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INDIA TODAY

Wed, 08 Sept 2021

Anti-drone plan: How India is strengthening its unmanned warfare power

The drone attack on the Jammu Air Force station on June 27 was a rude wake-up call for India to enhance its anti-drone capabilities

By Abhishek Bhalla

New Delhi: The drone attack on the Jammu air force station on June 27 was a rude wake-up call for India to enhance its anti-drone capabilities. The strike was a wake-up call to the lurking danger.

This was a glimpse of future warfare that can cause maximum damage without using much manpower.

Representative image | Anti-drone plan: How India is strengthening its unmanned warfare power.

The attack was followed by a series of drones being neutralised at the borders. It was time to take a relook at the existing options and enhance measures for combating unmanned warfare.

The security establishment has put in place a plan for this, and without further delays, platforms are being procured to take on the menace of drone attacks.

In a series of orders, the armed forces have given out contracts to Indian companies in line with the self-reliance mantra anti-drone platforms—Counter Unmanned Aircraft Systems (CUAS).

The armed forces have ordered Indian-made anti-drone systems worth over Rs 300 crores in a short span, and more contracts are awaited.

The systems being developed and given to the forces have both soft and hard kill capabilities. Soft kill refers to jamming the incoming drone rendering it ineffective, while a hard kill destroys the drone with a direct hit.

The latest among the recent contracts is the Indian Air Force placing an order worth Rs 155 crore for anti-drone platforms or counter-unmanned aircraft systems.

The contract has been bagged by Hyderabad-based Zen Technologies that will supply the systems within a year.

The IAF's contract comes soon after the Indian Navy inked an agreement with Bharat Electronics Limited (BEL) for India's indigenous Naval Anti Drone System (NADS).

The Naval Anti Drone System can instantly detect and jam micro drones. It uses a laser-based kill mechanism to terminate targets.

The anti-drone system was first deployed to provide security cover for the Republic Day Parade this year and later during the Prime Minister's Independence Day address to the Nation from the ramparts of the Red Fort. The system offers 360-degree coverage and was also deployed in

Ahmedabad for the Modi-Trump roadshow. The system comes in two versions—mobile and static and both platforms will be available with the Indian Navy to secure its onshore installations.

This will be deployed for all critical assets, including the Navy's airfields that have air assets.

With the help of radar, electro-optical/infrared sensors and radiofrequency detectors, the drones can be detected and jammed.

The anti-drone technology system developed by DRDO provides both 'soft kill' and 'hard kill' options to the Indian Armed Forces to tackle fast-emerging aerial threats.

Looking at the future, the Air Force wants 10 anti-drone systems armed with laser-directed energy weapons to bring down rogue drones. The Request for Information for this was issued a day after the attack on the Jammu air force station where unmanned aerial vehicles were used to drop bombs.

While the DRDO has developed an anti-drone technology to detect, intercept and shoot down drones, there are options from the private industry as well Hyderabad-based Grene Robotics says it has developed India's drone dome 'Indrajaal' that can guard against drone threats.

After the Indian Navy and the Indian Air Force, other security agencies are also looking at immediately procuring the indigenous anti-drone capabilities without further delays.

https://www.indiatoday.in/india/story/anti-drone-plan-india-is-strengthening-its-unmanned-warfare-power-1850285-2021-09-07

TheDefensePost

Wed, 08 Sept 2021

India, US to Co-Develop Air-Launched Drones

By Inder Singh Bisht

India and the US have signed a $22 million agreement to co-develop Air-launched Unmanned Aerial Vehicles (ALUAV).

Artist's concept of LongShot UAV. Image: DARPA

The project, to be carried out by the US Air Force Research Lab (AFRL) and India's Defence Research and Development Organisation (DRDO), aims to develop "small UAVs, avionics, payload power, propulsion, and launch systems through prototyping" for the Indian and US air forces.

The cost of the project will be shared equally by the two countries.

Conceptualized in 2006

According to the Indian ministry of defense, the project stems from a 2006 agreement between the two countries to co-develop defense equipment.

Under the agreement, renewed in 2015, "joint working groups (JWG) on land, naval, air, and aircraft carrier technologies have been established to focus on mutually agreed projects in respective domains." The JWG on-air systems will oversee the ALUAV project.

Deputy Undersecretary of the US Air Force, International Affairs, Kelli L. Seybolt, said: "The United States and India share a common vision of a free and open Indo-Pacific."

"This co-development agreement further operationalizes India's status as a Major Defense Partner and builds upon our existing strong defense cooperation."

India: Major Defense Partner

In 2016, the US designated India as a Major Defense Partner and two years later elevated the country to Strategic Trade Authorization Tier 1 status, "which allows India to receive license-free access to a wide range of military and dual-use technologies regulated by the Department of Commerce."

Since then, the two nations have signed some key defense and security pacts, including the Logistics Exchange Memorandum of Agreement in 2016, the Communications Compatibility and Security Agreement in 2018, and the Basic Exchange and Cooperation Agreement last year.

https://www.thedefensepost.com/2021/09/07/india-us-co-develop-drones/

Wed, 08 Sept 2021

India to produce BrahMos-NG cruise missile

According to information published by Tass on September 7, 2021, a new generation of the BrahMos cruise missile (BrahMos-NG) will be produced at a plant near Lucknow (Uttar Pradesh, India), Indian Defense Minister Rajnath Singh told during his business visit to the region.

BrahMos-NG cruise missile at India's Defexpo 2016 exhibition (Picture source: Navy Recognition)

The BrahMos-NG cruise missile is planned to complete its trials in 2023.

BrahMos is a supersonic cruise missile produced by BrahMos Aerospace Russian-Indian joint venture. It was designed by the Russian NPO mashinostroeniya (a subsidiary of the Tactical Missiles Corporation, KTRV) and Indian DRDO. The first test launch took place in 2001. The Indian Air Force, Navy and Ground Forces are armed with BrahMos.

Two new Project 11356 Talwar-class frigates being built at the Goa Shipyard Limited plant under Russian license are planned to be armed with the BrahMos.

The Brahmos missile has flight range of up to 290-km with supersonic speed all through the flight, leading to shorter flight time, consequently ensuring lower dispersion of targets, quicker engagement time and non-interception by any known weapon system in the world. It operates on the 'Fire and Forget Principle', adopting varieties of flights on its way to the target. Its destructive power is enhanced due to large kinetic energy on impact. Its cruising altitude could be up to 15 km and terminal altitude is as low as 10 meters. The missile carries a conventional warhead weighing 200 to 300 kg.

BrahMos-NG (Next Generation) is a mini version based on the existing BrahMos, will have same 290 km range and mach 3.5 speed but it will weigh around 1.5 tons, 5 metres in length and 50 cm in diameter, making BrahMos-NG 50 percent lighter and three metres shorter than its predecessor.

The Talwar-class frigates or Project 11356 are a class of stealth guided missile frigates designed and built by Russia for the Indian Navy. The Talwar-class guided missile frigates are the improved versions of the Krivak III-class (Project 1135) frigates used by the Russian Coast Guard. The design has been further developed as the Admiral Grigorovich-class frigate for the Russian Navy. Six ships were built in two batches between 1999 and 2013.

https://www.navyrecognition.com/index.php/naval-news/naval-news-archive/2021/september/10669-india-to-produce-brahmos-ng-cruise-missile.html

The Dispatch

Wed, 08 Sept 2021

Lack of military-civil cooperation framework impeding innovation in space tech: IAF Vice Chief

The lack of robust "military-civil fusion"-like framework is preventing us from innovating and manufacturing next-generation space technologies on a large scale, he said, adding there is a need for a concerted focus on this regard

New Delhi: The lack of framework for cooperation between military and civilian entities is preventing India from innovating and manufacturing next-generation space technology on a large scale, Air Marshal Vivek Ram Chaudhari said on Tuesday.

"In our context, the Indian space eco system — at present being largely civilian in nature — works around the Space Commission and its constituent Department of Space," said the Vice Chief of the Indian Air Force (IAF) at an event of industry body FICCI.

The lack of robust "military-civil fusion"-like framework is preventing us from innovating and manufacturing next-generation space technologies on a large scale, he said, adding there is a need for a concerted focus on this regard.

According to the US State Department, "military-civil fusion" or MC is an aggressive, national strategy of the Chinese Communist Party (CCP) with a goal to enable China to develop the most technologically advanced military in the world.

A key part of MCF is the elimination of barriers between China's civilian research and commercial sectors, and its military and defense industrial sectors, stated the US State Department.

Chaudhari said India, at present, does not have indigenous capability to observe, track and identify non-cooperative objects in outer space.

"This not only restricts out defensive counter-space capabilities but also limit our anti-satellite capability in future," he mentioned.

Therefore, space situational awareness is the need of the hour and we should be able to know hostile manoeuvres by adversaries' space objects, he stated.

"The existing capabilities of the ISRO (Indian Space Research Organisation) and the DRDO (Defence Research and Development Organisation) would need to be integrated into the air surveillance picture of the IAF. This integration would be a gradual progression to a comprehensive space surveillance network," he noted.

In India's context, another key focus area should be supplementing our ground-based ballistic missile architecture by creating space-based ballistic missile defence capabilities, Chaudhari mentioned.

"It should enable early warning detection and destruction of ICBMs (intercontinental ballistic missiles) along with location for launch pads and prediction of impact points," he said.

Another changing paradigm in the space application is the growing ubiquity of low-earth orbit satellites or LEO satellites, particularly in domains which were historically done purely by geo-synchronous satellites, he said.

An example is Starlink satellite network launched by SpaceX that provides low latency broadband internet to consumers across the globe, he said.

"While traditional communication satellites with geo-synchronous orbits have proved their worth due to longer service life and wide coverage area, communication satellites in lower and medium earth orbits have their own advantages," he noted.

The disadvantage of requirement of large number of satellites can be mitigated by faster communication and lower vulnerability when compared to existing geo-synchronous satellites, he added.

"We are entering a proliferated low earth orbit with multiple commercial players entering this segment. With time, the technology will rapidly evolve thereby reducing the manufacturing and launching costs which would favour the shift towards this concept," he stated.

I can see that in the near future, this would become the key area of cooperation between the military and the commercial entities, he said.

Chaudhari said on Tuesday that the Defence Space Agency (DSA), which is the lead agency for aggregating the demands of the armed forces in India, could play a key role in synergising the military-civil space cooperation to achieve the desired capabilities.

"This would made increased interplay between both government and commercial space agencies," he mentioned.

https://www.thedispatch.in/lack-of-military-civil-cooperation-framework-impeding-innovation-in-space-tech-iaf-vice-chief/

DRDO on Twitter

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Tue, 07 Sept 2021 3:29PM

Raksha Mantri Shri Rajnath Singh approves delegation of financial powers to armed forces for revenue procurement

Terms it as Government's another big step in defence reforms to strengthen security infrastructure

Key Highlights of DFPDS 2021:

- ***Financial powers devolved to field formations; focus on operational preparedness; promote ease of doing business & jointness among Services***
- ***Two times general enhancement for Competent Financial Authorities; Up to 5-10 times at field formations in certain Schedules***
- ***10% increase in Delegated Financial Powers of Vice Chiefs of Services***
- ***Up to three times increase in Schedules related to Indigenisation/R&D to achieve 'Atmanirbhar Bharat'***
- ***Enabling provision of Emergency Financial Powers to Field formations below Command level for Defence Services incorporated in Emergency Powers Schedule for ops immediate military necessities***

Raksha Mantri Shri Rajnath Singh released in New Delhi on September 07, 2021 order on Delegation of Financial Powers to Defence Services (DFPDS) 2021, providing enhanced delegation of Revenue Procurement powers to the Armed Forces. The DFPDS 2021 aims to empower field formations; focus on operational preparedness; promote ease of doing business and enhance jointness among the Services.

The enhanced delegation of Financial Powers to functionaries in Service Headquarters and lower formations would result in quicker decision making at all levels leading to better planning and operational preparedness of the Services in a quicker time frame and optimum utilisation of resources.

The primary focus of the enhanced delegation of financial powers is to empower Field Commanders and below to procure equipment/war-like stores in a speedy manner for urgent operational necessities and meeting essential sustenance requirements. Last such enhancement at all levels for the Defence Services was done in 2016.

Speaking on the occasion, the Raksha Mantri described DFPDS 2021 as another big step in the series of defence reforms being undertaken by the Government to strengthen the security infrastructure of the country. He stressed on the need to revise the policies to cater to the needs of

the Armed Forces, exuding confidence DFPDS 2021 will not only overcome procedural delays, but also bring about greater decentralisation and operational efficiency.

The Raksha Mantri reiterated the Government's resolve to make the security system of the country strong and 'Aatmanirbhar' in every way. Calling for optimum use of resources, he exhorted all the stakeholders to cooperate in realising the vision of the Government.

In his introductory remarks, Financial Advisor (Defence Services) Shri Sanjiv Mittal expressed confidence that DFPDS 2021 will provide enhanced impetus towards ease of doing business right up to the grassroots level and facilitate greater decentralisation through enhanced devolution of delegated financial powers. He said it will accord greater efficiency in attaining operational preparedness of the Defence Services. He added that DFPDS 2021 was a result of wide-ranging deliberations by the Services under the aegis of Department of Military Affairs and Department of Defence.

The DFPDS 2021 consists of guidelines related to the following Schedules of Financial Powers:

- Army Schedules of Powers-2021 (ASP-2021)
- Navy Schedules of Powers-2021 (NSP-2021)
- Air Force Schedules of Powers-2021 (AFSP- 2021)
- IDS Schedules of Powers-2021 (ISP-2021)

A general enhancement of up to two times has been approved for the Competent Financial Authorities (CFAs). In certain Schedules, this enhancement at field formations is in the range of up to 5-10 times on account of operational requirements. Delegated Financial Powers of Vice Chiefs of the Services have been increased by 10 per cent, subject to an overall ceiling of Rs 500 crore. Financial Powers of Chief of Integrated Defence Staff to the Chairman Chiefs Of Staff Committee (CISC) as CFA has been enhanced substantially and aligned with that of the Vice Chiefs of the Services.

New CFAs have been added viz. Deputy Chief of Army Staff, Master General Sustenance, ADG (Procurement)/DG Air Operations/DG Naval Operations etc. in Service Headquarters and in the field formations on account of reorganisation/restructuring/functional requirements.

An enabling provision of Emergency Financial Powers to the Field formations below Command level for the Defence Services has now been incorporated in the Emergency Powers Schedule which till present was available to Vice Chiefs and C-in-Cs/equivalent.

New Schedules for Field Commanders Special Financial Powers to meet Strategic/Operational requirements, in line with the existing Army Schedule on 'Army Commanders Special Financial Powers' have been introduced for Navy and Air Force.

Substantial enhancement has been approved in the Schedules related to Indigenisation/Research & Development up to three times of the existing powers, in line with 'Atmanirbhar Bharat' envisioned by Prime Minister Shri Narendra Modi.

A new schedule on hiring of aircraft and associated equipment has been introduced for Indian Air Force which includes hiring of Air to Air re-fuellers. For Indian Navy, powers for replenishment of Disaster Management Bricks have been delegated to Command Level for immediate response to Natural Disasters/HADR Operations.

Clarifications or interpretation of provisions will be addressed by an Empowered Committee headed by AS&FA, Ministry of Defence with representatives of Department of Defence (DoD)/Department of Military Affairs (DMA).

A system of oversight, disclosure and internal audit mechanism will be put in place by the administrative wing of DoD/DMA in consultation with MoD (Finance). Substantial delegation has also been approved for non procurement powers.

Chief of Defence Staff General Bipin Rawat, Chief of Naval Staff Admiral Karambir Singh, Defence Secretary Dr Ajay Kumar and other senior civil & military officials of Ministry of Defence were present on the occasion.

https://pib.gov.in/PressReleasePage.aspx?PRID=1752820

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 07 Sept 2021 3:29PM

रक्षा मंत्री श्री राजनाथ सिंह ने सशस्त्र बलों को राजस्व प्रबंधन के लिए वित्तीय अधिकार सौंपने की स्वीकृति प्रदान की

इसे सुरक्षा बुनियादी ढांचे को मजबूत बनाने के लिए मौजूदा रक्षा सुधारों में सरकार का एक और महत्वपूर्ण कदम करार दिया है

डीएफपीडीएस 2021 के मुख्य बिंदु:

- ***वित्तीय शक्तियां क्षेत्रीय टुकड़ियों को हस्तांतरित; परिचालन तैयारियों पर विशेष ध्यान; व्यावसायिक गतिविधियों में आसानी व सेवाओं के बीच संयुक्तता को बढ़ावा देने पर जोर***
- ***सक्षम वित्तीय प्राधिकारियों के लिए दो गुना सामान्य वृद्धि; कुछ अनुसूचियों में क्षेत्रीय टुकड़ियों पर 5 से 10 गुना तक***
- ***सेवाओं के उप प्रमुखों की प्रदत्त वित्तीय शक्तियों में 10% की बढ़ोतरी***
- ***'आत्मनिर्भर भारत' के लक्ष्य को प्राप्त करने के लिए स्वदेशीकरण/अनुसंधान एवं विकास से संबंधित कार्यक्रमों में तीन गुना तक की वृद्धि***
- ***तात्कालिक सैन्य आवश्यकताओं के संचालन के वास्ते आपातकालीन शक्तियों की अनुसूची में शामिल रक्षा सेवाओं हेतु कमांड स्तर से नीचे की क्षेत्रीय टुकड़ियों को आकस्मिक वित्तीय शक्तियों के प्रावधान के लिए सक्षम बनाना***

रक्षा मंत्री श्री राजनाथ सिंह ने 07 सितंबर 2021 को नई दिल्ली में रक्षा सेवाओं (डीएफपीडीएस) 2021 को वित्तीय शक्तियों के इस्तेमाल से संबंधित आदेश जारी किया, जो सशस्त्र बलों को राजस्व अधिप्राप्ति शक्तियों के मामले में बढ़े हुए अधिकार प्रदान करता है। डीएफपीडीएस 2021 का उद्देश्य क्षेत्रीय टुकड़ियों को सशक्त बनाना; परिचालन तैयारियों पर विशेष ध्यान देना और व्यावसायिक गतिविधियों में आसानी व सेवाओं के बीच संयुक्तता को बढ़ावा देना है।

सेवा मुख्यालयों और निचले कार्यालयों में अधिकारियों के लिए वित्तीय शक्तियों का दायरा बढ़ जाने से सभी स्तरों पर त्वरित निर्णय लेने में आसानी होगी, जिससे सेवाओं की बेहतर योजना और संचालन की तैयारी तेज समय सीमा में होगी तथा संसाधनों का अधिकतम उपयोग होगा।

वित्तीय शक्तियों के बढ़ाये हुए प्राधिकारों का प्राथमिक लक्ष्य फील्ड कमांडरों और उससे नीचे के स्तर पर तात्कालिक परिचालन आवश्यकताओं तथा जरूरी भरण-पोषण की आवश्यकताओं को पूरा करने के लिए उपकरण / वॉर लाइक स्टोर की खरीद हेतु सशक्त बनाना है। रक्षा सेवाओं के लिए सभी स्तरों पर इस तरह की अंतिम वृद्धि 2016 में की गई थी।

इस अवसर पर अपने संबोधन में रक्षा मंत्री ने डीएफपीडीएस 2021 को देश के सुरक्षा ढांचे को मजबूत करने के लिए सरकार द्वारा किए जा रहे रक्षा सुधारों की श्रृंखला में एक और महत्वपूर्ण कदम बताया।

उन्होंने सशस्त्र बलों की जरूरतों को पूरा करने के लिए नीतियों को संशोधित करने की आवश्यकता पर बल दिया और विश्वास व्यक्त करते हुए कहा कि डीएफपीडीएस 2021 न केवल प्रक्रियात्मक अवरोधों को दूर करेगा, बल्कि अधिक विकेंद्रीकरण तथा परिचालन दक्षता भी लाएगा।

रक्षा मंत्री ने इस अवसर पर देश की सुरक्षा व्यवस्था को हर तरह से मजबूत और 'आत्मनिर्भर' बनाने के सरकार के संकल्प को दोहराया। संसाधनों के अधिकतम उपयोग का आह्वान करते हुए उन्होंने सभी हितधारकों से सरकार के दृष्टिकोण को साकार बनाने में सहयोग करने का आग्रह किया।

वित्तीय सलाहकार (रक्षा सेवा) श्री संजीव मित्तल ने अपनी आरंभिक टिप्पणी में विश्वास व्यक्त किया कि डीएफपीडीएस 2021 से जमीनी स्तर तक व्यावसायिक गतिविधियों में अधिक प्रोत्साहन मिलेगा और प्रत्यायोजित वित्तीय शक्तियों के संवर्धित हस्तांतरण के माध्यम से अधिक विकेंद्रीकरण की सुविधा मिलेगी। उन्होंने कहा कि इससे रक्षा सेवाओं की परिचालन तैयारियों को प्राप्त करने में अधिक दक्षता भी प्राप्त होगी। श्री मित्तल ने कहा कि डीएफपीडीएस 2021 सैन्य मामलों के विभाग और रक्षा विभाग के तत्वावधान में विभिन्न सर्विसेस द्वारा व्यापक विचार-विमर्श का ही परिणाम है।

डीएफपीडीएस 2021 में वित्तीय शक्तियों की निम्नलिखित अनुसूचियों से संबंधित दिशानिर्देश शामिल हैं:

- सेना अधिकार अनुसूचियां -2021 (एएसपी-2021)
- नौसेना अधिकार अनुसूचियां -2021 (एनएसपी-2021)
- वायु सेना अधिकार अनुसूचियां -2021 (एएफएसपी-2021)
- आईडीएस अधिकार अनुसूचियां -2021 (आईएसपी-2021)

सक्षम वित्तीय प्राधिकरणों (सीएफए) के लिए दो गुना तक की सामान्य वृद्धि को मंजूरी दी गई है। कुछ अनुसूचियों में, क्षेत्रीय टुकड़ियों में यह वृद्धि परिचालन आवश्यकताओं के कारण 5 से 10 गुना तक की सीमा में है। सेवाओं के उप-प्रमुखों को प्रदत्त वित्तीय शक्तियों में 10 प्रतिशत की वृद्धि की गई है, जो कुल मिलाकर 500 करोड़ रुपये तक की सीमा के अधीन है। सीएफए के रूप में चीफ ऑफ स्टाफ कमेटी (सीआईएससी) के अध्यक्ष के लिए एकीकृत रक्षा स्टाफ के प्रमुख की वित्तीय शक्तियों को काफी हद तक बढ़ाया गया है तथा सेवाओं के उप-प्रमुखों के साथ गठबंधन किया गया है।

नए सीएफए भी जोड़े गए हैं अर्थात पुनर्गठन/नवीनीकरण/कार्यात्मक आवश्यकताओं के लिए सेवा मुख्यालयों और क्षेत्रीय टुकड़ियों में डिप्टी चीफ ऑफ आर्मी स्टाफ, मास्टर जनरल सस्टेनेंस, एडीजी (प्रोक्योरमेंट)/डीजी एयर ऑपरेशंस/डीजी नेवल ऑपरेशंस आदि होंगे।

रक्षा सेवाओं में कमांड स्तर से नीचे की क्षेत्रीय टुकड़ियों के लिए आपातकालीन वित्तीय शक्तियों का एक सक्षम प्रावधान अब आपातकालीन शक्तियों की अनुसूची में शामिल किया गया है, जो वर्तमान में उप-प्रमुखों और सी-इन-सी / समकक्ष को ही उपलब्ध था।

नौसेना और वायु सेना के लिए 'सेना कमांडरों की विशेष वित्तीय शक्तियों' पर मौजूदा सेना अनुसूची के अनुरूप सामरिक/संचालन संबंधी आवश्यकताओं को पूरा करने के लिए फील्ड कमांडरों को विशेष वित्तीय शक्तियों से संबंधित नई अनुसूचियां पेश की गई हैं।

प्रधानमंत्री श्री नरेन्द्र मोदी द्वारा परिकल्पित 'आत्मनिर्भर भारत' के अनुरूप मौजूदा सैन्य क्षमताओं के तीन गुना तक स्वदेशीकरण / अनुसंधान एवं विकास से संबंधित अनुसूचियों में पर्याप्त वृद्धि को मंजूरी दी गई है।

भारतीय वायु सेना के लिए विमान और संबंधित उपकरणों को किराए पर लेने का एक नया कार्यक्रम शुरू किया गया है, जिसमें हवा से हवा में ही ईंधन भरने वाले विमानों को किराए पर लेना भी शामिल है।

भारतीय नौसेना हेतु, प्राकृतिक आपदाओं/एचएडीआर संचालनों से जुड़ी तत्काल प्रतिक्रिया के वास्ते आपदा प्रबंधन सहायकों की पुनःपूर्ति के लिए कमान स्तर को अधिकार सौंपे गए हैं।

इन प्रावधानों के स्पष्टीकरण या व्याख्या को रक्षा मंत्रालय (डीओडी)/सैन्य मामलों के विभाग (डीएमए) के प्रतिनिधियों के साथ रक्षा मंत्रालय के एएस एंड एफए की अध्यक्षता वाली एक अधिकार प्राप्त समिति के द्वारा संबोधित किया जाएगा।

रक्षा मंत्रालय (वित्त) के परामर्श से डीओडी/डीएमए के प्रशासनिक विंग द्वारा निरीक्षण, प्रकटीकरण एवं आंतरिक लेखापरीक्षा तंत्र की एक प्रणाली स्थापित की जाएगी। गैर-खरीद शक्तियों के लिए पर्याप्त प्रत्यायोजन को भी मंजूरी दी गई है।

इस अवसर पर चीफ ऑफ डिफेंस स्टाफ जनरल बिपिन रावत, नौसेना प्रमुख एडमिरल करमबीर सिंह, रक्षा सचिव डॉ. अजय कुमार और रक्षा मंत्रालय के अन्य वरिष्ठ असैन्य तथा सैन्य अधिकारी उपस्थित थे।

https://pib.gov.in/PressReleasePage.aspx?PRID=1752918

Press Information Bureau
Government of India

Ministry of Defence

Tue, 07 Sept 2021 7:30PM

CAS visit to Chandigarh

Air Chief Marshal RKS Bhadauria PVSM AVSM VM ADC, Chief of the Air Staff visited Air Force Chandigarh on 06 Sep 21. His visit coincided with the 60th anniversary of Air Force Station Chandigarh. On his arrival, he was received by Air CmdeTejbir Singh AVSM VM, AOC, Air Force Station Chandigarh.

CAS reviewed the ongoing capability enhancement and infrastructure upgradation initiatives in the Station. He appreciated the role played by personnel of the Station in accomplishing the heavy lift and air maintenance tasks in general and undertaking rapid air mobilisation during the Eastern Ladakh contingency.

The CAS also visited Kendriya Vidyalaya (KV), Sector 47, Chandigarh as a mark of gratitude for his alma-mater and teachers to commemorate Teacher's Day. He acknowledged the pivotal role that his teachers had played during those formative years and conveyed his best wishes to the school and Kendriya Vidyalaya Sangathan. Earlier in the day, he addressed principals of 130 Air Force Schools across the country through a virtual mode.

https://pib.gov.in/PressReleasePage.aspx?PRID=1752945

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 07 Sept 2021 7:30PM

वायुसेना प्रमुख की चंडीगढ़ यात्रा

वायुसेना प्रमुख एयर चीफ मार्शल आरकेएस भदौरिया पीवीएसएम एवीएसएम वीएम एडीसी ने दिनांक 06 सितंबर 2021 को वायुसेना स्टेशन चंडीगढ़ का दौरा किया। उनकी यात्रा वायुसेना स्टेशन चंडीगढ़ की 60 वीं वर्षगांठ के अवसर पर हुई। उनके आगमन पर एयर कमोडोर तेजबीर सिंह एवीएसएम वीएम, एओसी, वायु सेना स्टेशन चंडीगढ़ द्वारा उनका स्वागत किया गया ।

वायुसेना प्रमुख ने स्टेशन में चल रही क्षमता वृद्धि और बुनियादी ढांचे के उन्नयन की पहल की समीक्षा की। उन्होंने सामान्य रूप से भारी लिफ्ट और हवाई रख-रखाव कार्यों को पूरा करने और पूर्वी लद्दाख में पैदा हुई आकस्मिक स्थिति के दौरान तेजी से हेवी लिफ्ट एवं हवाई संचालन करने में वायुसेना स्टेशन के वायुसैनिकों द्वारा निभाई गई भूमिका की सराहना की।

वायुसेना प्रमुख ने केंद्रीय विद्यालय (केवी), सेक्टर 47, चंडीगढ़ का भी दौरा किया, ताकि शिक्षक दिवस मनाने के लिए अपने अल्मा-मेटर और शिक्षकों के प्रति आभार व्यक्त किया जा सके। उन्होंने उन प्रारंभिक वर्षों के दौरान उनके शिक्षकों द्वारा निभाई गई महत्वपूर्ण भूमिका को स्वीकार किया और स्कूल तथा केंद्रीय विद्यालय संगठन को अपनी शुभकामनाएं दीं। इससे पहले दिन में उन्होंने आभासी माध्यम से देशभर के 130 वायु सेना स्कूलों के प्राचार्यों को संबोधित किया।

https://pib.gov.in/PressReleasePage.aspx?PRID=1752960

Press Information Bureau
Government of India

Ministry of Defence

Tue, 07 Sept 2021 4:58PM

INS Tabar conducts maritime partnership exercise with Egyptian Navy

On leaving the port of Alexandria on 05 September 21, INS Tabar undertook a maritime partnership exercise with ENS Alexandria, a frontline frigate of the Egyptian Navy, in the Mediterranean Sea.

The exercise involved multiple activities covering a wide range of naval operations. These included drills for transit through asymmetric threat environment, operations for interdicting suspect vessels at sea, communication procedures, joint development of maritime domain picture and replenishment at sea drills. A highlight of the exercise was the cross-deck helo operations that involved helo recovery procedures and airborne light replenishment drills between the two ships.

The exercise was significantly beneficial in enhancing interoperability between the two navies and widened the scope for combined operations against common maritime threats in future. The maritime partnership exercise culminated with a 'Steam Past' between the two ships, as per naval custom.

https://pib.gov.in/PressReleasePage.aspx?PRID=1752855

Wed, 08 Sept 2021

Bangladesh Army Chief holds talks with Gen Bipin Rawat, MM Naravane on defence ties, Afghanistan

Officials said further deepening military-to-military cooperation between India and Bangladesh was the key focus of the talks

Chief of Bangladesh Army Gen SM Shafiuddin Ahmed on Tuesday held extensive talks with India's top military brass on ways to further deepen defence cooperation between the two countries. Gen Ahmed held separate meetings with Chief of Defence Staff Gen Bipin Rawat, Army Chief Gen MM Naravane, Air Chief Marshal RKS Bhadauria and Defence Secretary Ajay Kumar.

It is learnt that the latest developments in Afghanistan and their impact on regional security also figured in the talks.(File photo/ANI)

Officials said further deepening military-to-military cooperation between India and Bangladesh was the key focus of the talks. It is learnt that the latest developments in Afghanistan and their impact on regional security also figured in the talks.

"General SM Shafiuddin Ahmed, Chief of Army Staff, Bangladesh Army called on General Bipin Rawat #CDS and discussed issues of bilateral defence cooperation," the Army tweeted. The Indian Air Force said contemporary issues of mutual interest and ways to enhance avenues for bilateral defence cooperation were discussed in the meeting between Air Chief Marshal Bhadauria and Gen Ahmed.

"Great meeting with Gen Shafiuddin CoAS of Bangladesh and reinforced warm and friendly relationship and defence ties between two countries," Kumar tweeted. Before his meetings, the Bangladesh Army Chief laid a wreath at National War Memorial and paid homage to the soldiers who laid down their lives during 1971 War, the Army said.

He was also accorded a guard of honour at the South Block lawns. There has been a series of visits between India and Bangladesh in the last few months notwithstanding the coronavirus pandemic.

In April, Gen Naravane paid a five-day visit to Bangladesh to explore ways to further expand defence and military cooperation. In June, Air Chief Marshal Bhadauria travelled to the neighbouring country.

The year 2021 marks the 50th anniversary of the liberation of Bangladesh and the birth centenary of Bangabandhu Sheikh Mujibur Rahman. In reflection of close ties, India is also hosting a number of events to mark the 50th anniversary of the 1971 war that led to the liberation of Bangladesh.

Around 93,000 Pakistani troops had surrendered before the joint forces of the Indian Army and the "Mukti Bahini" on December 16, 1971, that paved way for the birth of Bangladesh.

https://www.news18.com/news/india/bangladesh-army-chief-holds-talks-with-gen-bipin-rawat-mm-naravane-on-defence-ties-afghanistan-4176695.html

Wed, 08 Sept 2021

For Indian Navy to be self-reliant, infusion of new technology & MSME participation crucial: Rear Admiral R Vijay Sekhar

New Delhi: Incorporation of new technology along with active participation of MSMEs, start-ups and academia will play a pivotal role in making the Indian Navy completely self-reliant, said Rear Admiral R Vijay Sekhar.

For Indian Navy to be self-reliant, infusion of new technology & MSME participation crucial: Rear Admiral R Vijay Sekhar

Rear Admiral R Vijay Sekhar who was also conferred with Nau Sena Medal (Devotion to Duty) and is Additional Chief of Materials (ACOM), Modernisation, Indian Navy, said this during an interactive webinar on Indigenisation Requirements of Indian Navy: Opportunities for MSMEs on Friday.

The interactive webinar focused on MSME opportunities with regards to the production of niche technology products for the Indian Naval Forces.

R Vijay Sekhar, highlighted that, the production of auxiliary like weapons, sensors, propulsion and etcetera has been rather slow and the need of the hour is that industries invest their complete support in the indigenisation of Indian Navy.

"The Indian Navy is committed to becoming completely self-reliant and the key to which lies in incorporation of new technology as well as active participation of MSMEs, start-ups and the academia," he mentioned.

Vikram Sahgal, Co-Chair, PHDCCI Defence & HLS Committee while addressing this webinar, he mentioned that the Indian Navy has been in forefront in indigenisation of its platforms, systems, sensors and weapons. The modernisation and enhancement of naval capabilities are an ongoing process.

"We are assured that the Indian Navy is striving to address the capability enhancement in all the areas through indigenisation," he added.

Commander Deepak Kota, Commander Indigenisation, Indian Navy gave an elaborate and informative technical presentation. He further mentioned that the fundamental concept of indigenisation has three aspects - design, manufacture and system integration. He shared the various opportunities for MSMEs for collaborating with the Indian Navy.

Highlighting the industry perspective Commander Bhaskar Sengupta, IN (Retd) General Manager (QA, IEP & VD), GRSE informed that there is a huge opportunity in outsourcing, a lot of value addition happens.

The path ahead is all about exploring partnerships and another scope for indigenisation is with regards to the 'Magazine Fire Fighting System, he said.

https://knnindia.co.in/news/newsdetails/sectors/for-indian-navy-to-be-self-reliant-infusion-of-new-technology-msme-participation-crucial-rear-admiral-r-vijay-sekhar

REPUBLICWORLD.COM

Wed, 08 Sept 2021

India, Kazakhstan conduct 5th edition of joint drills to strengthen military diplomacy

The annual bilateral joint exercise KAZIND-21 was held between India and Kazakhstan for the fifth time, bolstering military diplomacy between the two countries

By Srishti Goel

The 5th edition of the annual bilateral joint exercise KAZIND-21 was held between India and Kazakhstan, strengthening military diplomacy between the two nations. "Troops of India and Kazakhstan carrying out the demonstration of a raid on a terrorist hideout during the joint military exercise KAZIND-21 at Training Node Aisha Bibi, Kazakhstan," stated the Indian Army.

Picture Credit: PTI

India, Kazakhstan carry out drills KAZIND-21

The 5th "KAZIND-21" is being held in Kazakhstan from August 30 to September 11 as part of military diplomacy and to promote the expanding strategic relationship with Kazakhstan. The exercise is a combined training exercise between both armies that would strengthen India-Kazakhstan relations. A battalion of The Bihar Regiment with a total of 90 people led by a Contingent Commander represented the Indian Army contingent. A corporate group from Kazakhstan's army was present.

India, Kazakhstan bilateral joint exercise KAZIND-21

According to a notification from the Ministry of Defence, the exercise will provide a chance for the Armed Forces of India and Kazakhstan to train for counter-insurgency/counter-terrorism operations in hilly, rural environments under UN mandate. Professional exchange, planning and execution of operations in a counterterrorism environment at the sub-unit level, and sharing expertise on skills at arms, combat shooting, and counterinsurgency/counter-terrorism operations are all part of the Joint Exercise.

Bangladesh Army Chief pays tributes at National War Memorial in New Delhi

India is also currently working on strengthening ties with Bangladesh as its COAS General SM Shafiuddin Ahmed visited Inda. On Tuesday, General SM Shafiuddin Ahmed laid a wreath at the National War Memorial in New Delhi and paid his respects to the fallen troops.

Indian Army tweeted, "General MM Naravane #COAS extended a warm welcome to General SM Shafiuddin Ahmed, Chief of Army Staff, Bangladesh Army on his arrival at #SouthBlock, New Delhi."

A guard-of-honour is presented to the Bangladeshi Army's Chief of Army Staff at South Block. Ahmed is currently in India on a three-day official visit. Hasan Mahmud, Bangladesh's Minister of Information and Broadcasting, is also in India for a four-day visit. A close, long-standing friendship has developed between India and Bangladesh throughout the years, encompassing a wide range of activities and exchanges.

https://www.republicworld.com/world-news/rest-of-the-world-news/india-kazakhstan-conduct-5th-edition-of-joint-drills-to-strengthen-military-diplomacy.html

Hindustan Times

Wed, 08 Sept 2021

Interpreting the US's China Military Power Report 2020

The study has been authored by KK Venkatraman is research fellow, Fellow, Institute of Chinese Studies and research scholar, Punjabi University

Since 2000, the United States (US) Department of Defense (DoD) has published 'Annual Reports on Military and Security Developments involving the People's Republic of China' (hereinafter called the Report). The 2020 Report builds on reports of the past two decades and provides an overview of the future. It covers various aspects such as national strategy, force modernisation, resources and the People's Liberation Army (PLA)'s growing global presence. While the Report provides the most authoritative inputs on the China's military and security developments, few caveats are in order. One, the US aims to maintain military superiority over other countries. Two, the report is intended to facilitate informed decision-making by the US policymakers by providing them with relevant information on China and hence provides a US perspective of China's modernisation. Three, being an unclassified Report, "the numbers ascribed by the United States to China are … an estimate that we (the US) would be comfortable releasing publicly" (Billingslea 2020). Hence, the Report needs to be corroborated with inputs from other sources and analysed.

While the Report provides the most authoritative inputs on the China's military and security developments, few caveats are in order.(AP File Photo)

One such area is description of the PLA in superlatives – largest standing ground forces in the world, largest navy in the world, second largest military spender in the world and so on. It identifies areas – shipbuilding, land-based missiles and integrated air defence system - where China is likely to have achieved parity with or superiority over the United States and suggests that by mid-21st century, PLA is likely to be at par with or in certain areas, superior to US military. Terming the PLA as the 'world's largest standing ground force' with 915,000 active-duty personnel in combat units may be incorrect as the strength of the Indian Army is higher. The variation could possibly be due to assessment of strength in combat units of both armies. Similarly, while the PLA Navy is larger in number of ships, the US Navy is much larger in terms of tonnage and capability.

This paper seeks to highlight the salient aspects of the DoD Report and analyse the same. Certain critical aspects such as force modernisation, strategy and doctrine and nuclear weapons given in the succeeding paragraphs.

As can be discerned from the annual reports of the past two decades, China's ambitious goals, long-term vision and planning and a continuous endeavour to achieve these goals by every means possible, has narrowed the gap between the US and China, with resultant security implications for rest of the world. Apart from force modernisation, China has undertaken comprehensive revision of its national strategy, Higher defence organisations and doctrine to achieve synergy between various agencies during peace and provide timely response during crisis.

China's national strategy is aimed at achieving 'the great rejuvenation of the Chinese Nation' by becoming a global leader in innovation by 2035 and attaining 'global power' status by 2049. Commensurate with the national strategy, the PLA seeks to complete military modernisation by 2035 and transform into a 'world class military' by 2049. This synchronisation of national and military goals ensures that the armed forces are allotted necessary resources to build capabilities, essential to support national goals.

Changes in national security outline are likely to have been followed up with strategy guidelines to adapt to strategic competition, technological developments and national goals. Strategic guidelines (zhanlue fangzhen 战略方针) provide authoritative guidance for the operational doctrine, training and force structure of the PLA. They provide direction for future reforms and have been amended nine times, since the establishment of PRC. While specifics of the revised guideline are not known, the 2019 White Paper suggests that the PLA will be tasked to contribute towards and secure China's global interests and to prepare to fight across various domains including outer space. It is also likely to take into account emerging technologies such as Artificial Intelligence (AI), which some PLA academics believe to be the future of warfare.

The study has been accessed by clicking here.

(The study has been authored by KK Venkatraman is research fellow, Fellow, Institute of Chinese Studies and research scholar, Punjabi University.)

https://www.hindustantimes.com/ht-insight/international-affairs/interpreting-the-us-s-china-military-power-report-2020-101631014491389.html

TIMESNOWNEWS.COM

Wed, 08 Sept 2021

[Exclusive] China's nuclear submarine building facilities expansion leaves India concerned

The expansion of the Chinese nuclear submarine fleet is likely in the near future

By Srinjoy Chowdhury

New Delhi: The huge expansion of China's nuclear submarine building facilities has the world, and also India, concerned

. The Huludao Shipyard, once the Bohai Shipyard in Liaoning Province has more than tripled in size and is now capable of making 7 nuclear-powered submarines simultaneously.

Representational Image | Photo Credit: IANS

The original construction area was about 300,000 sq metres, but it is now three times the size. So, instead of being able to make 2 submarines simultaneously, it can make 7.

As a result, the expansion of the Chinese nuclear submarine fleet is likely in the near future. Currently, the Chinese Navy has 13 nuclear-powered attack submarines or SSNs and SSBNs or nuclear-powered ballistic submarines. The Chinese Navy has 1 Xia class, 6 Jin-class and 6 Shang class submarines. This is estimated to grow to 36 nuclear-powered submarines in 15 years. There could be 12 SSBNs, which carry long-range missiles and 24 SSNs.

The new submarines could be bigger and more capable. The Tang class vessels can carry 24 submarine launched ballistic missiles as opposed to 12 by the current ones. The Sui class vessels at 8000 tonnes will be bigger than the Shang class ones.

India has begun manufacturing the Arihant-class nuclear powered submarines and leasing nuclear-powered attack submarines from Russia. Nuclear-powered submarines have more capability than other submaines, though both are necessary. The chief of defence staff, General Bipin Rawat, has already spoken out about having more submarines, especially conventional submarines, pointing out that previous Indian Navy chiefs had often spoken about bolstering the submarine fleet.

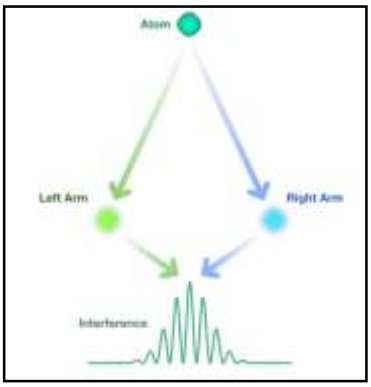
https://www.timesnownews.com/india/article/exclusive-chinas-nuclear-submarine-building-facilities-expansion-leaves-india-concerned/809050

PHYS.ORG

Wed, 08 Sept 2021

Exploring quantum gravity and entanglement using pendulums

When it comes to a marriage with quantum theory, gravity is the lone holdout among the four fundamental forces in nature. The three others—the electromagnetic force, the weak force, which is responsible for radioactive decay, and the strong force, which binds neutrons and protons together within the atomic nucleus—have all merged with quantum theory to successfully describe the universe on the tiniest of scales, where the laws of quantum mechanics must play a leading role.



In an atomic interferometer, the atom's wave function is split into left and right arms. The left and right arms are then recombined, producing an interference pattern. Credit: S. Kelley/NIST

Although Einstein's theory of general relativity, which describes gravity as a curvature of space-time, explains a multitude of gravitational phenomena, it fails within the tiniest of volumes—the center of a black hole or the universe at its explosive birth, when it was less than an atomic diameter in size. That's where quantum mechanics ought to dominate.

Yet over the past eight decades, expert after expert, including Einstein, have been unable to unite quantum theory with gravity. So, is gravity truly a quantum force?

Researchers at the National Institute of Standards and Technology (NIST) and their colleagues have now proposed an experiment that may help settle the question.

The experiment takes advantage of two of the weirdest properties of quantum theory. One is the superposition principle, which holds that an undisturbed atomic particle can be described as a wave, with some probability of being in two places at once. For instance, an undisturbed atom traveling through a region with two slits, passes through not one or the other of the slits but both.

And because the atom is described by a wave, the portion that passes through one slit will interfere with the part that passes through the other, producing a well-known pattern of bright and dark fringes. The bright fringes correspond to regions where the hills and valleys of the two waves align so that they add together, creating constructive interference and the dark regions correspond to regions where the hills and valleys of the waves cancel each out, creating destructive interference.

The second strange quantum property is known as entanglement, a phenomenon in which two particles can be so strongly correlated that they behave as a single entity. Measuring a property of one of the particles automatically forces the other to have a complementary property, even if the two particles reside galaxies apart.

In a quantum theory of gravity, the gravitational attraction between two massive objects would be communicated by a hypothetical subatomic particle, the graviton, in the same way that the electromagnetic interaction between two charged particles is communicated by a photon (the fundamental particle of light). So, if a graviton truly exists, it should be able to connect, or entangle, the properties of two massive bodies, just as a photon can entangle the properties of two charged particles

The proposed experiment by Jake Taylor of NIST's Joint Quantum Institute at the University of Maryland, along with Daniel Carney, now at the Lawrence Berkeley National Laboratory, and

Holger Müller of the University of California, Berkeley, provides a clever way to test if two massive bodies can indeed become entangled by gravity. They described their work in an article published online in Physical Review X Quantum on August 18, 2021.

The experiment would use a cold cloud of atoms, trapped inside an atomic interferometer. The interferometer has two arms—a left arm and a right. According to the superposition principle, if each atom in the cloud is in a pure, undisturbed quantum state, it can be described as a wave occupying both arms simultaneously. When the two portions of the wave, one from each arm, recombine, they will produce an interference pattern that reveals any changes to their paths due to forces like gravity.

A small, initially stationary mass suspended as a pendulum is introduced just outside the interferometer. The suspended mass and the atom are gravitationally attracted. If that gravitational tug also produces entanglement, what would that look like?

The suspended mass will become correlated with a specific location for the atom—either the right arm of the interferometer or the left. As a result, the mass will start swinging to the left or the right. If the atom is located on the left, the pendulum will start swinging to the left; if the atom is located on the right, the pendulum will start swinging to the right. Gravity has entangled the position of the atom in the interferometer with the direction in which the pendulum begins swinging.

The position entanglement means that the pendulum has effectively measured the location of the atom, pinpointing it to a particular site within the interferometer. Because the atom is no longer in a superposition of being in both arms at the same time, the interference pattern vanishes or diminishes.

Half a period later, when the swinging mass returns to its starting point, it loses all "memory" of the gravitational entanglement it had created. That's because regardless of what path the pendulum took—initially swinging to the right, which picks out a location for the atom in the right interferometer arm, or initially swinging to the left, which picks out a location for the atom in the left arm—it returns to the same starting position, much like a child on a swing.

And when it returns to the starting position, it's equally likely that the pendulum will pick out a location for the atom in the left or right arm. At that moment, entanglement between the mass and the atom has been erased and the atomic interference pattern reappears.

Half a period after that, as the pendulum swings to one side or the other, entanglement is re-established and the interference pattern diminishes once again. As the pendulum swings back and forth the pattern repeats—interference, diminished interference, interference. This collapse and revival of interference, the scientists say, would be a "smoking gun" for entanglement.

"It is difficult for any phenomenon other than gravitational entanglement to produce such a cycle," said Carney.

Although the ideal experiment may be a decade or more from being built, a preliminary version could be ready in just a few years. A variety of shortcuts could be exploited to make things easier to observe, Taylor said. The biggest shortcut is to embrace the assumption, similar to Einstein's theory of general relativity, that it doesn't matter when you start the experiment—you should always get the same result.

Taylor noted that non-gravitational sources of quantum entanglement must be considered, which will require careful design and measurements to preclude.

More information: Daniel Carney et al, Using an Atom Interferometer to Infer Gravitational Entanglement Generation, *PRX Quantum* (2021). DOI: 10.1103/PRXQuantum.2.030330

https://phys.org/news/2021-09-exploring-quantum-gravity-entanglement-pendulums.html

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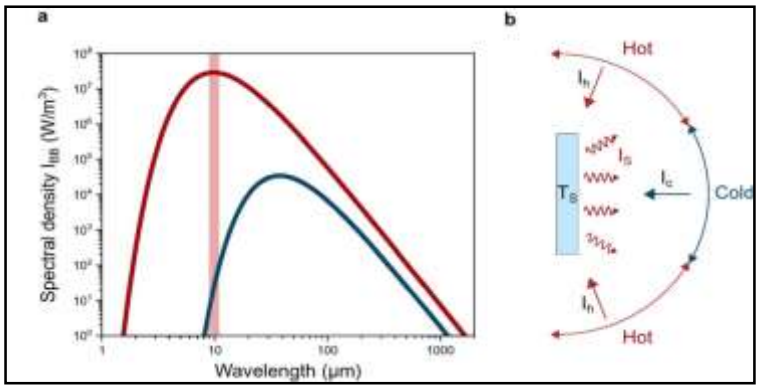
Wed, 08 Sept 2021

Contactless and spatially structured cooling by directing thermal radiation

Everyone knows what it's like to be out on a cold and cloudless winter night when the skies are studded with stars. In the open, the cold is all too keenly felt. But in a forest, under the protective cover of the trees, it is less so. The reason for this difference is thermal radiation, which is emitted by the body and, depending on the nature of the surroundings, may be replaced by a smaller amount of radiation emanating from the environment. With a temperature of −270 degrees Celsius, the universe is far colder than our own immediate surroundings, and therefore emits hardly any thermal radiation. Research groups around the world have recently begun to explore novel methods for cooling buildings and clothing, even in broad daylight, by enhancing the rate of heat exchange with the universe—without the need for further energy consumption. However, potential applications of these methods for technological or experimental purposes—on a small scale—have rarely been investigated up to now.



Black body emission and view factor. (a) Blackbody radiation spectra at room temperature (red curve) and at liquid nitrogen temperature (blue curve). The light red bar indicates the wavelength range relevant for this work (9–11 µm). (b) While a sample will always emit thermal energy homogeneously within the solid angle of a half-sphere, the amount of incident hot and cold radiation will determine the temperature distribution on the sample. By tuning the view factor of hot and cold radiation over the solid angle, the temperature profile can be manipulated. The sample is at a temperature T_S and emits radiation with intensity I_S. The hot sections of the solid angle environment emit with intensity I_h and the cold section with I_C.

Researchers led by Professor Jochen Feldmann at LMU's Nano-Institute have now succeeded in generating a cold gradient in an experimental sample by targeted and contactless control of the distribution of thermal radiation. "To do so, we simulated the effect of the remote universe with the aid of a distant cryostat," says Nicola Kerschbaumer, a Ph.D. student in Feldmann's team and first author of the study. A cryostat can be thought of as a kind of cooling unit designed to reach and maintain extremely low temperatures. With the aid of a special optical set-up and an arrangement of elliptical mirrors, the team was able to collect the long-wave thermal radiation emitted by the sample (which is initially at room temperature), and focus it onto a plate placed in the center of the cryostat. In this way, they were able to create a kind of one-way street for the emitted radiation, which resulted in the effective cooling of the sample. In an initial application, this contactless method of cooling was shown to be particularly effective for what is known as the supercooling of liquids.

The researchers believe that their new contactless method, which uses "radiative cooling" to generate a cold gradient in a sample, will find many applications. According to Privatdozent Theobald Lohmüller, Leader of the Biophotonics Group in the Nano-Institute and co-author of the study, contactless thermal manipulations of biological samples will be of particular interest.

The study is published in *Scientific Reports*.

More information: Nicola M. Kerschbaumer et al, Contactless and spatially structured cooling by directing thermal radiation, *Scientific Reports* (2021). DOI: 10.1038/s41598-021-95606-2

Journal information: *Scientific Reports*

https://phys.org/news/2021-09-contactless-spatially-cooling-thermal.html

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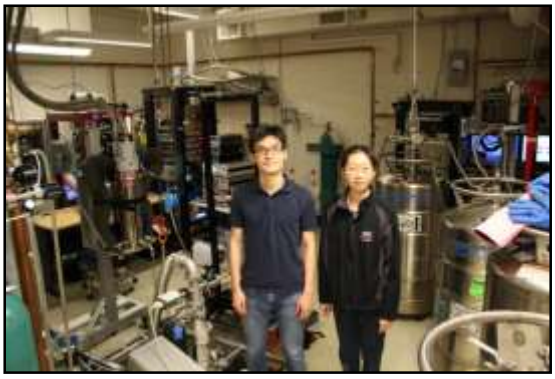
Wed, 08 Sept 2021

Physicists engineer new property out of 'white' graphene

By Elizabeth A. Thomson

Ultrathin materials made of a single layer of atoms have riveted scientists' attention since the discovery of the first such material—graphene—about 17 years ago. Among other advances since then, researchers including those from a pioneering lab at MIT have found that stacking individual sheets of the 2D materials, and sometimes twisting them at a slight angle to each other, can give them new properties, from superconductivity to magnetism.



MIT researchers and colleagues report the creation of a new ultrathin material with ferroelectricity, a property that could give the material important applications in computer memory and more. Here Kenji Yasuda (left), an MIT postdoctoral fellow, and Xirui Wang, an MIT graduate student in physics, stand in the MIT lab key to the work. Credit: Kenji Yasuda and Xirui Wang

Now MIT physicists from the same lab and colleagues have done just that with boron nitride, known as "white graphene" in part because it has an atomic structure similar to its famous cousin. The team has shown that when two single sheets of boron nitride are stacked parallel to each other, the material becomes ferroelectric, in which positive and negative charges in the material spontaneously head to different sides, or poles. Upon the application of an external electric field, those charges switch sides, reversing the polarization. Importantly, all of this happens at room temperature.

The new material, which works via a mechanism that is completely different from existing ferroelectric materials, could have many applications.

"Wide varieties of physical properties have already been discovered in various 2D materials. Now we can easily stack the ferroelectric boron nitride with other families of materials to generate emergent properties and novel functionalities," says Pablo Jarillo-Herrero, the Cecil and Ida Green Professor of Physics and leader of the work, which was reported in the journal Science. Jarillo-Herrero is also affiliated with MIT's Materials Research Laboratory.

In addition to Jarillo-Herrero, additional authors of the paper are Kenji Yasuda, an MIT postdoctoral fellow; Xirui Wang, an MIT graduate student in physics, and Kenji Watanabe and Takashi Taniguchi of the National Institute for Materials Science in Japan.

Potential Applications

Among the potential applications of the new ultrathin ferroelectric material, "one exciting possibility is to use it for denser memory storage," says Yasuda, lead author of the Science paper. That's because switching the polarization of the material could be used to encode ones and zeros—digital information—and that information will be stable over time. It won't change unless an electric field is applied. In the Science paper the team reports a proof-of-principle experiment showing this stability.

Because the new material is only billionths of a meter thick—it's one of the thinnest ferroelectrics ever made—it could also allow much denser computer memory storage.

The team further found that twisting the parallel sheets of boron nitride at a slight angle to each other resulted in yet another "completely new type of ferroelectric state," Yasuda says. This general approach, known as twistronics, was pioneered by the Jarillo-Herrero group, which used it to achieve unconventional superconductivity in graphene.

New Physics

The new ultrathin ferroelectric material is also exciting because it involves new physics. The mechanism behind how it works is completely different from that of conventional ferroelectric materials.

Says Yasuda, "The out-of-plane ferroelectric switching occurs through the in-plane sliding motion between two boron nitride sheets. This unique coupling between vertical polarization and horizontal motion is enabled by the lateral rigidity of boron nitride."

Toward Other Ferroelectrics

Yasuda notes that other new ferroelectrics could be produced using the same technique described in Science. "Our method for turning a non-ferroelectric starting material into an ultrathin ferroelectric applies to other materials with atomic structures similar to boron nitride, so we can vastly expand the family of ferroelectrics. Only a few ultrathin ferroelectrics exist today," he says. The researchers are currently working to that end and have had some promising results.

The Jarillo-Herrero lab is a pioneer at manipulating and exploring ultrathin, two-dimensional materials like graphene. Nevertheless, the conversion of ultrathin boron nitride to a ferroelectric was unexpected.

Says Xirui Wang:

"I still remember when we were doing the measurements and we saw an unusual jump in the data. We decided that we should run the experiment again, and when we did it again and again we confirmed that there was something new happening."

More information: Kenji Yasuda et al, Stacking-engineered ferroelectricity in bilayer boron nitride, *Science* (2021). DOI: 10.1126/science.abd3230

Journal information: *Science*

https://phys.org/news/2021-09-physicists-property-white-graphene.html

MEDICAL NEWS TODAY

Wed, 08 Sept 2021

Common hypertension drug may help treat severe COVID-19

- ***Acute respiratory distress syndrome (ARDS) is a potentially fatal condition involving lung damage, and experts often associate it with severe COVID-19.***
- ***There is a link between high mortality rates and COVID-19-induced ARDS, which is why there is an urgent need for effective treatments.***
- ***An uncontrolled, excessive immune response to the rapid SARS-CoV-2 replication is implicated in the development of ARDS.***
- ***A new study suggests that metoprolol, a beta-blocker approved for the treatment of hypertension, can reduce lung inflammation and improve clinical outcomes in patients with COVID-19-associated ARDS.***

Approximately 14–33%Trusted Source of individuals with a SARS-CoV-2 infection develop severe illness, and about two-thirds of those with severe illness develop ARDS.

ARDS involves injury to the lung tissue due to inflammation and the accumulation of fluid in the alveoli, the air sacs in the lungs where the exchange of gases occurs with blood vessels.

The accumulation of fluids in the alveoli due to leaking blood vessels limits the lungs' ability to supply oxygen to the rest of the body. ARDS thus requires admission to the intensive care unit (ICU) and invasive mechanical ventilation to compensate for limited lung function.

New research points to a common type of beta-blocker as an inexpensive COVID-19 treatment. R_Type/Getty Images

ARDS is a major cause of fatality in COVID-19, and there is a lack of effective treatments for severe COVID-19-associated ARDS.

A recent study, which appears in the *Journal of the American College of Cardiology*, reports that metoprolol can reduce lung inflammation and improve respiratory function in people with COVID-19-induced ARDS. Metoprolol is a common beta-blocker designed to treat high blood pressure, and it may provide an inexpensive treatment for severe COVID-19.

Excessive immune response

The infection by SARS-CoV-2 activates an immune response that aims to block the progression of the disease.

However, in some cases of severe COVID-19, uncontrolled and excessive activation of the immune system can occur in response to the rapidly replicating virus, causing ARDS and other complications, such as organ failure.

The initial damage to the tissues due to a SARS-CoV-2 infection results in the production of signaling molecules called cytokines. The cytokines and other molecules released from the damaged tissues recruit immune cells, such as neutrophils and macrophages, to the lungs and result in the activation of these cells.

The excessive production of cytokines, which scientists term a cytokine storm, and the overactivation of neutrophils and macrophages are hallmarks of ARDS associated with severe COVID-19.

After recruitment to the lungs, the activated neutrophils and macrophages themselves produce cytokines and contribute to the cytokine storm.

Besides cytokines, activated neutrophils release granules and produceTrusted Source neutrophil extracellular traps (NETs) that help kill viruses and bacteria. NETs are web-like structures that consist of DNA and proteins that immobilize bacteria and viruses.

While activated neutrophils play a critical role in defending the body from the virus, hyperactivation of neutrophils can cause damage to the lung tissue and blood vessels, as observedTrusted Source in ARDS. Consistent with this, the number of neutrophils in the lungs correlates with the severity of COVID-19 and can predict the risk of complications, such as ARDS.

These data suggest that neutrophils could be a promising target for reducing lung inflammation in people with severe COVID-19.

Beta-blockers for curbing immune response

Beta-blockers are a class of drugs that block the effects of the two hormones that mediate the fight-or-flight response: epinephrine and norepinephrine. Doctors commonly use beta-blockers to treat cardiovascular conditions.

Dr. Sverre Kjeldsen, professor at the University of Oslo in Norway, who was not involved in the study, told *Medical News Today*:

"Very sick COVID-19 patients are under enormous stress — they have the strongest activation of the sympathetic nervous system that you can imagine. Release of huge amounts of noradrenaline (norepinephrine) and adrenaline (epinephrine) do damage to almost every organ, including the lungs, and treatment with metoprolol, a beta-1 selective adrenoreceptor blocker, at least partially inhibits the damaging effects of these plasma catecholamines."

In an editorial published last year, Dr. Kjeldsen also notes that beta-blockers could be candidates for the treatment of patients with severe COVID-19 due to the drugs' ability to reduce inflammation and combat fluid accumulation in the lungs.

The team led by researchers at the Centro Nacional de Investigaciones Cardiovasculares Carlos III (CNIC) has now shown that the beta-blocker metoprolol can reduce lung inflammation and improve blood oxygen levels. The results come from a small pilot study involving COVID-19 patients with ARDS.

Specifically, the team found that metoprolol reduced neutrophil count in the lungs and resulted in lower levels of neutrophil activation.

The study's first author, Agustín Clemente-Moragón, a Ph.D. fellow at CNIC, told *MNT*:

"In the last years, our research group (the Translational Laboratory for Cardiovascular Therapy and Imaging) at the Spanish National Centre for Cardiovascular Research (CNIC) has generated a vast knowledge about the disruptive and unique role of the beta-blocker metoprolol against neutrophil-driven inflammatory responses."

"These experimental data prompted us to investigate in the MADRID-COVID pilot trial whether 3-day intravenous metoprolol administration (15 milligrams each day) could result in promising outcomes in patients with COVID-19-associated ARDS."

Study co-author Dr. Valentin Fuster, CNIC general director and director of Mount Sinai Heart, told *MNT*: "We have very little therapy that has been shown to be of significance at this late stage of the disease. […] [T]he significance of this study is that, if this is correct, now have a new approach with a very cheap drug, that is very affordable."

Effects on inflammatory response

The study involved 20 COVID-19 patients with ARDS who had been on mechanical ventilation for fewer than 3 days. The patients were randomized to receive either intravenous (IV) metoprolol, that is, administered directly into a vein, or standard care in the control group.

The experimental group consisted of 12 patients who received IV metoprolol daily for 3 days, whereas the remaining 8 patients, in the control group, received standard care.

The researchers collected blood samples and fluid from the lungs of the patient before the onset of treatment and on the fourth day, 24 hours after the last dose of metoprolol.

They found that metoprolol administration, compared with standard care, resulted in a reduction in the number of specific immune cells in the fluid samples collected from the lungs of the COVID-19 patients.

Specifically, there was a decrease in the number of neutrophils in the fluid samples collected from the lungs of the patients who received metoprolol.

Moreover, metoprolol treatment reduced the level of pro-inflammatory cytokines, such as MCP-1 in the lungs and IL-8 in the blood.

The researchers also observed a drop in markers associated with the production of NETs by neutrophils after metoprolol treatment, which indicates a reduction in neutrophil activation.

These results suggest that metoprolol can reduce lung inflammation and limit the recruitment and activation of neutrophils in COVID-19 patients with ARDS.

Clinical outcomes

Investigating the impact of metoprolol on clinical outcomes, the researchers found that metoprolol administration improved blood oxygen levels.

Although there was a link between metoprolol treatment and fewer days on mechanical ventilation and earlier discharge from intensive care, these results did not reach statistical significance.

Notably, there were no side effects associated with metoprolol treatment.

The authors conclude that the "[IV] administration of the clinically approved beta-blocker metoprolol to critically ill patients with ARDS caused by COVID-19 is safe and disrupts the exacerbated lung inflammation associated with the disease."

Strengths of the study

Describing the strengths of the study, Clemente-Moragón said, "Metoprolol is a clinically available and cheap drug (daily treatment costs less than $3), which could potentially reduce the extreme pressure COVID-19 is placing on ICUs worldwide, even in countries where vaccines are not rolled out to a large extent yet."

"In addition, this treatment could be beneficial for all patients with COVID-19 without contraindications for metoprolol (with only a few patients not being good candidates to receive it), and this benefit could possibly be greater if started before intubation," he added.

In an editorial accompanying the article, Dr. Mourad Senussi commends the authors for the study and writes, "Although a small-sized, single-center study amid a multitude of others exploring potential treatment modalities for COVID-19, this study uses a readily available, safe, and inexpensive medication; has a simple study design; and, most importantly, shows biological plausibility."

Dr. Senussi is the medical director of the cardiac care unit at Baylor St. Luke's Medical Center in Houston, TX, and was not involved in the research.

Limitations and caveats

The researchers acknowledge that the study had a few limitations. Firstly, they note that the study had a small sample size and took place at a single location. Furthermore, there was potential for bias, because the doctors were aware of which patients belonged to the treatment and control groups.

To address these concerns, Dr. Fuster said that they were in the process of preparing for a larger randomized controlled trial to further test the ability of metoprolol to reduce lung inflammation in patients with COVID-19-associated ARDS.

“Although all these data need to be corroborated in a larger trial, our recent study could be enough to consider its use in some patients, such as young patients admitted to ICU with severe COVID-19,” said Clemente-Moragón.

The authors also note, “we cannot rule out a selection bias resulting in patients with very poor condition according to physicians not considered for inclusion.”

Furthermore, Dr. Senussi noted that caution must be exercised while interpreting the study results. Speaking to *MNT*, he said:

“We should temper our enthusiasm. This is not a miracle drug or cure for COVID-19. […] This study showed improved markers of lung inflammation in those patients who received [IV] beta-blocker with less lung damage and ventilator days.”

“This is not a treatment per se of COVID-19 but rather a means to attenuate the intense inflammatory response that has beneficial downstream effects. This medication was given early during the course of the illness to critically ill patients on ventilators. Patients who were very sick and unstable could not receive this medication,” Dr. Senussi continued.

https://www.medicalnewstoday.com/articles/common-hypertension-drug-may-help-treat-severe-covid-19#Strengths-of-the-study