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DRDO Technology News

Wed, 26 May 2021

Artificial Intelligence in Military: How India readies for future warfare

By Maj Gen PK Chakravorty (Retd)

Artificial Intelligence (AI) has impacted the world with numerous applications which are affecting numerous spheres allowing openings in various fields of the scientific environment. There are many definitions, a simple one is, "AI refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term also may be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving."

A few areas where current research in AI has brought new products are smartphones, unmanned aerial systems (commonly referred to as Drones), unmanned ground vehicles (UGVs), unmanned ships, under water vehicles, audio printing, usage of robots in restaurants, hotels, schools, gas stations and the armed forces. The remote of the television screen is also an AI device that is universally used by all viewers.

Current Perspective

Defence Research and Development Organisation (DRDO) has a specialised laboratory, Centre for Artificial Intelligence and Robotics (CAIR) with about 150 scientists which focus on AI Robotics, Control Systems, Command Control Communications and Intelligence (C3I), Networking and Communications Secrecy. They have produced a family of robots for surveillance and reconnaissance applications. The robot has been named RoboSen a mobile robot for reconnaissance and surveillance. Further, a miniaturised man-portable UGV for low-intensity conflicts, a wall climbing flapping-wing robot and a walking robot with four and six legs for logistics support. They have also developed robots with cognitive capabilities which can play Chess and inspect the serviceability of components. Further, intelligent wheelchairs have been developed for physically challenged persons. CAIR has also developed a NetWork Traffic Analysis (NETRA) which can monitor internet traffic. This device can intercept keywords such as bomb blast, kill and other designated words in real-time.

AI has also been focused upon by the Union Government and in this context, a report was submitted by N Chandrasekaran, Chairman Tata Sons, in 2018 to the Ministry of Defence. Based

on the recommendations of a Task Force, the Department of Defence Production issued a Government Order on 8 February 2019 that listed the following:

- Defence AI Council (DAIC) was constituted with Defence Minister as Chairman. It included the three Service Chiefs, the Secretary of Defence; Defence Production; DRDO, Financial Adviser Defence Services, National Cyber Security Coordinator and eminent representatives from industry and academia. The Council would meet twice a year to provide strategic direction towards AI-driven transformation in defence, provide guidance in addressing issues related to data sharing; enable strategic partnership with industry, decide acquisitions of technology; review ethical, safe and privacy assured usage of AI in defence. Further, evolve policies in partnership with government institution and industries.
- A Defence AI Project Agency (DAIPA) will also be established with Secretary Defence Production as the Chairman. The other members will be from the Service Headquarters, Headquarters Integrated Defence Staff, Defence Public Sector units, DRDO, industry and academia.
- Each Service Headquarters has been directed to earmark Rs 100 crores for AI-specific application development for the next five years
- The Indian Navy has taken the lead and has divided AI usage into short, medium and long term goals for implementation.
- The Indian Army during Army Day in 2021 demonstrated a Swarm Attack by drones on multiple targets. Further efforts are being made to directly translate spoken Mandarin to English.
- In a recent webinar held at Vivekananda International Foundation, the Chief of Defence Staff spoke of the usage of AI for predictive maintenance of equipment in the Indian Army.

China and AI

China is investing heavily in AI with an aggressive push in the military domain. It exports armed autonomous platforms to numerous countries mainly Pakistan and Saudi Arabia. China has been experimenting and developing UGVs, UAVs, AI-enabled satellites, UUVs and unmanned ground warfare platforms. They have converted T-59 tanks into unmanned platforms. They are using their UUVs in the South China Sea.

China has moved AI into new domains of space warfare and information warfare using a plethora of devices. They have developed satellites with AI, having the capability to destroy satellites and other missiles in outer space. China has left no stone unturned to fine-tune its missiles to attain 'Fire and Forget' capabilities as also if the need arises, change targets in flight. The country is making great strides in the employment of UAV Swarms. They have often demonstrated more than 1000 drones moving in a synchronised manner to undertake a variety of tasks. It is amazing to watch the enthusiasm with which China is going ahead with this aspect and in all probability is assisting Pakistan to attain this capability.

There is no doubt that no country in the world is focusing on AI as much as China. In terms of finance, China spends nine times higher than India on AI. It has seven times more manpower than India in the AI domain. Further, its robot density surpassed the world average in 2017 and 2018. The focus is gradually being upgraded to the cognitive domain for the usage of AI in Command Control Communications Computers Information Intelligence Surveillance and Reconnaissance (C4 I2SR). China is using AI in the cyber domain and undertaking numerous cyber developments in 'Offensive and Defensive Operations'.

As one can assess in terms of military applications of AI currently, China is only second to the United States. A comparative estimate of ratios of end-user industrial robots in various countries reflects that China has 154 end-user robots vis-à-vis 55 in Japan, 40 of the USA and 4 in India. The day is not far when combat robots will be participating in logistics and thereafter in operations. We have to traverse a long way to stand up to China's challenge.

Way Ahead

Albert Einstein had stated, “Imagination is more important than Knowledge”. The Indian Navy and Indian Air Force are focusing on UUVs, Unmanned Aerial Systems (UAS) and Lethal Autonomous Weapon Systems. The Indian Army must focus on a few issues which are as elucidated:

- Image interpretation for target identification and classification
- System for diagnosis and maintenance of sophisticated weapon systems
- Analysis of trajectory of missiles
- Use of robots for anti-Improved Explosive Device and firing of weapons
- Logistics applications particularly in High Altitude Terrain

In the current grey zone warfare scenario, where troops are operating in small teams, it would be important to apply AI as listed below:

- Gathering of real-time intelligence by use of satellites and UAS
- Devices to detect sensors, mines and booby traps
- Use of loitering munitions which can be used for surveillance and target engagement
- Gradually move into the field of combat robots, who can act as buddies and thereafter with the greater improvement of cognitive abilities be able to act as pathfinders, navigators and possibly undertake kinetic strikes.

The moot point is how do we achieve it? We need a Task Force which operates directly with the Chief of Defence Staff and DRDO in conjunction with the Private Sector who would help us to achieve our targets.

Conclusion

AI would be intensively used in future conflicts. China is straining every sinew to applying AI in defence to become a world power. It’s likely to assist Pakistan in improving its AI capability. Comparatively, our armed forces are in a nascent stage in terms of AI technology application is concerned. We need to accelerate and the only way to do it is through a link up with the private sector. There are no other options but shifting gears and enhancing the pace to match China and Pakistan in the battle space.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the official policy or position of BharatShakti.in)

https://bharatshakti.in/artificial-intelligence-in-military-how-india-readies-for-future-warfare/

INDIA TODAY

Wed, 26 May 2021

DRDO's missile testing facilites in Odisha shielded from Cyclone Yaas, Says official

The Integrated Test Range (ITR) of the Defence Research and Development Organisation (DRDO) has taken all measures to protect its facilities at Chandipur and Abdul Kalam Island from Cyclone Yaas

Balasore/Bhubaneswar: In wake of the cyclone Yaas which is likely to make a landfall in Odisha, the Integrated Test Range (ITR) of the Defence Research and Development Organisation (DRDO) has put in place all preventive measures to shield its facilities at Chandipur and Abdul Kalam Island, an official said on Tuesday.

The ITR has three missile launch pads at Chandipur and one launch complex at Abdul Kalam Island, in addition to two separate mission control rooms and block houses. (Representative File Photo)

The ITR has three missile launch pads at Chandipur and one launch complex at Abdul Kalam Island, in addition to two separate mission control rooms and block houses.

The island, known for its strategic location for test-launching of all long-range missiles, is 80 nautical miles (110 km) from the ITR, and more likely to be impacted by the cyclone, the official said.

"We have prepared for the very severe cyclonic storm, and are implementing the standard operating procedures prepared by DRDO. We are ready to face any eventuality," Milan Kumar Pal, the spokesperson of the ITR facility, told PTI.

While the safety of critical installations has been ensured, vital equipment are stored inside laboratories, he added.

According to sources, the control room and block house, however, have been designed to withstand wind speeds up to 400 km.

On Tuesday morning, a scientist at the Regional Meteorological Centre, Bhubaneswar had said that a landfall is likely to occur between Dhamra and Chandbali in Bhadrak district.

The DRDO had launched the missile testing facility in 1982 as a project under the Integrated Guided Missile Development Programme (IGMDP).

Since the 1999 super cyclone, the testing range has withstood over a dozen similar storms, including 'Amphan' and 'Bubul' in the recent past.

https://www.indiatoday.in/india/story/drdo-missile-testing-facilites-odisha-cyclone-yaas-official-1806884-2021-05-25

COVID 19: DRDO's Contribution

THE TIMES OF INDIA

Wed, 26 May 2021

Maharashtra: DRDO to set up oxygen plant at Jalna Covid-19 Centre

Jalna: The Defence Research and Development Organisation (DRDO) will install an oxygen plant at the district Covid Centre here in Maharashtra in the next three days, a senior official said on Tuesday.

Collector Ravindra Binwade also said the district administration has undertaken measures to tackle the projected "third wave" of the coronavirus pandemic.

"The DRDO's oxygen plant has a flow rate of 1,000 litres per minute and can cater to 190 patients at a time. The system can cater to 190 patients at a flow rate of 5 LPM and charge 195 jumbo cylinders per day," deputy collector Ravindra Parlikar said.

Representative image

The plant is being set up under the PM Cares Fund.

He said the plant utilizes the Pressure Swing Adsorption (PSA) technique and Molecular Sieve (Zeolite) technology to generate oxygen directly from the atmospheric air.

Presently, the district Covid hospital has liquid oxygen generated plant which supplies oxygen to 100 patients.

https://timesofindia.indiatimes.com/city/mumbai/maharashtra-drdo-to-set-up-oxygen-plant-at-jalna-covid-19-centre/articleshow/82946924.cms

Wed, 26 May 2021

हरियाणा के 8 जिलों में DRDO लगाएगा ऑक्सीजन जनरेशन प्लांट, 6210 बेड्स की बढ़ोतरी भी होगी

By Vijay

चंडीगढ़: कोरोना महामारी से निपटने में हरियाणा सरकार को केंद्र सरकार से लगातार सहयोग मिल रहा है। अब केंद्र सरकार के सहयोग से यहां 8 जिलों में पीएसए ऑक्सीजन प्लांट लगाए जाएंगे। डीआरडीओ द्वारा इन प्लांट्स का काम 30 जून तक पूरा कराया जाएगा। इस बारे में प्रदेश के गृह एवं स्वास्थ्य मंत्री अनिल विज ने जानकारी दी। विज ने यह भी कहा कि, इन प्लांट्स के लगने से हरियाणा में 6210 ऑक्सीजन बेड बढ़ जाएंगे।

स्वास्थ्य मंत्री अनिल विज बोले- "डीआरडीओ जो प्लांट स्थापित करा रहा है, वो हर प्लांट प्रति मिनट 1000 लीटर ऑक्सीजन का उत्पादन करेगा।" विज ने कहा कि, "प्लांट लगने से अग्रोहा मेडिकल परिसर में 550 बेड्स की क्षमता हो जाएगी। इसी प्रकार मिलिट्री अस्पताल (एमएच) अम्बाला में 550 बेड्स, एम्स झज्जर में 750 बेड्स, कल्पना चावला राजकीय मेडिकल कॉलेज करनाल में 550 बेड्स, एसएचकेएम राजकीय मेडिकल कॉलेज नल्हल में 652 बेड्स, वेस्टर्न कमांड चंडीमंदिर पंचकुला में 658 बेड्स, पीजीआईएमएस रोहतक में 2 हजार और और बीपीएस राजकीय मेडिकल कॉलेज खानपुर कलां सोनीपत में 500 बेड्स की बढ़ोतरी हो जाएगी।

ऑक्सीजन उत्पादन में आत्मनिर्भर होगा हरियाणा

प्रदेश के स्वास्थ्य मंत्री ने कहा कि, उपरोक्त सभी स्थानों पर कार्य पूरा करने के लिए एनएचएआई को अधिकृत किया गया है। इन स्थानों पर लगाए जाने वाले प्लांट्स में 1000 लीटर प्रति मिनट (एलएमपी) ऑक्सीजन की उपलब्धता होगी। मंत्री ने कहा कि, ऑक्सीजन उत्पादन में अपने हरियाणा को अब आत्मनिर्भर बनाया जाएगा। उन्होंने कहा कि, सूबे के प्राइवेट अस्पतालों को भी 6 माह में उनका खुद प्लांट लगाने का समय दिया गया है।

स्वास्थ्य मंत्री ने कहा कि, हाल ही में डीआरडीओ द्वारा पानीपत व हिसार में 500-500 बिस्तरों के 2 जिलों में कोविड केयर सेंटर का निर्माण किया गया। इसके अलावा भारतीय सेना ने भी सेंटर स्थापित कराए हैं।

https://hindi.oneindia.com/news/haryana/drdo-to-set-up-oxygen-generation-plant-in-8-districts-of-haryana-6210-beds-to-be-increased-619774.html?story=2

THE NEW INDIAN EXPRESS

Wed, 26 May 2021

Puducherry LG Tamilisai Soundararajan gets 2-DG sample drugs for Covid patients

The drug is effective and Covid patients improved symptomatically and became free from supplemental oxygen dependence, said Dr. Tamilisai Soundararajan, who herself is a medico

By Debjani Dutta

Puducherry: Puducherry Lt Governor Dr. Tamilisai Soundararajan got some sample '2-DG' drugs, the indigenously developed anti-Covid-19 drug, 2-deoxy-D-glucose or '2-DG' from Telangana to Puducherry on Tuesday

Puducherry Lt Governor Dr. Tamilisai Soundararajan

The 2-DG drug has been developed by the Institute of Nuclear Medicine and Allied Sciences (INMAS), New Delhi, a lab of the Defence Research and Development Organisation (DRDO), in collaboration with Hyderabad-based pharma company Dr Reddy's Laboratories (DRL).

The drug is effective and Covid patients improved symptomatically and became free from supplemental oxygen dependence, said Dr. Tamilisai Soundararajan, who herself is a medico.

The medicine which is given for 10 days, provided an early relief from oxygen dependence gradually after four days. Stating that she has held discussions through video conferencing with the producers and requested them to provide the medicine to Puducherry when it is made available in all states in a week or two.

The Lt Governor also handed over corona relief items such as masks, face shields, and PPE kits, oxygen concentrators, disinfectants, provided by various charities in Hyderabad to the Health Secretary Dr. T Arun at the Puducherry Airport in the presence of other health officials.

Stating that the Sputnik vaccine is being manufactured at three locations in Telangana, Dr. Tamilisai Soundararajan urged the manufacturers to set up a manufacturing unit in Puducherry. This will provide employment to youths in Puducherry and at the same time the vaccine would be made available to people in Puducherry and its neighboring areas, she said.

The Lt Governor said that she had gone to Telangana for a major event and had approved the appointment of Vice-Chancellors of 10 Universities.

She said that the state of Telangana had received a lot of help from various charities there and had appealed to them to provide for Puducherry. Responding to her request, many charities had made their contribution by donating and providing relief items to Puducherry, she said.

https://www.newindianexpress.com/states/tamil-nadu/2021/may/25/puducherry-lg-tamilisai-soundararajan-gets-2-dg-sample-drugs-for-covid-patients-2307485.html

अमर उजाला

Wed, 26 May 2021

उत्तराखंड: आज मुख्यमंत्री करेंगे ऋषिकेश में बने पांच सौ बेड के कोविड अस्पताल का शुभारंभ

सार

आईडीपीएल परिसर में डीआरडीओ की ओर से बनाया गया कोविड-19 अस्पताल बहुत कम समय में बनकर तैयार हुआ है।

विस्तार

डीआरडीओ की ओर से आईडीपीएल मैदान में बने पांच सौ बेड के अस्थायी कोविड अस्पताल का शुभारंभ प्रदेश के मुख्यमंत्री तीरथ सिंह रावत बुधवार को करेंगे। इस कार्यक्रम में वर्चुअल शामिल होने के लिए रक्षामंत्री राजनाथ सिंह को भी निमंत्रण भेजा गया है।

मंगलवार को विधानसभा अध्यक्ष प्रेमचंद अग्रवाल ने बताया कि आईडीपीएल परिसर में डीआरडीओ की ओर से बनाया गया कोविड-19 अस्पताल बहुत कम समय में बनकर तैयार हुआ है। इसके लिए उन्होंने प्रधानमंत्री नरेंद्र मोदी, रक्षा मंत्री राजनाथ सिंह का आभार व्यक्त करते हुए डीआरडीओ के अधिकारियों और कर्मचारियों की प्रशंसा की। कहा बुधवार को प्रदेश के मुख्यमंत्री इसका शुभारंभ करेंगे।

मुख्यमंत्री तीरथ सिंह रावत - फोटो : अमर उजाला फाइल फोटो

राहत! अस्पतालों में खाली होने लगे आईसीयू, ऑक्सीजनयुक्त बेड

कोरोना संक्रमित मरीजों और तीमारदारों को अब आईसीयू बेड और ऑक्सीजनयुक्त बेड के लिए सरकारी और निजी अस्पतालों में बहुत अधिक जद्दोजहद नहीं करनी पड़ेगी। कारण कि राजधानी देहरादून के सरकारी और निजी अस्पतालों में अब आईसीयू और ऑक्सीजनयुक्त बेड खाली होने लगे हैं।

दून अस्पताल के उप चिकित्सा अधीक्षक डॉ. एनएस खत्री ने बताया कि कोरोना संक्रमित मरीजों का ग्राफ गिरने के साथ ही अस्पताल में बेड खाली होने लगे हैं। अभी अस्पताल में 100 ऑक्सीजनयुक्त बेड खाली हैं, लेकिन अभी आईसीयू बेड खाली नहीं हैं।

सहारनपुर, हरिद्वार, ऋषिकेश के अलावा पर्वतीय जिलों के बड़ी संख्या में गंभीर मरीजों के अस्पताल पहुंचने की वजह से आईसीयू बेड की अभी थोड़ी दिक्कत है। जिस तरीके से मरीजों का ग्राफ तेजी से गिर रहा है, आने वाले दिनों में आईसीयू बेड भी खाली हो जाएंगे।

आरोग्यधाम अस्पताल के निदेशक व वरिष्ठ गैस्ट्रोसर्जन डॉ. विपुल कंडवाल ने बताया कि कोरोना की दूसरी लहर का असर तेजी से कम हो रहा है। गंभीर मरीजों की संख्या में भी तेजी से कमी आई है। ऐसे में अस्पताल में आईसीयू के साथ ही ऑक्सीजनयुक्त बेड काफी संख्या में खाली हो गए हैं।

बता दें कि पिछले दिनों जब कोरोना संक्रमण पीक पर था तब तमाम अस्पतालों में आईसीयू और ऑक्सीजनयुक्त बेड की किल्लत हो गई थी। स्थिति यह थी कि मरीजों और तीमारदारों को एक-एक बेड के लिए जद्दोजहद करनी पड़ी।

https://www.amarujala.com/dehradun/coronavirus-in-uttarakhand-latest-news-cm-tirath-singh-rawat-inaugurates-drdo-covid-hospital-today

जागरण

Wed, 26 May 2021

जम्मू और श्रीनगर के बाद DRDO के डिजाइन किए दो और अस्पतालों को मंजूरी

प्रदेश के दूरदराज के जिलों के मरीजों को इलाज में कोई दिक्कत न पेश आए इसके लिए भी डीआरडीओ की ओर से डिजाइन किए हुए 250-250 बिस्तर की क्षमता वाले अस्सपतालों के निर्माण को मंजूरी मिल गई है।

By Vikas Abrol

जम्मू: केंद्र शासित प्रदेश जम्मू कश्मीर में कोरोना संक्रमण से ग्रस्त मरीजों के इलाज के लिए केंद्र और प्रदेश स्तरी पर स्वास्थ्य के बेहतरीन प्रबंध किए जा रहे हैं। केंद्र की पहल पर जम्मू और कश्मीर में पहले से ही डीआरडीओ की ओर से 500-500 की क्षमता वाले दो अस्पतालों का निर्माण कार्य करीब-करीब पूरा हो चुका है। प्रदेश के दूरदराज के जिलों के मरीजों को इलाज में कोई दिक्कत न पेश आए इसके लिए भी डीआरडीओ की ओर से डिजाइन किए हुए 250-250 बिस्तर की क्षमता वाले अस्सपतालों के निर्माण को मंजूरी मिल गई है।

मुख्य सचिव बीवीआर सुब्रहमण्यम ने केंद्रीय गृह सचिव अजय कुमार भल्ला को स्वास्थ्य ढांचे के संबंध में बताया कि चार हजार पंचायतों में पांच-पांच बिस्तरों की क्षमता वाले कोविड केयर सेंटर बनाए गए हैं। इनमें से एक-एक बिस्तर आक्सीजन की सुविधा वाला है। इमरजेंसी पड़ने पर इन्हें अन्य अस्पतालों में रेफर कर दिया जाता है। घरों में इलाज करवा रहे 33 हजार लोगों में कोविड केयर मेडिकल किट वितरित की गई हैं।

यह भी बताया गया कि जम्मू और श्रीनगर में डिफेंस रिसर्च और डेवलपमेंट आर्गेनाइजेशन (डीआरडीओ) 500-500 बिस्तरों की क्षमता वाले कोविड अस्पताल बना रही है। जम्मू का अस्पताल बुधवार से शुरू हो रहा है जबकि श्रीनगर का अस्पताल एक जून से शुरू होगा। दोनों अस्पतालों के लिए दो आक्सीज टैंकर भी स्थापित किए गए हैं। दूरदराज के जिलों के मरीजों के लिए भी डीआरडीओ के डिजाइन किए हुए 250-250 बिस्तरों की क्षमता वाले दो अन्य अस्पतालों को भी मंजूरी दी गई है। इससे पहले गृह सचिव केंद्र शासित प्रदेशों में कोविड प्रबंधन के लिए उठाए गए कदमों की समीक्षा कर रहे थे।

उन्होंने लगातार आ रही कोरोना संक्रमण की लहरों से बचाव के लिए पुख्ता कदम उठाने को कहा। उन्होंने कहा कि पूर्व के अनुभवों को देखते हुए टेस्टिंग और टीकाकरण दोनों में कमी न आने दें। लोगों से एसओपी का सख्ती के साथ पालने करने और स्वास्थ्य ढांचे को मजबूत करें। केंद्रीय गृह सचिव ने जम्मू-कश्मीर को हर संभव सहायता देने का आश्वासन दिया।

https://www.jagran.com/jammu-and-kashmir/jammu-two-more-drdo-designed-hospitals-approved-after-jammu-and-srinagar-21676071.html

DAILYEXCELSIOR.COM

Wed, 26 May 2021

Advisor Bhatnagar reviews progress on establishment of DRDO hospitals

Jammu: Advisor to Lieutenant Governor, Rajeev Rai Bhatnagar today chaired a high level meeting to review the progress of work on establishment of two 500 bedded DRDO Hospitals at Jammu and Srinagar respectively.

The meeting was attended by Financial Commissioner Health and Medical Education, Atal Dulloo; Divisional Commissioners of Jammu/Kashmir, Deputy Commissioners of Jammu/Srinagar, Principals of GMC Jammu/Kashmir, Director Health Services of Jammu/Kashmir, Chief Engineer R&B Jammu/Kashmir, Chief Engineer DRDO, incharge Medical Superintendents of both Hospitals, senior officials of health as well as other allied departments both in person as well as through virtual mode.

During the meeting, Advisor Bhatnagar took a detailed review of all the major works needed for early operationalisation of the hospital like status of civil work, water power supply, sewerage system, public utilities, hiring of man power as well as other aspects of the hospitals. He directed the concerned officers to expedite the pace of work and ensure that the hospitals are completed within the given timelines and dedicated to public use at the earliest.

The Advisor further asked the officers to give adequate training to doctors and other paramedical staff who will be deployed at these hospitals. He further directed them to give specialised training to those doctors and paramedics who will be dealing with the ICU wards of these Hospitals.

He stressed upon the concerned officers that details of medicines required, medical consumables, diagnostic tools and other logistics should be thoroughly worked out well in advance so that treatments as per protocols can be provided to the patients.

Taking stock of other allied works, the Advisor impressed upon the officers that laying of medical oxygen gas pipelines, sewerage network system and other allied works should be completed within the fixed timelines besides availability of medical oxygen has to be ensured with emergency back up systems in place.

He further asked the concerned officers to devise a mechanism for deployment of Engineers of PWD, PDD, Mechanical Engineering Department, Jal Shakti, plumbers and other required technical staff to the Hospitals till their own staff is arranged. He impressed upon them to work in close coordination and synergy, so that the required works are completed at the earliest and the Hospitals are commissioned for public use in these critical times.

During the meeting, the Divisional Commissioners of Jammu and Kashmir apprised the Advisor about the status of Hospitals in their respective divisions.

The Engineers from DRDO informed the Advisor that the works on both the Hospitals are going in full swing and the Hospitals will be completed within the given timelines.

Regarding the deployment of the manpower, the Advisor was informed that some health care professionals, para medical staff have been provided by Directorates of Health Services while as advertisements have also been issued by Principals of GMC Jammu/Srinagar for engagement of doctors, lab technicians, para medical staff etc in these Hospitals.

https://www.dailyexcelsior.com/advisor-bhatnagar-reviews-progress-on-establishment-of-drdo-hospitals/

the pioneer

Wed, 26 May 2021

Covid: DRDO all set to hand over 500 bed hospital in Jammu soon

By Mohit Kandhari

Jammu: Defence Research Development Organisation (DRDO) is all set to hand over the 500 bedded makeshift hospital in Jammu to the UT administration in Jammu and Kashmir to ensure best possible patient care services to the Covid-19 patients.

According to official sources, "the Covid-19 dedicated hospital will be made functional by May 28/29". "Our teams are working round the clock and a test run of facilities is currently going on before formally handing over the facility to the J&k administration".

Advisor to Lieutenant Governor, Rajeev Rai Bhatnagar also chaired a high level meeting to review the progress of work on establishment of two 500 bedded DRDO Hospitals at Jammu and Srinagar respectively.

The Engineers from DRDO informed the Advisor that the works on both the Hospitals are going in full swing and the Hospitals will be completed within the given timelines.

Meanwhile, 53 patients succumbed to the coronavirus across Jammu and Kashmir on Tuesday while 2964 new patients tested positive.

According to the media bulletin, 33 patients died in Jammu region and 20 in Kashmir. However, the positivity rate recorded on Tuesday stood at 7.16 percent while 3623 patients were discharged from different hospitals across J&k.The active case load has also come down to 44918 in J&k.

Currently, Jammu and Kashmir is among the leading regions in the country in vaccination of above 45 years age group having vaccinated 66% of its eligible population which is well above the national average of 32%.

Within J&K, 4 districts- Ganderbal, Jammu, Samba, and Shopian, have achieved100% coverage in this category, while the remaining continue with promising progress.

Meanwhile, in order to get on the spot appraisal of medical facilities being extended to the people of Samba and Kathua Districts, Lieutenant Governor, Manoj Sinha Tuesday visited GMC Kathua, District Hospital & Covid Care Centre at Samba.

During his visits, the Lt Governor took a comprehensive review of the Covid containment measures in the respective districts.

https://www.dailypioneer.com/2021/india/covid--drdo-all-set-to-hand-over-500-bed-hospital-in-jammu-soon.html

THE NORTHLINES

Wed, 26 May 2021

500 bedded Jammu DRDO hospital to be ready in 10 days

Jammu Tawi: The work on Defence Research and Development Organisation (DRDO) hospital is going on with full speed in Jammu division while officials said that the hospital would be functional in next 10 days.

Top health officials informed that around 80 percent work has been completed already while work on the pending part is going on in full swing and it is expected to be completed in next one week while the hospital will be functional in next 10 days.

Dr Sanju Gupta Sudan Medical officer Jammu Municipal Corporation said that such a facility in Jammu division was the need of the hour and it will greatly help the locals.

She said that the sanitization part has been assigned to the Municipal Corporation and they are working on it.

She said that 80 percent work has been already done and hopefully within 10 days the hospital will be functional.

"We will try to beautify it so that people coming here won't feel depressed and feel mentally comfortable," she said.

The DRDO has started construction of two 500 bed hospitals one each in Jammu and Kashmir.

The 500 bed Covid hospital is being constructed at State land near Amarnath Yatri Niwas Bhagwati Nagar Jammu.

The hospital will have 500 isolation beds with oxygen support including 125 fully equipped ICU beds**.**

https://www.thenorthlines.com/jammu-drdo-hospital-to-be-ready-in-10-days/

Defence News

Defence Strategic: National/International

The Hitavada

Wed, 26 May 2021

Army completes 5-yr LAC infra projects in one year

Accommodation for more than double the number of troops present at LAC readied by Army

By Ajit K Dubey

The Indian Army, engaged in a military stand-off with the Chinese army for more than a year, has developed infrastructure and now the capability to accommodate a large number of troops in habitats that have been built in the Ladakh sector and other areas along the Line of Actual Control (LAC). The Indian Army has been able to complete the work planned in next five years in the last 12 months, thus creating accommodation for more than double the number of troops present there. These habitats would allow the troops to function efficiently even during the harsh winters experienced in Ladakh and sustain them through temperatures which sometimes go down to minus 45 degrees.

Habitat facilities established by the Indian Army for troops in Eastern Ladakh, in order to ensure operational efficiency of troops deployed in winters. (ANI)

"Due to the military stand-off with China, the Indian Army has been able to complete the work planned in next five years in the last 12 months itself. The number of troops which can be easily accommodated and stationed in the Ladakh sector alone in the newly constructed habitats would be more than double the number of troops presents there," Government sources told ANI. According to estimates, both India and China have deployed more than 50,000 troops in the Eastern Ladakh sector opposite each other despite the limited disengagement in the Pangong lake sector by both sides earlier this year. The sources said that the Corps of Engineers are still working all along the LAC to erect structures for the troops to operate there and accommodate additional forces if the need arises. India has also been working to develop the road infrastructure in all the sectors along the LAC and has speeded up work on the Nimu-Padam-Darcha axis which is going to help troops move to Ladakh from other parts of the country round the year.

The Defence Ministry is also set to soon clear a proposal to allow the BRO to construct a 4.5 km-long tunnel for connectivity on the new road. The road connectivity to all the forward locations has also been made available much before the due dates by the Army engineers. The military standoff between the two sides had started in the month of April- May last year when the Chinese used a summer military exercise to divert troops for aggression along the Indian territory in the eastern Ladakh areas while they built up troops along in the Sikkim sector and other locations in the North-East to pressurise India.

https://www.thehitavada.com/Encyc/2021/5/25/Army-completes-5-yr-LAC-infra-projects-in-one-year.html

The Tribune

Wed, 26 May 2021

Army to merge CSD canteens of static units located in same station

Solely owned by the Ministry of Defence, CSD is the most profitable retail chain in India

By Vijay Mohan

Chandigarh: As part of the efforts to reduce operating costs and revamp functional structure, the Army has issued orders to merge unit run canteens (URC) of the Canteen Stores Department (CSD) functioning from various static military establishments located in the same station.

Any one URC of a static unit, preferably the one with largest dependency, be nominated as the 'merged URC' and all other URCs be kept in 'suspended animation'. URCs of those units that are likely to be affected by rotational movements should be exempted from the merger, a letter issued by the Quartermaster General's Branch at Army Headquarters to the establishments of all three services on May 24 states.

Based on the recommendations by a board of officers (BOO) comprising all stakeholders, formation commanders, local military authorities and station commanders will have the leeway to nominate the merged URC, which should be centrally located so that it is convenient for all to commute, the letter adds. Station Canteens for ex-servicemen can continue in accordance with the BOO's recommendations.

The letter also states that all URCs in suspended animation shall retain their names and URC Codes, but the supporting CSD depots shall not process any demands received from such URCs. Pro-rata portion of profit will be shared with the units of URCs kept in suspended animation under supervision of the headquarters concerned.

Last year the Minister of State for Defence, Shripad Naik, had stated in Parliament that while the government has not given any orders for closure of URCs. Merger of URCs is a periodic process based on the number of beneficiaries in the area, proximity to other URCs and organisational efficiency. All efforts are made to ensure that there is no inconvenience to the clientele, including ex-servicemen, he had further stated.

Solely owned by the Ministry of Defence, CSD is the most profitable retail chain in India, selling a wide variety of products like groceries, household appliances, liquor, vehicles, cosmetic and sports equipment at subsidized rates to serving and retired armed forces personnel and civilians employed in defence establishments.

It has 34 depots and 3,809 URCs located across India and an inventory of over 4,000 products sourced from 436 companies. A significant amount of profit is generated by CSD out of which 50 per cent is deposited into the Consolidated Fund of India (CFI). For the 2019-20 fiscal, the amount deposited in CFI was 384.5 crore.

Last year the sale of directly imported items, including liquor, in CSD canteens was stopped. As many as 422 such items were taken off the CSD's inventory in a bid to promote indigenously manufactured products.

More recently, CSD has started online purchase for 'Against Firm Demand (AFD)' items, that include items such as vehicles and high end appliances. All purchases of AFD items are now being made through CSD's online portal.

CSD has also had its share of functional problems such as inadequate budgetary support, non-availability of certain products, pilferage of goods and delays in processing demands from clientele.

https://www.tribuneindia.com/news/nation/army-to-merge-csd-canteens-of-static-units-located-in-same-station-258224

Wed, 26 May 2021

Iron Dome Explained: All about it's working & Israel's Missile Defense System here

Know what is Iron Dome, how does it work and what are its benefits in the article below. Iron Dome has proved to be a boon for Israel in the recent war with Palestinian militancy group Hamas

By Tulika Tandon

Iron Dome: Why in News?

Before the announcement of a cease-fire in the Israel Palestine Conflict, militant groups like Hamas and Islamic Jihad had launched precisely 4,369 rockets of all possible ranges from Gaza toward Israel.

Israel's Iron Dome

Israel's military was able to stop more than 90% of those attacks. They said that almost 2/3rd of these missed their targets as they hit fields and other open areas. Many of them were informed to have malfunctioned. Inspite of this, almost 1,500 rockets were able to reach the built-up areas.

What was surprising was that this attack resulted in fewer deaths than expected. The credit goes to Israel's missile-defense system, Iron Dome.

Israeli military spokesman Lt Col Jonathan Conricus said, "The number of Israelis killed and wounded would be far higher if it had not been for the Iron Dome system, which has been a lifesaver as it always is."

Iron Dome: History

The system was first initiated in the war Israel fought with Lebanon's Hezbollah movement. The year was 2006. During this war too, numerous rockets were launched into Israel that caused huge damage, mass evacuations and deaths.

It was after facing this damage that Israel decided to develop a new missile defence shield.

Iron Dome was created by Israeli firms Rafael Advanced Defense Systems and Israel Aerospace Industries. It is known that with the support from the United States of America, the Iron Dome became operational in 2011.

Iron Dome: Features

1. The control system in the Iron Dome has been built by Israel's known software company mPrest Systems on being engaged by Rafael.
2. The missile launched by the MFU of Iron Dome included Tamir interceptor missiles also.
3. It has various steering fins for high manoeuvrability which are also equipped with electro-optic sensors.
4. The missile system has great interception capability, with day-and-night along with all-weather capability, quick reaction time etc.
5. It can also adapt to rapidly evolving threats and handle multiple threats at the same time.

How does Iron Dome work?

It works in 5 steps as shown in the picture below.

Step 1:

Enemies Rockets are fired- In this the enemies would target their air missiles or rockets towards Israel

Step 2:

Detection by Radar- The Radar System of Israel detects the rockets and its tracks that may penetrate the air space of Israel

Step 3:

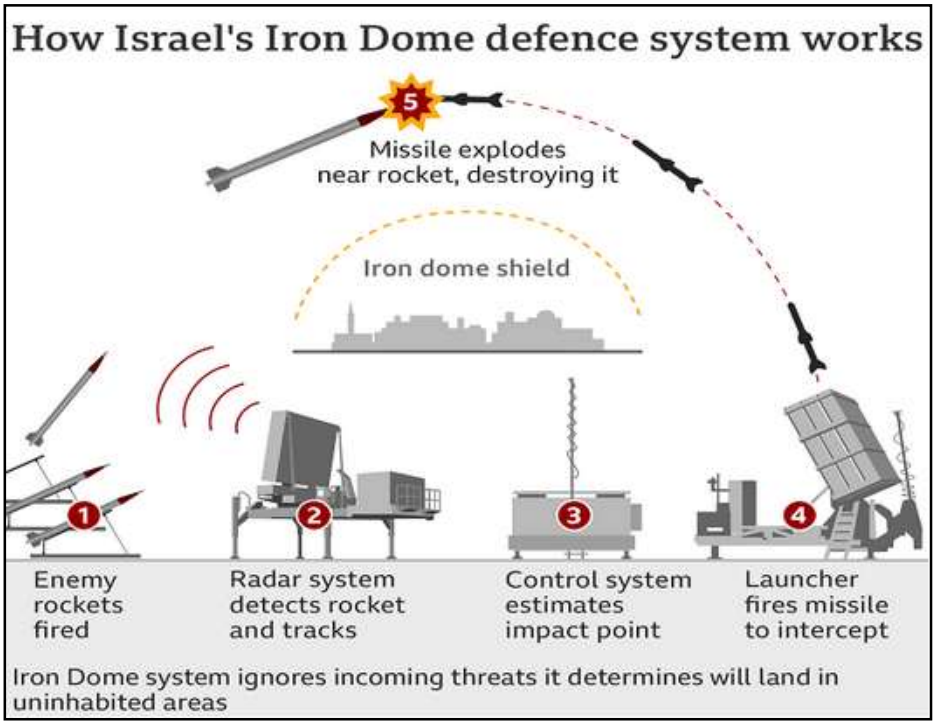
Control System estimates Impact Point- The control system in the dome intercepts the target point of the rockets fired

Step 4:

Fire Missiles launched- The Launcher fires the missiles to intercept. The best thing about Iron Dome is that it would not act on the threats that it can intercept to fall in uninhabited areas.

Step 5:

Rockets destruction- The missiles are launched which explode close to the rockets thereby destroying them.



Benefits of Iron Dome:

1. It is an all-weather system.
2. It helps combat shorter-range rudimentary weapons like the rockets fired from Gaza.
3. It can differentiate between missiles likely to hit built-up areas and those that would not.
4. Static and mobile units only launch interceptor missiles to shoot-down anything interpreted as dangerous.
5. Iron Dome can detect, analyse and intercept a range of incoming threats that include C-RAM, various precise guided missiles, cruise missiles, unmanned aerial vehicles and air-breathing threats.

Israel has 10 batteries deployed across the country now that a decade has passed since the development of the dome system. Each battery has three to four launchers that can fire 20 interceptor missiles. The system has intercepted more than 2,500 incoming targets with a success rate of over 90% so far.

Israels Iron Dome is one of the most sought after defense products of the world and even India has signed deals with Israel in this regard.

https://www.jagranjosh.com/general-knowledge/iron-dome-explained-all-about-israels-missile-defense-system-here-1621938407-1

Wed, 26 May 2021

India, Oman renew two major defence pacts: All you need to know!

India and Oman had signed an agreement giving Indian Navy access to facilities at Oman's Duqm port in 2018 during Prime Minister Narendra Modi's visit to Muscat, Oman

By Sangeeta Nair

India and Oman have renewed two major defence pacts that focus on enhancing on maritime security and military cooperation. Oman is India's oldest strategic partner in the Gulf region and a key ally in the Indo-Pacific region and eastern and southern Africa.

The two agreements include a maritime transport agreement, which was signed in December 2019 and another agreement that was agreed upon in 2018, which gave Indian Navy access to facilities at Oman's Duqm port.

1. Maritime transport agreement

India and Oman had signed a maritime transport agreement in December 2019 during Union External Affairs Minister Dr S Jaishankar's visit to the nation.

Why is this important?

The maritime agreement enabled India to expand its footprint in the western and southern Indian Ocean, the Persian Gulf and East Africa. It was the first such agreement that India had signed with any gulf nation.

2. Agreement giving Indian Navy access to facilities at Oman's Duqm port

India and Oman had signed another agreement giving Indian Navy access to facilities at Oman's Duqm port in 2018 during Prime Minister Narendra Modi's visit to Muscat, Oman.

Why is this important?

- The Duqm port serves as India's gateway to the wider West and East Africa. It is just 40 minutes away from Mumbai by flight.
- The Duqm Port is also designated as the largest deep-sea port in the Indian Ocean.
- India had sought interest in gaining access to facilities of the port amid Chinese Navy's increased activity in the western part of the Indian Ocean region.

India and Oman had signed a total of 8 MoUs during PM Modi's visit to Oman on February 11, 2018 to expand cooperation in different sectors including defence and tourism. The agreements included provision of facilities for Indian military vessels to visit Duqm Port in terms of service and dry dock use.

Significance

At the end of PM Modi's visit to the Sultnate, the two nations had issued a joint statement saying that they have agreed to strengthen cooperation to strengthen maritime security in the Gulf and Indian Ocean Territory, which ia essential to the security and prosperity of both countries.

India-Oman Defence Relations

- Oman was the first Gulf nation to establish formal defence relations with India. The two nations signed their first defence agreement in 2006 after conducting joint military exercises.
- The defence cooperation between the two nations was further stepped up after Prime Minister Manmohan Singh visited Oman in 2008.
- The Indian Navy has berthing rights in Oman and has been utilising Oman's ports as bases for conducting anti-piracy operations in the Gulf of Aden.
- The Indian Air Force also holds biannual joint exercises with the Royal Air Force of Oman since 2009.

India supplies Oman with rifles that are most standardly used by the Royal Army of Oman.

- Oman currently provides anchors for India in the Persian Gulf and eastern and southern Africa.
- India and Oman's military ties developed largely under the late Omani Sultan, Qaboos bin Said Al Said.
- The relations between the two nations have received further boost in the last couple of years with more agreements being signed.
- India is currently considering setting up a defense production facility in Oman.

https://www.jagranjosh.com/current-affairs/india-oman-renew-two-major-defence-pacts-all-you-need-to-know-1621938128-1

Wed, 26 May 2021

China's anti-ship ballistic missile capability in South China Sea – Analysis

By Felix K. Chang

(FPRI) — In August 2020, China fired what were reported to be anti-ship ballistic missiles (ASBM) into the South China Sea. The missile firings were the second time that China launched such missiles into the disputed waters. The first occurred in June 2019, when China fired six ASBMs into the area. Whether the two missile firings were launched against mobile targets or predetermined ones at sea is unclear, but it is likely that the ASBMs involved were DF-21D medium-range or DF-26 intermediate-range ballistic missiles. And since China normally conducts its missile tests in the Bohai Sea and the fact that U.S. naval forces operated in South China Sea during the weeks prior to the missile firings, China probably conducted them to not only test its ASBM capabilities, but also to deter what it considers American meddling in its waters.

File photo of China's Yuan Wang 2 ship, used for tracking and support of satellite and intercontinental ballistic missiles. Photo Credit: Gadfium, Wikipedia Commons

Nonetheless, missile launches alone, however successful, do not mean that China can reliably hit ships at sea with ASBMs. That is because missiles and the warheads atop them are only part of a larger kill chain. Just as a rifle and bullet need a reliable human eye to hit the intended target, China's ASBMs and their warheads need reliable intelligence, surveillance, and reconnaissance (ISR) to hit intended targets at sea. Creating such an ISR capability is not easy. But China has been steadily assembling the components needed to develop it in the South China Sea.

The Targeting Problem

While ASBMs have come a long way since the Soviet Union pioneered (and then abandoned) them in the 1970s, how they are envisioned to work remains the same. A conventionally armed ASBM is designed to take advantage of its ballistic trajectory through the upper atmosphere to propel its warhead (or warheads) to hypersonic speeds so that they can penetrate any shipboard anti-ballistic missile (ABM) system that its targets have fielded. Traveling at several times the

speed of sound, an ASBM's warhead would clearly give a defending ABM system little time to react. Given a warhead's mass and the speed of its descent, even a successful interception with an ABM missile might not be enough to stop it. Making matters worse for the defender, China has sought to design maneuverable warheads that would further complicate the task of ABM systems.

All that, however, assumes that China's ISR collection assets can detect, identify, track, and target ships at sea with sufficient accuracy so that its ASBMs can locate and hit their targets. That is not a trivial matter, not least because the waters of the South China Sea contain some of the busiest maritime traffic in the world. Just as problematic is that ships at sea tend to be constantly in motion. In 10 minutes, even cruise ships can traverse 10 km (at about 30 knots). Plus, they can change course (perhaps more than once) or stop entirely. Though a maneuvering warhead might be able to adjust its course in-flight to reduce the need for absolute ISR accuracy, there is a physical limit to how much steering ASBM warheads can do while traveling at hypersonic speeds.

Of course, China's rocket forces could try to mitigate any targeting error by launching a salvo of several missiles and warheads against a single target. They could also employ a mix of warheads with different terminal seekers to improve the chances that one sort or another could overcome shipboard defenses. Blanketing an area with such warheads would no doubt raise the likelihood of hitting a ship at sea. But doing so could also increase the risk of hitting other nearby ships, including neutral ones, especially if the plasma sheaths which form around warheads as they descend through the atmosphere blind their seekers. In any case, repeatedly launching ASBM salvos would deplete China's supply of missiles far faster than launching a small number of well-aimed ones. Hence, a robust ISR capability will always play an important part in any effective ASBM system.

Fusion for Precision

China has greatly expanded its seaward-looking ISR with an array of air, land, sea, and space-based collection assets. Chinese commanders now have more ways to detect, identify, track, and target ships offshore than ever before. Paradoxically, however, the great diversity of collection assets may make it more difficult for those commanders to fuse the data from them into a single common operating picture. Creating the infrastructure needed to deconflict multiple data feeds and present information in a manner that allows commanders to make quick decisions is a major technical challenge. But given enough financial investment, China can be expected to eventually surmount it.

What might present a bigger challenge to China's ISR fusion is an organizational one. First, it takes repeated practice (and consequently time) to iron out the kinks. The United States took decades to properly fuse its joint ISR resources after it created its unified combatant commands; on the other hand, China only reorganized its military regions into unified "theater commands" in 2017. Second, for fused ISR data to be of any use, it must be coupled with the centralized authority to act, but that runs against Beijing's traditional preference to disperse authority in its military to ensure its subservience to the Chinese Communist Party (CCP). Exemplifying that, for over 70 years, the Chinese military has operated under a dual-command system, where decision-making is shared between line officers and political commissars.[1] While three decades of reform has transformed China's military into a far more professional fighting force, Chinese General Secretary Xi Jinping's drive to root out any hint of dissent (even among top CCP leaders) shows how easily it could backslide.[2]

Missiles and Seekers

Should China overcome the challenges to fusing (and using) its ISR data, the South China Sea is likely to be the first maritime area where Chinese commanders have sufficient ISR fidelity to support ASBM targeting. As for the ASBMs themselves, the missiles most commonly thought to have an anti-ship role are the DF-21D and DF-26. The DF-21D is said to have a range of 1,500 km and the DF-26 a range of 4,000 km.[3] From their launch sites on the Chinese mainland, the DF-21D could cover most of the South China Sea as well as the approaches to it from the Pacific Ocean through the Bashi and Luzon Straits. The DF-26 could cover not only the South China Sea but also large parts of the Indian and Pacific Oceans and beyond.

But the longer an ASBM's range is, the more accurate the ISR data must be to target a ship at sea because greater distance would give the ship more opportunity to get out of harm's way. Thus, China has fitted its DF-21D ASBMs with maneuverable warheads that are guided by terminal seekers.[4] That way, even with slightly inaccurate ISR data, the terminal seeker could steer a warhead towards its target, so long as the seeker can identify that target and the guidance it provides is within the warhead's ability to maneuver. Of course, creating such a seeker is no mean feat. It will have to function not only at hypersonic speeds, but also while encased in the plasma that forms around a warhead as it plunges through the atmosphere.

Naturally, the types of terminal seeker that China might use are also important. One type is an electro-optical seeker, which uses the spectral signature (i.e., image) of a target to identify it. Unfortunately, atmospheric conditions (i.e., clouds) and hours of darkness can often get in the way. An infrared seeker can overcome those shortcomings by using a target's heat signature for identification. However, even the best infrared seeker is open to spoofing with technology that either masks or mimics heat radiation. A third type is an active-radar seeker, which identifies a target using its radar cross-section; it, too, can be fooled. While an ideal terminal seeker is likely one that combines multiple sensors, such a seeker would be more difficult to manufacture, given a warhead's size and weight constraints.

Conclusion

To be sure, China's potential adversaries are aware of its ambitions to target ships at sea with ASBMs. They have once again begun to train their navies to strictly manage their electronic emissions to evade China's ISR collection assets. Within the South China Sea, however, the time when such basic countermeasures are enough may be dwindling. While it may never be publicly known whether China's 2019 or 2020 ASBM firings into the South China Sea were directed against mobile or fixed targets (or whether they were successful or not), the fact that the missile firings occurred at all so close to waters where commercial and naval ships often ply suggests that China was reasonably confident that its missiles would not hit those ships. Of course, that does not imply that China's ASBM capability has become operational—it does imply that it may be one step closer.

The views expressed in this article are those of the author alone and do not necessarily reflect the position of the Foreign Policy Research Institute, a non-partisan organization that seeks to publish well-argued, policy-oriented articles on American foreign policy and national security priorities.

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[1] Jeff W. Benson and Zi Yang, *Party on the Bridge: Political Commissars in the Chinese Navy* (Washington, D.C.: Center for Strategic and International Studies, Jun. 2020), pp. 26-30, 34.

[2] Chun Han Wong, "Xi's China Ramps Up Drive to Squelch Dissent," *Wall Street Journal*, Nov. 28-29, 2020, pp. A1, A10.

[3] Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020* (Washington, D.C.: U.S. Department of Defense, Sep. 2020), p. 56.

[4] *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020*, p. 56.

https://www.eurasiareview.com/26052021-chinas-anti-ship-ballistic-missile-capability-in-south-china-sea-analysis/

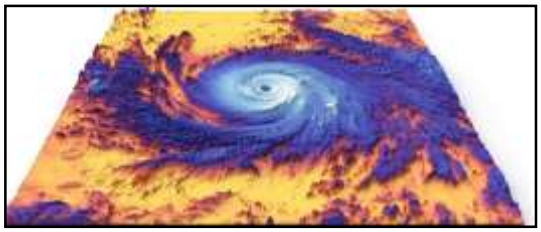
INDIA TODAY

Wed, 26 May 2021

Nasa joins hands with ISRO to develop Earth Observatory to mitigate climate change, better disaster management

As part of the Earth System Observatory, each satellite will be designed uniquely to work together and create a 3D, holistic view of Earth, from bedrock to atmosphere

New Delhi: As India prepares to tackle the upcoming Cyclone Yaas, disaster management has emerged as a critical part of the global agenda as climate change leads to increased cyclonic storms, wildfires and major forest fires. Now, a new system to be developed by the National Aeronautics and Space Administration (Nasa) aided by radar systems from the Indian Space & Research Organisation (Isro) will provide key information to guide efforts related to climate change and disaster mitigation.



As part of the Earth System Observatory, each satellite will be designed uniquely to work together and create a 3D, holistic view of Earth, from bedrock to atmosphere.

"The observatory follows recommendations from the 2017 Earth Science Decadal Survey by the National Academies of Sciences, Engineering and Medicine, which lays out ambitious but critically necessary research and observation guidance," Nasa said in a statement.

ISRO to provide radar systems for observatory

While the observatory is at a formulation stage, Isro will provide two radar systems that can measure changes in Earth's surface less than a half-inch. The radar to be used in one of the observatory's first missions intended as a pathfinder has been dubbed as Nasa-Isro Synthetic Aperture Radar (NISAR).

"This mission will measure some of the planet's most complex processes such as ice-sheet collapse and natural hazards such as earthquakes, volcanoes, and landslides," Nasa said in the statement. NISAR will assist planners and decision-makers with managing both hazards and natural resources in the future.

Key focus on predicting natural hazards

The new system will focus on finding answers to the critical question of how aerosols affect the global energy balance, air quality forecasting, and prediction of severe weather. The system will also provide drought assessment and forecast, associated planning for water use for agriculture, as well as supporting natural hazard response.

Scientists will use the data from the observatory to understanding climate changes that impact food and agriculture, habitation, and natural resources. Meanwhile, it will also provide quantifying models of sea-level and landscape change driven by climate change, hazard forecasts, and disaster impact assessments including dynamics of earthquakes, volcanoes, landslides, glaciers, groundwater, and Earth's interior.

https://www.indiatoday.in/science/story/nasa-isro-disaster-management-system-climate-change-cyclone-1806655-2021-05-25

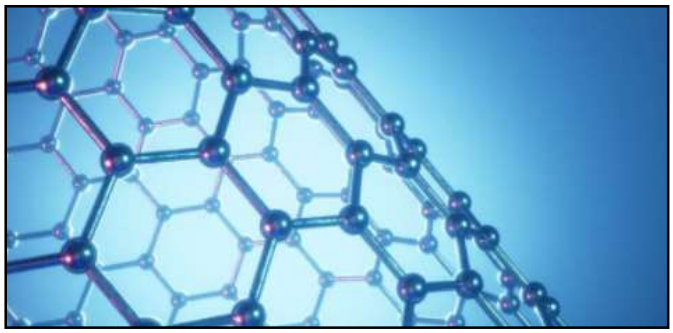
PHYS.ORG

Wed, 26 May 2021

Folded 2D materials have properties useful for quantum communications

By Adelina Ilie

Graphene is a material made of carbon atoms one layer thick, arranged in a honeycomb structure. It has been used to make materials stronger, create ultra-high frequency components for communications, boost battery performance and even used to make COVID-19 tests. It's the archetypal two-dimensional (2D) material—but there's much more to 2D materials than graphene.



Credit: Shutterstock/Rost9

Since graphene was first isolated in 2004, research has expanded to the creation of other, non-carbon 2D materials. Now there are many tens of these, and they're hailed to make an impact where graphene is less suited, such as in novel transistors and next-generation optoelectronic devices, which generate, detect and control light.

Our recent study focused on a new form of the 2D material tungsten disulfide (WS2), which is both 2D and 3D. WS2 is a semiconductor—the same as silicon, which is found in almost all electronic devices. However, unlike silicon, WS2 can exist in a stable 2D form. We arranged the WS2 material in a new way to create a 3D arrangement of 2D sheets that we call a nanomesh.

Quantum communications would be secure from hackers. Credit: Shutterstock/Untitled Title

The WS2 nanomesh doubles the frequency and halves the wavelength of laser light—changing its color as it does so—with great efficiency. This means it could be useful in components for quantum communications using light, where attempts to "eavesdrop" on messages can always be detected. Light is important in quantum communications because particles of light, called photons, can be used to carry information. When two photons experience something called quantum entanglement, anything that happens to one of them is immediately observable in the other, no matter how far apart they are.

Quantum communication has the potential to deliver truly secure communication across the world. Using the bizarre property of entanglement, it's possible to engineer a system so that when a signal is intercepted, the sender immediately knows.

Many of the attempts so far to create quantum communications have been using laser light. But in order to do this we need an efficient way of controlling the light. This could potentially be done with 2D materials.

Two dimensional confinement

In 2D materials, electrons can move in two dimensions but their motion in the third dimension is restricted. This confinement gives 2D materials interesting properties that mean they show great promise as ultra-thin devices for IT, communications, sensing, energy, imaging and quantum

computing. For many of these applications, the 2D materials, which are just one atom thick, lie flat on a supporting surface.

Unfortunately, however, the strength of these materials—that they are extremely thin—is also their greatest weakness. This means when they are illuminated, visible light can interact with them only over a tiny thickness and the resulting effect is weak. To overcome this, researchers like me are starting to look for new ways to pack the 2D materials into complex 3D structures.

Nanomesh

My Ph.D. student and I created a webbed 3D network of densely-packed, randomly distributed stacks, containing rotated and fused 2D sheets called a nanomesh. Its unique characteristics are the result of the specific synthesis process we developed. We started by growing one-dimensional nanotubes (rolled sheets) of WS2, like a scaffold. These are naturally filled with a material from which WS2 sheets could grow at the nanotube tips and on their sides, rotated on top of each other and deployed like a fan. These sheets then fused with each other to create larger 2D sheets intersecting in 3D to create the nanomesh.

Inside a semiconductor there are energy bands, separated by an energy gap. Only light with energy larger than the energy gap can interact with the material in a useful way. If new energy levels are introduced inside this energy gap, the doubling of frequency of the light that passes through the material is much more efficient and can take place over a larger range of wavelengths. This is exactly what our nanomesh achieves, it changes the energy landscape—the energy bands, energy gaps and energy levels inside the gap—of the material.

Measurements by my colleagues in the photonics group demonstrated the nanomesh material indeed efficiently converts one laser color into another over a broad palette of colors. Compared to flat-lying WS2 layers, the nanomesh is highly efficient and responds to a wide range of light wavelengths, while also being durable and able to be grown over large areas.

Our study is proof that assembling 2D materials into a 3D arrangement doesn't just result in thicker 2D materials with which the light interacts more strongly—it produces materials with entirely new properties.

The nanomesh we made is technologically simple to produce at large scale, and offers interaction with light that can be tuned. The material could be evolved further, for example by including small metallic nanoparticles or by depositing a second material. Such hybrids would offer additional ways to change laser light passing through them.

Our next goal is to incorporate the nanomesh into devices that transmit and modify light and which can be integrated with traditional microelectronics. This is a route for developing practical quantum optical communications.

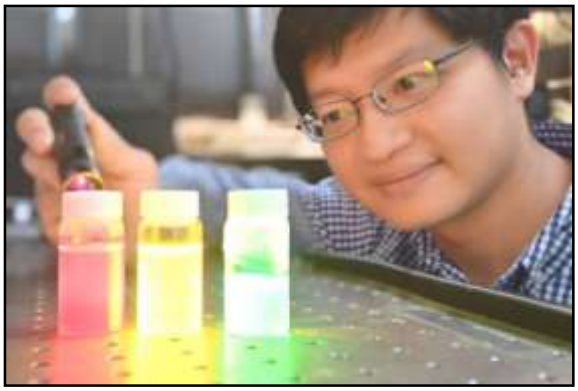
https://phys.org/news/2021-05-2d-materials-properties-quantum.html

PHYS.ORG

Wed, 26 May 2021

Research team develops self-healing quantum emitter with unprecedented brightness

Perovskite quantum dots are the rising stars of quantum emitters, but their inherent instability has hampered their development. Professor Hao-Wu Lin of the Department of Materials Science and Engineering, Associate Professor Chih-Sung Chuu of the Department of Physics, and Professor Richard Schaller of the Department of Chemistry at Northwestern University in the United States have jointly developed a perovskite quantum emitter with high stability and self-healing ability by a self-developed, simple, and economical procedure—spray-synthesis method. The unprecedented single-photon brightness of these quantum dots breaks the world-record, which makes them become the brightest room-temperature quantum emitter materials and constitute a major breakthrough in both quantum communication and quantum computing.



Professor Hao-Wu Lin of the Department of Materials Science and Engineering at National Tsing Hua University in Taiwan has played a key role in developing the world's brightest quantum emitters at room temperature. Credit: National Tsing Hua University

Lin said that in contrast with other quantum emitters, perovskite quantum dots can realize single photon emission at room temperature and have excellent optical properties, such as high quantum yield and high color purity, making them ideal for displays and high-speed computing and communications. In recent years, perovskite quantum dots have attracted much attention among the international material community. However, their development has been hampered by their short operation lifetime, which can only survive under excitation for a few minutes.

Professor Hao-Wu Lin of the Department of Materials Science and Engineering at National Tsing Hua University in Taiwan has developed a spray-synthesis method for preparing perovskite quantum dots with a uniform protective organic layer. Credit: National Tsing Hua University

The traditional method of preparing perovskite quantum dots is to directly inject and mix two different solutions. By contrast, Lin's research team has developed a spray-synthesis method which greatly increases the contact area of two different solutions, making it possible to grow a uniform protective organic layer on the surface of the quantum dots. Consequently, the perovskite quantum dots retain their brightness even after 24 hours of intensive continuous excitation, indicating that they overcome the poor stability of perovskite quantum dots.

Surprisingly, the perovskite quantum dots prepared in this way also have a unique self-healing ability. Although the quantum dots are damaged and decayed by extremely high-intensity excitation, they retrieve their original brightness after "resting" for just a few minutes. The team's research has been published in *ACS Nano*, and has also been chosen as the cover of the upcoming issue.

Lin compares researchers to chefs, and correlates preparing quantum dots with making dumplings. Some have tried using different materials, others have tried using thicker wrappers, and still others have tried doubling the wrappers, but he adopted a different approach: He simply kept on refining the method used for wrapping the dumplings.

The first author of the journal paper is NTHU doctoral student Bo-Wei Hsu. Recalling the moment when he first witnessed the self-healing capability of quantum dots, he said, "Following a period of strong excitation, the quantum dots gradually dimmed, but after a short while, they recovered their original brightness, and I could hardly believe my eyes!" Hsu did the experiments repeatedly and eventually confirmed that the quantum dots indeed possess this self-healing ability.

Lin pointed out that a perovskite quantum emitter prepared by this spray synthesis method requires only about 1% of the excitation intensity needed for other quantum emitters, and its single-photon brightness is as high as 9 million photons per second, which is a new world record. In addition, its single-photon purity is quite high as 98%.

More information: Bo-Wei Hsu et al, Very Robust Spray-Synthesized CsPbI3 Quantum Emitters with Ultrahigh Room-Temperature Cavity-Free Brightness and Self-Healing Ability, *ACS Nano* (2021). DOI: 10.1021/acsnano.1c00733

Journal information: ACS Nano

https://phys.org/news/2021-05-team-self-healing-quantum-emitter-unprecedented.html

Wed, 26 May 2021

Rice physicists' RAMBO reveals magnetic phenomenon useful for quantum simulation and sensing

Sometimes things are a little out of whack, and it turns out to be exactly what you need.

That was the case when orthoferrite crystals turned up at a Rice University laboratory slightly misaligned. Those crystals inadvertently became the basis of a discovery that should resonate with researchers studying spintronics-based quantum technology.

Rice physicist Junichiro Kono, alumnus Takuma Makihara and their collaborators found an orthoferrite material, in this case yttrium iron oxide, placed in a high magnetic field showed uniquely tunable, ultrastrong interactions between magnons in the crystal.

Orthoferrites are iron oxide crystals with the addition of one or more rare-earth elements.

Magnons are quasiparticles, ghostly constructs that represent the collective excitation of electron spin in a crystal lattice.

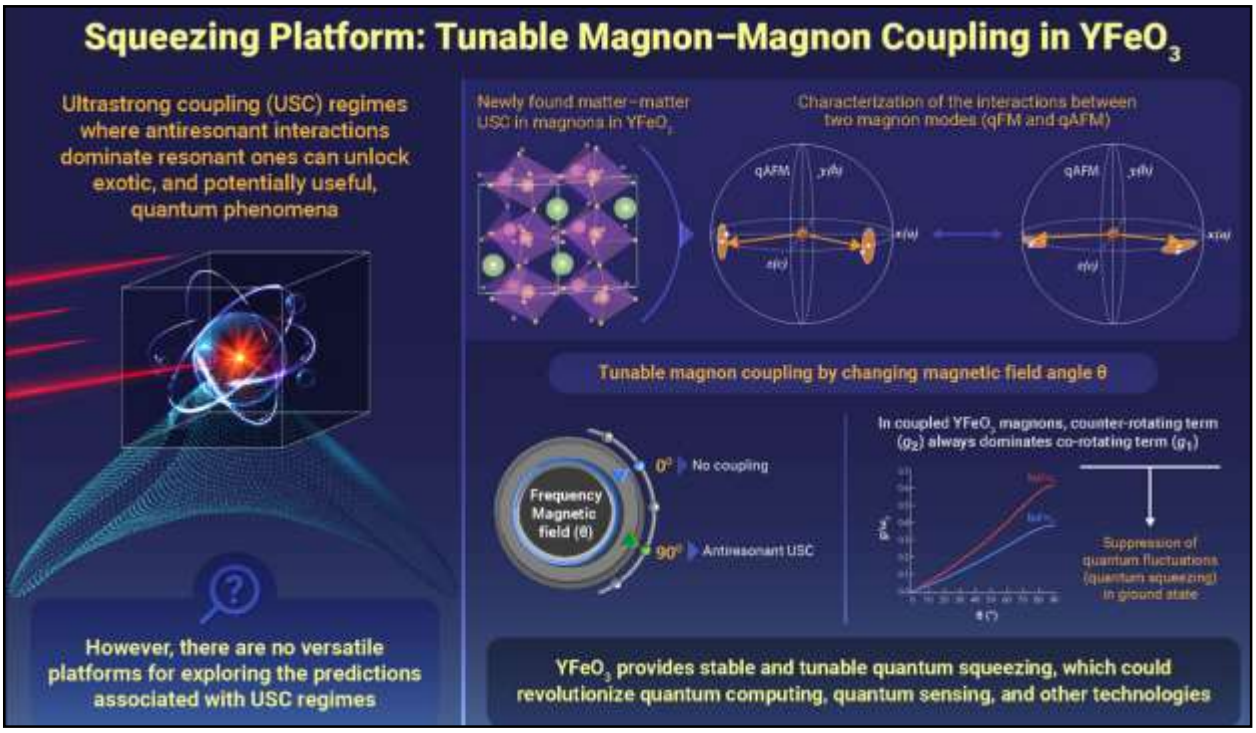
What one has to do with the other is the basis of a study that appears in *Nature Communications*, where Kono and his team describe an unusual coupling between two magnons dominated by antiresonance, through which both magnons gain or lose energy simultaneously.

Usually, when two oscillators resonantly couple, one gains energy at the expense of the other, conserving total energy, Kono said.

But in antiresonant (or counterrotating) coupling, both oscillators can gain or lose energy at the same time through interaction with the quantum vacuum, the zero-point field predicted to exist by quantum mechanics.

Think of it as an ephemeral seesaw that can be forced to bend in the middle.

Makihara and co-authors Kenji Hayashida of Hokkaido University and physicist Motoaki Bamba of Kyoto University used the discovery to show via theory the likelihood of significant quantum squeezing in the ground state of the coupled magnon-magnon system.



A Rice University-led study finds a unique form of tunable and ultrastrong spin-spin interactions in orthoferrites under a strong magnetic field. The discovery has implications for quantum simulation and sensing. Credit: Motoaki Bamba/Kyoto University

In the squeezed state, the amount of fluctuation, or noise, of a measurable quantity associated with the magnons can be suppressed, with simultaneously increased noise in another quantity, Kono said. "It's related to the Heisenberg uncertainty principle in which a set of variables is correlated, but if you try to precisely measure one, you lose information about the other. If you squeeze one, uncertainty about the other grows.

"Usually, in order to create a quantum squeezed state, one has to strongly drive the system using a laser beam. But Takuma's system is intrinsically squeezed; that is, it can be described as an already squeezed state," he said. "This could become a useful platform for quantum sensing applications."

Makihara said the unique state is achieved with a strong magnetic field like that used in magnetic resonance imaging. The field applies torque to the magnetic moments in atoms, in this case those of the orthoferrite. That causes them to rotate (or precess).

That takes a powerful field. The Kono lab's RAMBO—the Rice Advanced Magnet with Broadband Optics—is a unique spectrometer developed with physicist Hiroyuki Nojiri at Tohoku University that allows researchers to expose materials cooled to near absolute zero to powerful magnetic fields up to 30 tesla in combination with ultrashort laser pulses.

"We were saying, 'What can we study with RAMBO? What new physics is there in this unique regime?'" said Makihara, now a graduate student at Stanford University. "Orthoferrites have these magnons that shift up to 30 tesla and frequencies in the terahertz regime. The initial measurements weren't that interesting.

"But then we received crystals (grown by Shanghai University physicist Shixun Cao and his group) that didn't have perfectly parallel faces," he said. "They were kind of cut at an angle. And one day, we loaded the crystal on the magnet at such an angle that the magnetic field was not applied along the crystal axis.

"We expected the magnon frequency to just shift up with the magnetic field, but when it was tilted, we saw a small gap," Makihara said. "So, after discussing this finding with Professor Bamba, we explicitly requested crystals that were cut at different angles and measured those, and saw this huge degree of anti-crossing. That's the signature of ultrastrong coupling."

Antiresonance always exists in light-matter and matter-matter interactions but is a minor presence compared to the dominant resonant interaction, the researchers noted. That was not the case with the orthoferrites studied by the Kono lab.

Exposing the material to a high magnetic field and tilting the crystal with respect to the field pumped antiresonance that equaled and even surpassed the resonance.

If additional rotating magnetic fields (for instance, from circularly polarized light) are introduced, the precessing moments strongly interact with fields that rotate with the moments (the co-rotating fields), whereas they weakly interact with fields that rotate in the opposite directions (the counterrotating fields).

In quantum theory, Bamba said, these so-called counterrotating interactions lead to bizarre interactions where both the light and matter subsystems can gain or lose energy at the same time. The interactions between the magnetic moments and the counterrotating fields are considered antiresonant and normally have little effect. However, in the matter-matter coupled system studied at Rice, the antiresonant interactions could be made dominant.

"The strength of the co-rotating and counterrotating interactions is usually a fixed constant in a system, and the effects of the co-rotating interactions always dominate those of the counterrotating interactions," Kono said. "But this system is counterintuitive because there are two independent coupling strengths, and they are incredibly tunable via crystal orientation and magnetic field strength. We can create a novel situation where effects from the counterrotating terms are more dominant than from the co-rotating terms.

"In light-matter systems, when the frequencies of light and matter become equal, they mix together to form a polariton," he said. "Something similar happens in our case, but it's between matter and matter. Two magnon modes hybridize. There is a long-standing question of what happens when the degree of hybridization becomes so high that it even exceeds the resonance energy.

"In such a regime, exotic phenomena are predicted to occur due to counterrotating interactions, including a squeezed vacuum state and a phase transition into a novel state where static fields spontaneously appear," he said. "And we found that we can achieve such conditions by tuning the magnetic field."

The new study advances the Kono team's efforts to observe the Dicke superradiant phase transition, a phenomenon that could create a new exotic state of matter and lead to advances in quantum memory and transduction. The lab found a promising approach for realizing it in matter-matter coupling in 2018, reporting its discovery in *Science*.

The discovery also demonstrates that orthoferrite in a magnetic field could serve as a quantum simulator, a simple and highly tunable quantum system that represents a more complex one with an intractable number of interacting particles or an experimentally inaccessible regime of parameters, Kono said.

Tunable magnon-magnon coupling in orthoferrites can be used to provide insight into the nature of the ground state of an ultrastrong, coupled light-matter hybrid, he said.

Kono said their findings will also prompt a search for more materials that exhibit the effect. "Rare-earth orthoferrites is a big family of materials, and we studied just one," he said.

More information: *Nature Communications* (2021). DOI: 10.1038/s41467-021-23159-z

Journal information: Nature Communications

https://phys.org/news/2021-05-rice-physicists-rambo-reveals-magnetic.html

NATIONAL HERALD

Wed, 26 May 2021

Mild COVID-19 induces antibody protection lasting lifetime: Research

Researchers at Washington University in St Louis, US, found that during a viral infection, antibody-producing immune cells rapidly multiply and circulate in the blood, driving antibody levels sky-high

US researchers have found that people who have had mild illness due to COVID-19, go on to develop antibody-producing immune cells that can last for a lifetime and give them protection against the virus.

Researchers at Washington University in St. Louis, US, found that during a viral infection, antibody-producing immune cells rapidly multiply and circulate in the blood, driving antibody levels sky-high.

Once the infection is resolved, most such cells die off, and blood antibody levels drop.

However, a small population of antibody-producing cells, called long-lived plasma cells, migrate to the bone marrow and settle in, where they continually secrete low levels of antibodies into the bloodstream to help guard against another encounter with the virus.

"We found antibody-producing cells in people 11 months after the first symptoms. These cells will live and produce antibodies for the rest of people's lives. That's strong evidence for long-lasting immunity," said Ali Ellebedy, Associate Professor at the varsity's School of Medicine. The findings of the small study are published in the journal Nature.

For the study, the team involved 77 participants whose antibody levels in blood samples were assessed at three-month intervals starting about a month after initial infection. The team obtained bone marrow from 18 of the participants seven or eight months after their initial infections.

For comparison, the scientists also obtained bone marrow from 11 people who had never had Covid-19.

Of the bone marrow samples, 15 contained antibody-producing cells specifically targeting the virus that causes Covid-19. Such cells could still be found four months later in the five people who came back to provide a second bone-marrow sample. None of the 11 people who had never had Covid-19 had such antibody-producing cells in their bone marrow.

"Mild infection by Covid-19 will also trigger the immune response as it will lead to immune stimulation both cell mediated and antibody linked creating lasting immunity. In fact, this is the principle of vaccination that triggers the immune response by stimulating the antigen induced reaction giving rise to immunity of the body.

"It has also been shown that the reinfection rate of people already having mild infection is only two per cent which is very less," Praveen Gupta, director and head, neurology, Fortis Memorial Research Institute, Gurugram said.

"Based on this fact the principle of herd immunity was developed, if a large number of people will get a mild clinical infection that will lead to the development of herd immunity," he added.

https://www.nationalheraldindia.com/health/mild-covid-19-induces-antibody-protection-lasting-lifetime-research