Apr
2021

समाचार पत्रों से चयित अंश
Newspapers Clippings

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खंड : 46 अंक : 81 27 अप्रैल 2021

Vol.: 46 Issue : 81 27 April 2021

रक्षा विज्ञान पुस्तकालय
Defence Science Library
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DRDO develops Single Crystal Blades for helicopter engine application

Defence Research and Development Organisation (DRDO) has developed single crystal blades technology and supplied 60 of these blades to Hindustan Aeronautics Limited (HAL) as part of their indigenous helicopter development program for helicopter engine application. It is part of a program taken up by Defence Metallurgical Research Laboratory (DMRL), a premium laboratory of DRDO, to develop five sets (300 in number) of single crystal high pressure turbine (HPT) blades using a nickel-based super alloy. The supply of remaining four sets will be completed in due course.

Single Crystal Blades for Helicopter Engine Application

Helicopters used in strategic and defence applications need compact and powerful aero-engines for their reliable operation at extreme conditions. To achieve this, state-of-the-art Single Crystal Blades having complex shape and geometry, manufactured out of Nickel based superalloys capable of withstanding high temperatures of operation are used. Very few countries in the world such as USA, UK, France and Russia have the capability to design and manufacture such Single Crystal (SX) components.

The DMRL undertook this task based on its expertise gained during the development of such a technology for an aero-engine project earlier. Complete vacuum investment casting process to realise the blades, including die design, wax pattering, ceramic moulding, actual casting of components non-destructive evaluation (NDE), heat treatment and dimensional measurement, has been established at DMRL.

Special ceramic composition had to be formulated for making strong ceramic moulds which can withstand metallostatic pressure of liquid CMSX-4 alloy at 1500°C and above during casting operation. The challenge of maintaining the required temperature gradient has also been overcome by optimising the casting parameters. A multi-step vacuum solutionising heat treatment schedule for complex CMSX-4 superalloy to achieve the required microstructure and mechanical properties has also been established.Further, a stringent non-destructive evaluation (NDE) methodology for the blades along with the technique for determining their crystallographic orientations has been developed.

Raksha Mantri Shri Rajnath Singh has congratulated DRDO, HAL and the industry involved in the development of critical technology.

Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy congratulated and appreciated the efforts involved in the indigenous development of this vital technology.

https://www.pib.gov.in/PressReleasePage.aspx?PRID=1714134

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Mon, 26 April 2021 4:29PM

डीआरडीओ ने हेलीकॉप्टर इंजन एप्लीकेशन के लिए सिंगल क्रिस्टल ब्लेड विकसित किए

रक्षा अनुसंधान और विकास संगठन - डीआरडीओ ने सिंगल क्रिस्टल ब्लेड प्रौद्योगिकी विकसित की है और इनमें से 60 ब्लेड की आपूर्ति हिंदुस्तान एयरोनॉटिक्स लिमिटेड - एचएएल को हेलीकॉप्टर इंजन एप्लीकेशन के लिए स्वदेशी हेलीकॉप्टर विकास कार्यक्रम के हिस्से के रूप में की है। यह डीआरडीओ की प्रीमियम प्रयोगशाला डिफेंस मेटालर्जिकल रिसर्च लेबोरेटरी (डीएमआरएल) द्वारा शुरू किये गए एक कार्यक्रम का हिस्सा है, जिसमें निकल-आधारित उत्कृष्ट मिश्रित धातु का उपयोग करके सिंगल क्रिस्टल उच्च दबाव वाले टरबाइन (एचपीटी) ब्लेड के पांच सेट (300 की संख्या में) विकसित किए जा रहे हैं। शेष चार सेटों की आपूर्ति उचित समय पर पूरी की जाएगी।

Single Crystal Blades for Helicopter Engine Application

रणनीतिक व रक्षा एप्लीकेशन्स में इस्तेमाल किए जाने वाले हेलीकाप्टरों को चरम स्थितियों में अपने विश्वसनीय संचालन के लिए कॉम्पैक्ट तथा शक्तिशाली एयरो-इंजन की आवश्यकता होती है। इस उद्देश्य की प्राप्ति के लिए, जटिल आकार और ज्यामिति वाले अत्याधुनिक सिंगल क्रिस्टल ब्लेड, जो ऑपरेशन के उच्च तापमान को सहन करने में सक्षम निकल आधारित उत्कृष्ट मिश्रित धातु से निर्मित हैं, का उपयोग किया जाता है। दुनिया के बहुत ही कम देशों जैसे अमरीका, ब्रिटेन, फ्रांस और रूस में ऐसे सिंगल क्रिस्टल (एसएक्स) पुर्जों को डिजाइन एवं निर्माण करने की क्षमता है।

डीएमआरएल ने पूर्व में एयरो-इंजन परियोजना के लिए इस तरह की तकनीक के विकास के दौरान प्राप्त की गई विशेषज्ञता के आधार पर यह कार्य किया था। ब्लेड को बनाने के लिए पूर्ण वैक्यूम निवेश कास्टिंग प्रक्रिया, जिसमें डाई डिजाइन, वैक्स पैटरिंग, सिरेमिक मोल्डिंग, पुर्जों की वास्तविक कास्टिंग गैर-विनाशकारी मूल्यांकन (एनडीई), ताप उपचार और आयामी माप शामिल है, को डीएमआरएल में स्थापित किया गया है।

विशेष सिरेमिक संघटक को मजबूत सिरेमिक मोल्ड बनाने के लिए तैयार किया जाना था, जो कास्टिंग ऑपरेशन के दौरान 1500 डिग्री सेल्सियस और उससे अधिक तापमान पर तरल सीएमएसएक्स -4 मिश्र धातु के दबाव का सामना कर सकता है। आवश्यक तापमान के उतार-चढ़ाव को बनाए रखने की चुनौती भी कास्टिंग मापदंडों को अनुकूलित करके दूर की गई है। जरूरी माइक्रोस्ट्रक्चर और यांत्रिक गुणों को प्राप्त करने के लिए जटिल सीएमएसएक्स -4 उत्कृष्ट मिश्रित धातु के लिए एक बहु-चरणीय वैक्यूम समाधान ताप उपचार शिड्यूल भी स्थापित किया गया है। इसके अलावा, ब्लेड के लिए एक कठोर गैर-विनाशकारी मूल्यांकन (एनडीई) पद्धति के साथ-साथ इनके क्रिस्टलोग्राफिक झुकाव का निर्धारण करने की तकनीक विकसित की गई है।

रक्षा मंत्री श्री राजनाथ सिंह ने डीआरडीओ, एचएएल और महत्वपूर्ण प्रौद्योगिकी के विकास में शामिल उद्योग को बधाई दी है।

रक्षा विभाग में अनुसंधान एवं विकास सचिव तथा डीआरडीओ के अध्यक्ष डॉ जी सतीश रेड्डी ने भी इस उपलब्धि पर बधाई दी और इस महत्वपूर्ण प्रौद्योगिकी के स्वदेशी विकास में शामिल लोगों के प्रयासों की सराहना की।

https://pib.gov.in/PressReleasePage.aspx?PRID=1714198

THE HINDU

Tue, 27 April 2021

DRDO develops critical crystal blade technology for aero engines

'Very few countries have the capability to design and manufacture such components'

New Delhi: In a major technological breakthrough, the Defence Research and Development Organisation (DRDO) on Monday said it has developed single crystal blade technology and supplied 60 of such blades to the Hindustan Aeronautics Limited (HAL) as part of their indigenous helicopter development programme for helicopter engine application.

"It is part of a programme taken up by the Defence Metallurgical Research Laboratory (DMRL), a laboratory of the DRDO, to develop five sets, 300 in number, of single crystal high pressure turbine (HPT) blades using a nickel-based super alloy," the DRDO said in a statement. The supply of the other four sets will be completed in due course, it said.

Representative Image: Very few countries such as the U.S., the U.K., France and Russia have the capability to design and manufacture such single crystal components. | Photo Credit: REUTERS

Very few countries such as the U.S., the U.K., France and Russia have the capability to design and manufacture such single crystal components, it said. The DRDO has been working for a long time to develop this technology which is a critical component in aero engines.

Helicopters need compact and powerful aero-engines for operating at extreme conditions and to achieve this, state-of-the-art single crystal blades having complex shape and geometry, manufactured out of nickel based super-alloys capable of withstanding high temperatures of operation are used.

The DMRL undertook this development based on its expertise gained during the development of such a technology for an aero-engine project earlier. Complete vacuum investment casting process to realise the blades, including die design, wax pattering, ceramic moulding, actual casting of components non-destructive evaluation, heat treatment and dimensional measurement, has been established at the DMRL, the statement said.

https://www.thehindu.com/news/national/drdo-develops-critical-crystal-blade-technology-for-aero-engines/article34415540.ece

INDIA TODAY

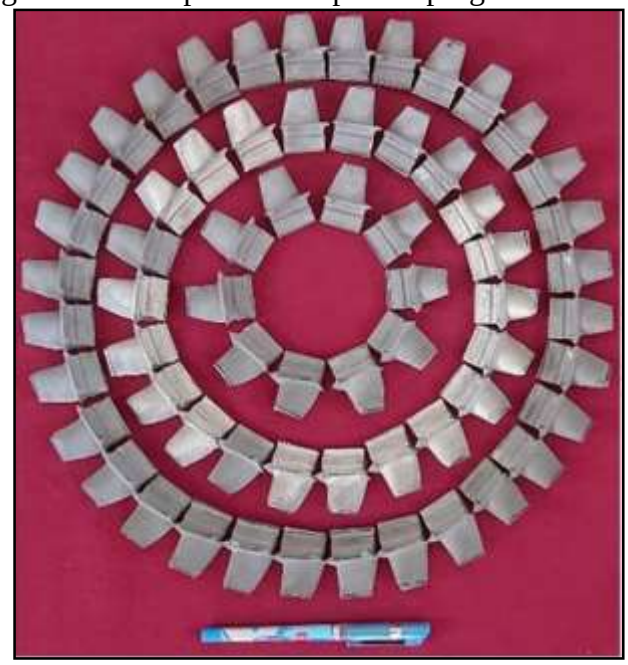
Tue, 27 April 2021

DRDO develops single crystal blades for helicopter engine application

The Defence Research and Development Organisation (DRDO) made single crystal blades technology using nickle based superalloy for helicopters

By Manjeet Negi

New Delhi: The Defence Research and Development Organisation (DRDO) has developed single crystal blades technology for helicopters and has supplied 60 of these blades to Hindustan Aeronautics Limited (HAL) as part of their indigenous helicopter development programme for engine application.



Single Crystal Blades for Helicopter Engine Application

This is part of a programme taken up by Defence Metallurgical Research Laboratory (DMRL) to develop five sets of single crystal high-pressure turbine (HPT) blades using a nickel-based superalloy.

The remaining four sets will be supplied later.

Helicopters used in strategic and defence applications need compact and powerful aero engines for operating in extreme conditions. To achieve this, state-of-the-art single crystal blades with complex shape and geometry, manufactured out of nickel-based superalloys capable of withstanding high temperatures of operation are used. Very few countries in the world such as the US, the UK, France and Russia have the ability to design and manufacture such components.

According to DMRL, "Complete vacuum investment casting process to realise the blades, including die design, wax pattering, ceramic moulding, the actual casting of components non-destructive evaluation (NDE), heat treatment and dimensional measurement has been established at DMRL".

Special ceramic composition had to be formulated for making strong ceramic moulds that can withstand metallostatic pressure of liquid CMSX-4 alloy at 1500°C and above during casting operation, DMRL said.

The challenge of maintaining the required temperature gradient has also been overcome by optimizing the casting parameters, it said, adding that a multi-step vacuum heat treatment schedule for complex CMSX-4 superalloy to achieve the required microstructure and mechanical properties has also been established.

Further, a stringent Non-destructive Evaluation (NDE) method for the blades along with the technique for determining their crystallographic orientations has been developed.

Defence Minister Rajnath Singh congratulated DRDO, HAL and industry involved in the advancement of this technology.

https://www.indiatoday.in/india/story/drdo-develops-single-crystal-blades-for-helicopter-engine-application-1795221-2021-04-26

Tue, 27 April 2021

DRDO ने बनाया ऐसा ब्लेड जो हेलिकॉप्टर को देगा असीम ताकत

रक्षा अनुसंधान और विकास संगठन (DRDO) ने सिंगल क्रिस्टल ब्लेड प्रौद्योगिकी विकसित की है। ये ब्लेड्स इंजन को ज्यादा गर्मी में भी सुरक्षित रखते हैं। ऐसा करने वाला भारत दुनिया का पांचवां देश बन गया है। इससे पहले अमेरिका, ब्रिटेन, फ्रांस और रूस के पास ही यह तकनीक थी। इन ब्लेड्स से छोटे और ज्यादा शक्तिशाली इंजनों का निर्माण किया जा सकेगा।

By मंजीत नेगी

स्टोरी हाइलाइट्स

- ***ऐसी तकनीक हासिल करने वाला दुनिया का पांचवां देश बना भारत***
- ***हेलिकॉप्टर इंजन विपरीत परिस्थितियों में भी करेगा बेहतरीन काम***
- ***1500 डिग्री सेल्सियस तक का तापमान बर्दाश्त कर सकते हैं ये ब्लेड्स***

रक्षा अनुसंधान और विकास संगठन (DRDO) **ने सिंगल क्रिस्टल ब्लेड प्रौद्योगिकी विकसित की है। ये ब्लेड्स इंजन को ज्यादा गर्मी में भी सुरक्षित रखते हैं। ऐसा करने वाला भारत दुनिया का पांचवां देश बन गया है। इससे पहले अमेरिका, ब्रिटेन, फ्रांस और रूस के पास ही यह तकनीक थी। इन ब्लेड्स से छोटे और ज्यादा शक्तिशाली इंजनों का निर्माण किया जा सकेगा।**

DRDO द्वारा बनाया गया सिंगल क्रिस्टल ब्लेड. फोटोः डीआरडीओ

DRDO **ने इनमें से** 60 **ब्लेड की आपूर्ति हिंदुस्तान एयरोनॉटिक्स लिमिटेड** (HAL) **को हेलिकॉप्टर इंजन एप्लीकेशन** (Helicopter) **के लिए दिया है। आपको बता दें कि** HAL **इस समय स्वदेशी हेलीकॉप्टर विकास कार्यक्रम के तहत हेलिकॉप्टर बना रहा है। जिसमें इस क्रिस्टल ब्लेड का उपयोग किया जाएगा।**

सिंगल क्रिस्टल ब्लेड (Single Crystal Blade) **को डीआरडीओ की प्रीमियम प्रयोगशाला डिफेंस मेटालर्जिकल रिसर्च लेबोरेटरी** (DMRL) **ने बनाया है। इसमें निकल-आधारित उत्कृष्ट मिश्रित धातु का उपयोग किया गया है। सिंगल क्रिस्टल उच्च दबाव वाले टरबाइन** (HPT) **ब्लेड के पांच सेट** (300) **में विकसित किए जा रहे हैं। पहला सेट** HAL **को मिल गया है।** DMRL **शेष चार सेटों की आपूर्ति उचित समय पर पूरी करेगा।**

रणनीतिक व रक्षा एप्लीकेशन्स में इस्तेमाल किए जाने वाले हेलिकाप्टरों को चरम स्थितियों में अपने विश्वसनीय संचालन के लिए कॉम्पैक्ट तथा शक्तिशाली एयरो-इंजन की आवश्यकता होती है। इसके लिए जटिल आकार वाले अत्याधुनिक सिंगल क्रिस्टल ब्लेड काम आते हैं। ये मिशन के दौरान उच्च तापमान सहन करने में सक्षम है। दुनिया के बहुत ही कम देश जैसे अमेरिका, ब्रिटेन, फ्रांस और रूस ही ऐसे सिंगल क्रिस्टल (SX) **पुर्जों को डिजाइन एवं निर्माण करने की क्षमता रखते हैं।**

ये ब्लेड्स कास्टिंग ऑपरेशन के दौरान 1500 डिग्री सेल्सियस और उससे अधिक तापमान पर तरल सीएमएसएक्स-4 मिश्र धातु के दबाव का सामना कर सकता है। आवश्यक तापमान के उतार-चढ़ाव को बनाए रखने की चुनौती भी कास्टिंग मापदंडों को अनुकूलित करके दूर की गई है। जरूरी माइक्रोस्ट्रक्चर और यांत्रिक गुणों को प्राप्त करने के लिए जटिल सीएमएसएक्स-4 उत्कृष्ट मिश्रित धातु के लिए एक बहु-चरणीय वैक्यूम शेड्यूल भी स्थापित किया गया है।

इसके अलावा, ब्लेड के लिए एक कठोर गैर-विनाशकारी मूल्यांकन (एनडीई) पद्धति के साथ-साथ इनके क्रिस्टलोग्राफिक झुकाव का निर्धारण करने की तकनीक विकसित की गई है। रक्षा मंत्री राजनाथ सिंह ने डीआरडीओ, एचएएल और महत्वपूर्ण प्रौद्योगिकी के विकास में शामिल उद्योग को बधाई दी है। रक्षा विभाग में अनुसंधान एवं विकास सचिव तथा डीआरडीओ के अध्यक्ष डॉ। जी सतीश रेड्डी ने भी इस उपलब्धि पर बधाई दी।

https://www.aajtak.in/science/story/drdo-develops-single-crystal-blades-for-helicopter-engine-tstr-1245237-2021-04-26

Tue, 27 April 2021

Rajnath Singh congratulates DRDO on developing single crystal blades for helicopter engine application

The Defence Research and Development Organisation (DRDO) has developed a single crystal blades technology and has supplied 60 number of these blades to Hindustan Aeronautics Limited (HAL) as part of their indigenous helicopter development program for helicopter engine application

New Delhi: The Defence Research and Development Organisation (DRDO) has developed a single crystal blades technology and has supplied 60 number of these blades to Hindustan Aeronautics Limited (HAL) as part of their indigenous helicopter development program for helicopter engine application. The supply of the remaining four sets will be completed in due course.

Visual of DRDO's single crystal blades for helicopter engine application (Photo/Twitter). Image Credit: ANI

According to Ministry of Defence, this is part of a program taken up by Defence Metallurgical Research Laboratory (DMRL), a premium laboratory of DRDO to develop 5 sets (300 Numbers) of single crystal high pressure turbine (HPT) blades using a nickel-based super alloy. The supply of the remaining 4 sets will be completed in due course. Meanwhile, Defence Minister Rajnath Singh congratulated the DRDO. "Raksha Mantri Rajnath Singh has congratulated DRDO, HAL and the industry involved in the development of this critical technology," his office tweeted.

The DRDO said that helicopters used in strategic and defence applications need compact and powerful aero-engines for their reliable operation at extreme conditions. To achieve this, state-of-the-art single crystal blades having complex shape and geometry, manufactured out of Nickel based superalloys capable of withstanding high temperatures of operation are used. Very few

countries in the world such as the USA, the UK, France, Russia, have the capability to design and manufacture such Single Crystal (SX) components. DMRL undertook this task based on its expertise gained during the development of such a technology for an aero-engine project earlier. Complete vacuum investment casting process to realise the blades, including die design, wax pattering, ceramic moulding, actual casting of components non-destructive evaluation (NDE), heat treatment and dimensional measurement, has been established at DMRL.

"Special ceramic composition had to be formulated for making strong ceramic moulds which can withstand metallostatic pressure of liquid CMSX-4 alloy at 1500 degree Celsius and above during casting operation. The challenge of maintaining the required temperature gradient has also been overcome by optimising the casting parameters. A multi-step vacuum solutionising heat treatment schedule for complex CMSX-4 superalloy to achieve the required microstructure and mechanical properties has also been established," the Ministry said. Further, a stringent non-destructive evaluation (NDE) methodology for the blades along with the technique for determining their crystallographic orientations has been developed. (ANI)

(This story has not been edited by Devdiscourse staff and is auto-generated from a syndicated feed.)

https://www.devdiscourse.com/article/headlines/1549834-rajnath-singh-congratulates-drdo-on-developing-single-crystal-blades-for-helicopter-engine-application

The EurAsian Times

Tue, 27 April 2021

Indian Army's Arjun Mk-1 Alpha Tanks 'Desert-Storms' India-Pakistan border; tests firing capability

By Ayush Jain

The Indian Army demonstrated the combat capabilities of its Arjun Mk-1 Alpha tanks in a live-fire exercise at the Pokhran Field Firing Range in Rajasthan's Jaisalmer, on the weekend.

Konark Corps (XII Corps) GOC Lt. Gen. P S Minhas, Battle Axe Division GOC Major-Gen. Ajit Singh Gehlot and other officials observed the firing capabilities of the latest tank, The Times of India reported.

This tank is the cavalry's latest workhorse handed over to the service in February 2021 by Prime Minister Narendra Modi in Chennai. The Defense Acquisition Council had cleared the procurement of 118 Arjun Mk-1A tanks (earlier called Mk-II) at an estimated price of Rs 8400 crore.

A senior official was quoted as saying by TOI, "Seeing the current scenario and challenges, the firepower demonstration of Main Battle Tank Arjun Mk-1 Alpha, which is an advanced version of Arjun, took place to check its capabilities in various parameters in the desert area, thus fulfilling army's future requirements."

One of the main features demonstrated was the ability to fire accurately while on the move. "The Mk-1A includes an improved gunner's main sight, integrated with automatic target tracking. This would enable the tank crew to track moving targets automatically, and engage them even when Arjun is on the move," the source added.

Arjun Mk-1A

The development of the Arjun Mk-1A tank has been an exhaustive and long-awaited process of about 48 years, since the commencement of the project at CVRDE (Combat Vehicles Research and Development Establishment) laboratories in 1972.

It was only in 1996 that the Indian government decided to mass-produce the tank at the Indian Ordnance Factory's production facility in Avadi on the outskirts of the southern Indian city of Chennai.

The Arjun tanks have seen a lot of improvement since its first variant, the Arjun Mk-1. The Mk-1, being the initial production batch, had undergone extensive trials and paved the way for the development of the Mk-2 (re-designated to Mk-1A).

While weight has been termed as the primary issue for the tank, its ground pressure is lesser than that of the T-72 due to inherent design features.

The Arjun had been developed focusing on increased protection against emerging threats of the new century. The turret and glacis are protected with "Kanchan" (gold) modular composite armor, which derived its name from Kanchan Bagh, Hyderabad, where the Defence Metallurgical Research Laboratory (DMRL) is located.

Kanchan is made by sandwiching composite panels between Rolled Homogenous Armour (RHA). This helps in defeating APFDS (armor-piercing fin-stabilized discarding sabot) and HEAT (high-explosive anti-tank) rounds. Trials conducted in 2000, showcased the ability of Kanchan armor to protect the tank, even when hit at point-blank range by a T-72.

It also demonstrated the capability to defeat HESH (high-explosive squash head) and APFSDS rounds, which included the Israeli APFSDS rounds.

The tank comes with a new honeycomb design of non-explosive and non-energetic reactive armor (NERA) along with nuclear, biological, and chemical (NBC) protection equipment, along with mine sweeps and an automatic fire fighting system.

Indian Army Armoured Corps has cleared the upgraded Arjun Mk 1A after successful completion of final integration tests conducted in Rajasthan in 2019. It comes with 72 improvements over Arjun Mk 1 with 14 major upgrades.

https://eurasiantimes.com/watch-indian-armys-home-grown-arjun-mk-1a-tank-showcases-its-fire-power/

नवभारत टाइम्स

Tue, 27 April 2021

रेतीले राजस्थान में सुनाई दी अर्जुन टैंक की गूंज

जैसलमेर: अर्जुन मार्क-1 अल्फा की मारक क्षमता को पोकरण फिल्ड फायरिंग रेंज में परखा जा रहा है। हाल ही कोणार्क कोर जीओसी लेफ्टिनेंट जनरल पी एस मिन्हास, बैटल एक्स डिवीजन जीओसी मेजर जनरल अजीत सिंह गहलोत और अन्य वरिष्ठ अधिकारी टैंक की फायरिंग क्षमता को देखने के लिए पोकरण फिल्ड फायरिंग रेंज में मौजूद रहे। सैन्य अधिकारियों ने रेगितानी क्षेत्र में अर्जुन मार्क-1 की विभिन्न मापदंडों में क्षमताओं की जांच की। बता दें कि टैंक के नए उन्नत संस्करण में, फायरिंग सिस्टम को मिसाइलों के साथ अपग्रेड किया गया है।

महाभारत के पात्र अर्जुन के नाम वाला ये टैंक है दमदार

अर्जुन एक तीसरी पीढ़ी का मुख्य युद्धक टैंक है। इसे भारतीय सेना के लिए भारत के रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) ने विकसित किया गया है। अर्जुन टैंक का नाम महाभारत के पात्र अर्जुन के नाम पर रखा गया है। अर्जुन टैंक में 120 मिमी में एक मेन राइफल्ड गन है जिसमें भारत में बने आर्मर-पेअरसिंग फिन-स्टेबलाइज़्ड डिस्कार्डिंग-सेबट एमुनीशन का प्रयोग किया जाता है।

67 किमी की रफ्तार से है दौड़ता

मिली जानकारी के अनुसार इसमें PKT 7.62 मिमी कोएक्सिल मशीन गन और NSVT 12.7 मिमी मशीन गन भी है। यह 1,400 हार्सपावर के एक एमटीयू बहु ईंधन डीजल इंजन द्वारा संचालित है।इसकी अधिकतम गति 67 किमी / घंटा (42 मील प्रति घंटा) और क्रॉस-कंट्री में 40 किमी / घंटा (25 मील प्रति घंटा) है। कमांडर, गनर, लोडर और चालक का एक चार सदस्यीय चालक दल इसे चलाता है।

https://navbharattimes.indiatimes.com/state/rajasthan/jaisalmer/sound-of-arjun-tank-heard-in-sandy-rajasthan-watch-video/videoshow/82260169.cms

COVID 19: DRDO's Contribution

जागरण

Tue, 27 April 2021

अब 450 नही 500 बेड का होगा लखनऊ के DRDO का कोविड अस्पताल, कंट्रोल रूम भी होगा स्थापित

कोरोना संक्रमित गंभीर रोगियों के लिए वेंटिलेटर वाले एल 3 श्रेणी के अस्पताल की बड़ी कमी को अवध शिल्प ग्राम में बन रहा डीआरडीओ का कोविड केअर अस्पताल पूरा करेगा। अब यह अस्पताल 450 की जगह 500 बेड का बनेगा।

By Rafiya Naz

लखनऊ: कोरोना संक्रमित गंभीर रोगियों के लिए वेंटिलेटर वाले एल 3 श्रेणी के अस्पताल की बड़ी कमी को अवध शिल्प ग्राम में बन रहा डीआरडीओ का कोविड केअर अस्पताल पूरा करेगा। अब यह अस्पताल 450 की जगह 500 बेड का बनेगा। जिसमें 150 बेड आईसीयू की सुविधा वाले होंगे। जबकि 350 बेड में ऑक्सीजन की आपूर्ति 24 घंटे होगी। डीआरडीओ 200 आईसीयू बेड लखनऊ की एक फर्म से मंगवाने के लिए संपर्क किया है। डीआरडीओ के अस्पताल को लेकर रविवार को सैन्य अधिकारियों और शासन के अधिकारियों के बीच बैठक हुई। जिंसमे सैन्य अधिकारियों ने कोविड अस्पताल के नियंत्रण को लेकर अपने मास्टर प्लान को साझा किया।

मध्य कमान के सैन्य अधिकारियो ने कहा कि वह मौजूदा संसाधन में अधिक कोरोना रोगियों का उपचार कर सकते हैं। यहां पहले 450 रोगियों के उपचार की तैयारी थी। लेकिन आर्म्ड फ़ोर्स मेडिकल सर्विस के अधिकारियों की तैनाती इस कोविड अस्पताल में होगी। ऐसे में सेना के आईसीयू विशेषज्ञ डॉक्टरो की तैनाती होने से यहां आईसीयू की संख्या भी बढ़ाने का निर्णय लिया गया। कोविड अस्पताल से जुड़े सैन्य अधिकारी के मुताबिक यह यूपी में सबसे अधिक आईसीयू वाला अस्पताल बनेगा। देश भर से नेवी, आर्मी और एयरफोर्स के चिकित्सा अधिकारियों और पैरा मेडिकल स्टाफ की तैनाती की जाएगी। डीआरडीओ के अस्पताल को लालबाग स्थित कमांड कोविड सेंटर से जोड़ा जाएगा। जहां से कोरोना संक्रमित रोगियों को डीआरडीओ अस्पताल भेजा जाएगा। इस अस्पताल में एक मर्चुरी भी बनाया जाएगा।

ऑक्सीजन प्लांट तैयारअवध शिल्प ग्राम में बन रहे डीआरडीओ के अस्पताल में शनिवार को बीस हजार लीटर की क्षमता की मेडिकल ऑक्सीजन टैंक आया था।।रविवार को टैंक के लिए वेपोराइजर प्लांट भी लगा दिया गया। लिक्विड ऑक्सीजन को इसी प्लांट से कम्प्रेस कर पाइप के जरिये सीधे बेड तक पहुंचाया जाएगा। वही आईसीयू बेड की फिटिंग का काम भी तेज हो गया है। व्हील चेयर और स्ट्रेचर के सैम्पल भी आये।

https://www.jagran.com/uttar-pradesh/lucknow-city-now-drdo-covid-hospital-of-lucknow-will-be-of-500-bed-with-control-room-21592514.html

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Mon, 26 April 2021 5:57PM

Project DANTAK completes 60 years in Bhutan

Project DANTAK is commemorating its Diamond Jubilee in Bhutan. Indian Ambassador to Bhutan Smt Ruchira Kamboj laid a floral wreath at the DANTAK Memorial in Simtokha on April 24, 2021. Commandant, Indian Military Training Team (IMTRAT) Maj Gen Sanjeev Chauhan and Chief Engineer DANTAK Brig Kabir Kashyap also paid their respects at the memorial. It was a fitting tribute to the sacrifices made by personnel of DANTAK in strengthening the bonds of friendship between India and Bhutan. It may be recalled that over 1,200 DANTAK personnel laid down their lives while constructing important infrastructure in Bhutan.

Project DANTAK was established on April 24, 1961 as a result of the visionary leadership of His Majesty the Third King and then Prime Minister Jawahar Lal Nehru. Identifying the utmost importance of connectivity in spurring the socio-economic development and growth of Bhutan, DANTAK was tasked to construct the pioneering motorable roads in the Kingdom. DANTAK completed the road connecting Samdrup Jongkhar to Trashigang in 1968. In the same year, Thimphu was connected to Phuentsholing by DANTAK. Many Bhutanese had also volunteered to work with DANTAK.

Over the years, DANTAK has met the myriad infrastructure requirements in Bhutan in accordance with the vision of Their Majesties and the aspirations of the people in a symbiotic manner. Some other notable projects executed by the project include the construction of Paro Airport, Yonphula Airfield, Thimphu – Trashigang Highway, Telecommunication & Hydro Power Infrastructure, Sherubtse College, Kanglung and India House Estate.

The medical and education facilities established by DANTAK in far flung areas were often the first in those locations. The food outlets along the road introduced the Bhutanese to Indian delicacies and developed a sweet tooth in them. The famous Takthi Canteen midway between Phuentsholing and Thimphu has been a compulsory stop for travelers.

As DANTAK celebrates six decades in Bhutan, the project reaffirms its commitment to support the march of Bhutan towards realising the dreams of His Majesty Druk Gyalpo, the plans of the Royal Government of Bhutan and aspirations of the people of the kingdom.

https://www.pib.gov.in/PressReleasePage.aspx?PRID=1714170

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Mon, 26 April 2021 5:57PM

भूटान में दंतक परियोजना ने 60 साल पूरे किए

भूटान में दंतक परियोजना अपनी डायमंड जुबली मना रही है। भूटान में भारतीय राजदूत श्रीमती रुचिरा कंबोज ने 24 अप्रैल, 2021 को सिम्टोखा के दंतक स्मारक में एक पुष्पांजलि अर्पित की। भारतीय सैन्य प्रशिक्षण दल (आईएमटीआरएटी) के कमांडेंट मेजर जनरल संजीव चौहान और मुख्य अभियंता दंतक ब्रिग कबीर कश्यप ने भी इस स्मारक पर पुष्पांजलि अर्पित की। यह भारत और भूटान के बीच दोस्ती के बंधन को मजबूत करने में दंतक के कर्मियों द्वारा किए गए बलिदान के लिए एक श्रद्धांजलि थी। याद रहे कि भूटान में महत्वपूर्ण बुनियादी ढाँचे का निर्माण करते समय 1,200 से अधिक दंतक कर्मियों ने अपने जीवन का बलिदान दिया है।

24 अप्रैल, 1961 को भूटान के महामहिम तीसरे राजा और तत्कालीन भारतीय प्रधानमंत्री जवाहर लाल नेहरू के दूरदर्शी नेतृत्व के परिणामस्वरूप प्रोजेक्ट दंतक की स्थापना की गई थी। भूटान के सामाजिक-आर्थिक विकास और तरक्की को प्रभावित करने में कनेक्टिविटी के अत्यधिक महत्व की पहचान करते हुए, दंतक को राज्य में अग्रणी मोटर योग्य सड़कों के निर्माण का काम सौंपा गया था। दंतक ने 1968 में समद्रुप जोंगखर को त्रासीगंग से जोड़ने वाली सड़क को पूरा किया था। उसी वर्ष, थिम्फू को दंतक द्वारा फुंटशोलिंग से जोड़ा गया। कई भूटानियों ने भी स्वेच्छा से काम करना शुरू कर दिया था।

इन वर्षों में दंतक ने भूटान में असंख्य राजसी जरूरतों को पूरा किया है, जो कि वहां की राजशाही की दृष्टि और लोगों की आकांक्षाओं के अनुरूप है। परियोजना द्वारा निष्पादित कुछ अन्य उल्लेखनीय परियोजनाओं में पारो हवाई अड्डे, योनफुला एयरफील्ड, थिम्फू - त्रासीगंग राजमार्ग, दूरसंचार और हाइड्रो पावर इन्फ्रास्ट्रक्चर, शेरुबसे कॉलेज, कांग्लुंग और इंडिया हाउस एस्टेट का निर्माण शामिल है।

दंतक द्वारा सुदूरवर्ती क्षेत्रों में स्थापित चिकित्सा और शिक्षा सुविधाएं उन स्थानों में पहली थीं। सड़क के किनारे भोजन की दुकानों ने भूटानी लोगों को भारतीय व्यंजनों से परिचित कराया और भारतीय भोजन के लिए उनका स्वाद विकसित हुआ। फुंटशोलिंग और थिम्फू के बीच पड़ने वाली प्रसिद्ध तक्थी कैंटीन यात्रियों के लिए एक अनिवार्य पड़ाव बना रहा है।

जैसा कि दंतक भूटान में छह दशक का जश्न मना रहा है, यह परियोजना भूटान के महामहिम ड्रुक ग्यालपो के सपनों को साकार करने की दिशा में भूटान के समर्थन में अपनी प्रतिबद्धता, भूटान की शाही सरकार की योजनाओं और राज्य के लोगों की आकांक्षाओं की पुष्टि करती है।

https://pib.gov.in/PressReleasePage.aspx?PRID=1714201

DNA
DAILY NEWS & ANALYSIS

Tue, 27 April 2021

CDS Gen Bipin Rawat briefs PM Modi on armed forces' readiness in fight against COVID-19

To offer assistance to the healthcare workers of the country, retired or prematurely retired medical personnel are being recalled

Edited By Sheetal Patro

The Chief of Defence Staff (CDS) General Bipin Rawat on Monday met PM Modi and briefed him on the initiatives taken by the armed forces to combat the ongoing COVID-19 pandemic in the country. The efforts are directed to assist the states and civil authorities to function smoothly against the second wave of coronavirus, Rawat said.

Photo: Twitter/@DefencePROPalam

The Air Force is actively undertaking transportation of oxygen and other essentials in India and abroad, which was reviewed by the PM. On Saturday, the Air Force brought four cryogenic oxygen tanks from Singapore to Panagarh in West Bengal. On Monday, the C-17 aircraft of the IAF carried seven empty cryogenic oxygen tanks from Dubai and unloaded them in Panagarh in the evening.

The Indian Navy's mission, 'Oxygen Express' under the Southern Naval Command, is transporting essentials like oxygen cylinders, rapid antigen testing kits to the remote island of Kavaratti, Lakshadweep.

The CDS also told the Prime Minister that to offer assistance to the healthcare workers of the country, retired or prematurely retired medical personnel are being recalled. The personnel will be near a Covid facility close to their current residence. The personnel who have retired earlier also have been asked to be available for consultations through emergency helpline numbers.

The Prime Minister was also informed that all medical officers on staff appointments at Command, Corps, Division, and similar headquarters of Navy and Air Force will be employed at hospitals.

General Rawat informed PM Modi that nursing personnel are being employed in large numbers to compliment the doctors at the hospitals and that oxygen cylinders available with Armed Forces in various establishments will be released for hospitals.

The CDS also said that they are creating medical facilities in large numbers and where possible military medical infrastructure will be made available to civilians.

Comprehensive efforts are being put by the armed forces, along with the Defence PSUs, Ordnance Factory Board, DRDO, and other arms of the Defence Ministry. DRDO has re-opened its Covid-19 facility centre in Delhi. It also has proceeded to open a 500-bed Covid hospital in Patna, a 450-bed hospital in Lucknow, a 750-bed hospital in Varanasi and a 900-bed hospital in Ahmedabad.

https://www.dnaindia.com/india/report-cds-gen-bipin-rawat-briefs-pm-modi-on-armed-forces-readiness-in-fight-against-covid-19-2887965

ThePrint

Tue, 27 April 2021

Army, Navy, Air Force seek emergency financial powers for 3 months to tackle Covid crisis

The proposals from the three armed services are currently under the active consideration of the govt, and a decision is expected shortly

By Amrita Nayak Dutta, Edited by Debalina Dey

New Delhi: The Army, the Navy and the Air Force have sought emergency financial powers from the defence ministry to expedite critical procurement needed to build additional infrastructure to tackle the growing burden of the coronavirus pandemic, ThePrint has learnt.

According to sources in the government, the proposals seeking emergency financial powers for additional infrastructure — such as quarantine facilities and equipping them with stores, ration and other materials — for a period of three months are currently under the active consideration of the government.

A decision on this is expected shortly. The services were granted emergency financial powers last year too.

The Army and other services have been engaged in India's efforts against Covid-19 (representational image) | Photo: ANI

Once approved, the emergency powers could range from delegating full financial powers to providing spending powers of Rs 20 lakh to the heads of different formations of the three services.

For example, last year, Army commanders were sanctioned full financial powers, while corps commanders or area commanders were made eligible to spend Rs 50 lakh, and division commanders or sub-area commanders could spend Rs 20 lakh on Covid-related infrastructural work in their respective jurisdiction.

The development comes after the defence ministry last week sanctioned invoking Schedule 8.1 of Delegation of Financial Powers to Defence Services (DFPDS-2016), which deals with the grant of emergency financial powers to the Armed Forces Medical Service (AFMS) upto 30 September 2021.

Schedule 8.1 of DFPDS-2016 provides for full financial powers to the Director General (DG), Armed Forces Medical Service (AFMS) for procurement of medical items, materials and stores.

In addition, DGs Medical Services in the service headquarters of the Army, Navy and Air Force have also been granted financial powers of Rs 5 crore. At the field level in Commands/Corps, Rs 3 crore will be made available to a Major General-equivalent and another Rs 2 crore to a brigadier-equivalent officer of the AFMS.

These emergency financial powers will also be utilised for providing various services on treatment and management of Covid-19.

In addition, Schedule 2.5 of DFPDS also provides for expenditure upto 5 lakh per day per patient to commandants of Military Hospitals headed by a Lieutenant General.

It will also accord spending powers of Rs 3 lakh and Rs 2 lakh on hospitals headed by Major Generals and Brigadiers. Defence sources told The Print that this schedule is also being used for managing the pandemic.

Tackling a health crisis

According to defence sources, the services have pointed out the exponential rise in Covid cases and thus the requirement of augmenting infrastructure of military hospitals and quarantine facilities with materials, equipment, stores, rations, beds and ambulances, to tackle the health crisis.

This will also include personal protection gear, sanitisation and other medical equipment.

"There was emphasis on how invoking emergency powers will help in better management of the Covid-19 situation and aid repairs and faster procurement of medicines and other medical equipment needed for the pandemic on a real-time mode," a defence source said.

As reported by ThePrint, last year too, the Ministry of Defence had granted emergency financial powers to Army commanders, corps commanders as well as division or sub-area commanders to expedite procurement related to establishing and running quarantine facilities, among other things, for an initial period of three months, which was later extended by three more months.

The powers were later also given to Naval and Air Force commanders and other senior officers of the services.

When are these powers exercised

The emergency powers to the three services enumerated under different schedules of the DFPDS-2016 are exercised as and when the government notifies an event through an order declaring war, hostility, natural calamity or disaster or when the defence minister declares and orders military preparedness for emergency or other immediate military necessities.

It will also be applicable as and when a proposal, mooted by the service chiefs, is approved by the defence minister for immediate action to be taken in case of a series of incidents or when the Army is requisitioned for internal security duties.

Procurement powers under various heads vary and are enhanced in consultation with the Integrated Financial Adviser (IFA), who is from the Controller General of Defence Accounts (CGDA).

On Monday, Chief of Defence Staff General Bipin Rawat met Prime Minister Narendra Modi to review the preparations and operations undertaken by the armed forces to tackle the pandemic.

https://theprint.in/defence/army-navy-air-force-seek-emergency-financial-powers-for-3-months-to-tackle-covid-crisis/646414/

The Indian EXPRESS

Tue, 27 April 2021

India third highest military spender in 2020, states data published by Stockholm International Peace Research Institute

The US spent a total of $778 billion in 2020, China spent $252 billion and India's military expenditure was $72.9 billion. All three countries saw their military spending go up compared to 2019, even during a pandemic year

By Krishn Kaushik

New Delhi: India was the third largest military spender in the world in 2020, behind only the US and China. According to the latest military expenditure database published on Monday by the Stockholm International Peace Research Institute, which tracks military expenditure and arms trade globally, the US accounted for 39 per cent of the money spent on military globally, China accounted for 13 per cent, and India accounted for 3.7 per cent of the globe's share.

The US spent a total of $778 billion in 2020, China spent $252 billion and India's military expenditure was $72.9 billion. All three countries saw their military spending go up compared to 2019, even during a pandemic year.

While India's spending since 2019 grew by 2.1 per cent, the increase for China was more moderate, at 1.9 per cent. The US saw a 4.4 per cent growth over its 2019 expenditure.

The United States' military spending was 3.7 per cent of its GDP while the corresponding numbers for China and India were 1.7 per cent and 2.9 per cent respectively.

From 2011 to 2020, American military expenditure dropped by 10 per cent, but China saw a 76 per cent growth while India's military spending grew by 34 per cent. (File photo)

From 2011 to 2020, American military expenditure dropped by 10 per cent, but China saw a 76 per cent growth while India's military spending grew by 34 per cent.

SIPRI said that military spending in Asia and Oceania "was 2.5 per cent higher in 2020 than in 2019 and 47 per cent higher than in 2011, continuing an uninterrupted upward trend since at least 1989" and attributed the rise "primarily to increases in spending by China and India, which together accounted for 62 per cent of total military expenditure in the region in 2020".

The other top spenders included Russia with $61.7 billion, the UK at $59.2 billion, Saudi Arabia at $57.5 billion, followed by Germany and France at just under $53 billion each.

Releasing the latest data, SIPRI said that the total "global military expenditure rose to $1981 billion last year, an increase of 2.6 per cent in real terms from 2019" and the "five biggest spenders in 2020, which together accounted for 62 per cent of global military expenditure".

It mentioned that the "2.6 per cent increase in world military spending came in a year" when the global GDP shrank by 4.4 per cent (October 2020 projection by the International Monetary Fund), "largely due to the economic impacts of the Covid-19 pandemic".

It added that as a result, "military spending as a share of GDP—the military burden—reached a global average of 2.4 per cent in 2020, up from 2.2 per cent in 2019," which, it said, "was the biggest year-on-year rise in the military burden since the global financial and economic crisis in 2009".

https://indianexpress.com/article/india/india-third-highest-military-spender-in-2020-7290118/

THE HINDU

Tue, 27 April 2021

U.K. aircraft carrier on maiden deployment to Indian Ocean in autumn

Britain will also establish a maritime partnership with India to support mutual security objectives

New Delhi: As part of its Indo-Pacific focus, the U.K.'s aircraft carrier Queen Elizabeth will sail to the Indian Ocean on its maiden operational deployment later this year and will also exercise with the Indian Navy.

"As a representation of the 'Indo-Pacific tilt' in the U.K.'s foreign policy, the HMS Queen Elizabeth Carrier, the largest ship ever built by the Royal Navy, will sail to India, Japan, South Korea, Singapore and the wider region," the British High Commission said in a statement on Monday. "The UK's Carrier Strike Group (CSG) 2021, led by HMS Queen Elizabeth, will sail to India in the autumn on its maiden operational deployment."

The HMS Queen Elizabeth Carrier will conduct a series of joint exercises with Indian military forces in the Indian Ocean.

The ship will conduct a series of joint exercises with Indian military forces in the Indian Ocean, "expanding our interoperability and enhancing our capabilities to defend against shared threats and protect our democratic values," the statement said.

Throughout the deployment, the U.K. will support freedom of passage through vital global trading routes and demonstrate commitment to a recognised international system of norms and behaviours that benefit all countries, it said. "It will also help to establish a maritime partnership with India to support our mutual security objectives in the Indian Ocean."

In a landmark review of its foreign, defence, development and security policy, published last month, the U.K. government committed to "becoming the European country with the broadest, most integrated presence in the Indo-Pacific in support of trade, shared security and values".

The CSG will travel over 26,000 nautical miles from the Mediterranean to the Red Sea, from the Gulf of Aden to the Arabian Sea, and from the Indian Ocean to the Philippine Sea.

Logistics support agreement

As part of deepening defence cooperation, India and the U.K. are close to signing a mutual logistics support agreement while the U.K. has expressed interest in posting a Liaison Officer at the Indian Navy's Information Fusion Centre for Indian Ocean Region (IFC-IOR).

Britain has also offered India collaboration on development of sixth generation fighter technologies and the design of Queen Elizabeth for Indian Navy's proposed second indigenous aircraft carrier which is yet to be approved by the government.

https://www.thehindu.com/news/national/uk-aircraft-carrier-on-maiden-deployment-to-indian-ocean-in-autumn/article34415345.ece

Tue, 27 April 2021

China is planning on building a defence system for Near-Earth Asteroids

China has made space exploration a top priority in recent years, aiming to establish a programme operating thousands of space flights a year and carrying tens of thousands of tonnes of cargo and passengers by 2045

China will hold discussions on building a defence system against near-Earth asteroids, a senior space agency official said on Saturday, as the country steps up its longer-term space ambitions. Zhang Kejian, head of the China National Space Administration, did not provide further detail in his opening remarks at a ceremony for China's space day in the eastern city of Nanjing.

China has made space exploration a top priority in recent years, aiming to establish a programme operating thousands of space flights a year and carrying tens of thousands of tonnes of cargo and passengers by 2045.

Representative image.

The European Space Agency last year signed a deal worth 129 million euros ($156 million) to build a spacecraft for a joint project with NASA examining how to deflect an asteroid heading for Earth.

China is pushing forward a mission where one space probe will land on a near-Earth asteroid to collect samples, fly back toward Earth to release a capsule containing the samples, and then orbit another comet, the official Xinhua news agency reported, citing Ye Peijian, an academic at the Chinese Academy of Sciences.

The mission could take about a decade to complete, Ye said.

China and Russia signed a memorandum of understanding last month to set up an international lunar research station.

https://www.news18.com/news/buzz/china-is-planning-on-building-a-defence-system-for-near-earth-asteroids-3678746.html

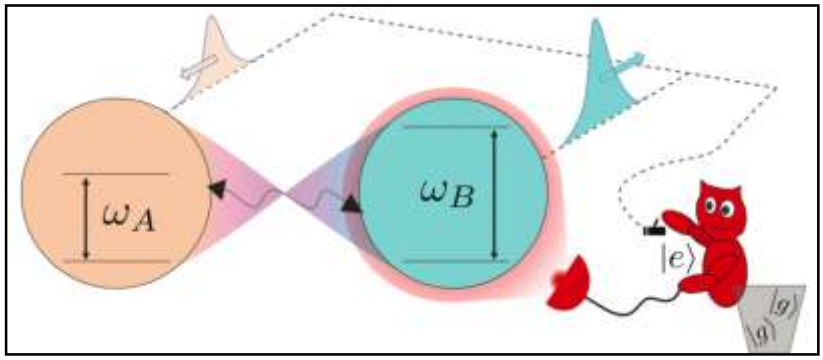
PHYS.ORG

Tue, 27 April 2021

A two-qubit engine powered by entanglement and local measurements

By Ingrid Fadelli

Researchers at Institut Néel-CNRS, University of Saint Louis and University of Rochester recently realized a two-qubit engine fueled by entanglement and local measurements. This engine's unique design, outlined in a paper published in *Physical Review Letters*, could open up exciting possibilities for thermodynamics research and inform the development of new quantum technologies.



Credit: Bresque et al.

"Our paper is based on a very simple and deep effect of quantum mechanics: Measuring a quantum system disturbs the system, i.e., changes its state in a random way," Alexia Auffèves, one of the researchers who carried out the study, told *Phys.org*. "As an immediate consequence, the measuring device provides both energy and entropy to the quantum system, playing a role similar to a hot source fueling a thermal engine. The noticeable difference is that here, the fuel is not thermal, but quantum."

A few years ago, Auffèves and some of her colleagues at Institut Néel-CNRS introduced the proof of concept for a measurement-fueled engine based on a single qubit. This was the first of a series of proposals that revealed the energetic counterpart of measurement devices.

So far, measurement processes were typically modeled using classical theoretical approaches. In their new paper, the researchers took a bold step forward by opening 'the black box' of measuring devices and looking at it from a quantum physics perspective.

"We specifically considered the creation of quantum correlations between the system to measure and a 'quantum meter,'" Auffeves said. "We tracked the energy and entropy flows along this process, unveiling the microscopic origin of the measurement fuel. This was the most important objective of our work."

In their study, Auffeves and her colleagues thus focused on so-called 'composite systems." Their analysis ultimately led to the design of a measurement-powered engine based on entangled qubits. In addition to local measurements, this engine is fueled by a physical phenomenon known as quantum entanglement. Entanglement occurs when a set of particles interact or remain connected such that the actions performed by one affect the other, even if there is a significant distance between them.

The new engine proposed by the researchers has two qubits. A qubit is a quantum system with two energy states: the ground state |0> and the excited state |1>,

"When a qubit is measured in |1>, one can deterministically extract a quantum of energy from it, dubbed a photon," Auffèves said. "When the photon is released, the qubit is back to |0> by energy

conservation. Respectively, when the qubit is in |0>, one can provide one photon to excite it in the |1> state."

Auffèves and her colleagues played with two qubits of different colors: a red one and a blue one. The red qubit exchanges red photons, while the blue one exchanges blue photons. Notably, the red qubit carries less energy than the blue qubit.

The protocol used by the researchers initially provides a red photon to the red qubit, preparing $|1_a>$ while the blue qubit is $|0_b>$. Subsequently, the qubits interact by exchanging photons with each other, becoming entangled.

"We then measured the blue qubit," Auffeves said. "If it is measured in $|0_b>$ we are back to the initial state, and the process restarts. If it is measured in $|1_b>$ a blue photon can be extracted. Since blue photons are more energetic than red ones, one gains energy from the process on average. As we show and analyze, this energy comes from the measuring device."

The measurement-powered engine proposed by Auffèves and her colleagues relies on a composite working substance, and entanglement plays a crucial role in its fueling mechanism. The researchers were able to carry out a quantitative assessment of the two physical resources brought by quantum measurement, namely information and fuel. In addition, they examined the effects of these resources on the engine's performance.

"Our findings provide new insights into the fundamental energetic resources at play when a quantum system is measured, or equivalently, when quantum correlations are created between a quantum system and a quantum meter," Auffèves said. "Originally, these results are valid in the absence of a well-defined temperature as the only considered source of noise is measurement itself."

Auffèves and her colleagues were among the first to extend measurement-powered engines to composite working substances and to offer a microscopic interpretation of the fueling mechanism. Their findings could help to extend concepts related to thermodynamics to quantum sources of noise, such as those that can appear inside a cryostat.

In the future, the researchers' work could inspire other teams to realize similar engines. In addition, their study could open up an entirely new field of research, which they suggest could be called "quantum energetics."

"Our results shed new light on the measurement postulate in quantum mechanics," Auffèves said. "Since this mechanism still feeds fundamental debates, one can hope that quantum energetics provides new measurable quantities to distinguish between the various interpretations of quantum mechanics. On a more applied side, the energetic footprints of quantum measurement and entanglement will have an impact on the energy cost of quantum technologies and their potential for scalability."

More information: Two-qubit engine fueled by entanglement and local measurements. *Physical Review Letters*(2021). DOI: 10.1103/PhysRevLett.126.120605

Journal information: *Physical Review Letters*

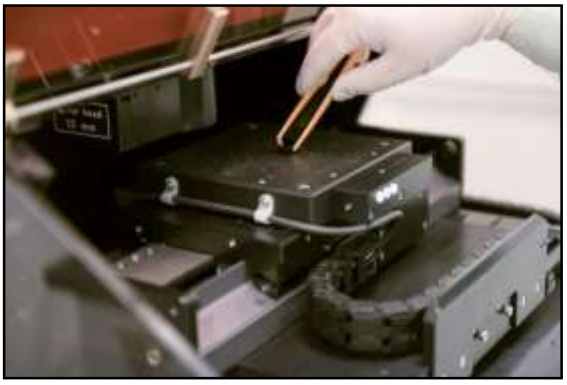
https://phys.org/news/2021-04-two-qubit-powered-entanglement-local.html

PHYS.ORG

Tue, 27 April 2021

Experimental proof for Zeeman spin-orbit coupling in antiferromagnetics

A NUST MISIS professor was part of an international research team that has found evidence for the existence of the Zeeman spin-orbit coupling in antiferromagnetic conductors. This work may pave the way for the next generation of electronics. The study was published in *npj Quantum Materials*.



Laboratory equipment at the NUST MISIS Department of Theoretical Physics and Quantum Technologies Credit: Sergey Gnuskov/NUST MISIS

The electron possesses two fundamental properties: charge and spin. Conventional electronic devices use only the charge of the electron for information processing. In recent years, an enormous research effort has been focused on building fundamentally new electronic devices (often called 'spintronic devices') that would specifically exploit spin properties in addition to charge degrees of freedom. Transfer from conventional electronics to spintronics technology opens the possibilities to construct devices with high storage density and fast operation. The two-component nature of spin-based systems makes them potentially applicable for quantum computing.

Current effort in designing spintronic devices is focusing on understanding and making use of spin-orbit coupling, an interaction between the orbital angular momentum and the spin angular momentum of an individual particle, such as an electron. However, spin-orbit coupling occurring in many compounds is often weak or its emergence requires the use of heavy components. One way to overcome spin-orbit coupling related challenges could be the use of antiferromagnetics. A spin-orbit coupling of an unusual nature, termed Zeeman spin-orbit coupling is expected to manifest itself in a wide range of ferromagnetic conductors. Being proportional to the applied magnetic field, the coupling is tunable. Yet, experimental proof of this phenomenon has been lacking.

The collaboration of a NUST MISIS physicist with colleagues from Germany, France and Japan produced, for the first time, experimental evidence of Zeeman spin-orbit coupling in two very different layered conductors: an organic antiferromagnetic superconductor, and a prominent electron-doped superconductor that belongs to the family of high-temperature cuprate superconducting materials. Obtained on two very different materials, the results of this work demonstrate the generic nature of the Zeeman spin—orbit coupling. In addition to its fundamental importance, the Zeeman spin-orbit coupling opens new possibilities for spin manipulation, much sought after in the current effort to harness electron spin for future spintronic applications.

"The Zeeman spin-orbit coupling can be significantly stronger than other known kinds of spin-orbit coupling, thus providing new avenues for the development of fundamentally new electronic devices", noted Pavel Grigoriev, Professor at the NUST MISIS Department of Theoretical Physics and Quantum Technologies, senior researcher at Landau Institute for Theoretical Physics.

More information: R. Ramazashvili et al, Experimental evidence for Zeeman spin–orbit coupling in layered antiferromagnetic conductors, *npj Quantum Materials* (2021). DOI: 10.1038/s41535-021-00309-6

https://phys.org/news/2021-04-experimental-proof-zeeman-spin-orbit-coupling.html

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Tue, 27 April 2021

Researchers complete high-precision time-frequency dissemination

Prof. Pan Jianwei and his colleagues from the University of Science and Technology of China of the Chinese Academy of Sciences investigated the high-loss free space, high-precision time-frequency dissemination between remote locations, simulating high-precision time-frequency high-orbit satellite-ground links in the channel loss, atmospheric noise, and transmission delay effects.

This link experiment exhibits that the instability of the time-frequency transfer via a satellite in middle-high earth orbits might reach 10^{-18} at 10,000 s, enabling the potential performance of optical atomic clocks and intercontinental comparison of ground clocks. The study was published in the journal *Optica*.

Credit: Pixabay/CC0 Public Domain

High-precision time-frequency dissemination and comparison techniques apply in all kinds of large-scale precision measurement systems. At present, the international metrology standard systems are at the quantization stage. The frequency standard is at the core of the precision measurement and international metrology systems. Other basic physical quantities except for the amount of matter (mol) are directly or indirectly traced to the frequency. On the other hand, the novel optical frequency standard technologies develop rapidly, whose accuracy is two orders of magnitude better than that of the original second definition frequency standard.

The most important part of the technical roadmap of the change of the second definition is to set the intercontinental time-frequency comparison with the optical frequency standard at the 10^{-18} level. To have an ultra-long-distance high-precision time-frequency comparison or dissemination is an unsolved problem, while the satellite-ground link is recognized as the most feasible solution.

In this study, the researchers used a dual-comb linear optical sampling time measurement method. Compared to the continuous-wave or the single-photon link method, this complex link has the advantage of the high time resolution and the large ambiguous range.

The researchers first comprehensively analyzed parameters such as satellite-ground link loss, Doppler effect, link time asymmetry, and atmosphere noise, and found that high-orbit links enable more stable time-frequency comparison or dissemination by taking advantage of the long duration, a large common view range, and the lower relativistic effects.

Then, they performed a high-orbit satellite-ground time-frequency transmission experiment to simulate links with the link loss, atmosphere noise, and delay effects.

Through low-noise optical comb amplification, low-loss high-stability dual-comb interference optical path, and high-precision high-sensitivity linear sampling, the researchers built a 16-kilometer horizontal atmospheric free space and high-precision dual-comb time-frequency transmission link in Shanghai. The frequency transmission link realized an instability of $4\ 10^{-18}$ at 3,000 s with an average loss of 72 dB and a 1 s link delay.

Based on these results, they expected that the instability of the time-frequency transfer via a high-orbit satellite-ground link might reach 10^{-18} at 10,000 s.

More information: Qi Shen et al, Experimental simulation of time and frequency transfer via an optical satellite–ground link at 10^{-18} instability, *Optica* (2021). DOI: 10.1364/OPTICA.413114

Journal information: *Optica*

https://phys.org/news/2021-04-high-precision-time-frequency-dissemination.html

THE SWADDLE

Tue, 27 April 2021

Healthy gums may limit risk of severe Covid19 infection, Research Suggests

By Devrupa Rakshit

Maintaining good oral hygiene may help people protect themselves from severe Covid19 infections, according to two different studies published this year; suggesting the simple practice of taking care of one's teeth and gums could be potentially life-saving.

The studies, both peer-reviewed, found links between periodontitis, a gum disease often caused by poor oral hygiene, and severe Covid19 infections. Periodontitis, a form of infection caused by bacteria, can cause gums to pull away from their teeth, leaving behind small, exposed areas between them, where the gums should ideally have been. This resulting inflammation determines the extent to which a Covid19 patient is affected, a study published this month in the *Journal of Oral Medicine and Dental Research* shows.

An international team of researchers from the U.S., the U.K., and South Africa found that the coronavirus is present in high concentrations in the saliva of Covid19 patients. Due to infected gums that have begun pulling away from one's teeth, the coronavirus infection can enter the individual's bloodstream and make its way to the lungs — even before the airways are affected by the virus. And this can significantly determine how much and how severe of a hold the novel coronavirus has on the individual.

"Gum disease makes the gums leakier, allowing microorganisms [and viruses] to enter into the blood," Iain Chapple, professor of periodontology at the University of Birmingham in the U.K., who co-authored this study, told the press. Another study, published in February in the *Journal of Clinical Periodontology*, found that individuals suffering from periodontitis were more than three times as likely to require hospitalization, more than four times likelier to need ventilation, and the worst — almost nine times more likely to die of Covid19.

"In patients with severe cases of Covid19, the virus causes an inflammatory response that can lead to complications such as being intubated or even death. Our research shows that periodontitis can [exacerbate] this," Wenji Cai, a trained dentist pursuing her Ph.D. at the McGill University in Canada, who also co-authored the February study, said in a statement.

But how does periodontitis, a bacterial infection, exacerbate Covid19, a viral infection? Cai's colleague breaks it down as follows: "What we suspect is happening is that upon Covid19 infection, periodontal patients start the course of the disease with an already high level of inflammation in their bodies… This puts the patients at a disadvantage… rendering them more susceptible to the severe outcomes of the disease," Faleh Tamimi, an assistant professor in the Faculty of Dentistry at McGill University, who was also involved in the study, explained.

It is important to note both the studies established a *correlation* between periodontitis and severe Covid19 infections, and not a *causation*. While scientists continue to investigate the link further, it may be time to put common knowledge to use to prevent a serious Covid19 infection — especially given the dynamic, worsening trajectory of Covid19 within and outside India.

"Daily oral hygiene and plaque control will not only improve oral health and well-being," Iain Chapple says, "but could also be life-saving in the context of the pandemic."

https://theswaddle.com/healthy-gums-may-limit-risk-of-severe-covid19-infection-research-suggests/