डायरेक्टर जनरल ने अस्पताल में कोविड ड्यूटी के लिए तैनात एसडीआरएफ के बीस जवानों के साथ मुलाकात की और इस चुनौतीपूर्ण समय में उनकी सराहना की।



डायरेक्टर जनरल ने पदोन्नत हुए सभी को बधाई दी और उसने पूरी इमानदारी के साथ काम करने को कहा।

डायरेक्टर जनरल ने सभी को प्रशस्ति पत्र और दो-दो हजार रुपये नकद इनाम देने की घोषणा की

उनका हौंसला बढ़ाने के लिए डायरेक्टर जनरल ने सभी को प्रशस्ति पत्र और दो-दो हजार रुपये नकद इनाम देने की घोषणा की। इससे पहले उन्होंने एसडीआरएफ की दूसरी बटालियन में पदोन्नत हुए 40 जवानों और असिस्टेंट पुलिस इंस्पेक्टरों को स्टार भी लगाए।

डायरेक्टर जनरल ने पदोन्नत हुए सभी को बधाई दी

इनमें पंद्रह असिस्टेंट सब इंस्पेक्टरों को सब इंस्पेक्टर, तीन को हेड कांस्टेबल से असिस्टेंट सब इंस्पेक्टर और 22 को हेड कांस्टेबल बनाया गया। डायरेक्टर जनरल ने पदोन्नत हुए सभी को बधाई दी और उसने पूरी इमानदारी के साथ काम करने को कहा।

<https://m.jagran.com/lite/jammu-and-kashmir/jammu-director-general-of-sdrf-visits-covid-hospital-bhagwati-nagar-21746637.html>

## वाराणसी: BHU में पीएम केयर फंड से लग रहा PSA ऑक्सिजन प्लांट, DRDO ने दी मशीन

बीएचयू के सर सुंदरलाल अस्पताल में 1 हजार लीटर का ऑक्सिजन प्लांट लगाया जा रहा है।  
पीएम केयर फंड से लग रहा य्हे ऑक्सिजन प्लांट वातावरण के हवा को

*By Raghavendra Shukla, अभिषेक जायसवाल*

वाराणसी: कोरोना की संभावित तीसरी लहर से पहले पूर्वांचल का एम्स कहे जाने वाले बीएचयू के सर सुंदरलाल अस्पताल में ऑक्सिजन की क्षमता बढ़ाई जा रही है। पीएम केयर फंड से अस्पताल में 1 हजार एलपीएम का पीएसए ऑक्सिजन प्लांट लगाया जा रहा है। इस प्लांट से अस्पताल के इमरजेंसी वार्ड में मरीजों को ऑक्सिजन की आपूर्ति होगी। एनबीटी ऑनलाइन से बातचीत में बीएचयू अस्पताल के चिकित्सा अधीक्षक डॉ केके गुप्ता ने बताया कि इस प्लांट के लिए डीआरडीओ ने मशीन उपलब्ध कराया है।



सर सुंदरलाल हॉस्पिटल

हवा से बनाएगा ऑक्सिजन

नैशनल हाइवे ऑफ इंडिया और डीआरडीओ के इंजीनियर प्लांट को लगाने का काम कर रहे हैं। प्लांट लगाने के लिए उन्हें जमीन उपलब्ध करा दी गई है। डॉ केके गुप्ता ने बताया कि ये पीएसए ऑक्सिजन प्लांट वातावरण के हवा को प्यूरिफाई कर ऑक्सिजन का निर्माण करेगा। इसकी प्यूरिटी 98 फीसदी होगी। 1 मिनट में इस प्लांट से 1 हजार लीटर ऑक्सिजन का उत्पादन होगा। जिससे अस्पताल के 100 बेड पर मरीजों को ऑक्सिजन की आपूर्ति हो सकेगी।

20 हजार लीटर तक क्षमता बढ़ाने की तैयारी

बीएचयू अस्पताल और ट्रामा सेंटर को मिलाकर देखा जाए तो पहले से अस्पताल में कुक 30 हजार लीटर का ऑक्सिजन प्लांट संचालित किया जा रहा है। अस्पताल प्रशासन अब इसे बढ़ाकर 50 हजार लीटर करने की तैयारी में है। इसको लेकर अस्पताल प्रशासन ने लाइसेंस और अन्य काजगी कोरम को पूरा करने में जुटी हैं।

<https://navbharattimes.indiatimes.com/state/uttar-pradesh/varanasi/psa-oxygen-plant-being-installed-in-bhu-from-pm-care-fund-drdo-gave-machine/articleshow/83600630.cms>



## Varanasi: Patients shifted, DRDO temporary Covid-19 hospital stops operating

Varanasi: The process to stop operating the 750-bed Defence Research and Development Organisation (DRDO) temporary hospital - Pandit Rajan Mishra Covid Hospital - for Covid patients was started on Wednesday with the shifting of 12 patients to the super-speciality wing of Banaras Hindu University (BHU) SSL hospital.

The temporary DRDO hospital was set up by the Army at the Amphitheatre ground of BHU in April.

"The basic infrastructure of the DRDO hospital will be kept intact in view of the anticipated third wave of Covid-19," said divisional commissioner Deepak Agrawal, mentioning that the decision was taken in view of the drastic fall in the number of patients.

Varanasi Development Authority (VDA) vice-chairman and nodal officer for DRDO hospital, Isha Duhan said, "Only 12 patients were left in the 250-bed level-3 facility of the DRDO hospital on Wednesday morning after which the verbal order for stopping its operation was received from the Army authorities. With the arrival of written order, the hospital will stop operating in the next 2-3 days."

Medical superintendent of SSL hospital Prof KK Gupta said, "The DRDO hospital authorities had sent a request for shifting 12 patients admitted there to the super-speciality wing, where BHU runs L-3 facility of around 400 beds and currently only about 60 beds are occupied. We gave our consent for shifting in the morning."

Additional chief medical officer Dr AK Maurya said, "Shifting of all patients from DRDO hospital to SSL hospital was completed by evening."

"A total of 514 patients have been treated at the 250-bed L-3 facility of DRDO hospital since its inauguration on May 10. The two L-2 wings of 250-beds each were not made operational as the demand for beds had already started reducing by May 10," he added.

The DM said, "Letters were sent on May 28 to the state government, Government of India, DRDO and Army officials concerned to minimise the staff at the temporary Covid facility but continue with the hospital infrastructure for the next few months in view of the prediction of the third wave of Covid after September."

"Apart from the request for continuing this hospital," he said, "Proposal for converting one of the two L-2 facilities of this hospital into L-3 wing for paediatric cases by installing ventilators, high flow nasal cannula and other equipment has also been made and this process is likely to complete by July end."

After the second wave of Covid-19 started wreaking havoc, the Ministry of Defence came forward to establish the temporary Covid hospital after April 20 as the facilities available at SSL hospital of BHU, SPG divisional hospital, DDU district hospital, LBS government hospital, ESIC, BLW hospital, Homi Bhabha Cancer Hospital and private hospitals were insufficient to tackle the number of critical cases from the district as well as the surrounding region.

After Delhi, Ahmedabad and Lucknow the DRDO started its 750-bed Covid facility in Varanasi by bringing set-up of L-3 and L-2 facilities in German hangars at the Amphitheatre ground.

Armed Forces Medical Services (AFMS) specialists, doctors, nursing and other medical staff had been moved from across the country on a war-footing to run the hospital in coordination with BHU and the civil administration.

<https://timesofindia.indiatimes.com/city/varanasi/patients-shifted-drdo-temporary-covid-19-hospital-stops-operating/articleshow/83601375.cms>

## मजिस्ट्रेट के हवाले होगा वाराणसी का डीआरडीओ अस्पताल, पीडियाट्रिक के 250 बेड की तैयारी रहेगी जारी

रक्षा अनुसंधान विकास संगठन (डीआरडीओ) की अेर से बीएचयू परिसर में स्थापित पं. राजन मिश्र कोविड चिकित्सालय में अब मरीजों को भर्ती नहीं किया जाएगा। भर्ती मरीज बीएचयू अस्पताल में स्थानांतरित किए जा रहे हैं। यह जिम्मेदारी अब क्षेत्रीय मजिस्ट्रेट के पास होगी।

*By Saurabh Chakravarty*

वाराणसी: रक्षा अनुसंधान विकास संगठन (डीआरडीओ) की अेर से बीएचयू परिसर में स्थापित पं. राजन मिश्र कोविड चिकित्सालय में अब मरीजों को भर्ती नहीं किया जाएगा। भर्ती मरीज बीएचयू अस्पताल में स्थानांतरित किए जा रहे हैं। हालांकि इंफ्रास्ट्रक्चर पूर्व की तरह ही बना रहेगा। इसके साथ कोई छेड़छाड़ नहीं की जाएगी। अस्पताल की व्यवस्था पर नजर रखने के लिए बतौर तैनात नोडल अधिकारी तैनात वीडिए उपाध्यक्ष को जिम्मेदारी से मुक्त कर यह जिम्मेदारी अब क्षेत्रीय मजिस्ट्रेट के पास होगी। स्थानीय पुलिस इस पर नजर रखेगी। साथ ही डीआरडीओ की सुरक्षा एजेंसी इसकी देखरेख करेगी।

घटाया जाएगा बिजली का लोड

कमिश्नर दीपक अग्रवाल की अध्यक्षता में डीआरडीओ, वीडिए व स्वास्थ्य विभाग के अधिकारियों के बीच हुई बैठक में यह निर्णय लिया गया। अस्थाई अस्पताल की सुरक्षा के पुख्ता इंतजाम पर चर्चा की गई। इसमें निर्णय लिया गया कि बिजली का लोड घटाया जाएगा, लेकिन सामान्य तौर पर इतना लोड अवश्य रहेगा कि सामान्य गतिविधियां सुचारू रूप से संचालित हो सके। अस्पताल में लाइट, तकनीकी सपोर्ट के अन्य कार्य ठीक से चल सकें। इसके साथ ही तीसरी लहर की तैयारी को लेकर भी यहां काम हो सके। इसी को ध्यान में रखते हुए अस्थाई अस्पताल में 250 पिडियाट्रिक वाई को संसाधन से लैस करने की तैयारी जारी रखने का भी निर्णय लिया गया। कोविड की तीसरी लहर में बच्चे के अधिक प्रभावित होने के विशेषज्ञों के अनुमान के आधार पर यह तैयारी बतायी जा रही है।



जिलाधिकारी कौशल राज शर्मा ने कहा कि क्षेत्रीय मजिस्ट्रेट इस अस्पताल पर नजर रखेंगे। डीआरडीओ की सुरक्षा एजेंसी से जुड़े लोग देखेंगे। मरीजों को भर्ती नहीं किया जाएगा। जरूरी मशीनें बीएचयू की सिपुर्दगी में दिया जाएगा लेकिन इंफ्रास्ट्रक्चर यूं ही रहेगा। इसकी निगरानी की जिम्मेदारी सौंप दी गई है।

<https://www.jagran.com/uttar-pradesh/varanasi-city-varanasi-drdo-hospital-will-be-handed-over-to-magistrate-preparations-for-250-beds-of-pediatrics-will-continue-21747601.html>

TIMESNOWNEWS.COM

Fri, 18 June 2021

## Top Army commanders review India's overall security challenges; situation along LAC

*The commanders also deliberated on the ongoing ceasefire between Indian and Pakistani troops along the Line of Control (LoC) in Jammu and Kashmir besides reviewing the security scenario in union territories*

New Delhi: Top commanders of the Army on Thursday carried out a comprehensive review of India's overall security challenges including in eastern Ladakh as well as other sensitive areas along the Line of Actual Control with China on the first day of a two-day conference, people familiar with the development said.

The commanders also deliberated on the ongoing ceasefire between Indian and Pakistani troops along the Line of Control (LoC) in Jammu and Kashmir besides reviewing the security scenario in the union territories, they said.

They said Chief of Army Staff Gen MM Naravane and top commanders of the nearly 1.3 million-strong force were briefed India's combat readiness in eastern Ladakh where Indian and Chinese troops have been locked in a bitter standoff for over one year.

India and China were locked in a military standoff at multiple friction points in eastern Ladakh since early May last year. However, the two sides completed the withdrawal of troops and weapons from the North and South banks of Pangong lake in February following a series of military and diplomatic talks.

The two sides are now engaged in talks to extend the disengagement process to the remaining friction points.

"All operational matters relating to India's security preparedness were discussed at the conference," said one of the sources about the deliberations at the conference being held in Delhi.

The sources said the deliberations on ways to further enhance India's combat prowess will figure in Friday's deliberations.

The conference took place two days after the first anniversary of the deadly clashes in Galwan valley in which 20 Indian soldiers laid down their lives while defending the country's territorial integrity in the face of unprecedented Chinese aggression.

In February, China officially acknowledged that five Chinese military officers and soldiers were killed in the clashes with the Indian Army though it is widely believed that the death toll was higher.

The conference is being attended by all Army Commanders, Principal Staff Officers (PSOs) of the Army headquarters and other senior officers.



Indian Army Chief General MM Naravane

"The Commanders are carrying out a comprehensive review of the security challenges facing the nation," said another person.

Last month, Army Chief Gen Naravane had said that there can be no de-escalation without complete disengagement at all friction points in eastern Ladakh and that the Indian Army is prepared for all contingencies in the region.

Gen Naravane also said that India is dealing with China in a "firm" and "non-escalatory" manner to ensure the sanctity of its claims in eastern Ladakh and that it was even open to initiating confidence-building measures.

The people familiar with the development said the commanders also deliberated on matters relating to human resource management and promotions in the Army.

The Army commanders are also expected to deliberate on various reform measures recommended by separate internal committees, they said.

<https://www.timesnownews.com/india/article/top-army-commanders-review-indias-overall-security-challenges-situation-along-lac/772284>

## नवभारत टाइम्स

Fri, 18 June 2021

### पूर्वी लद्दाख के हालात पर आर्मी कमांडर्स कर रहे मंथन, सरकार ने कहा- डिसइंगेजमेंट से ही बहाल होगी शांति

**हाइलाइट्स:**

- सेना के टॉप कमांडर्स दो दिन तक आपस में करेंगे चर्चा
- पहले दिन भारत के ओवरऑल सिक््योरिटी पर हुई बात
- सरकार ने किया साफ- बिना डिसइंगेजमेंट के शांति नहीं
- पेंगोंग झील के उत्तरी और दक्षिण तट से ही हटे सैनिक

नई दिल्ली: सेना के शीर्ष कमांडर्स ने बृहस्पतिवार को दो दिवसीय सम्मेलन के पहले दिन पूर्वी लद्दाख के अलावा चीन के साथ लगती वास्तविक नियंत्रण रेखा एवं अन्य संवेदनशील क्षेत्रों सहित भारत की समग्र सुरक्षा चुनौतियों की व्यापक समीक्षा की। अधिकारियों यह जानकारी दी। उन्होंने कहा कि कमांडर्स ने केंद्र शासित प्रदेशों जम्मू कश्मीर एवं लद्दाख में सुरक्षा परिदृश्य की समीक्षा करने के अलावा जम्मू कश्मीर में नियंत्रण रेखा (एलओसी) पर भारतीय और पाकिस्तानी सैनिकों के बीच जारी संघर्षविराम पर भी विचार-विमर्श किया।



अभी जारी है बातचीत, एक राउंड पूरा

भारत और चीन के बीच पिछले साल मई की शुरुआत से पूर्वी लद्दाख में कई बिंदुओं पर सैन्य गतिरोध था। हालांकि, दोनों पक्षों ने सैन्य और राजनयिक वार्ता की एक श्रृंखला के बाद गत फरवरी में पेंगोंग झील के उत्तर और दक्षिणी तट से सैनिकों और हथियारों की वापसी पूरी की। दोनों पक्ष इस प्रक्रिया को शेष टकराव वाले बिंदुओं तक बढ़ाने के लिए बातचीत में लगे हुए हैं।

दिल्ली में हो रहे इस सम्मेलन में विचार-विमर्श के बारे में सूत्रों ने कहा, “सम्मेलन में भारत की सुरक्षा तैयारियों से संबंधित सभी मामलों पर चर्चा की गई।” सूत्रों ने कहा कि भारत की युद्ध क्षमता को और बढ़ाने के तरीकों पर विचार-विमर्श शुक्रवार को होगा।

पूर्वी लद्दाख में पीछे हटने की प्रक्रिया जल्द पूरी होने से ही शांति बहाली संभव: मंत्रालय

पूर्वी लद्दाख में चीन के साथ गतिरोध पर भारत ने बृहस्पतिवार को कहा कि क्षेत्र में संघर्ष के शेष इलाकों से सैनिकों के जल्द पीछे हटने से ही भारत और चीनी सैनिकों के लिये स्थिति सामान्य बनाने पर विचार करने का मार्ग प्रशस्त हो सकता है और सीमावर्ती इलाकों में पूर्ण रूप से शांति और समरसता बहाल हो सकती है। विदेश मंत्रालय के प्रवक्ता अरिंदम बागची ने डिजिटल माध्यम से आयोजित सप्ताहिक प्रेस वार्ता में यह बात कही।

<https://navbharattimes.indiatimes.com/india/top-army-commanders-review-indias-overall-security-challenges-on-the-lac/articleshow/83617418.cms>



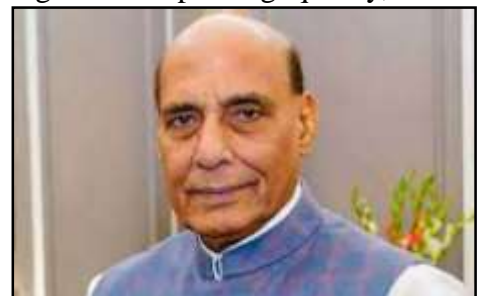
*Fri, 18 June 2021*

## **In a major move, Cabinet approves restructuring of Ordnance factory Board into seven fully government-owned entities**

Taking the long-awaited decision, the Union Cabinet has approved the corporatisation of the British-era Ordnance Factory Board (OFB), which has 41 factories, into seven new fully government-owned corporate entities on the lines of Defence Public Sector Undertakings (DPSU).

The corporatisation of the ordnance factories is aimed at bringing autonomy, improving accountability and bringing efficiency into the functioning of the two-and-a-half-century-old institutions. Further, the restructuring focuses on transforming the ordnance factories into profitable assets, deepening specialisation in the product range and improving quality, which would lead to achieving cost efficiency.

Interacting with the media, Defence Minister Rajnath Singh asserted that the interests of the over 70,000 OFB employees will be safeguarded. “I assure that the service conditions of the employees will not be affected by the move.” The Cabinet note on the decision also stated that there won’t be any change whatsoever in the status and service conditions of the employees.



“It is an imperative decision from the perspective of national security. India should be Aatmanirbhar when it comes to national security,” the Defence Minister said while talking about the historic decision.

The imperative restructuring process

Through these seven new entities, the existing 70,000-strong workforce of the OFB will see no change in their service conditions along with their pension, which would continue and be borne by the national government.

All employees of the OFB (Group A, B and C) belonging to the Department of Defence Production units would be transferred to the corporate entities initially for a span of two years without altering their service conditions as Central government employees.



Notably, the factories would be restructured into seven corporate entities based on the type of products they are manufacturing. Factories producing ammunition and explosives would be put into one entity. Similarly, factories that manufacture force mobility and combat vehicles such as tanks, BMP, trawls, and mine protected vehicles would be placed under one entity.

Also, the institutions manufacturing small arms, medium and large calibre guns and similar ammunition would be put together into a single entity to meet and boost the share of their domestic market, as well as for product diversification.

Additionally, troop comfort items group, optoelectronics group, ancillary group, and parachute group would be placed under the same corporate institution.

The corporatisation process by the cabinet would be supervised by the Empowered Group of Ministers (EGM) chaired by Rajnath Singh and this EGM would address any issue that may arise during the course of the implementation.

Tracing the genesis of OFB

On 18th March 1801, the first Ordnance Factory, now known as the 'Gun and Shell Factory' at Cossipore was established under the aegis of its corporate headquarters Ordnance Factory Board (OFB) in Kolkata.

The conglomerate of 41 ordnance factories has been a strategic asset to the nation and has played a significant role in national security by producing the necessary weapons, ammunition, equipment, clothing, and other items to all three Indian Armed Forces. ie the Indian Army, the Indian Navy, and the Indian Air force to execute their responsibilities.

Marvel of 'Make in India' in the Defence sector by OFB

Under the 'Make-In-India' initiative, Ordnance Factories have made considerable progress with the development of the 155 mm 45 calibre 'Dhanush' and the upgrading of existing 130 mm M-46 artillery guns to 155 mm 45 calibre 'Sharang' gun systems.

#### **DHANUSH**

With a truly indigenous 45 calibre gun system, Dhanush is a marvellous lethal and majestic triumph of Indian technological strength with over 80% indigenous content. It is the result of synergies between the ordnance factory board and the Indian army.

#### **SHARANG**

Sharang is a field artillery gun M-46 designed between 1946 and 1950, was part of the Indian Army in Indo-Pak War 1971. The gun's range has now gone from 27km to over 36km with the upgrade by the Indian Army. It also has more explosive capability and hence more damage potential.

<http://newsonair.com/2021/06/17/in-a-major-move-cabinet-approves-restructuring-of-ordnance-factory-board-into-seven-fully-government-owned-entities/>



## Cost vs combat edge: Future of IAF's Jaguar fleet is hanging in the balance

*If plan does not work out, IAF's 110-odd Jaguar fighters will start retiring by 2024*

*By Ajai Shukla*

New Delhi: The future of the Indian Air Force's (IAF's) six squadrons of Jaguar strike fighters is hanging in the balance. The IAF has regarded the Jaguar as under-powered ever since it entered service in the late-1970s.

Now, wear and tear on its twin Rolls-Royce Adour 804/811 engines has reduced the aircraft's thrust even further, by an estimated 15-20 per cent.

As a result, the Jaguar faces difficulty in carrying out its demanding combat role: Flying low and fast, deep into enemy territory; bombing its ground target accurately in a single pass and then screaming back to base, ahead of enemy interceptors. In such missions, power is essential for survival.



“A new Adour 811 engine initially provides about 32.5 KiloNewtons (kN) of thrust. But after about a decade of service, it drops to barely 26 kN,” says a senior IAF pilot with extensive experience flying the Jaguar.

Aiming to replace the Jaguar's underpowered engines, Hindustan Aeronautics Ltd (HAL) and the IAF negotiated for a decade with US defence giant, Honeywell, to “retro-fit” its F-125IN turbofan engines into the fighter. That was expected to make the Jaguar operationally viable for another two decades since the F-125IN engine delivers an impressive 40.4 kN of thrust, with full afterburners.

However, negotiations with Honeywell have proved futile. The US company wants a price the IAF considers exorbitant and is unwilling to pay.

IAF and HAL sources say Honeywell has quoted a price of \$2.4 billion for 180 new F-125IN engines – which include 160 engines for 80 twin-engine Jaguars, plus 20 spare engines. The cost of each engine works out thus to \$13.3 million, or about Rs 95 crore.

The cost of “re-engining” each twin-engine Jaguar, therefore, adds up to a prohibitive Rs 210 crore, including HAL's charge of Rs 20 crore per aircraft for integrating, flight-testing and certifying the new F-125IN engines.

With the IAF buying the improved Tejas Mark 1A fighter from HAL at Rs 315 crore per aircraft, it regards Rs 210 crore too much to pay for just a more powerful power plant.

With negotiations with Honeywell broken down, HAL is back talking with Rolls-Royce, which built the Jaguar's original Adour Mark 804/811 engines. In extensive discussions over the last four years, Rolls-Royce has proposed refurbishing the Jaguar's power plant by replacing worn out engine components with brand new replacements from the Adour 871 engines that HAL builds in Bangalore for the Hawk trainer the IAF bought in 2004.

A Technical White Paper that Rolls-Royce authored at the request of the IAF said: “It is proposed to introduce Mark 871 hardware, where appropriate, into the Mark 811 to help regain engine performance... Performance modelling predicts that an additional 13-18% more thrust than the baseline Mark 811 is achievable at take-off on hot day conditions.”

Rolls-Royce assured the IAF: “This prototype configuration has already been demonstrated on the sea level test bed at Rolls-Royce Bristol [in the UK].”

The White Paper is confident of overcoming technical difficulties. “Some of the Adour Mark 871 hardware was originally designed to be interchangeable with Mark 811 components... At a module level, many modules can be interchanged directly (noting that some components are common to all marks),” it said.

If Rolls-Royce’s proposal does not materialise, the IAF’s 110-odd Jaguar fighters will start retiring by 2024; with all of them likely to be phased out by 2030. This would seriously disrupt the IAF’s force planning, creating a six-squadron gap in the IAF’s combat fleet, which would cost \$20-30 billion to fill.

Phasing out the Jaguar would also render fruitless the sophisticated avionics upgrades that HAL has carried out to its mission systems, making it a far more potent and accurate fighter-bomber than when it first came to India. The upgrades include HAL’s latest navigation-attack system called DARIN-3, which can guide the Jaguar unerringly to a target hundreds of kilometres away, even in the dead of night.

Meanwhile, there is growing scepticism, especially within HAL, about whether the F-125IN Honeywell engine can be integrated into the Jaguar. “A fighter’s airframe is engineered to match with an engine and the Jaguar’s is matched with the Adour engine. One can keep tweaking the engine to get more efficiency out of it. But it is difficult to replace a fighter’s original engine with another type,” said an engineer who is familiar with this project.

In four years of exploratory talks between the IAF and Rolls-Royce, the cost of refurbishing the old Adour 804/811 engines with Adour 871 parts has not yet been discussed. However, HAL and the IAF officials both agree, “refurbishing” the old Adour engine will be significantly cheaper than “retro-fitting” the new Honeywell one.

[https://www.business-standard.com/article/economy-policy/cost-vs-combat-edge-future-of-iaf-s-jaguar-fleet-is-hanging-in-the-balance-121061800014\\_1.html](https://www.business-standard.com/article/economy-policy/cost-vs-combat-edge-future-of-iaf-s-jaguar-fleet-is-hanging-in-the-balance-121061800014_1.html)

# Why India urgently needs nuclear powered submarines more than ever & France could be a ‘top contender’

By Anupama Ghosh

India is increasingly finding itself encircled by Pakistan and China. And to counter an ambitious China with its rapidly modernizing naval fleet, India must urgently enhance its underwater capabilities, according to an Indian defense analyst.

Earlier this month, the Ministry of Defence (MOD) approved the much-awaited Project 75-I, under which six submarines will be built in India.

The EurAsian Times had reported on the tenders issued for the six submarines by the Indian Navy. The Request for Proposals (RFP) “envisages indigenous construction of six conventional submarines equipped with the state-of-the-art Air Independent Propulsion (AIP) system”.



INS Chakra – Wikimedia Commons

According to reliable sources, France has an edge over the US and Russia in signing a deal for the development of six submarines for the Indian Navy.

Some clear indications would have been out to this effect but the postponement of PM Modi’s visit to France that was scheduled earlier this month (May) may have delayed the same. Modi was scheduled to visit the French SSNs base at Toulon and French SSBN base at Brest.

In 2017, the Ministry of Defence had introduced the policy, under which selected private-sector companies were permitted to manufacture arms and platforms, including submarines, in a partnership model with foreign original equipment manufacturers (OEMs).

The state-run Mazgaon Dockyard Limited (MDL) and Larsen & Toubro are the two Indian companies, which have been finalized by the MOD. The five shortlisted foreign vendors are — Rubin Design Bureau of Russia, Naval Group of France, Navantia of Spain, the German company ThyssenKrupp Marine Systems (TKMS) and the South Korean firm Daewoo Shipbuilding & Marine Engineering.

The first submarine is expected to be inducted by the Indian Navy by 2030.

## Indian Navy’s Submarine Program

Defense analyst Prakash Chandra argues that the Indian Navy has made repeated attempts at modernizing its submarine fleets for decades. However, such attempts have been stalled time and time again, with the lack of support from the succeeding governments.

An article by Chandra mentions that India had paid credible attention to the matter of submarines only in 1999, when the rise of China, with its enhanced naval fleet in the Indo-Pacific, became a reality.

“The 30-Year Submarine Construction Program was then charted out to replace the submarine fleet with vessels built under two categories: the P-75 (Scorpene) and the P-75I”, Prakash Chandra wrote on business news platform Moneycontrol.

According to the plan, six submarines were to be built using western technology, while another submarine was to be built in collaboration with Russia. The plan thus envisioned the Indian

engineers to be able to build more submarines indigenously with collaboration with domestic and foreign players.

Accordingly, the work began on the P-75 in 2005, though its deliveries have been long overdue. Reportedly till now, only three Scorpene deliveries have been made, and three more are expected to be delivered by 2024.

The process for the P-75I seems to be much more delayed, as the Defence Ministry could not finalize the foreign original equipment manufacturers (OEMs).

A big boost to the navy's attempt at enhancing its underwater arms capacity came in 2011 with the recommendations of the Krishnamurthy Committee. The recommendations of the Committee included invitations to private sector investments through the model of public-private partnerships.

It was also recommended that private sector shipyards must also be included in such plans, as they may help in the completion of priority projects.

This, the author writes, was because "policymakers realized that moving in this direction would not only obviate the need to import submarines but would also allow Indian companies to access the Rs 50,000 crore market".

The report highlights the worries of the Indian Navy, especially in the face of capable adversaries like China. The non-nuclear underwater submarine fleet of the Indian navy comprises 10 kilo-class Russian submarines and four German HDW vessels. These diesel-powered vessels are losing their viability in the race of rapidly modernizing naval fleets.

Also, a majority of these vessels are slated to be decommissioned soon, compounding the problems for the Indian Navy further. According to estimates, India requires around 18 conventional submarines at a time, for its surveillance of Indian coasts, but it may only have 6 submarines for the task.

### **Push For Nuclear Submarines**

The new submarines are expected to be equipped with air-independent propulsion (AIP) systems, which enhance the operational capabilities of the vessels. However, Chandra noted that "the navy would still have to depend on nuclear submarines that have a vital role in India's nuclear deterrence policy".

Though the API system lets the submarine stay submerged, it cannot compete on that front with the nuclear-powered submarine. The Indian government had realized the potential of a nuclear-powered submarine, when in 2015, the plan to manufacture six nuclear-powered submarines was accepted.

In 2016, India commissioned the Ship, Submersible, Ballistic, Nuclear (SSBN) Arihant, which made India the only non-permanent member country of the United Nations Security Council (UNSC) to build SSBN.

The Arihant is equipped with 12 short-range K-15 ballistic missiles with a range of 700 to 1,000 km. It can also be adapted to launch four K-4 ballistic missiles with a range of 3,000 to 3,500 km. The INS Arighat, the second vessel in the league, is expected to be commissioned in 2021.

Reportedly, the Indian Navy is currently working on building two more Arihant-class SSBNs at Visakhapatnam. Even with this, India is far from bridging the gap in naval capability to maintain the tactical equilibrium in the region.

<https://eurasianimes.com/why-india-urgently-needs-nuclear-powered-submarines-more-than-ever-france-could-be-a-top-contender/>

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# **Trial on DFC by Indian Army! How Indian Railways plans to enhance mobilisation capability of Armed Forces**

*The intricate and synchronized coordination by the Indian Army with the national transporter and DFCCIL will enhance the mobilization capability of the Armed Forces significantly*

*By Devanjana Nag*

Indian Railways' DFCs are all set to enhance the mobilization capability of the Indian Armed Forces. Recently, the Indian Army conducted a successful trial by moving a military train from New Rewari to New Phulera, loaded with vehicles and equipment validating the efficacy of the Dedicated Freight Corridor. The DFC project of Indian Railways provides faster and smoother movement of freight across the country. According to the Railway Ministry, the intricate and synchronized coordination by the Indian Army with the national transporter and Dedicated Freight Corridor Corporation of India Limited (DFCCIL) will enhance the mobilization capability of the Armed Forces significantly.

The ministry said these trial runs were part of the "Whole of the Nation Approach" for optimizing national resources as well as achieve seamless synergy among various ministries and departments. Now, interactions by the Army with all stakeholders including DFCCIL, the implementing company of DFCs and Indian Railways will assist in leveraging the DFC as well as allied infrastructure into the mobilization matrix of Armed Forces.



**Indian Army conducted a successful trial by moving a military train from New Rewari to New Phulera, loaded with vehicles and equipment.**

At present, infrastructure development at certain locations in order to support mobilisation and trials to validate move of rolling stock owned by the defence, on RO-RO (Roll On-Roll Off) service is being formalized and also, modalities are being evolved. These trials, according to the ministry, herald the first step in this process to pave the way for enhancing Armed Forces' operational readiness. This move would set in place processes in a bid to ensure that requirements of the military are dovetailed in the national infra development at the planning stage itself, the ministry added.

Last month, it was reported that the goods trains that are running on the DFC are operating at a higher speed than Indian Railways' Rajdhani Express. A few days ago, a freight train clocked the highest speed of 99.3 km per hour on the DFC. The freight train's high speed was recorded on the 331-km long New Khurja-New Bhaupur section of the Eastern Dedicated Freight Corridor.

<https://www.financialexpress.com/infrastructure/railways/trial-on-dfc-by-indian-army-how-indian-railways-plans-to-enhance-mobilisation-capability-of-armed-forces/2272966/>



Fri, 18 June 2021

## India's human spaceflight plans coming together despite delays

*The nation may launch its first crewed spaceflight in 2023*

*By Rahul Rao*

So far, sending humans into space has been limited to the space programs of only three countries: the U.S., Russia (inheriting that of the former Soviet Union), and, joining them in the 21st century, China. But a fourth is poised to follow: the Indian Space Research Organization (ISRO), India's space exploration agency.

ISRO isn't afraid to dream big. The agency's head, K. Sivan, has talked about space stations and moonwalks. ISRO hopes that the long arc toward those goals can begin with its first program of crewed missions, Gaganyaan (derived from Sanskrit, meaning "sky-vehicle"). But Gaganyaan's timetable remains murky — largely thanks to the COVID-19 pandemic.

Certainly, all the pieces are coming into place. ISRO's first four would-be space travellers recently spent about a year in Russia, familiarizing themselves on old Soyuz capsules and simulating spaceflight conditions in centrifuges and pressure chambers. Now, they've returned to India, where they'll begin training on the Gaganyaan capsule itself.

To ensure that its space travellers are in good health, ISRO in April unveiled an agreement with its French counterpart. India and France have a long history of space cooperation, and France has plenty of space medicine knowledge that it has previously brought to programs like the International Space Station.

"It is only logical that Indian flight medical professionals train and learn from the French," Mukund Kadursrinivas Rao, chief executive of the Centre for Spatial Analytics and Advanced GIS in Bangalore, India, told Space.com.

ISRO hopes that such international partnerships will help build up the technology it needs to send up humans for the long term. To wit, ISRO has unveiled Indian space food and a humanoid robot for uncrewed flights. Rao says that, closer to home in India, ISRO has tested other key aspects of Gaganyaan, such as its launch abort and re-entry systems.

But looming over all of it is the tragic specter of COVID-19; India is now reopening after a debilitating second wave of the disease. ISRO had dedicated some of its resources to helping the country's strained healthcare system — for instance, supplying liquid oxygen and medical equipment.

For the meantime, many of the agency's employees had to stay at home. "That was a difficult step, I think," Rao said, explaining that it disrupted important tasks like assembling and testing the spacecraft, activities that need to be done in person.

"There are also many industries contributing to the missions, and they too would be affected," Rao said.



Four Indian astronauts recently traveled to Russia to train for upcoming crewed missions, the first of which could launch in 2022 or 2023. (Image credit: Roscosmos)



Plans called for the Gaganyaan program to kick off with two uncrewed test launches, the first set for December 2020. That date has come and gone; now, it appears the first launch will occur near the end of 2021, with the second coming in 2022.

After that, the third Gaganyaan mission would carry ISRO's historic first spacefarers to orbit. At least some Indian government officials wanted that crewed launch to take off in August 2022, around the 75th anniversary of modern India's independence. But a government minister recently said it won't happen before 2023.

One piece that remains is ensuring that the spacecraft — and the spacefarers on board — are never out of contact with controllers on Earth. ISRO's ground stations are concentrated in the Indian Ocean and Southeast Asia. To patch in the rest of the globe, ISRO is planning to launch a pair of data-relay satellites. Such spacecraft will be crucial even for the uncrewed missions, according to Rao.

Gaganyaan isn't ISRO's only project to face delays. ISRO's next moon mission, Chandrayaan-3 — which seeks to put a rover on the moon after its last attempt crashed on the lunar surface in September 2019 — was scheduled to take off later in 2021. Now, it seems to have slipped into 2022.

<https://www.space.com/india-human-spaceflight-plans-gaganyaan>



*Fri, 18 June 2021*

## Probing the dynamics of photoemission

Almost a century ago, Albert Einstein received the Nobel Prize for Physics for his explanation of the photoelectric effect. Published in 1905, Einstein's theory incorporated the idea that light is made up of particles called photons. When light impinges on matter, the electrons in the sample respond to the input of energy, and the interaction gives rise to what is known as the photoelectric effect. Light quanta (photons) are absorbed by the material and excite the bound electrons. Depending on the wavelength of the light source, this can result in the ejection of electrons. The electronic band structure of the material involved has a significant effect on the timescales of photoemission. Physicists based at Ludwig-Maximilian University (LMU) in Munich and the Max Planck Institute for Quantum Optics (MPQ) have now taken a closer look at the phenomenon of photoemission. They measured the influence of the band structure of tungsten on the dynamics of photoelectron emission, and provide theoretical interpretations of their observations.



Generation of attosecond pulses in a jet of neon gas. The excitation of the gas atoms makes the intersecting infrared laser beams (in red) in the resonator visible to the human. Credit: Thorsten Naeser

This is now possible thanks to the development and continuing refinement of attosecond technology. An "attosecond" corresponds to  $10^{-18}$  of a second, i.e. a billionth of a billionth of a second. The ability to reproducibly generate trains of pulses of laser light that last for a few hundred attoseconds enables researchers to follow the course of photoemission by "freezing the action" at regular intervals—analogously to a stroboscope, but with far better temporal resolution.

In a series of photoelectron spectroscopy experiments, the team used attosecond pulses of extreme ultraviolet light to probe the dynamics of photoemission from a tungsten crystal. Each pulse contained a few hundred X-ray photons, each energetic enough to dislodge a photoelectron.

With the aid of detectors mounted in front of the crystal, the team was able to characterize the ejected electrons in terms of their times of flight and angles of emission.

The results revealed that electrons that interact with incoming photons take a little time to react to such encounters. This finding was made possible by the adoption of a new approach to the generation of attosecond pulses. Thanks to the introduction of a passive cavity resonator with an enhancement factor of 35, the new set-up can now produce attosecond pulses at a rate of 18.4 million per second, approximately 1000-fold higher than that previously common in comparable systems. Because the pulse repetition rate is so high, only very few photoelectrons per pulse are sufficient to provide a high average flux.

"Since the negatively charged photoelectrons repel one another, their kinetic energies are subject to rapid change. In order to characterize their dynamics, it's therefore important to distribute them over as many attosecond pulses as possible," as joint first author Dr. Tobias Saule explains. The increased pulse rate means the particles have little opportunity to interact with each other because they are well distributed in time and space, so that the maximal energy resolution is largely retained. In this way, the team was able to show that in terms of the kinetics of photoemission, electrons in neighboring energy states in the valence band (i.e. the outermost orbits of the atoms in the crystal), which have different angular momenta also differ by a few tens of attoseconds in the time they take to respond to incoming photons.

Notably, the arrangement of the atoms within the crystal itself has a measurable influence on the delay between the arrival of the light pulse and the ejection of photoelectrons. "A crystal is made up of multitudes of atoms, all of whose nuclei are positively charged. Each nucleus is the source of an electrical potential, which attracts the negatively charged electrons—in the same way as a round hole acts as a potential well for marbles," says Dr. Stephan Heinrich, also joint first author of the report. "When an electron is dislodged from a crystal, what happens is a bit like the progress of a marble across a table that is pitted with depressions.

These indentations represent the positions of the individual atoms in the crystal, and they are regularly organized. The trajectory of the marble is directly affected by their presence, and it differs from what would be observed on a smooth surface," he points out. "We have now demonstrated how such a periodic potential within a crystal affects the temporal behavior of photoemission—and we can theoretically account for it," Stephan Heinrich explains. The delays observed can be attributed to the complex nature of electron transport from the interior to the surface of the crystal, and to the impact of the electron scattering and correlation effects that this entails.

"The insights provided by our study open up the possibility of experimental investigations of the complex interactions that take place in multi-electron systems in condensed matter on an attosecond timescale. This in turn will enable us to understand them theoretically," says LMU-Prof. Ulf Kleineberg, who led the project.

In the longer term, the new findings could also lead to novel materials with electronic properties that enhance light-matter interactions, which would make solar cells more efficient, and improve switching rates of nano-optical components for ultrafast data processing and promote the development of nanosystems for use in the biomedical sciences.

**More information:** S. Heinrich et al, Attosecond intra-valence band dynamics and resonant-photoemission delays in W(110), *Nature Communications* (2021). [DOI: 10.1038/s41467-021-23650-7](https://doi.org/10.1038/s41467-021-23650-7)

**Journal information:** [Nature Communications](https://www.nature.com)  
<https://phys.org/news/2021-06-probing-dynamics-photoemission.html>

# Physicists bring human-scale object to near standstill, reaching a quantum state

By Sarah McDonnell

To the human eye, most stationary objects appear to be just that—still, and completely at rest. Yet if we were handed a quantum lens, allowing us to see objects at the scale of individual atoms, what was an apple sitting idly on our desk would appear as a teeming collection of vibrating particles, very much in motion.

In the last few decades, physicists have found ways to super-cool objects so that their atoms are at a near standstill, or in their "motional ground state." To date, physicists have wrestled small objects such as clouds of millions of atoms, or nanogram-scale objects, into such pure quantum states.

Now for the first time, scientists at MIT and elsewhere have cooled a large, human-scale object to close to its motional ground state. The object isn't tangible in the sense of being situated at one location, but is the combined motion of four separate objects, each weighing about 40 kilograms. The "object" that the researchers cooled has an estimated mass of about 10 kilograms, and comprises about  $1 \times 10^{26}$ , or nearly 1 octillion, atoms.

The researchers took advantage of the ability of the Laser Interferometer Gravitational-wave Observatory (LIGO) to measure the motion of the masses with extreme precision and super-cool the collective motion of the masses to 77 nanokelvins, just shy of the object's predicted ground state of 10 nanokelvins.

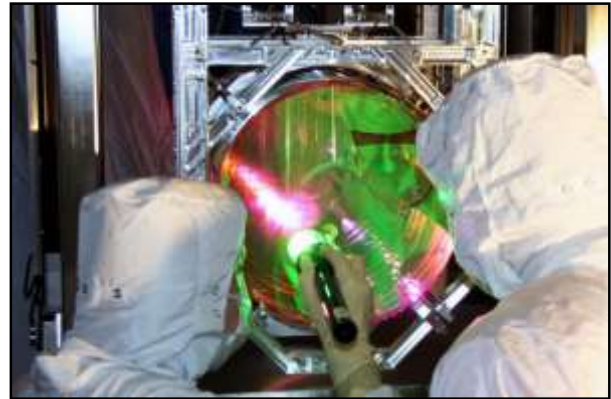
Their results, appearing today in *Science*, represent the largest object to be cooled to close to its motional ground state. The scientists say they now have a chance to observe the effect of gravity on a massive quantum object.

"Nobody has ever observed how gravity acts on massive quantum states," says Vivishek Sudhir, assistant professor of mechanical engineering at MIT, who directed the project. "We've demonstrated how to prepare kilogram-scale objects in quantum states. This finally opens the door to an experimental study of how gravity might affect large quantum objects, something hitherto only dreamed of."

The study's authors are members of the LIGO Laboratory, and include lead author and graduate student Chris Whittle, postdoc Evan Hall, research scientist Sheila Dwyer, Dean of the School of Science and the Curtis and Kathleen Marble Professor of Astrophysics Nergis Mavalvala, and assistant professor of mechanical engineering Vivishek Sudhir.

All objects embody some sort of motion as a result of the many interactions that atoms have, with each other and from external influences. All this random motion is reflected in an object's temperature. When an object is cooled down close to zero temperature, it still has a residual quantum motion, a state called the "motional ground state."

To stop an object in its tracks, one can exert upon it an equal and opposite force. (Think of stopping a baseball in mid-flight with the force of your glove.) If scientists can precisely measure



MIT scientists have cooled a 10-kilogram object to a near standstill, using LIGO's precise measurements of its 40-kilogram mirrors. Shown here are LIGO optics technicians examining one of LIGO's mirrors. Credit: Caltech/MIT/LIGO Lab

the magnitude and direction of an atom's movements, they can apply counteracting forces to bring down its temperature—a technique known as feedback cooling.

Physicists have applied feedback cooling through various means, including laser light, to bring individual atoms and ultralight objects to their quantum ground states, and have attempted to super-cool progressively larger objects, to study quantum effects in bigger, traditionally classical systems.

"The fact that something has temperature is a reflection of the idea that it interacts with stuff around it," Sudhir says. "And it's harder to isolate larger objects from all the things happening around them."

To cool the atoms of a large object to near ground state, one would first have to measure their motion with extreme precision, to know the degree of pushback required to stop this motion. Few instruments in the world can reach such precision. LIGO, as it happens, can.

The gravitational-wave-detecting observatory comprises twin interferometers in separate U.S. locations. Each interferometer has two long tunnels connected in an L-shape, and stretching 4 kilometers in either direction. At either end of each tunnel is a 40-kilogram mirror suspended by thin fibers, that swings like a pendulum in response to any disturbance such as an incoming gravitational wave. A laser at the tunnels' nexus is split and sent down each tunnel, then reflected back to its source. The timing of the return lasers tells scientists precisely how much each mirror moved, to an accuracy of 1/10,000 the width of a proton.

Sudhir and his colleagues wondered whether they could use LIGO's motion-measuring precision to first measure the motion of large, human-scale objects, then apply a counteracting force, opposite to what they measure, to bring the objects to their ground state.

### **Acting back on back-action**

The object they aimed to cool is not an individual mirror, but rather the combined motion of all four of LIGO's mirrors.

"LIGO is designed to measure the joint motion of the four 40-kilogram mirrors," Sudhir explains. "It turns out you can map the joint motion of these masses mathematically, and think of them as the motion of a single 10-kilogram object."

When measuring the motion of atoms and other quantum effects, Sudhir says, the very act of measuring can randomly kick the mirror and put it in motion—a quantum effect called "measurement back-action." As individual photons of a laser bounce off a mirror to gather information about its motion, the photon's momentum pushes back on the mirror. Sudhir and his colleagues realized that if the mirrors are continuously measured, as they are in LIGO, the random recoil from past photons can be observed in the information carried by later photons.

Armed with a complete record of both quantum and classical disturbances on each mirror, the researchers applied an equal and opposite force with electromagnets attached to the back of each mirror. The effect pulled the collective motion to a near standstill, leaving the mirrors with so little energy that they moved no more than  $10^{-20}$  meters, less than one-thousandth the size of a proton.

The team then equated the object's remaining energy, or motion, with temperature, and found the object was sitting at 77 nanokelvins, very close to its motional ground state, which they predict to be 10 nanokelvins.

"This is comparable to the temperature atomic physicists cool their atoms to get to their ground state, and that's with a small cloud of maybe a million atoms, weighing picograms," Sudhir says. "So, it's remarkable that you can cool something so much heavier, to the same temperature."

"Preparing something in the ground state is often the first step to putting it into exciting or exotic quantum states," Whittle says. "So this work is exciting because it might let us study some of these other states, on a mass scale that's never been done before."

**More information:** C. Whittle et al., "Approaching the motional ground state of a 10-kg object," *Science* (2021). [science.sciencemag.org/cgi/doi ... 1126/science.abh2634](https://science.sciencemag.org/cgi/doi/10.1126/science.abh2634)

**Journal information:** *Science*

<https://phys.org/news/2021-06-physicists-human-scale-standstill-quantum-state.html>



## Scientists achieve ultra-fast optical orbiting of nanoparticles at subdiffraction scale

Is it possible to drive nanoparticles to orbit below the light diffraction limit using a Gaussian beam? A recent joint research project reported in *Nature Communications* says yes.

It is well known that light possesses not only energy but also momentum. When light irradiates an object, momentum is transferred to the object, thus generating light pressure on the object. At the microscopic scale, microparticles and nanoparticles (such as biocells and macromolecules) can be manipulated by the light force. Atoms can be cooled by light pressure to achieve atomic clocks, Bose-Einstein condensation, and so on.

In addition to the linear momentum of light being transferable, the angular momentum of light can also be transferred to an object, thus causing object rotation. Since the conversion of momentum is usually derived from the linear interaction between light and objects, the orbital rotation speed and orbital radius have so far been limited to no more than 100 Hz in water and no less than one micrometer, respectively.



Credit: Pixabay/CC0 Public Domain

Recently, however, a team led by Prof. Jiang Yuqiang from the Institute of Genetics and Developmental Biology of the Chinese Academy of Sciences, in collaboration with Prof. Qiu Chengwei from the National University of Singapore, Prof. Yang Yuanjie from the University of Electronic Science and Technology of China, and Prof. Xiao Liantuan from Shanxi University, has overcome these limits.

Based on the nonlinear optical effect, the researchers have achieved an ultra-fast orbital rotation rate for nanoparticles at the subdiffraction scale.

The researchers trapped gold nanoparticles using a circularly polarized NIR femtosecond laser beam with a Gaussian mode. In the linear interaction regime, the trapped particles only spin in the beam center. In the nonlinear regime, however, an annular potential well can be formed by the effect of the 'trap split,' and the tangential optical force enhanced by the nonlinear polarization between the femtosecond laser and gold nanoparticles causes the particles to orbit at an ultra-fast speed in the annular trap well.

As a result, the spin angular momentum of light is converted into the orbital angular momentum of particles with super high efficiency.

In this work, the minimum radius of rotation was about 70nm, which is far below the diffraction limit. The highest orbital rotation speed exceeded 1000r/s, one order faster than previously reported speeds.

The study reveals a new mechanism of spin angular momentum conversion to orbital angular momentum, and provides a new method of light manipulation.

Since the orbital radius and orbital rotation speed can be controlled by adjusting the power of the femtosecond laser, the NA of the objective lens, and the material of the nanoparticles, it can be widely applied in various fields, such as optical micromachines, nanorheology, laser microfabrication, and so on.

**More information:** Yaqiang Qin et al, Nonlinearity-induced nanoparticle circumgyration at sub-diffraction scale, *Nature Communications* (2021). DOI: [10.1038/s41467-021-24100-0](https://doi.org/10.1038/s41467-021-24100-0)

**Journal information:** [Nature Communications](https://phys.org/news/2021-06-scientists-ultra-fast-optical-orbiting-nanoparticles.html)  
<https://phys.org/news/2021-06-scientists-ultra-fast-optical-orbiting-nanoparticles.html>



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# **Anti-inflammation drug Corticosteroids may effectively treat COVID-19 complications in kids, says Study**

*By Simran Kashyap*

London: Corticosteroids, a class of drugs that lowers inflammation, may be an effective treatment for children who develop a rare but serious condition after COVID-19 infection, according to a study.

All the 614 children in the study, published in the New England Journal of Medicine on Wednesday, developed a serious disorder following COVID-19 infection.

The disorder, called multi-system inflammatory syndrome in children (MIS-C), is thought to affect one in 50,000 children infected with SARS-CoV-2 virus. The illness generally occurs two to six weeks after the infection. It affects children of all ages but is more common in older children and teenagers.

The researchers from Imperial College London, UK, noted that the disorder is characterised by persistent high fever, often accompanied by abdominal pain, vomiting, red eyes and red rash.

According to the researchers, most global reports suggest a fatality of 2-4 per cent associated with the disorder. However, an important concern has been that some affected children have developed inflammation of their arteries that supply the heart with blood, resulting in widening of these arteries, they said.

The study "suggests that steroids may be a cheaper and more available alternative to immunoglobulin," said Elizabeth Whittaker, one of the authors of the study from Imperial College. "Corticosteroids are cheap and available worldwide whereas immunoglobulin is expensive, and there is a worldwide shortage of it. This is a particular problem in many low and middle income countries," she added.

The researchers investigated two initial treatments for this condition: a type of steroid called corticosteroids, such as methyl prednisolone, and antibody treatment called immunoglobulin. The antibodies come from human blood, and have been shown to reduce inflammation in the body.

The study also compared initial treatment with steroids together with immunoglobulin. The research involved hundreds of doctors worldwide uploading information about patient outcomes onto an online database.

All three treatments -- immunoglobulin, immunoglobulin combined with corticosteroids and cortico-steroids alone -- resulted in more rapid decrease of inflammation. There were no clear differences between the three treatments in rate of recovery from organ failure, or progression to organ failure, the researchers noted.

They noted that the number of fatal cases (2 per cent) was too low to enable comparison between treatments, but death was included in a combined assessment with organ failure, which found no significant differences between the three treatments.

The analysis was then restricted to the 80 per cent of children who met the World Health Organization's criteria for MIS-C. There was evidence of a lower rate of organ failure or death at two days in those receiving steroids alone as initial treatment, compared to immunoglobulin alone.



However, the authors stress there is insufficient data to establish that all three treatments are equivalent in preventing coronary artery aneurysms. Around six per cent of children in the study suffered a coronary artery aneurysm, they added.

"Our finding, that treatments with immunoglobulin, steroids or a combination of both agents all result in more rapid resolution of inflammation will be of great value to paediatricians worldwide in their treatment of children with this new disorder," said Professor Michael Levin, from the Department of Infectious Disease at Imperial, who led the study.

As immunoglobulin is unavailable or in short supply in many countries, and is expensive, the findings may provide some reassurance for those who only have access to corticosteroids," Levin added.

<https://www.oneindia.com/international/anti-inflammation-drug-corticosteroids-may-effectively-treat-covid-19-complications-in-kids-says-st-3274514.html?story=2>

