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Business Standard

Fri, 07 May 2021

Tejas versus JF-17 Thunder

*India and Pakistan's approach to light fighters
is a study in contrast with lessons for indigenization*

By Ajai Shukla

Since its first flight in 2001, India's homegrown Tejas light combat aircraft (LCA) has faced two decades of unrelenting opposition from the Indian Air Force (IAF). For long, the fighter pilots who make all the key decisions in the IAF opposed the indigenous fighter's entry into service, arguing that it lacked the performance needed for surviving in the highly-contested airspace that would prevail in an Indo-Pakistan or Sino-Indian war. Only last year was the Ministry of Defence (MoD) able to push through an order for 83 Tejas Mark 1A fighters – an improved version of the aircraft that will start being delivered in a couple of years. With this endorsement from the IAF, there is interest in the fighter from other regional air forces, including those of Malaysia and Sri Lanka.

In sharp contrast to the IAF, the Pakistan Air Force (PAF) wholeheartedly supported its own fighter – the JF-17 Thunder, which Pakistan and China co-designed as a no-nonsense, light fighter that met unambitious performance benchmarks without endless scrutiny and comparisons with the cutting edge in military aviation. Consequently, the JF-17 is already inducted in numbers into the PAF and is encountering interest from other countries (though, notably, not from China) who are encouraged by the PAF's enthusiastic endorsement.



With the National Democratic Alliance government setting great store by “Make in India” and “Atmanirbharta” (self reliance), it is worth comparing the Indian and Pakistani approaches to their light fighters and drawing lessons for indigenisation.

In defining the Tejas programme as it did, the Defence R&D Organisation (DRDO) set itself the aim of leapfrogging technologies and catching up with the world. This high-risk gambit involved going straight for a fourth generation (Gen-4), state-of-the-art aircraft. Old-timers admit it was pure technological arrogance to reason: “I’ve never made an aircraft earlier, but I’ll start by developing a Gen-4 fighter”. Astonishingly, this risky strategy worked!

In contrast, China-Pakistan chose a very different, low-risk path: To utilize the technologies China already had and realise an aircraft into service quickly and cheaply. The JF-17 is a heavily re-engineered MiG-21, which allowed a more modest development trajectory. The core of a fighter development problem is technology and risk management. Since China already had the technologies, the risk was minimal. The PAF knowingly chose a less capable fighter, whose performance shortfalls could be compensated for with numbers.

In taking forward the Tejas project, the Aeronautical Development Agency (ADA) – the DRDO agency that was made responsible for developing the Tejas – ambitiously incorporated four Gen-4 technologies into the new fighter. These were (a) Unstable design and digital flight control; (b) Building major aircraft structures (wings, fuselage, etc) with lightweight composite materials; (c) Microprocessor based controls for on-board utilities (such as fuel); and (d) An all-glass cockpit, which meant the pilots flew and fought with smart, digital control panels, enabling them to do more.

The Tejas fighter's most advanced Gen-4 technology lay in its fully unstable design, which improves flight performance. With an unstable design, safety demands that flight control systems must be quadruplex – which means catering for three levels of failure. Ninety per cent of the design effort goes into managing failure. The Tejas was, therefore, the most advanced aircraft in the IAF's fleet. Even the Mirage 2000, with a similar delta-wing design, is a Gen-3 aircraft with "relaxed stability", but not a fully unstable design. That is half a generation behind the Tejas.

Tejas' other big Gen-4 advantage comes from the use of lightweight composite materials. Over 45 per cent of the Tejas's total weight comes from composite materials, including its fuselage, vertical tailfin, skin, spars, elevons, rudder, the air brakes and the landing gear doors. Having thus saved a significant amount of weight, the Tejas can carry more payload, increasing its operational range and strike power. In contrast, the JF-17, a Gen-3 aircraft that China developed for export, is constructed of aluminium alloy. As a result, it is almost a tonne heavier than the Tejas and, therefore, carries less fuel and armaments.

However, the Tejas has a problem with its air intakes design. This stems from initial confusion about its role, which was to replace the MiG-21 as the IAF's light fighter. Since the MiG-21 was designed for high-speed interceptions at speeds of Mach 2 (twice the speed of sound, or 2,500 km per hour), the Tejas designers worked for a top speed of Mach 1.8. However, they chose fixed air intakes, which are suitable only for speeds up to Mach 1.4. Higher speeds require more sophisticated air intakes, incorporating moving intakes, cones, etc. The Tejas' fixed air intakes reduce its thrust by 30-40 per cent. Even so, the fighter is good for Mach 1.2-1.4, the regime where most air battle engagements actually occur.

Lower speeds save fuel and increase mission flexibility. Experience showed that when the MiG-21 climbed at Mach 2 to high altitude and the engagement was aborted, it was left without the fuel needed for another mission and had to return to base for refuelling. For that reason, the Tejas Mark 2 will be optimised for air combat engagements at Mach 1.2. With the design skills in ADA, that can easily be done.

Both the Tejas and JF-17 have had problems in choosing engines. The Tejas was to be powered by the DRDO's Kaveri turbofan engine but, due to development delays, ADA chose the General Electric F-404 instead. In China, the JF-17 developers chose the Russian RD-93 after-burning turbofan due to its low fuel consumption and price. However, the RD-93 delivers inadequate power – a dry thrust of 50 kiloNewtons (kN) and 81.3 kN thrust with afterburner. This is significantly lower than that of the Tejas Mark 2. Its GE F-414 engine, with 35 per cent more thrust than the F-404, will deliver a robust 60 kN of dry thrust and 98 kN with afterburner. The JF-17 is likely to be upgraded to the Chinese WS-13 engine, but its development is clouded in uncertainty.

Upgrading to a higher performance engine requires the freedom to redesign the basic aircraft. A higher thrust engine such as the F-414 or the WS-13 is heavier than the engine it replaces and, therefore, upsets the aircraft's balance, forces design changes and, being heavier, consumes more fuel. So an upgraded engine often delivers disappointing performance.

In sum, the Tejas has emerged as a light multirole fighter with Gen-4 technology and innovation, such as its unique aerodynamic configuration, the use of composite materials and its advanced avionics. With its design in Indian hands, it can be easily modified into variants, such as a naval fighter or a lead-in fighter trainer. . It can also be tailored to suit export customers' requirements.

The JF-17, in contrast, is a Gen-3 fighter that cannot be tailored for export customers beyond a point. On the plus side, its off-the-shelf materials, sub-systems and systems cut costs and reduce design risks, making it a cheap and reliable fighter for air-to-air combat. As a Chinese analyst summed up: “The JF-17 is the aircraft of today and the Tejas is the aircraft of tomorrow.”

https://www.business-standard.com/article/opinion/tejas-versus-jf-17-thunder-121050601415_1.html



Fri, 07 May 2021

Big boost to India’s LCA Tejas Mark II as the UK agrees to collaborate on India’s Indigenous Fighter Jet program

In a major boost to India’s LCA Tejas Mark II program, the UK has agreed to collaborate on the development of the 4.5 generation fighter jet.

Being developed by the state-owned Hindustan Aeronautics Ltd (HAL), Tejas Mark II is likely to be rolled out next year and its first high-speed trials will start in 2023, HAL chief R Madhavan had said earlier this year.

UK Prime Minister Boris Johnson discussed the matter with his Indian counterpart, Narendra Modi, during a “virtual summit” recently.

The meeting “set out a shared vision for the UK-India defense partnership and agreed to advance the relationship to a new level, with a particular focus on maritime and industrial collaboration,” according to a UK government statement.

The two leaders reaffirmed the benefits of closer cooperation in a free and open Indo-Pacific, recognizing their shared interest in regional prosperity and stability.

They agreed to significant new cooperation on Maritime Domain Awareness, which includes new agreements on maritime information sharing, an invitation to the UK to join India’s Information Fusion Centre in Gurgaon in the National Capital Region, and an ambitious exercise program, which includes joint tri-lateral exercises, the statement said.

The UK Minister for Defense Procurement, Jeremy Quin, said, “We remain committed to close collaboration with India as we both adapt to meet future threats and look to innovate our defense equipment programs and systems.”

Modi and Johnson also “agreed to build on existing government-to-government collaboration on India’s future combat air engine requirement”.

“As part of a ‘2030 Roadmap’, they agreed to work closely together in support of India’s indigenous development of the Light Combat Aircraft Mark 2 (Tejas). They also spoke of the potential for further industrial collaboration in areas like maritime propulsion, space and cyber, marking the start of a promising new era of UK-India research, capability and industrial collaboration on Indian combat air and beyond,” the statement released on May 4 read.

“This agreement builds upon that signed between Hindustan Aeronautics Limited and Rolls Royce to move aspects of the manufacture of the MT30 Gas Turbine engine to India, supporting PM Modi’s Make in India initiative. The MT30 is an engine employed widely in navies around the world and is the basis of the UK’s Integrated Electric Propulsion system that powers the Queen Elizabeth Class Carriers.”

British High Commissioner to India, Alex Ellis, said the UK and India are natural partners in defense and security. “Today’s announcements underline our shared ambition for that partnership,

enhancing cooperation, building joint expertise and accelerating industrial cooperation, building up to the arrival of our new aircraft carrier and its accompanying ships to India this autumn.

UK's Carrier Strike Group 2021 (CSG21) led by HMS Queen Elizabeth will sail to India in the autumn on its maiden operational deployment to the Indo-Pacific region.

HAL Tejas MK II

The Hindustan Aeronautics Limited (HAL) Tejas Mark 2 is a single-engine multirole fighter designed by Aeronautical Development Agency (ADA) and HAL. It has a tailless compound delta-wing configuration with high maneuverability.

As reported by The EurAsian Times, the Mark II, fitted with a heavier GE 414 engine, will roll out in 2022, take to the skies in 2023 and join Indian Air Force by 2026. The Tejas MK II is a 4.5 generation aircraft.

Tejas Mark II is likely to be equipped with a multi-sensor data fusion system which will feature an active electronically scanned array radar, infrared search and track and a missile approach warning system, according to experts.

<https://eurasianimes.com/boost-to-indias-homegrown-lca-tejas-mark-ii-as-the-uk-agrees-to-collaborate-british-govt/>



Fri, 07 May 2021

UK to Support India's Tejas MK2 Development, Collaborate on Marine Engines

The United Kingdom has agreed to work with India to develop Tejas Mark 2 fighter aircraft.

In the recent virtual dialogue held between Indian Prime Minister Narendra Modi and his British counterpart Boris Johnson, the topic of the latter aiding the development of the Light Combat Aircraft (LCA) Tejas MK2 was breached.

The leaders reaffirmed the benefits of closer co-operation in a free and open Indo-Pacific, recognising their shared interest in regional prosperity and stability. They agreed to significant new cooperation on Maritime Domain Awareness, which includes new agreements on maritime information sharing, an invitation to the UK to join India's Information Fusion Centre in Gurgaon and an ambitious exercise programme which includes joint tri-lateral exercises, the UK Ministry of Defence said in a release.



LCA Tejas @IAF

The two countries are also working to conclude a Logistics Memorandum of Understanding that will enhance our joint ability to tackle shared challenges.

In addition to commitments on the Indo-Pacific, the two countries agreed to build on existing government-to-government collaboration on India's future combat air engine requirement. As part of a '2030 Roadmap', they agreed to work closely together in support of India's indigenous development of the Light Combat Aircraft Mark 2. They also spoke of the potential for further industrial collaboration in areas like maritime propulsion, space and cyber, marking the start of a promising new era of UK-India research, capability and industrial collaboration on Indian combat air and beyond.

This agreement builds upon that signed between Hindustan Aeronautics Limited (HAL) and Rolls Royce to move aspects of the manufacture of the MT30 Gas Turbine engine to India, supporting PM Modi's Make in India initiative. The MT30 is an engine employed widely in navies around the world and is the basis of the UK's Integrated Electric Propulsion system that powers the Queen Elizabeth Class Carriers.

https://www.defenseworld.net/news/29517/UK_to_Support_India_s_Tejas_MK2_Development_Collaborate_on_Marine_Engines#.YJTJ8h9czcc

COVID 19: DRDO's Contribution



Press Information Bureau
Government of India

Ministry of Defence

Thu, 06 May 2021 7:01PM

Augmentation of Manpower at Dhanvantari Covid Care Hospital at Ahmedabad

In its continuous and ongoing efforts to provide aid to the civil administration in times of this unprecedented crisis, the Indian Navy has today augmented the manpower of Dhanvantari Covid Care Hospital at Ahmedabad, thus providing a much-needed and timely fillip to management of Covid patients in the city.

A total of 90 personnel, including anaesthesiologists, physicians, medical officers, nursing staff and paramedical staff have been flown from various Naval Stations to Ahmedabad. All members of the team are experienced in their respective specializations and well-versed with Covid care protocols. The team of personnel deployed also includes Battle-Field Nursing Assistants (BFNAs) who are non-medical personnel and have been specially trained to assist the medical manpower in patient care duties.



In addition, a three-member Logistic Support Team has also been provided which would oversee the administration of the hospital. This would ensure that the auxiliary hospital functions are well looked after and the medical manpower can manage patients effectively and efficiently.

With the present augmentation, the total manpower provided to the hospital by the Navy has gone up to 169 and highlights the Indian Navy's commitment to the service of the Nation.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1716570>



पत्र सूचना कार्यालय
भारत सरकार
रक्षा मंत्रालय

Thu, 06 May 2021 7:01PM

अहमदाबाद के धनवंतरी कोविड केयर अस्पताल में चिकित्सा कर्मियों की बढ़ोतरी

इस अभूतपूर्व संकट के समय में नागरिक प्रशासन को सहायता प्रदान करने के अपने निरंतर और सतत चल रहे प्रयासों में, भारतीय नौसेना ने आज अहमदाबाद के धनवंतरी कोविड केयर अस्पताल में अपने कर्मियों की संख्या में बढ़ोतरी की है, इस प्रकार से शहर में कोविड रोगियों की देखभाल और उनकी सहायता के लिए बहुत ही आवश्यक तथा समय पर मिलने वाली सुविधा प्रदान की गई है।

विभिन्न नौसेना स्टेशनों से अहमदाबाद के लिए एनेस्थेसियोलॉजिस्ट, चिकित्सक, चिकित्सा अधिकारी, नर्सिंग स्टाफ और पैरामेडिकल स्टाफ सहित कुल 90 कर्मियों को भेजा गया है। टीम के सभी सदस्य अपने - अपने संबंधित क्षेत्र के विशेषज्ञ हैं और बेहतर अनुभव रखते हैं, साथ ही ये सभी कोविड देखभाल प्रोटोकॉल से अच्छी तरह से वाकिफ हैं। तैनात किये गए इन कर्मियों की टीम में बैटल-फील्ड नर्सिंग असिस्टेंट (बीएफएनए) भी शामिल हैं जो गैर-चिकित्सा कर्मी हैं, लेकिन ये सब विशेष रूप से रोगी की देखभाल करने के सभी कार्यों में चिकित्सीय सहायता के लिए प्रशिक्षित किए गए हैं।



इसके अलावा, तीन सदस्यीय लॉजिस्टिक सपोर्ट टीम भी अस्पताल को उपलब्ध कराई गई है जो हॉस्पिटल के प्रशासन की देखरेख करेगी। यह दल सुनिश्चित करेगा कि, सहायक अस्पताल के कार्यों पर अच्छी तरह से ध्यान दिया जाए और चिकित्साकर्मी प्रभावी ढंग से तथा कुशलता से रोगियों की देखभाल कर सकें।

कर्मियों की संख्या में इस बढ़ोतरी के साथ ही, नौसेना द्वारा अस्पताल को भेजे गए कुल कर्मियों की संख्या 169 हो गई है और यह राष्ट्र की सेवा के लिए भारतीय नौसेना की प्रतिबद्धता को दर्शाता है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1716646>

Covid-19: Oxygen plant installed at Delhi's RML hospital

Amid soaring demand for medical oxygen in the national capital due to a surge in COVID-19 cases, an oxygen plant has been installed at the Dr. Ram Manohar Lohia (RML) Hospital with the help of DRDO and Union Health Ministry

New Delhi: Amid soaring demand for medical oxygen in the national capital due to a surge in COVID-19 cases, an oxygen plant has been installed at the Dr. Ram Manohar Lohia (RML) Hospital with the help of DRDO and Union Health Ministry.

Speaking to ANI here today, Dr. Rana AK Singh, Director and Medical Superintendent of RML Hospital said, "We've installed an oxygen plant in our hospital with the help of DRDO and Union Health Ministry. This plant will produce 960 liters of oxygen/minute. We already have oxygen supply, now our oxygen capacity has increased."

Singh further informed that the hospital earlier had 205 oxygen beds which have now been increased by 200.

"We were managing with 205 COVID beds but now we've increased 200 oxygen beds more in the hospital. We also have 24 ICU beds for COVID patients. We'll also convert 22 oxygen beds into ICUs," he added.

Meanwhile, Delhi reported 20,960 new COVID-19 cases, 19,209 discharges and 311 deaths in the last 24 hours, said the state health bulletin on Wednesday.

The total count of cases went up to 12,53,902 including 91,859 active cases and 11,43,980 discharges. The death toll went up to 18,063.

The positivity rate yesterday dipped to 26.37 percent. This is the lowest positivity rate since the commencement of lockdown.

According to Delhi government health bulletin on Wednesday, 79,491 COVID-19 tests were conducted.

It said that 90,365 people were vaccinated against COVID-19 yesterday in the city. Out of these, 64,983 persons were administered their first dose and 25,382 got their second dose.

The bulletin also said that 34,83,832 vaccinations had been given cumulatively till Wednesday.

<https://www.livemint.com/news/india/covid19-oxygen-plant-installed-at-delhi-s-rml-hospital-11620297653904.html>



File Photo: The total count of cases went up to 12,53,902 including 91,859 active cases and 11,43,980 discharges. The death toll went up to 18,063 (PTI)

AIIMS और RML में डीआरडीओ के ऑक्सीजन प्लांट्स ने काम करना किया शुरू, देश भर में लगने हैं ऐसे प्लांट्स

डीआरडीओ को कुल 500 ऐसे मेडिकल ऑक्सीजन प्लांट लगाने की जिम्मेदारी सौंपी गई है। ये ऑक्सजीन प्लांट्स एलसीए तेजस फाइटर जेट्स की ऑक्सीजन सप्लाई करने वाली तकनीक पर आधारित हैं।

By नीरज राजपूत

नई दिल्ली: डीआरडीओ के एम्स और आरएमएल स्थित ऑक्सीजन प्लांट्स गुरुवार शाम को शुरू हो गए हैं। दोनों प्लांट्स से मरीजों को ऑक्सजीन सप्लाई भी शुरू हो गई है।

बता दें कि महज़ 15 दिनों से भी कम समय में इन प्लांट्स को लगाकर ऑपरेशनल कर दिया गया है। 20 अप्रैल को प्रधानमंत्री नरेंद्र मोदी और रक्षा मंत्री राजनाथ सिंह ने डीआरडीओ को देश के हर जिले में इस तरह के मेडिकल ऑक्सीजन प्लांट्स लगाने का आदेश दिया था।

डीआरडीओ को मिली ऑक्सीजन प्लांट लगाने की जिम्मेदारी

डीआरडीओ को कुल 500 ऐसे मेडिकल ऑक्सीजन प्लांट लगाने की जिम्मेदारी सौंपी गई है। ये ऑक्सजीन प्लांट्स एलसीए तेजस फाइटर जेट्स की ऑक्सीजन सप्लाई करने वाली तकनीक पर आधारित हैं। इन सभी प्लांट्स की फंडिंग पीएम-केयर फंड से की जा रही है।

348 प्लांट टाटा कंपनी लगाएगी

डीआरडीओ ने एलसीए तेजस की ये तकनीक तुरंत प्राइवेट और सरकारी कंपनियों को सौंपी है। निर्णय लिया गया कि इन 500 प्लांट्स में से 348 प्लांट टाटा कंपनी लगाएगी और 48 प्लांट कोयम्बटूर की ट्राईटेंड कंपनी लगाएगी। बाकी 120 प्लांट लगाने की जिम्मेदारी सीएसआईआर यानि काउंसिल ऑफ साइंटिफिक एंड इंडस्ट्रियल रिसर्च के आईआईपी यानि इंडियन इंस्टीट्यूट ऑफ पेट्रोलियम को सौंपी गई।

इन तीनों कंपनियों को जुलाई के महीने तक सभी 500 ऑक्सीजन प्लांट्स देश के हर जिले में लगाने का काम पूरा करना है- यानि हर महीने 165-170 प्लांट। एम्स और आरएमएल हॉस्पिटल में मेडिकल ऑक्सीजन प्लांट्स ट्राईटेंड कंपनी ने लगाए हैं। दिल्ली-एनसीआर के बाकी तीन हॉस्पिटल्स में भी इस महीने की 10 तारीख तक प्लांट्स लगाने का काम पूरा होने की संभावना है।

डीआरडीओ पहले भी लगा चुकी है ये प्लांट्स

दरअसल, इस तरह के प्लांट्स डीआरडीओ ने पहले से ही सेना के लिए लेह और उत्तर-पूर्व के हाई-ऑल्टिट्यूड इलाकों में लगा रखे हैं ताकि सैनिकों को ऑक्सीजन की सप्लाई की जा सके। वर्ष 2017 से डीआरडीओ के पास इस तरह के ऑक्सीजन प्लांट लगाने की टेक्नोलॉजी मौजूद है।

सूत्रों की मानें तो इस तरह के एक मेडिकल ऑक्सीजन प्लांट पर करीब-करीब 80 लाख का खर्च आता है। यानि सभी 500 प्लांट्स पर कुल 400 करोड़ का खर्चा आएगा। ये सारा खर्च पीएम-केयर फंड उठाएगा।

<https://www.abplive.com/news/india/drdo-oxygen-plants-started-functioning-in-aiims-and-rml-such-plants-are-set-up-all-over-the-country-ann-1910987>



फोटो साभार @DefenceMinIndia

Nellore gets 40 oxygen concentrators from DRDO

Highlights

District Collector K V N Chakradhar Babu said the district administration has received 40 oxygen concentrators provided by DRDO Chairman Dr G Satheesh Reddy for distributing to the GGH and other hospitals in the revenue divisions in the district.

Nellore: District Collector K V N Chakradhar Babu said the district administration has received 40 oxygen concentrators provided by DRDO Chairman Dr G Satheesh Reddy for distributing to the GGH and other hospitals in the revenue divisions in the district. The Collector said these oxygen concentrator machines will be used at casualty wards for people with mild symptoms of Covid-19. He visited the GGH on Thursday and observed the equipment.

He also said there has been a huge demand for oxygen during the second wave and consequently DRDO chief Satheesh Reddy supported the need considering difficulties in the district. He also informed that the 10 concentrators would be handed over to the GGH and 5 to each revenue division.

Chakradhar Babu said they had formed a committee headed by Joint Collector T Bapi Reddy for monitoring the availability and usage of oxygen. The committee will also monitor collection of oxygen from industries in the district and maintain stocks at the GGH for utilising during emergencies. They were also reviewing the situation daily for taking instant steps to avoid any shortage of oxygen, he added.

Chakradhar Babu also said for the past few weeks, 30-33 per cent of positive cases are being reported and hence, the hospitals are experiencing severe pressure for oxygen. He also said Remdesivir vials are available adequately and they would initiate stern action against black marketeers.

A committee has been formed for monitoring food, medication and sanitation in the hospitals and it will review regularly for taking immediate measures and said the district the administration was completely focusing on Covid situation and imposed curfew as per the directions of the state government for restricting the movement of the population to arrest the spread of virus.

He said doctors will take a decision on how much volume of oxygen to be provided to the patients and suggested the people to follow Covid protocol of wearing a facemask, maintain social distancing and frequent handwash. Joint Collectors Dr M N Harendra Prasad, T Bapi Reddy, GGH Superintendent Dr J Prabhakar and others were present.

<https://www.thehansindia.com/andhra-pradesh/kakinada-firm-donates-concentrators-to-ggh-685198?infinitescroll=1>



District Collector K V N Chakradhar Babu observing the oxygen concentrator along with the officials at the Government General Hospital in Nellore on Thursday

16 oxygen plants to come up in Rajasthan, 4 in Jaipur

Jaipur/Jaisalmer: Out of the 581 oxygen plants that the DRDO and the NHAI plan to set up in the country, 16 units of 1,000, 500 and 200 LPM (litres per minute) capacity will come up in eight districts of Rajasthan including Jaipur and Ajmer. These are expected to start in next seven days. While DRDO will set up 400 plants, NHAI will instal 181 with the help of HLL Infra Tech Service. With the help of DRDO and NHAI, work on the 12 plants in Rajasthan started from Thursday.

The Centre had ordered the states to identify locations for oxygen plants in hospitals by May 5. Land has been identified in 12 hospitals in Rajasthan including four in Jaipur, two in Ajmer, one each in Barmer, Pali, Nagaur, Rajsamand, Kota and Sikar.

The funds for the plants will be provided from the PM Cares. NHAI has been made the nodal agency for setting up these units.

One of the plants will be set up at Nahata Hospital Balotara where 1,000 litres of oxygen will be generated in a minute. Different companies are setting up oxygen plants in different parts of the country. Work has started in most of the places from Thursday and these plants will be ready in next 7-10 days and will be handed over to the hospitals concerned.

Apart from this, four oxygen plants of 250 LPM capacity will also be set up in the state. With setting up of 16 plants in Rajasthan, 2,400 Covid serious patients will be provided oxygen.

The rest of the plants will come up in Andhra Pradesh (21), Nagaland (2), Haryana (11), Uttar Pradesh (21), Kerala (1), Daman and Diu (3), Himachal Pradesh (6), Odisha (6), Assam (4), West Bengal (70), Gujarat (20), Maharashtra (6), Tamil Nadu (113), Telangana (37), Mizoram (1), Uttarakhand (7), Delhi (13), Punjab (11), Karnataka (16) and Bihar (15).

NHAI Barmer manager Jitendra Choudhary said DRDO and NHAI will set up these plants in the entire country.

<https://timesofindia.indiatimes.com/city/jaipur/16-o2-plants-to-come-up-in-raj-for-covid-treatment/articleshow/82443009.cms>



The funds for the plants will be provided from the PM Cares. NHAI has been made the nodal agency for setting up these units (Representational image)

पटना के ESIC अस्पताल का कमान संभालेगी भारतीय सेना - 100 ICU के साथ 500 बेड का कोविड अस्पताल होगा तैयार

बिहार में लगातार बढ़ते कोरोना वायरस के संक्रमण को देखते हुए भारतीय सेना पटना के बिहटा स्थित ESIC अस्पताल में 500 बेड का अस्पताल बनाने जा रही है।

By Neel Kamal

हाइलाइट्स:

- सेना के मेडिकल स्पेशलिस्ट, मेडिकल ऑफिसर और नर्सिंग स्टाफ की टीम पहुंची पटना
- बिहटा के ESIC में 500 कोरोना पेशेंट का हो सकेगा इलाज
- भारतीय सेना ने दो फील्ड अस्पताल को पटना किया है रवाना
- शुक्रवार को बिहटा स्थित एसआईसी अस्पताल का कमान संभालने की संभावना

पटना: बता दें कि फिलहाल बिहटा स्थित ESIC में सौ बेड का कोविड अस्पताल शुरू कर दिया गया है। भारतीय सेना के कमान संभालने के बाद इस अस्पताल में 500 कोरोना पेशेंट का इलाज हो सकेगा। मिली जानकारी के अनुसार 500 बेड वाले इस अस्पताल में ICU के 100 बेड भी होंगे। बता दें कि इस अस्पताल में पहले से ही मेडिकल स्पेशलिस्ट और मेडिकल ऑफिसर के साथ नर्सिंग स्टाफ पहुंच चुके हैं।

गुरुवार को देर शाम वायु सेना के दो विशेष विमान से सेना की मेडिकल टीम भारी मात्रा में आकस्मिक चिकित्सा उपकरणों के साथ पटना पहुंच गई है। इससे पहले बुधवार की रात भी दो विशेष विमान से सेना के डॉक्टर, पारा मेडिकल स्टाफ और नर्सिंग स्टाफ और जवान चिकित्सा सामग्री के साथ पटना पहुंचे थे। एयरपोर्ट से सेना की मेडिकल टीम बिहार रेजिमेंट दानापुर पहुंची। संभावना है कि सेना शुक्रवार को बिहटा स्थित एसआईसी अस्पताल का कमान संभालने लगेगी।



पटना के ESIC को 500 बेड का कोविड अस्पताल बनाने के लिए भारतीय सेना ने दो फील्ड अस्पताल को पटना रवाना कर दिया गया था। बताया गया कि उत्तर - पूर्व से यह दोनों अस्पताल पटना भेजे गए हैं। मिली जानकारी के अनुसार ESIC अस्पताल में चिकित्सा कर्मचारियों की ताकत बढ़ाने के लिए, अतिरिक्त विशेषज्ञ, चिकित्सा अधिकारी, नर्सिंग स्टाफ के साथ - साथ प्रशिक्षित इन्फैंट्री बैटलफील्ड नर्सिंग सहायकों को पटना भेजा गया है।

पूर्व केंद्रीय राज्यमंत्री और पाटलिपुत्र से बीजेपी सांसद रामकृपाल यादव ने बताया कि उन्होंने बिहार खासकर पटना में बढ़ते कोरोना संक्रमण को देखते हुए उन्होंने केंद्रीय गृह मंत्री अमित शाह और रक्षा मंत्री राजनाथ सिंह को पत्र लिखा था। उन्होंने बताया कि पत्र के जरिए उन्होंने बिहटा के एसआईसी (ESIC) अस्पताल में डीआरडीओ (DRDO) द्वारा 500 बेड का कोविड अस्पताल की अविलंब स्थापना करने का आग्रह किया था। सांसद रामकृपाल यादव ने बताया कि केंद्रीय गृह मंत्री अमित शाह ने इस बाबत खुद फोन कर उन्हें बताया कि जल्द ही बिहटा के ESIC में DRDO द्वारा 500 बेड का कोविड अस्पताल की स्थापना जल्द कर दी जाएगी।

सांसद रामकृपाल यादव ने बताया कि 2020 अगस्त में DRDO द्वारा बिहटा में नवनिर्मित एसआईसी अस्पताल परिसर में 500 बिस्तरों वाले कोविड अस्पताल की स्थापना की गई थी। जिसमें अलग से 125 आईसीयू बेड की भी व्यवस्था थी। यह कोविड अस्पताल दिल्ली कैंट में बने 1000 बिस्तरों वाले कोविड अस्पताल की तर्ज पर बनाया गया

था। इसके लिए पीएम केयर फंड की ओर से धन आवंटित किया गया था। चिकित्सकों और पारा मेडिकल स्टाफ की तैनाती दिल्ली में DRDO द्वारा बनाए गए कोविड अस्पताल की तर्ज पर डायरेक्टर जनरल आर्म्ड फोर्स मेडिकल सर्विस (DGAfMS) और आर्म्ड फोर्स मेडिकल कॉलेज (AFMC) पुणे के सहयोग से किया गया था।

<https://navbharattimes.indiatimes.com/state/bihar/patna/bihar-news-indian-army-will-command-patnas-esic-hospital-due-to-rising-corona-infection-in-bihar/articleshow/82439924.cms>

The Tribune

Fri, 07 May 2021

NHAI to raise infrastructure for 63 oxygen plants in Punjab, Haryana

Work begins in K'thala, Nawanshahr, Panipat, Samalkha & Rohtak

By Vijay C Roy

Chandigarh: To meet the requirement for oxygen during the second Covid-19 surge, the National Highways Authority of India (NHAI) has been mandated as a nodal agency by the Centre for raising infrastructure (civil and electrical) for the installation of 63 oxygen plants — 44 in Haryana and 19 in Punjab — with the help of technology developed by the Defence Research and Development Organisation (DRDO).

The sites for these plants, ideally on the premises of government hospitals, have been identified in consultation with the state governments concerned. Once operational, the plants will generate on-site medical oxygen in a cost-effective manner.

“The civil works began today in Kapurthala and Nawanshahr in Punjab and Panipat, Samalkha and Rohtak in Haryana. The NHAI hopes to complete civil as well as electrical work within seven days,” said RP Singh, Regional Officer, NHAI. The medical oxygen plants will be set up in these locations in collaboration with private players. Each plant has the capacity to generate oxygen with 93% (plus, minus 3%) concentration which can be directly supplied to hospital beds or used to fill medical oxygen cylinders.



The DRDO plants use the pressure swing adsorption (PSA) technique and molecular sieve (zeolite) technology to generate oxygen directly from atmospheric air. At present, Haryana's oxygen quota is 257 MT. With the caseload rising, the state has already requested the Centre to enhance this quota to 300 MT to ensure uninterrupted oxygen supply across the state.

For Punjab, the daily oxygen allocation stands at 195 MT of which 90 MT comes from Bokaro in eastern India. The remaining 105 MT comes from LMO facilities in Haryana, Himachal Pradesh and Uttarakhand. However, Punjab is not getting its daily allocated quota owing to shortage of containers. In addition, there are 15 air separation units (ASUs) with a generation capacity of around 60-65 tonnes per day.

Amid the oxygen crisis, Punjab has announced “thrust sector” status for all oxygen units. It has appointed a nodal officer to coordinate with the Customs Department for quick clearance of foreign aid.

<https://www.tribuneindia.com/news/nation/nhai-to-raise-infra-for-63-oxygen-plants-in-punjab-haryana-249248>

ThePrint

Fri, 07 May 2021

Big boost for military as Modi govt gives officers powers of additional & joint secretaries

Formal appointment means the officers can now dispose of files at their levels under powers delegated to them, instead of routing them through Secretary, DMA, Gen. Bipin Rawat

By Snehesh Alex Philip

New Delhi: In a landmark move in the country's armed forces history, uniformed personnel from the Army, Air Force and Navy have been for the first time formally appointed as additional secretary and joint secretaries in the Ministry of Defence.

In a late evening order Monday, the Appointments Committee of the Cabinet (ACC), headed by Prime Minister Narendra Modi, appointed Lt Gen. Anil Puri as the Additional Secretary in the Department of Military Affairs (DMA).

Maj. Gen. K. Narayanan, Rear Admiral Kapil Mohan Dhir and Air Vice Marshal Hardeep Bains have been appointed as joint secretaries in the DMA, which began functioning in January 2020 as part of the defence reforms introduced by the government.

Gen Bipin Rawat holds the position of Chief of Defence Staff (CDS) and Secretary, DMA.

While Puri was already officiating as additional secretary and the other three officers as joint secretaries, the formal appointment opens up decision-making powers and streamlines the functions.

'Historic and landmark moment'

The move is being hailed as a significant step.

Explaining this, a source said: "Till now, without official notification, all files had to be moved to Secretary, DMA for decisions. This is no longer needed because each appointment can now dispose of files as per powers delegated."

Calling it a "historic and landmark moment" for the armed forces in the country, another source said: "The ACC approval was in the pipeline and it has finally come. This makes the process much smoother and formalised in a bureaucratic set-up."

As reported by ThePrint in 2019, the DMA, headed by the four-star CDS, will look after the affairs of the Army, the Navy and the Air Force, but will have no operational control over individual organisations, which will remain with the respective service chiefs.

While the DMA will look after all procurement exclusive to the three services — barring capital acquisitions, according to prevalent rules and procedures, besides the Territorial Army and various functions relating to the Services — its mandate includes promoting 'jointness' in procurement, training and staffing for the services through joint planning and integration of their requirements.



The Ministry of Defence at South Block in New Delhi | Commons

It is also responsible for facilitation of restructuring of military commands for optimal utilisation of resources by bringing about jointness in operations, including through establishment of joint/theatre commands besides promoting use of indigenous equipment by the services.

<https://theprint.in/defence/big-boost-for-military-as-modi-govt-gives-officers-powers-of-additional-joint-secretaries/653183/>



Fri, 07 May 2021

US expert calls India's 'Mysterious' ballistic missile submarine a formidable deterrent to regional opponents

By Ayush Jain

Indian Navy's new ballistic missile submarine, INS Arighat, which is the second in the Arihant-class SSBN, is expected to join the service this year.

The two submarines that still remain a mystery could significantly boost India's naval might vis-a-vis its adversaries — Pakistan and China.

Last month, the Indian Navy had expressed its willingness to go for the procurement of six more nuclear submarines instead of a third aircraft carrier, a move stated to significantly boost its capabilities against the rising aggression of the People's Liberation Army Navy in the Indian Ocean.

Even India's arch-rival Pakistan has a fleet of at least five conventionally-powered attack submarines.

Closely guarding the Malacca Straits, the Indian Navy's presence in the Andaman and Nicobar Islands has been an important strategic asset for New Delhi in the Indian Ocean Region.

These quiet predators lurking under the sea can operate indefinitely without needing to refuel until supplies run out for the crew.

What's more interesting is the fact that these super-secretive Indian nuclear ballistic missile submarines are perhaps one of the world's least-photographed vessels ever, according to the defense analyst H I Sutton.

Nearly all the photos available on the internet themselves are many years old. These two Arihant-class submarines also complete India's nuclear triad, capable of carrying the nuclear-tipped submarine-launched ballistic missiles (SLBMs), K-15 'Sagarika' and K-4.

The K-4 is an intermediate-range SLBM, which can be armed with nuclear warheads delivering payloads up to 1900 nautical miles. This is almost four times the range of the K-15 'Sagarika' SLBM, which is stated to be an interim solution having a range of 400 nautical miles with a 1,000-kg warhead.

Four large-diameter missile silos are arranged in a single line behind the submarine's sail. Initially, these are fitted with triple tubes for the K-15. However, each missile tube is expected to fit a single K-4 in the future.

Meanwhile, Sutton believes that the commissioning of the second Arihant-class submarine, the INS Arighat, sometime this year would not change the secretive approach of the Indian Navy towards the boat's capabilities.

But its commissioning may provide new clues to the classes' capabilities. And any differences between the two boats. Also, the third of the class may emerge from its construction hall soon, he writes for Naval News.

“The defense world is patiently waiting,” he remarked.

The Arighat was quietly launched in November 2017 by then-Defense Minister Nirmala Sitharaman. A total of 4 vessels are planned in the class, the first two being INS Arihant and INS Arighat with a total displacement of 6,000 tonnes.

The remaining two are yet to be named and would be bigger having a displacement of 7,000 tonnes with enhanced capability of carrying 12-15 long-range ballistic missiles.

<https://eurasianimes.com/us-expert-calls-indias-mysterious-ballistic-missile-submarine-a-formidable-deterrent-to-regional-opponents/>



Fri, 07 May 2021

Armed forces fight the 'invisible army' as Covid-19 threatens India

The Army has mobilised its resources to set up new facilities to treat patients suffering from coronavirus, while the Indian Air Force has deployed its transport aircraft Navy's ships to provide logistic support to facilitate the supply of oxygen and ferrying medical equipment from foreign countries

By Shishir Gupta

New Delhi: The armed forces have waged a war against the spiralling crisis of the deadly second wave of the coronavirus disease in India, calling it an “invisible, yet deadly army”.

The Army has mobilised its resources to set up new facilities to treat patients suffering from coronavirus, while the Indian Air Force has deployed its transport aircraft Navy's ships to provide logistic support to facilitate the supply of oxygen and ferrying medical equipment from foreign countries.

Union defence minister Rajnath Singh recently directed the armed forces to extend help to the civil administration to the tide over the growing crisis of coronavirus disease (Covid-19) pandemic.

He said that his ministry has given emergency financial powers the armed forces so that they can set up and operate quarantine facilities and hospitals and procure essential equipment. He added that the powers were in addition to the emergency financial powers delegated to Director General Medical Services of the three service wings and other medical officers their units.

In a blog post on his website, the defence minister wrote, “Nearly 750 beds in various Military Hospitals have been set aside for civilian use while the AFMS also dedicated 19 hospitals, over 4,000 beds and 585 ICU units across the country. Base Hospital in Delhi has been converted into a COVID hospital with capacity being increased from around 400 to 1,000 beds.”

The DRDO has set up a 500-bed facility each in New Delhi and Lucknow, a 900-bed hospital in Ahmedabad and converted ESIC Hospital in Patna to a Covid-19 hospital with 500 beds. Work is in full swing to set up similar such hospitals at Muzaffarpur and Varanasi.

The DRDO also developed blood oxygen saturation supplemental oxygen delivery system for soldiers posted at extreme high-altitude areas. The system will be useful for Covid-19 patients as their conditions become similar.

Meanwhile, the Army has provided 100 beds each at Lucknow and Prayagraj in Uttar Pradesh to cater to the surge in cases. In Madhya Pradesh's Sagour, a 40-bed isolation facility has been set up along with ambulance facility, while 100 beds have been provided at facilities in Bhopal & Jabalpur and 40 beds at Gwalior.

It has also established a 50-bed isolation facility Jharkhand's in Namkuma and another 60-bed critical care facility in Pune and 100 beds at Barmer in Rajasthan.

It has also deployed army medical personnel in Ahmedabad and Patna and battlefield-nursing assistants to Patiala administration for hospital management.

Rajnath Singh said the Indian Air Force has carried out 50 sorties, airlifting 61 oxygen containers of 1,142 MT capacity from various countries to augment the supply of medical oxygen. Even within the country, It carried out 344 sorties, airlifting 230 containers of 4527 MT capacity till 05th of May 2021.

Similarly, the Navy deployed its warships for shipment of liquid medical oxygen-filled cryogenic containers and associated medical equipment from various countries in the Middle East and southeast Asia to augment the mission for meeting the oxygen requirements. The first such consignment was brought in to Mangalore on Wednesday by INS Talwar from Bahrain.

“As the whole of India stands united in the fight against the current surge in the pandemic the Armed Forces are walking the extra mile for the nation to emerge a winner. Hard times demand the manifestation of an indomitable spirit to fight against the odds and that is what the country is doing at the moment,” the defence minister wrote.

<https://www.hindustantimes.com/india-news/armed-forces-fight-the-invisible-army-101620303699269.html>



Fri, 07 May 2021

India, Guatemala to deepen cooperation in space, defence and security; India-SICA Trade negotiations to start soon

The two sides also discussed possible cooperation in -- Defence & Security, International Solar Alliance (ISA) as well as cooperation with CAABI and being part of OSA (Organization of American States)

By Huma Siddiqui

India and South American nation Guatemala met virtually on Wednesday (May 5, 2021) for the second Foreign Office Consultations (FOC) where the focus was on deepening cooperation in sectors including Science and Technology, Agriculture, Space, energy, education, health and traditional medicine and tourism.

The two sides also discussed possible cooperation in — Defence & Security, International Solar Alliance (ISA) as well as cooperation with CAABI and being part of OSA (Organization of American States).

Confirming this, India’s ambassador to Guatemala BS Mubarak told Financial Express Online “Apart from other issues, the discussions also revolved around the Defence and Security sector. India has offered training for the Civil Police and briefed the Guatemalan delegation on the strengths of the Indian defence sector.”

“In the Space Sector, the Government of Guatemala has expressed interest in Resource Mapping; Forest Fire Management Training as well as Remote Sensing Training,” Mr Mubarak shared.



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Besides expressing interest in ISA, the Central American nation has sought India's help in Waste Water Management.

SICA — Partial Free Trade Agreement: The two sides have evinced interest in such an agreement. This agreement will be with the six Central American Nations under SICA. During the Presidency of Guatemala for SICA in the second half of the year, the proposed agreement would be discussed with member countries.

Guatemala has invited India to take part as an observer in the OAS General Assembly which will take place later this year in Guatemala, India's envoy to Guatemala added.

The Central American nation is keen to collaborate in the import of the COVAXIN and welcomed FDI in pharmaceuticals, manufacturing and IT sector.

MEA Statement

According to an official statement issued by the Ministry of External Affairs, officials from both countries also reviewed the present status of bilateral relations in various fields including trade, consular, economic, political as well as cultural.

Also discussed was the COVID-19 situation and the Guatemalan side appreciated India's role in extending assistance to the Central American nation and to other countries in the LAC region.

While the Indian side was led by Ms. Riva Ganguly Das, Secretary (East), Vice Minister of the Ministry of Foreign Affairs, Guatemala, Mr Carlos Ramiro Martínez, led his side.

India-Guatemala Bilateral Trade

The two countries have decided to explore other sectors for expanding trade relationships.

As has been reported earlier in Financial Express Online earlier, trade is a very important pillar in the relations between the two countries, which has touched

USD 314.27 million in 2019-2020 with Indian exports at USD 291.32 million and imports at USD 22.95 million.

In an earlier interaction with Financial Express Online, the Indian envoy had shared that a large number of Indian companies have been visiting the Central exploring the market and have been showcasing their products including – pharmaceutical, automobile, textiles and engineering.

In 2020, the Indian mission was perhaps the only one in the region which had held virtual meetings and exhibitions, creating an opportunity for the Indian businesses to showcase their products.

What is OAS?

There are 35 independent states of the Americas. And is considered to be the main political, juridical and social governmental forum in the Hemisphere. According to the information available in the public domain, OAS has granted permanent observer status to 69 states, and also to the European Union (EU).

Why is SICA important?

The two sides are working towards a Customs Union, and to implement this according to officials, several measures need to be carried out which are based on the requirement of the member countries of SICA.

Key areas that are critical include Food & Energy; Pharmaceuticals; Security; Space Cooperation; Aerospace; Agriculture; MSMEs, and capacity building.

<https://www.financialexpress.com/defence/india-guatemala-to-deepen-cooperation-in-space-defence-and-security-india-sica-trade-negotiations-to-start-soon/2247276/>

Evading the uncertainty principle in quantum physics

The uncertainty principle, first introduced by Werner Heisenberg in the late 1920's, is a fundamental concept of quantum mechanics. In the quantum world, particles like the electrons that power all electrical product can also behave like waves. As a result, particles cannot have a well-defined position and momentum simultaneously. For instance, measuring the momentum of a particle leads to a disturbance of position, and therefore the position cannot be precisely defined.

In recent research, published in *Science*, a team led by Prof. Mika Sillanpää at Aalto University in Finland has shown that there is a way to get around the uncertainty principle. The team included Dr. Matt Woolley from the University of New South Wales in Australia, who developed the theoretical model for the experiment.

Instead of elementary particles, the team carried out the experiments using much larger objects: two vibrating drumheads one-fifth of the width of a human hair. The drumheads were carefully coerced into behaving quantum mechanically.



Schematic of the entangled drumheads. Credit: Aalto University

"In our work, the drumheads exhibit a collective quantum motion. The drums

vibrate in an opposite phase to each other, such that when one of them is in an end position of the vibration cycle, the other is in the opposite position at the same time. In this situation, the quantum uncertainty of the drums' motion is canceled if the two drums are treated as one quantum-mechanical entity," explains the lead author of the study, Dr. Laure Mercier de Lepinay.

This means that the researchers were able to simultaneously measure the position and the momentum of the two drumheads—which should not be possible according to the Heisenberg uncertainty principle. Breaking the rule allows them to be able to characterize extremely weak forces driving the drumheads.

"One of the drums responds to all the forces of the other drum in the opposing way, kind of with a negative mass," Sillanpää says.

Furthermore, the researchers also exploited this result to provide the most solid evidence to date that such large objects can exhibit what is known as quantum entanglement. Entangled objects cannot be described independently of each other, even though they may have an arbitrarily large spatial separation. Entanglement allows pairs of objects to behave in ways that contradict classical physics, and is the key resource behind emerging quantum technologies. A quantum computer can, for example, carry out the types of calculations needed to invent new medicines much faster than any supercomputer ever could.

In macroscopic objects, quantum effects like entanglement are very fragile, and are destroyed easily by any disturbances from their surrounding environment. Therefore, the experiments were carried out at a very low temperature, only a hundredth a degree above absolute zero at -273 degrees.

In the future, the research group will use these ideas in laboratory tests aiming at probing the interplay of quantum mechanics and gravity. The vibrating drumheads may also serve as interfaces for connecting nodes of large-scale, distributed quantum networks.

The article, "Quantum mechanics-free subsystem with mechanical oscillators," by Laure Mercier de Lépinay, Caspar F. Ockeloen-Korppi, Matthew J. Woolley, and Mika A. Sillanpää is published in *Science* 7 May.

More information: L. Mercier de Lépinay et al., "Quantum mechanics-free subsystem with mechanical oscillators," *Science* (2021). [science.sciencemag.org/cgi/doi ... 1126/science.abf5389](https://doi.org/10.1126/science.abf5389)

Journal information: [Science](#)

<https://phys.org/news/2021-05-evading-uncertainty-principle-quantum-physics.html>



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New boost in quantum technologies

In an international collaboration, researchers at the University of Stuttgart were able to detect quantum bits in two-dimensional materials for the first time. *Nature Materials* publishes this research in its May 6, 2021 issue.

Quantum computers or quantum sensors consist of materials that are completely different to their classical predecessors. These materials are faced with the challenge of combining contradicting properties that quantum technologies entail, as for example good accessibility of quantum bits with maximum shielding from environmental influences. In this regard, so-called two-dimensional materials, which only consist of a single layer of atoms, are particularly promising.

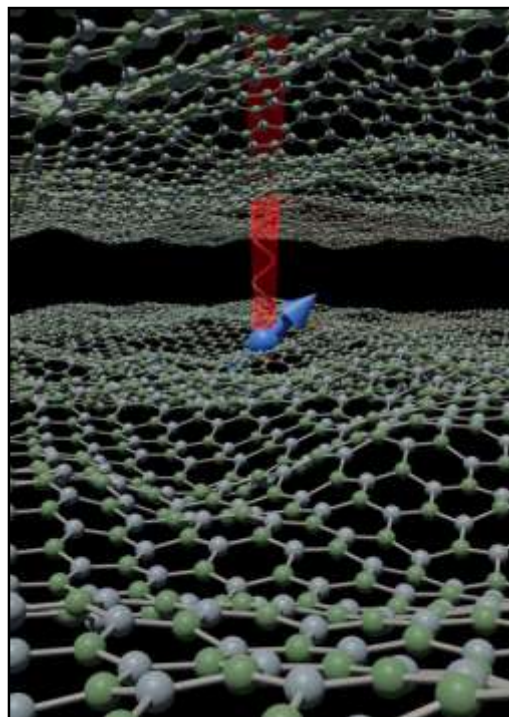
Researchers at the new Center for Applied Quantum Technologies and the 3rd Institute of Physics at the University of Stuttgart have now succeeded in identifying promising quantum bits in these materials. They were able to show that the quantum bits can be generated, read out and coherently controlled in a very robust manner.

"There certainly is still a long way to go before these quantum bits can be used in quantum technology," says the head of the study and director of the 3rd Institute of Physics at the University of Stuttgart, Prof. Jörg Wrachtrup. "However, the properties found by the scientists are so convincing that they can trigger a new boost in quantum technologies."

More information: Single-spin resonance in a van der Waals embedded paramagnetic defect, *Nature Materials* (2021). DOI: [10.1038/s41563-021-00979-4](https://doi.org/10.1038/s41563-021-00979-4)

Journal information: [Nature Materials](#)

<https://phys.org/news/2021-05-boost-quantum-technologies.html>



Quantum bit in a two-dimensional layer consisting of the elements boron and nitrogen. Credit: University of Stuttgart

Team directs and measures quantum drum duet

By Laura Os

Like conductors of a spooky symphony, researchers at the National Institute of Standards and Technology (NIST) have "entangled" two small mechanical drums and precisely measured their linked quantum properties. Entangled pairs like this might someday perform computations and transmit data in large-scale quantum networks.

The NIST team used microwave pulses to entice the two tiny aluminum drums into a quantum version of the Lindy Hop, with one partner bopping in a cool and calm pattern while the other was jiggling a bit more. Researchers analyzed radar-like signals to verify that the two drums' steps formed an entangled pattern—a duet that would be impossible in the everyday classical world.

What's new is not so much the dance itself but the researchers' ability to measure the drumbeats, rising and falling by just one-quadrillionth of a meter, and verify their fragile entanglement by detecting subtle statistical relationships between their motions.

The research is described in the May 7 issue of *Science*.

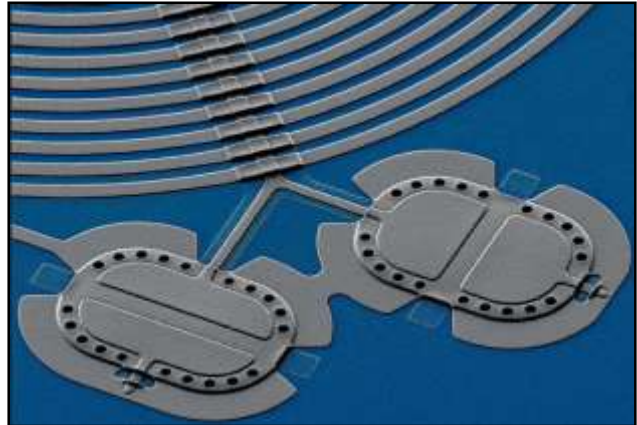
"If you analyze the position and momentum data for the two drums independently, they each simply look hot," NIST physicist John Teufel said. "But looking at them together, we can see that what looks like random motion of one drum is highly correlated with the other, in a way that is only possible through quantum entanglement."

Quantum mechanics was originally conceived as the rulebook for light and matter at atomic scales. However, in recent years researchers have shown that the same rules can apply to increasingly larger objects such as the drums. Their back-and-forth motion makes them a type of system known as a mechanical oscillator. Such systems were entangled for the first time at NIST about a decade ago, and in that case the mechanical elements were single atoms.

Since then, Teufel's research group has been demonstrating quantum control of drumlike aluminum membranes suspended above sapphire mats. By quantum standards, the NIST drums are massive, 20 micrometers wide by 14 micrometers long and 100 nanometers thick. They each weigh about 70 picograms, which corresponds to about 1 trillion atoms.

Entangling massive objects is difficult because they interact strongly with the environment, which can destroy delicate quantum states. Teufel's group developed new methods to control and measure the motion of two drums simultaneously. The researchers adapted a technique first demonstrated in 2011 for cooling a single drum by switching from steady to pulsed microwave signals to separately optimize the steps of cooling, entangling and measuring the states. To rigorously analyze the entanglement, experimentalists also worked more closely with theorists, an increasingly important alliance in the global effort to build quantum networks.

The NIST drum set is connected to an electrical circuit and encased in a cryogenically chilled cavity. When a microwave pulse is applied, the electrical system interacts with and controls the activities of the drums, which can sustain quantum states like entanglement for approximately a millisecond, a long time in the quantum world.



researchers entangled the beats of these two mechanical drums--tiny aluminum membranes each made of about 1 trillion atoms--and precisely measured their linked quantum properties. Entangled pairs like this (shown in this colorized micrograph), which are

For the experiments, researchers applied two simultaneous microwave pulses to cool the drums, two more simultaneous pulses to entangle the drums, and two final pulses to amplify and record the signals representing the quantum states of the two drums. The states are encoded in a reflected microwave field, similar to radar. Researchers compared the reflections to the original microwave pulse to determine the position and momentum of each drum.

To cool the drums, researchers applied pulses at a frequency below the cavity's natural vibrations. As in the 2011 experiment, the drumbeats converted applied photons to the cavity's higher frequency. These photons leaked out of the cavity as it filled up. Each departing photon took with it one mechanical unit of energy—one phonon, or one quantum—from drum motion. This got rid of most of the heat-related drum motion.

To create entanglement, researchers applied microwave pulses in between the frequencies of the two drums, higher than drum 1 and lower than drum 2. These pulses entangled drum 1 phonons with the cavity's photons, generating correlated photon-phonon pairs. The pulses also cooled drum 2 further, as photons leaving the cavity were replaced with phonons. What was left was mostly pairs of entangled phonons shared between the two drums.

To entangle the phonon pairs, the duration of the pulses was crucial. Researchers discovered that these microwave pulses needed to last longer than 4 microseconds, ideally 16.8 microseconds, to strongly entangle the phonons. During this time period the entanglement became stronger and the motion of each drum increased because they were moving in unison, a kind of sympathetic reinforcement, Teufel said. Researchers looked for patterns in the returned signals, or radar data. In the classical world the results would be random. Plotting the results on a graph revealed unusual patterns suggesting the drums were entangled. To be certain, the researchers ran the experiment 10,000 times and applied a statistical test to calculate the correlations between various sets of results, such as the positions of the two drums.

"Roughly speaking, we measured how correlated two variables are—for example, if you measured the position of one drum, how well could you predict the position of the other drum," Teufel said. "If they have no correlations and they are both perfectly cold, you could only guess the average position of the other drum within an uncertainty of half a quantum of motion. When they are entangled, we can do better, with less uncertainty. Entanglement is the only way this is possible."

"To verify that entanglement is present, we do a statistical test called an 'entanglement witness,'" NIST theorist Scott Glancy said. "We observe correlations between the drums' positions and momentums, and if those correlations are stronger than can be produced by classical physics, we know the drums must have been entangled. The radar signals measure position and momentum simultaneously, but the Heisenberg uncertainty principle says that this can't be done with perfect accuracy. Therefore, we pay a cost of extra randomness in our measurements. We manage that uncertainty by collecting a large data set and correcting for the uncertainty during our statistical analysis."

Highly entangled, massive quantum systems like this might serve as long-lived nodes of quantum networks. The high-efficiency radar measurements used in this work could be helpful in applications such as quantum teleportation—data transfer without a physical link—or swapping entanglement between nodes of a quantum network, because these applications require decisions to be made based on measurements of entanglement outcomes. Entangled systems could also be used in fundamental tests of quantum mechanics and force sensing beyond standard quantum limits.

More information: S. Kotler et al., "Direct observation of deterministic macroscopic entanglement," *Science* (2021). [science.sciencemag.org/cgi/doi ... 1126/science.abf2998](https://science.sciencemag.org/cgi/doi/10.1126/science.abf2998)

Journal information: *Science*
<https://phys.org/news/2021-05-team-quantum-duet.html>

One third of patients hospitalized with Covid-19 have lung changes after a year

Summary:

A new study has shown that most patients discharged from hospital after experiencing severe COVID-19 infection appear to return to full health, although up to a third do still have evidence of effects upon the lungs one year on.

COVID-19 has infected millions of people worldwide. People are most commonly hospitalised for COVID-19 infection when it affects the lungs -- termed COVID-19 pneumonia. Whilst significant progress has been made in understanding and treating acute COVID-19 pneumonia, very little is understood about how long it takes for patients to fully recover and whether changes within the lungs persist.

In this new study, published in *The Lancet Respiratory Medicine*, researchers from the University of Southampton worked with collaborators in Wuhan, China, to investigate the natural history of recovery from severe COVID-19 pneumonia up to one year after hospitalisation.

83 patients were recruited after they were discharged from hospital following severe COVID-19 pneumonia and were followed up after three, six, nine and twelve months. At each time point they underwent clinical assessment as well as measures of how well the lungs function, a CT scan of their chest to take a picture of the lungs, and a walking test.

Over 12 months in most patients there was an improvement in symptoms, exercise capacity, and COVID-19 related CT changes. By 12 months the majority of patients appeared to have fully recovered although about 5% of patients still reported breathlessness. A third of patients' measures of lung function were still reduced -- in particular how efficiently oxygen is transferred in the lungs into the blood -- and this was more frequently found in women than in men. In around a quarter of patients CT scans showed there were still small areas of change in the lungs, and this was more common in patients with more severe lung changes at time of hospitalisation.

Dr Mark Jones, Associate Professor in Respiratory Medicine at the University of Southampton and NIHR Southampton Biomedical Research Centre who co-led the study said, "the majority of patients with severe COVID-19 pneumonia appeared to fully recover, although for some patients this took many months. Women were more likely to have persistent reductions in lung function tests and further investigation is needed to understand if there is a sex specific difference in how patient's recover. We also don't yet know what happens beyond 12 months and this will need ongoing study."

The researchers acknowledged that this study only involved a small number of patients and the findings will require confirmation in additional studies, however they have identified a number of important implications.

Dr Yihua Wang, Lecturer in Biomedical Sciences at the University of Southampton and NIHR Southampton Biomedical Research Centre who co-led the study explained, "firstly, our research provides evidence that routine respiratory follow-up of patients hospitalised with COVID-19-pneumonia is required. Secondly, given the length of time it takes for some patients to recover it suggests that research into whether exercise programmes help patients recover more quickly is required. Finally, it highlights the need for treatment strategies to prevent the development of long term COVID-19 related lung changes."

Journal Reference:

1. Xiaojun Wu, Xiaofan Liu, Yilu Zhou, Hongying Yu, Ruiyun Li, Qingyuan Zhan, Fang Ni, Si Fang, Yang Lu, Xuhong Ding, Hailing Liu, Rob M Ewing, Mark G Jones, Yi Hu, Hanxiang Nie, Yihua Wang. **3-month, 6-month, 9-month, and 12-month respiratory outcomes in patients following COVID-19-related hospitalisation: a prospective study.** *The Lancet Respiratory Medicine*, 2021; DOI: [10.1016/S2213-2600\(21\)00174-0](https://doi.org/10.1016/S2213-2600(21)00174-0)
<https://www.sciencedaily.com/releases/2021/05/210506105342.htm>

