

Dec
2020

समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

खंड : 45 अंक : 288 17 दिसंबर 2020
Vol.: 45 Issue : 288 17 December 2020



रक्षा विज्ञान पुस्तकालय
Defence Science Library
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Thu, 17 Dec 2020

India successfully test fires Prithvi II ballistic missiles

New Delhi: India on Wednesday successfully test fired the DRDO-developed, nuclear-capable Prithvi II missile off the coast of Odisha in Balasore.

Earlier on October 16, India had successfully conducted a night trial of Prithvi-2 missile as part of a user trial by the Army from a test range in Odisha, defence sources said.

Successful night trial of nuclear-capable Prithvi-2 missile

The Prithvi-2 missile is capable of carrying 500-1,000 kg of warheads and is powered by liquid propulsion twin engines.

The sophisticated missile uses an advanced inertial guidance system with a maneuvering trajectory to hit its target, they said.

Already inducted into the armory of Indian defence forces in 2003, the nine-metre tall 'Prithvi' was the first missile to have been developed by DRDO under the Integrated Guided Missile Development Programme (IGMDP).

(With inputs from agencies)

<https://timesofindia.indiatimes.com/india/india-successfully-testfires-two-prithvi-2-ballistic-missiles/articleshow/79764112.cms>



Representative Photo

**INDIA
TODAY***Thu, 17 Dec 2020*

India successfully test-fires Prithvi-II ballistic missile with over 250 km strike range

The missile, developed by the Defence Research and Development Organisation (DRDO), is already the part of the Strategic Forces Command.

By Manjeet Singh Negi

New Delhi: India successfully test-fired the over 250 km strike range Prithvi-II ballistic missile off the coast of Balasore in Odisha. The missile, developed by the Defence Research and Development Organisation (DRDO), is already the part of the Strategic Forces Command.

The missile test comes a week after India successfully test-fired a new generation anti-radiation missile from a Su-30 MKI fighter aircraft of the Indian Air Force (IAF) that can destroy a wide variety of enemy radars, air defence systems and communication networks from large stand-off ranges.

On September 30, BrahMos Extended Range Supersonic Cruise Missile was test-fired off the coast of Odisha. The BrahMos Extended Range Supersonic Cruise Missile can strike the target at a distance of over 400 km.



<https://www.indiatoday.in/india/story/india-successfully-test-fires-prithvi-ii-ballistic-missile-1732373-2020-10-16>

THE TIMES OF INDIA

Thu, 17 Dec 2020

India plans major indigenous project for six powerful 'eyes in the sky' AWACS

By Rajat Pandit

New Delhi: India plans to launch a major Rs 10,500 crore project to indigenously develop six airborne warning and control system (AWACS) aircraft, which act as powerful “eyes in the sky” to look deep into enemy territory in modern-day warfare.

Defence sources on Wednesday said the project, which entails mounting indigenous 360-degree coverage AESA (active electronically scanned array) radars on six aircraft acquired from Air India, is set to soon get the initial approval or “acceptance of necessity” by the Rajnath Singh-led Defence Acquisitions Council.

The new project, which will involve cost-sharing between the IAF and DRDO, is actually a recast of an earlier plan to mount the indigenous AESA radar on two new Airbus A-330 wide-body jets, which was hanging fire for the last five years.

Under the new project, DRDO will acquire six smaller A-320 variants from the existing Air India fleet, get the airframes modified, and then mount the radars on them.

Netra AEW&C aircraft

“This project for six AWACS or advanced AEW&C (airborne early-warning and control) aircraft will be much more cost-effective than the earlier one of acquiring two new A-330s from the European multi-national company. DRDO has promised to deliver the six AWACS in a four-to-seven year timeframe,” said a source.

IAF currently has just three Israeli Phalcon AWACS, with a 400-km range and 360-degree radar coverage, and two indigenous “Netra” AEW&C aircraft. The latter have indigenous 240-degree coverage radars, with a 250-km range, fitted on smaller Brazilian Embraer-145 jets.

The acute operational need for additional AWACS was felt during the Balakot strikes and the subsequent aerial skirmish with Pakistani fighters in February last year. It has been further reinforced by the ongoing military confrontation with China in eastern Ladakh.



Israeli Phalcon AWACS

Though the IAF needs at least 10 AWACS, repeated attempts to acquire more have not yet fructified due to the high costs involved. The long-pending IAF case for two more Israeli Phalcons mounted on Russian A-50 aircraft, worth over \$1.5 billion, for instance, is yet to be cleared by the Cabinet Committee on Security.

AWACS can detect incoming fighters, cruise missiles and drones much before ground-based radars, direct friendly fighters during air combat with enemy jets, and keep tabs on enemy troop build-ups and warships.

Not just China, but even Pakistan is ahead of India in this arena. Pakistan has 8-10 Chinese Karakoram Eagle ZDK-03 AWACS and Swedish Saab-2000 AEW&C. China, in turn, has around 30, including Kong Jing-2000 “Mainring”, KJ-200 “Moth” and KJ-500 aircraft.

<https://timesofindia.indiatimes.com/india/india-plans-major-indigenous-project-for-six-powerful-eyes-in-the-sky-awacs/articleshow/79766365.cms>



Thu, 17 Dec 2020

Six new ‘eyes in the sky’ for IAF to be built by DRDO on Air India planes

Government sources said that as per the discussions on the AEW&C Block 2 aircraft to be developed by the DRDO under a Rs 10,500 crore project, the six aircraft would be acquired from the Air India fleet and modified to fly with a radar that will give 360-degree surveillance capability to the defence forces

New Delhi: In a major boost for the indigenous defence industry, India is going to make six new Airborne Early Warning and Control planes to be developed by Defence Research and Development Organisation (DRDO) on aircraft from Air India to further improve Air Force’s surveillance capabilities along borders with China and Pakistan.

Government sources said that as per the discussions on the AEW&C Block 2 aircraft to be developed by the DRDO under a Rs 10,500 crore project, the six aircraft would be acquired from the Air India fleet and modified to fly with a radar that will give 360-degree surveillance capability to the defence forces.

“The six AEW&C block two planes would be highly capable than their predecessor NETRA plane and provide 360-degree coverage deep inside the enemy territory during missions. The government is expected to clear the project soon,” government sources told ANI.

The project to build the AEW&C system on existing aircraft from the Air India fleet may also mean that India may not buy the six Airbus 330 transport aircraft planned to be acquired earlier from the European firm, the sources said.

The Defence Research and Development Organisation had earlier planned to build six Airborne Warning and Control System (AWACS) on the Airbus 330 aircraft for which some facilities were planned to be created in Bengaluru.

As per plans, the six new aircraft would be sent to a European destination to the original equipment manufacturer for modification of the planes for installing the radar, the sources said.



The Defence Research and Development Organisation had earlier planned to build six Airborne Warning and Control System (AWACS) on the Airbus 330 aircraft for which some facilities were planned to be created in Bengaluru.(File photo: ANI)

Sources said the project has been planned in a way to promote Make in India in defense and Aatmanirbhar Bharat.

Block-I of the project was delayed beyond the scheduled timelines but with the prior experience under its belt, the Centre for Airborne Studies lab of DRDO is planning to complete it in a shorter timeframe.

The IAF has three PHALCON AWACS systems bought by it from Israel and Russia under which the radar is provided by the Israelis whereas the platform used is the Russian Ilyushin-76 transport aircraft.

The two NETRA aircraft provided by the DRDO have also performed very well in the recent conflicts where they have flown extensively to keep an eye on the enemy activity.

The six new 'eyes in the sky' would be stationed at different places in the countries for effective surveillance long both the borders, the sources said.

<https://www.hindustantimes.com/india-news/six-new-eyes-in-the-sky-for-iaf-to-be-built-by-drdo-on-air-india-planes/story-aMZzLNsbLwqeLPH3rfooWN.html>



Thu, 17 Dec 2020

आसमान में और पैनी होंगी IAF की निगाहें, DRDO कर रहा '6 नई आंखों' का निर्माण

रक्षा अनुसंधान और विकास संगठन (Defence Research and Development Organisation DRDO) एयर इंडिया के लिए एयरक्राफ्ट पर नए तकनीक विकसित करने जा रही है। इसके तहत 6 नए प्लेन विकसित किए जाएंगे जिसमें पूर्व चेतावनी और कंट्रोल को लेकर उपकरण संलग्न होंगे।

By Monika Minal

नई दिल्ली: स्वदेशी रक्षा उद्योग को बढ़ाने के क्रम में भारत में छह नए एयरबोर्ड अर्ली वॉर्निंग एंड कंट्रोल प्लेन्स (AEW&C) तैयार किए जाने का फैसला लिया गया है। रक्षा अनुसंधान और विकास संगठन (Defence Research and Development Organisation, DRDO) एयर इंडिया के लिए एयरक्राफ्ट पर नए तकनीक विकसित करने जा रही है। इसके तहत 6 नए प्लेन का निर्माण किया जाएगा। इसमें पूर्व चेतावनी और कंट्रोल को लेकर उपकरण संलग्न होंगे। इसके जरिए चीन और पाकिस्तान से लगती सीमाओं पर भारतीय वायुसेना की निगरानी और भी सख्त हो जाएगी। आसमान में मिलने वाली ये 6 नई आंखें देश के विभिन्न हिस्सों में तैनात की जाएंगी ताकि पाकिस्तान और चीन से लगने वाली सीमा पर पैनी निगाहें बरकरार रहें।



रक्षा अनुसंधान और विकास संगठन (Defence Research and Development Organisation DRDO) एयर इंडिया के लिए एयरक्राफ्ट पर नए तकनीक विकसित करने जा रही है। इसके तहत 6 नए प्लेन विकसित किए जाएंगे जिसमें पूर्व चेतावनी और कंट्रोल को लेकर उपकरण संलग्न होंगे।

AEW&C ब्लॉक 2 एयरक्राफ्ट को 10 हजार 5 सौ करोड़ रुपये की लागत वाली प्रोजेक्ट के तहत तैयार किया जाएगा। एयर इंडिया फ्लिट की ओर से छह एयरक्राफ्ट खरीदे जाएंगे और इसके ऊपर रडार लगा होगा ताकि 360

डिग्री तक हमारे जवान निगरानी कर सके। पिछले NETRA विमान की तुलना में ये छह AEW&C ब्लॉक

2 विमान अत्याधुनिक होंगे और मिशन के दौरान दुश्मन के इलाके में काफी अंदर तक निगरानी करने में सक्षम होंगे।

प्रोजेक्ट का Block-I निर्धारित समय से देरी से हुआ लेकिन DRDO इसे कम समय में पूरा करने की योजना बना रहा है। IAF के पास तीन PHALCON AWACS सिस्टम है जो इसने इजरायल और रूस से खरीदा था। जिसके साथ इजरायल की ओर से रडार भी दिया गया।

सरकार को उम्मीद है कि इस प्रोजेक्ट को जल्द ही मंजूरी मिल जाएगी। एयर इंडिया फ्लीट पर AEW&C सिस्टम निर्माण की परियोजना का यह मतलब भी हो सकता है कि इंडिया छह एयरबस 330 ट्रांसपोर्ट एयरक्राफ्ट की खरीद न करे जिसे यूरोपीय कंपनी से खरीदने की पहले योजना बनाई गई थी। योजना के अनुसार, छह नए विमानों को यूरोप भेजा जाएगा जहां इसका मॉडिफिकेशन किया जाएगा और रडार लगाए जाएंगे। सूत्रों के अनुसार प्रोजेक्ट की प्लानिंग इस तरह से की गई है कि रक्षा और आत्मनिर्भर भारत में मेक इन इंडिया को बढ़ावा मिल सके।

<https://www.jagran.com/news/national-six-new-eyes-in-the-sky-for-iaf-to-be-built-by-drdo-on-air-india-planes-21172030.html>

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Thu, 17 Dec 2020

भारत के खिलाफ पाक-चीन की कोई भी चाल नहीं हो सकेगी कामयाब, आसमान से ही नजर रखेंगी ये 6 'आंखें'

नई दिल्ली: लद्दाख और जम्मू-कश्मीर में चीन-पाकिस्तान लंबे समय से तनाव पैदा करने की कोशिशों में लगा हुआ है। जहां लद्दाख में भारत-चीन की सेनाएं आमने-सामने की स्थिति में हैं, तो वहीं जम्मू-कश्मीर में, पाकिस्तान में बैठे आतंकी संगठनों के आका घुसपैठ कराने की जुगत में लगे रहते हैं। इस बीच, भारत ने अपनी क्षमताओं को और बढ़ाने का फैसला लिया है। डिफेंस रिसर्च एंड डेवलेपमेंट ऑर्गनाइजेशन (DRDO) छह नए एयरबोर्न अल्टी वॉर्निंग एंड कंट्रोल विमान बनाने जा रहा है। इन छह 'आंखों' की मदद से पाकिस्तान-चीन जैसे देशों की कोई भी नापाक हरकत को पहले से पता किया जा सकेगा। इससे दूसरे देशों की गतिविधियों पर आसमान से नजर रखी जा सकेगी। देश में ही बनने की वजह से स्वदेशी रक्षा उद्योग को बढ़ावा मिलेगा।



सरकारी सूत्रों ने बताया कि डीआरडीओ द्वारा बनाए जा रहे इन विमानों का यह प्रोजेक्ट 10,500 करोड़ रुपये का है। इसमें से छह विमान एयर इंडिया के बेड़े से हासिल किए जाएंगे और एक रडार के साथ उड़ान भरने के लिए मोडिफाई किए जाएंगे। इनकी मदद से सुरक्षा बलों को 360 डिग्री सर्वांगणिकता करने में मदद

मिलेगी। सरकारी सूत्रों ने बताया, "छह एईडब्ल्यू और सी ब्लॉक के दो विमान अपने पुराने एनईटीआरए विमान की तुलना में अधिक सक्षम होंगे और मिशन के दौरान दुश्मन के इलाके में 360 डिग्री तक नजर रख सकेंगे। सरकार से जल्द ही इस प्रोजेक्ट को मंजूरी मिलने की उम्मीद है।"

वहीं, सूत्रों ने यह भी बताया कि चूंकि यह प्रोजेक्ट अब पहले से मौजूद एयर इंडिया के एयरक्राफ्ट की मदद से ही बनेगा तो ऐसे में भारत छह एयरबस 330 ट्रांसपोर्ट एयरक्राफ्ट्स को यूरोपीय फर्म से खरीदने की योजना को टाल देगा। डिफेंस रिसर्च एंड डेवलेपमेंट ऑर्गनाइजेशन ने पहले एयरबस-330 विमान पर छह एयरबोर्न वॉर्निंग एंड कंट्रोल सिस्टम बनाने की योजना बनाई थी, जिसके लिए कुछ सुविधाओं को बेंगलुरु में बनाया जाना था।

आत्मनिर्भर भारत अभियान के तहत प्रोजेक्ट

मोदी सरकार लगातार आत्मनिर्भर भारत के अभियान को बढ़ावा देने के लिए काम कर रही है। सूत्रों का कहना है कि डीआरडीओ का यह प्रोजेक्ट भी रक्षा क्षेत्र में मेक इन इंडिया और आत्मनिर्भर भारत अभियान को बढ़ावा देने के लिए है। वहीं, प्रोजेक्ट के ब्लॉक- 1 को देरी हुई, लेकिन इसकी पुराने अनुभव के बाद, डीआरडीओ के एयरबोर्न स्टडीज लैब सेंटर ने इसे कम समय सीमा में पूरा करने की योजना बनाई है।

जानिए कहां तैनात किए जाएंगे ये विमान

भारतीय वायुसेना के पास इजराइल और रूस से खरीदे गए तीन PHALCON AWACS सिस्टम हैं, जिनके तहत इजराइल द्वारा रडार उपलब्ध कराया जाता है, जबकि इस्तेमाल किया जाने वाला प्लेटफॉर्म रूसी इल्युशिन -76 परिवहन विमान है। सूत्रों का कहना है कि ये छह नए विमान सीमाओं पर प्रभावी निगरानी के लिए देशों में विभिन्न स्थानों पर तैनात किए जाएंगे।

<https://www.livehindustan.com/national/story-india-china-standoff-six-new-eyes-in-the-sky-for-iaf-to-be-built-by-drdo-on-air-india-planes-3687507.html>



Thu, 17 Dec 2020

Indigenous carbine passes final user trials: Ordnance Factory Board

The carbine, jointly developed by the DRDO and the OFB, is being issued to Central paramilitary forces and state police organisations

Edited By Smiriti Sinha

Kolkata: A new joint venture protective carbine (JVPC) has successfully passed the final phase of user trials, meeting all criteria of the General Service Qualitative Requirement, the Ordnance Factory Board (OFB) has announced.

The compact gas-operated weapon has an effective range of more than 100 metres and weighs less than three kilos. During the tests, the ammunition penetrated 3.5 mm thick mild steel plate and 23 layers of soft armour at 100 metres, the OFB said in a statement.

The weapon can be fired with one hand. It has a rate of fire of 800 rounds per minute. The JVPC, which feeds through the pistol grip unlike any other indigenously developed weapon in 5.56 x30 mm calibre, is being issued to Central paramilitary forces



The weapon can be fired with one hand.(Ordnance Factory Board, Kolkata)

and state police organisations, Gagan Chaturvedi, deputy director general, OFB, said in a statement.

The weapon features a 30-round steel magazine, semi bull-pup design, retractable butt, low recoil and multiple rails for mounting lights, laser pointers and optical sights.

The carbine has been jointly developed by the Defence Research and Development Organisation (DRDO) and the OFB which has its headquarters in Kolkata. It is manufactured at the Small Arms Factory, Kanpur, while the ammunition is produced by Ammunition Factory Khadki in Pune.

The weapons earlier cleared the trials of the Directorate General of Quality Assurance, Chaturvedi said.

<https://www.hindustantimes.com/india-news/indigenous-carbine-passes-final-user-trials-ordnance-factory-board/story-AybXhL52kCkDWOIKA9Go6N.html>



Thu, 17 Dec 2020

India's Tejas LCA vs Pakistan's JF-17 Thunder Fighter Jet: Which one is better?

In this article, we have underscored the difference between the Indian Air Force's Tejas LCA and Pakistan Air Force's JF-17 Thunder

By Arfa Javaid

21 minutes, 1000-kg laser-guided bombs: On 26 February 2019 at 3:30 a.m., 12 Indian Air Force Mirage-2000 fighter jets entered Pakistan's airspace and dropped 1,000-kg laser-guided bombs on Jaish-e-Mohammed terror launch pads across the Line of Control (LOC). The next day, Pakistan Air Force deployed its F-16 Falcon and JF-17 Thunder fighter jets against IAF's Tejas LCA.

In this article, we have underscored the difference between the Indian Air Force's Tejas LCA and Pakistan Air Force's JF-17 Thunder.

Difference between India's Tejas LCA and Pakistan's JF-17 Thunder

History

Tejas LCA:

In the 1980s, Hindustan Aeronautics Limited (HAL) started the Light Combat Aircraft (LCA) programme to replace the ageing Soviet sourced MiG-21. In light of this, the indigenously built fighter aircraft- Tejas- was inducted in the IAF. An order of 20 jets was placed initially by the Indian Air Force and the first Tejas Squadron was formed in the year 2016 with the name 'Flying Daggers'.

As of 26 January 2020, IAF has placed an order of 40 Tejas Mk 1, including 32 single-seat and eight twin-seat aircrafts. Further, IAF has also initiated procurement of 83 single-seat aircrafts in MK 1A configuration.

JF-17 Thunder:

In the year 1995, Pakistan and China inked a Memorandum of Understanding (MoU) for joint design and development of a new fighter- JF-17 Thunder- jet to meet Pakistan Air Force's requirement for an affordable, modern and multi-role combat aircraft. USSR's Mikoyan (known for its MIG Series of planes) joined the project in the same year to provide 'design support'.

As of 2017, Pakistan Aeronautical Complex manufactured 70 Block 1 type and 33 Block 2 type jets in the country for Pakistan Air Force.



LCA Tejas vs JF-17 Thunder

Key Areas	Tejas LCA	JF-17 Thunder
Manufacturer	Hindustan Aeronautics Limited (HAL)	Chengdu Aircraft Industry Group/ Pakistan Aeronautical Complex
Role	Multirole Light Fighter	Multirole Combat Aircraft
Produced	2001- Present	2008- Present
Units Produced	34	150
Unit Cost	23-42 million USD	25-32 million USD
Maximum Speed	2205 km/hr	1960 km/hr
Maximum Height	52,500 ft.	55,500 ft.
Mid Air Refueling	Present	Absent
Required Take Off Distance	460 m	609 m
Landing Distance	750 m	823 m

Specifications:

Tejas LCA:

- 1- It is ideally a single-seat fighter jet and if required, can be manufactured into a twin-seat fighter jet.
- 2- Tejas LCA is famous for its delta wing arrangement.
- 3- It is powered by a single General Electric engine rated at 53.9 kN thrust dry and 90 kN with afterburner.
- 4- IAF's Tejas LCA has a length of 13.2 m and a wingspan of 8.2 m.
- 5- The weight of Tejas LCA is 6500 kg (dry) and has a maximum takeoff weight of 13000 kg.
- 6- It has a maximum speed of Mach 1.8 and can travel 500 km with drop tanks.
- 7- Tejas LCA can carry laser-guided bombs, air-to-air and air-to-surface missiles, anti-ship missiles, and has Israel's Elta EL/M2032 multi-mode fire control radar on board.
- 8- The maximum T/W (thrust to weight ratio) of Tejas LCA is 1.00:1.07.
- 9- Sustained Turn Rate (STR) of Tejas LCA is 16 degrees per second.
- 10- Instantaneous Turn Rate (ITR) of Tejas LCA is 30 degrees per second.
- 11- Tejas LCA's radar is ELM-2032, having a detection range of 150 km.
- 12- Tejas LCA is made up of composites with 45% by weight and 95% by surface area.
- 13- Tejas LCA has an in-service life of 9,000 flying hours and can be extended up to 12,000 hours.

JF-17 Thunder:

- 1- It is available in both single-seat and twin-seat configurations.
- 2- It is powered by a single Klimov RD-93 afterburning turbofan engine with digital electronic engine control (DEEC) and has a 49.4 kN dry thrust and 85.3 kN with afterburner.
- 3- JF-17 Thunder has a length of 14.93 m and a wingspan of 9.48 m.

- 4- The weight of JF-17 Thunder is 6,586 kg (dry) and has a maximum takeoff weight of 12,383 kg.
- 5- It has a maximum speed of Mach 1.6.
- 6- JF-17 Thunder can carry air-to-air and air-to-surface missiles, laser-guided bombs and China's Airborne Pulse-Doppler Fire-Control Radar on-board.
- 7- The maximum T/W (thrust to weight ratio) of JF-17 Thunder is 0.84:0.95.
- 8- Sustained Turn Rate (STR) of JF-17 Thunder is 14.4 degrees per second.
- 9- Instantaneous Turn Rate (ITR) of JF-17 Thunder is 24.4 degrees per second.
- 10- JF-17 Thunder's radar is KLJ-7, having a detection range of 105 km.
- 11- JF-17 Thunder has an in-service life of 4,000 flying hours.
- 12- JF-17 Thunder has an all-metal construction.

To sum up:

- 1- IAF's Tejas LCA is indigenously made fighter jet, while Pakistan's JF-17 Thunder is jointly developed by Pakistan and China.
- 2- Indian Air Force's HAL Tejas is faster and lighter in comparison to Pakistan Air Force's JF-17 Thunder.
- 3- Tejas LCA houses a more powerful engine than JF-17 Thunder.
- 4- The payload carrying capacity of HAL Tejas is more than that of JF-17 Thunder.
- 5- Tejas LCA has a better thrust to weight ratio than JF-17 Thunder. This means that Tejas LCA can manoeuvre more aggressively.
- 6- Tejas LCA can detect and lock JF-17 Thunder before it comes to know about the presence of Tejas in the region.
- 7- Tejas LCA has twice the life than that of JF-17 Thunder.

<https://www.jagranjosh.com/general-knowledge/tejas-fighter-jet-of-indian-air-force-vs-jf-17-of-pakistan-air-force-1608120689-1>



Thu, 17 Dec 2020

India-China standoff- How Indian Army is preparing to take on China's PLA in Ladakh's snow clad mountains

As the winters sets in over Line of Actual Control(LAC), India's Border Roads Organisation (BRO) has been working near the China border in Ladakh to ensure the Indian Army's movement in the intense snow causes no problem for quick movement

Indian Army near Zojila mountain pass

An Indian army soldier stands on a snow covered road after snowfall near Zojila mountain pass that connects Srinagar to the union territory of Ladakh, bordering China.



Border Roads Organisation at work near China border

Workers from Border Roads Organisation (BRO) clear a snow covered road at Sonamarg that connects Srinagar to the union territory of Ladakh, bordering China.

Eyeing the winter with the PLA

Workers from Border Roads Organisation (BRO) clear a snow covered road at Sonamarg that connects Srinagar to the union territory of Ladakh, bordering China.

Ladakh holds the key

Workers from Border Roads Organisation (BRO) stand after snowfall near Zojila mountain pass that connects Srinagar to the union territory of Ladakh, bordering China.

Border Roads Organisation at work near China border

Workers from Border Roads Organisation (BRO) use a machine to clear a snow covered road near Zojila mountain pass that connects Srinagar to the union territory of Ladakh, bordering China.

Snow covered bridge at Sonamar

Workers from Border Roads Organisation (BRO) clear a snow covered bridge at Sonamarg that connects Srinagar to the union territory of Ladakh, bordering China.

Winter is here!

Workers from Border Roads Organisation (BRO) clear a snow covered road at Sonamarg that connects Srinagar to the union territory of Ladakh, bordering China.

Indian Army prepares to take on PLA

Indian army soldiers stand on a snow covered road after snowfall near Zojila mountain pass that connects Srinagar to the union territory of Ladakh, bordering China.

<https://www.wionews.com/photos/india-china-standoff-how-indian-army-is-preparing-to-take-on-chinas-pla-in-ladakhs-snow-clad-mountains-350186#winter-is-here!-350173>



Thu, 17 Dec 2020

No intrusions, major faceoffs in Eastern Command area since Ladakh crisis: Lt Gen Anil Chauhan

Lt Gen Chauhan said the Indian Army and the People's Liberation Army had undertaken some precautionary deployment during the Ladakh crisis

Kolkata: Eastern Army Commander Lt Gen Anil Chauhan on Wednesday said there have been no intrusions or major faceoffs in the area of responsibility of the Eastern Command since the Ladakh standoff between Indian troops and China's PLA.

He said that post the Galwan Valley incident, bonhomie and mutual trust on the Line of Actual Control (LAC) between India and China evaporated, and it will take time for things to stabilise.

Lt Gen Chauhan, GoC-in-C Eastern Command, said the Indian Army and the People's Liberation Army had undertaken some precautionary deployment during the Ladakh crisis, which is now witnessing a gradual deduction in the eastern sector, due to the onset of winter.

"However, the Indian Army is prepared to beat any challenge during the winter," he told reporters at the Fort William here on the occasion of Vijay Diwas.

<https://www.newindianexpress.com/nation/2020/dec/16/no-intrusions-major-faceoffs-in-eastern-command-area-since-ladakh-crisis-lt-gen-anil-chauhan-2237005.html>



For representational purposes (Photo | PTI)

Indian Navy's Marine Commandos or MARCOS deployed in eastern Ladakh to deter China

Acclimatising the forces

According to a report by ANI, amid the ongoing stand-off between India and China, the Marine Commandos (MARCOS) of the Indian Navy have been deployed in the Pangong lake area in eastern Ladakh. The idea behind the deployment of the MARCOS in Eastern Ladakh where Indian Air Force's Garud operatives and Indian Army's Para Special Forces, which have been there since day one of the conflicts, is to enhance the integration of the three services and provide the naval commandos exposure to extreme cold weather conditions, government sources told ANI.

New boats for ops

"The MARCOS have been deployed in the Pangong lake area where the Indian and Chinese forces have been engaged in a conflict situation since April-May timeframe this year," the sources said. The Navy commandos are also soon going to get new boats for operations in the lake area along with the existing infrastructure for operations in the lake, they said.

Other forces in field

Indian Army's Special Forces including the Para Special Forces and Cabinet Secretariat's Special Frontier Force have been operating in Eastern Ladakh for carrying out special operations for a long time. The Indian Air Force's Garud Special Forces moved to hilltops on the strategic heights on the Line of Actual Control along with their Igla shoulder-fired air defence systems in the early days of the conflict to take care of any fighter or other aircraft of the enemy which may have tried to violate Indian air space.



Preempting the Chinese

The special troops belonging to both the Army and Air Force have been there for more than six months now. On August 29-30 also, the Indian side had used the special forces to occupy strategic heights along the LAC to preempt the Chinese from doing so. The Chinese have also maintained special troops on their side of the LAC.

Keeping foes at bay

The Indian Navy has deployed teams of its MARCOS in the Wular lake area of Jammu and Kashmir to tackle terrorism there. The Indian Air Force started deploying Garuds in Kashmir valley after the 2016 Pathankot operations to give them the feel of real operations as part of plans of the then Army chief and now Chief of Defence Staff Gen Bipin Rawat. Soon after their deployment, the Garuds proved their mettle and earned one Ashok Chakra, three Shaurya Chakras, and many other gallantry awards for eliminating a team of terrorists led by the nephew of 26/11 terrorist Zaki Ur Rehman Lakhvi.

<https://economictimes.indiatimes.com/news/defence/indian-navys-marine-commandos-or-marcos-deployed-in-eastern-ladakh-to-deter-china/new-boats-for-ops/slideshow/79753107.cms>

After INS Vikramaditya & Vikrant, Is Indian Navy Going For Third Aircraft Carrier To Match Chinese PLAN?

By *Smiriti Chaudhary*

As the Indian Navy's first domestically-built aircraft carrier, INS Vikrant, gears up for sea trials in early 2021, a fresh debate arises whether the country needs a third carrier, especially in view of China's growing presence in the Indian Ocean.

One of India's top defense experts, Vice Admiral Shekhar Sinha (retd), believes a third carrier could help serve the Indian Navy's requirement of "full surveillance of the Indian Ocean region" and to provide help to "like-minded countries".



Speaking to The EurAsian

Times, Vice Admiral Sinha (retd), said – "India's naval plans have always revolved around two carrier battle groups: Eastern Seaboard and Western seaboard. The third carrier would be necessary to be deployed when any one of the two carriers is under repair and maintenance."

He explained that a normal refill cycle for a ship is nine months, so when one is under refill, the other two could be deployed.

When asked about a comparison between the Indian carrier's strengths with the Chinese, Vice Admiral Sinha said that India's aim is not to compete with China but to have a carrier that could help serve the Navy's requirement of "full surveillance of the Indian Ocean region" and to provide help to "like-minded countries" who operate their littorals in the Indian Ocean region.

China is operating two aircraft carriers and is reportedly building two more. Earlier, there were reports that China is aggressively working on its third and fourth aircraft carriers at the Jiangnan shipyard in Shanghai, which many media outlets in China including state-run *Global Times* predicted, could be launched by 2025. Last year, the Indian Navy chief said that China is projected to operate 10 warships by 2049.

"We should only build what we need and require."

However, Vice Admiral Sinha said that China is a much richer country with an economy that is five times bigger than that of India, adding that it is difficult to compare "because (if) China is building then we should also build isn't a right approach".

Third Carrier On The Cards

Meanwhile, the Indian Navy has already declared its intention to procure a third carrier. On the occasion of Navy Day on December 4, Admiral Karambir Singh said that the Navy will make a formal request to the government for the acquisition of a third carrier.

"We have sent out certain RFIs (Request for Information) to gather information. Once we have collated them we will go in for the AON (Acceptance of Necessity). We all know that air operations are integral to naval operations and air power at sea is required here and now," Admiral Singh said.

“We are very clear that airpower at sea is required. If you are a nation that has aspirations and wants to be a \$5 trillion economy and do not want to be tethered to the shores...aircraft carriers are absolutely essential,” he added.

Vikrant Ready For Sea Trials

INS Vikrant has recently completed basin trials and is expected to undergo sea trials in early 2021. The basin trials were held at Cochin Shipyard Limited (CSL) in Kochi where the carrier is built.

The basin trials include the testing of the propulsion system and covers all four LM2500 gas turbines, main gearboxes, shafting, and controllable pitch propellers, along with their integrated control systems, reported *Naval Today*.

In addition, auxiliary equipment and systems such as steering gear, air conditioning plants, compressors, centrifuges, all 60 critical pumps, power generation and distribution system, major machinery fire-fighting and de-flooding systems, deck machinery, as well as entire internal communication equipment were tested during the trials.

In the next phase, the aircraft carrier will begin sea trials, during which it would be rigorously tested for its capabilities and equipment for one year to operationalize the ‘big beast’ and train its crew. Additional tests would be done to operationalize the aircraft deployed and the battle group.

Navy’s ‘Make in India’ Milestone

Under PM Narendra Modi’s flagship ‘Make In India’ or ‘Atmanirbhar Bharat’ initiative, INS Vikrant will be India’s largest indigenously-built naval ship. Indian Navy’s current flagship aircraft carrier, INS Vikramaditya, was a modified version of Kiev-class that was decommissioned by Russia in 1996.

“Today, the IAC (Indian Aircraft Carrier) is being built in India, which will be followed by Shivalik-class multi-role frigates and Kamorta-class anti-submarine warfare corvettes. Five to 10 years down the line, we visualize a dominant naval force with indigenous capabilities.

And for that to happen we need all including PSUs, Navy, MSME and startups to work together as a team,” said Flag Officer Commanding-in-Chief of the Eastern Naval Command, Atul Kumar Jain, addressing a press conference.

The 260 meters long INS Vikrant would have two take-off runways and a landing strip with three arrestor wires, capable of operating a STOBAR (short take-off but arrested delivery) system.

INS Vikrant will be able to host a variety of aircraft, including the Russian MiG-29K and the indigenous LCA (Navy) fighters along with Kamov Ka-31, Sea King, and the Naval variant of Advanced Light Helicopter (ALH) Dhruv.

Hi-Tech Equipment

According to the Indian Navy, the ship’s ability to sense and control a large air space around it will be enabled by modern C/D band early air warning radar, V/UHF tactical air navigational and direction finding systems, electromagnetic jamming system, and carrier control approach radars. Long-range surface-to-air missile (LR SAM) systems with multi-function radar (MFR) and close-in weapon system (CIWS) will form the protective suite of the ship.

With this, India will join the elite group of nations that have indigenously built aircraft carriers. At present, only the US, Russia, the UK, France, and China have the capacity to design and build aircraft carriers of 40,000 tonnes and heavier.

INS Vikrant is expected to be commissioned in service by the end of 2021 or early 2022.

<https://eurasianimes.com/after-ins-vikramaditya-vikrant-is-indian-navy-going-for-third-aircraft-carrier-to-match-chinese-plan/>

Why is India planning to fit Li-ion batteries in the future Indian Navy submarines?

The Indian Navy is planning to fit Li-ion batteries in its future submarines, replacing the traditional lead-acid batteries

By Arfa Javaid

The Indian Navy has issued a request for information, seeking details of Li-ion batteries as they will be fitted in all the future submarines in the Indian Navy.

In 2019, President of India, Ram Nath Kovind visited two out of the three 'Lithium Triangle' nations focussing on joint manufacturing and facilitating the process of acquiring Lithium as India plans to meet the target of having Electric Vehicles by the year 2030.

In light of this vision, the Government of India formed 'KABIL' consortium comprising of three state-owned companies-- National Aluminum Company (NALCO), Hindustan Copper (HCL) and Mineral Exploration Corp Ltd., (MECL).

India to manufacture Li-ion batteries

Amid the ongoing standoff between India and China, the Government of India is planning to manufacture the Li-ion batteries and cells in the country. Earlier, India 100% imported Li-ion batteries and cells due to their huge demand.

In light of this, India and Bolivia are in talks about having a joint manufacturing base for the batteries, while Chile and Argentina are in talks about exploration and exports of Lithium.



Lithium Triangle

Usage of Li-ion batteries

As per Indian Navy veteran Commodore Anil Jai Singh, "Li-ion batteries are already being used to power practice torpedoes and unmanned underwater vehicles but there had been a hesitation to incorporate these onboard submarines because of lingering safety concerns. The exploding Samsung -7 Note mobile telephones and the frequent fires on board the Boeing 787 aircraft were both attributed to lithium-ion batteries."

Earlier, the traditional lead-acid batteries were used on submarines and required frequent charging-- once in 48-72 hours.

Why there's a need for Li-ion batteries?

Lithium-ion batteries have a longer life and higher energy as compared to traditional acid-lead batteries. This will improve the endurance at higher speeds thereby facilitating the submarine commander with a wider range of tactical options and integration of the submarine into a network-centric force deployment over a larger area of the ocean. Thus, there's a need for Li-ion batteries.

What is 'Lithium Triangle'?

The 'Lithium Triangle' is a region of the Andes which is rich in lithium reserves around the borders of Argentina, Bolivia and Chile. This area is thought to hold around 54% of the world's lithium reserves.

Why 'KABIL' consortium was formed?

'KABIL' consortium was set up by the Government of India to acquire the most strategic mineral globally. The said mineral is not only required for electric vehicles but is also used in space launchers solar panels, mobile phones and laptops and hi-tech military platforms.

<https://www.jagranjosh.com/general-knowledge/li-ion-batteries-on-future-indian-navy-submarines-1608132727-1>

Ballistic missile submarine Arighat in final stages of trials, to be commissioned early 2021

Once Arighat is commissioned, India will have two operational SSBNs that are equipped with the 750-KM range K-15 missile, designed for retaliatory nuclear strikes

By Snehesh Alex Philip

New Delhi: Arighat, the second of the indigenous Arihant class nuclear-powered ballistic missile carrying submarine (SSBN), is in the final stages of sea trials and will be commissioned early next year, ThePrint has learnt.

Sources in the defence and security establishment said the submarine has performed well during the sea trials so far, and added that the commissioning of the vessel was delayed due to the coronavirus pandemic.

“It should be done (commissioned) early next year,” a source said.

The Arighat was quietly launched in November 2017 by the then Defence Minister Nirmala Sitharaman.

With Arighat in, India will be operating two SSBNs that are equipped with the 750 KM range K-15 submarine-launched ballistic missile, meant for punitive retaliatory strikes in case of a nuclear attack.

Both INS Arihant, which is on operational deployment, and the Arighat have the capacity to carry four missiles each.

India's Submarine Plan

While the original plan was to have four Arihant class submarines, it was changed by the UPA government, sources in the know said.

Now, the two Arihant class submarines will have a displacement of 6,000 tonnes while two other SSBNs will be of a larger size (7,000 tonnes displacement).

A key differentiating factor will be that the two larger vessels under construction — S4 and S4* at the Ship Building Centre in Visakhapatnam — will have eight missile tubes instead of four.

India currently also operates a nuclear-powered attack submarine (SSN) INS Chakra II, which is under lease from Russia.

It was in March last year that India and Russia signed a US\$3 billion deal for the lease of a third SSN — Chakra III — that is likely to be in Indian waters by 2025 at the earliest.

Russian submarines are being leased to train crews for India's own fleet of SSBNs.

In 2015, the Narendra Modi government gave the green light to build six indigenous SSNs. About two years later, in 2017, then Navy chief Admiral Sunil Lanba had confirmed that work on the SSNs had started.

India's Nuclear Triad

It was in November 2018 that India completed its nuclear triad when PM Modi announced to the world the completion of the first deterrence patrol by Arihant.

With that, India joined an elite group of countries that have the capability to launch a nuclear weapon from land, air and underwater. The only other countries capable of this are the US, Russia, China and France.



Representational image | India's kilo class submarine INS Sindhuraj during the Malabar 2020 exercise in the Bay of Bengal | Photo by special arrangement

INS Arihant was commissioned in 2016 by then defence minister Manohar Parrikar, but a formal announcement came only two years later.

<https://theprint.in/defence/ballistic-missile-submarine-arighat-in-final-stages-of-trials-to-be-commissioned-early-2021/567869/>

Science & Technology News

Business Standard

Thu, 17 Dec 2020

ISRO's technology transfer policy to get renewed focus and thrust

The Bengaluru-headquartered space agency under the Department of Space (DOS) has come out with revised technology transfer policy guidelines - 2020

Bengaluru: The Indian Space Research Organisation has proposed to give renewed focus and thrust to its policy on transfer of technologies developed by it to industries for commercialisation.

The Bengaluru-headquartered space agency under the Department of Space (DOS) has come out with revised technology transfer policy guidelines - 2020.

"We have put it in the public domain and after getting public comments, it will go through the due process (before its approval)", the Department's Secretary and ISRO Chairman, K Sivan, told PTI on the guidelines hosted on ISRO website.

One of the steps critical to success of technology transfer programme is the identification of technology that has a potential for commercialisation, and the DOS/ISRO centres play a vital role in this process, according to officials.

"A dedicated Technology Transfer Cell (TTC) within the centre may be identified with laid down responsibilities for end-to-end coordination, both within the organisation, i.e., the inventors, quality and testing teams and the potential licensee to ensure successful commercialisation of technologies for maximal exploitation", the guidelines said.

While the centre may have its own structure for picking up the technologies, it must be ensured that such technologies' maturity is assessed by rigorous screening process involving reliability testing quality certification, repeatability in in-house usage and proven worthiness, it was stated.

The technology transfer activities shall be organised through a centralised Technology Transfer Group (TTG) Office under Capacity Building Programme Office (CBPO) operating from ISRO headquarters here. Such centralised office shall interface with all DOS/ISRO centres through centre-level TTC for all day-to-day activities concerning technology transfer.

This revised guidelines document sets down the broad approach of ISRO, DOS, to the mechanism of transfer of technologies, developed by its centres/units.

The technology transfer activities of the DOS are primarily intended for the domestic utilisation of these technologies by Indian industries (both public and private sector).

"However, in the context of liberalisation and globalisation, requests from foreign organisations for transfer of DOS/ ISRO developed technologies shall be encouraged as per the guidelines issued by Government of India", according to the revised guidelines.

"However, such request shall be reviewed and processed on a case to case basis and the term of licensing shall be arrived at considering the merits of organisation, intellectual value of the technology and its commercial potential etc.", they said.

(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)

https://www.business-standard.com/article/pti-stories/isro-s-technology-transfer-policy-to-get-renewed-focus-and-thrust-120121600498_1.html

R. REPUBLICWORLD.COM

Thu, 17 Dec 2020

ISRO Chief inaugurates Space Situational Awareness control centre to protect space Assets

The Chairman of ISRO, Dr. K. Sivan on December 14 formally inaugurated the Space Situational Awareness (SSA) Control Centre at Peenya, Bangalore

By Bhavya Sukheja

The Chairman of ISRO, Dr. K. Sivan on December 14 formally inaugurated the Space Situational Awareness (SSA) Control Centre at Peenya, Bangalore. SSA has become an integral and indispensable part of safe and sustainable space operations. Along with Sivan, other dignitaries present at the inauguration ceremony were Shri. P. Kunhikrishnan, Director, URSC, Shri. R. Umamaheswaran, Scientific Secretary, and Dr. A. K. Anilkumar, Director, DSSAM.

SSA Control Centre 'NETRA'

While inaugurating the ISRO SSA Control Centre 'NETRA', Sivan reiterated the need for setting up a state-of-the-art facility dedicated to SSA activities on par with international agencies. According to the official press note, the SSA Control Centre is an important milestone in the progress of ISRO. The national space agency has set up a Directorate of Space Situational Awareness and Management aiming at protecting high valued space assets from space debris close approaches and collisions.



The Directorate engages in evolving improved operational mechanisms to protect Indian space assets through effective coordination amongst ISRO/DOS Centres, other space agencies and International bodies and establishment of necessary supporting infrastructures. NETRA or Network for space object TRacking and Analysis project is initiated as a first step towards meeting this goal. The Control Centre is also envisaged to function as a hub of all SSA activities within India.

The Control Centre, which is set up within the ISTRAC campus at Peenya, Bangalore, will have a provision to schedule and remotely operate the observational facilities from the control centre. The SSA activities will comprise close approach analysis between ISRO's satellite and launch vehicles, timely dissemination of advance alerts on upcoming critical conjunctions for collision avoidance of operational assets, prediction of atmospheric re-entry of derelict satellites and rocket bodies. Additionally, dedicated labs will also be set up in this control centre for Space Debris mitigation and remediation, compliance verification of UN/IADC guidelines and various R&D activities.

<https://www.republicworld.com/india-news/general-news/isro-chief-inaugurates-space-situational-awareness-control-centre-to-protect-space-assets.html>

Explained: All about ISRO's new center dedicated to Space Situational Awareness

*Directorate of Space Situational Awareness and Management (DSSAM) has been established at ISRO to enhance Space Situational Awareness
By Sidharth MP Edited By Tanweer Azam*

Highlights

- 1. ISRO has set up a dedicated Control Centre to monitor, track and protect India's space assets.**
- 2. DSSAM has been established at ISRO to enhance Space Situational Awareness.**
- 3. SSA is the science of tracking objects (man-made and natural) that are in orbit.**

The Indian Space Research Organization (ISRO) has set up a dedicated Control Centre to monitor, track and protect India's space assets and coordinate between Indian agencies, their foreign counterparts and international bodies. Directorate of Space Situational Awareness and Management (DSSAM) has been established at ISRO to enhance Space Situational Awareness.

Space Situational Awareness (SSA) is the science of tracking objects (man-made and natural) that are in orbit and also predicting when they would be at a given point in time. So far, only America, Russia and Europe have similar established capabilities in place to track space objects and share collision warnings.

An entity focused on SSA is much-needed owing to the manner in which space is getting overpopulated with government, private satellites, man-made space debris which pose a serious threat to satellites that are orbiting the earth.

The real danger posed by a possible collision of satellites would be the debris of varying sizes scattered across space in all directions, in high-speeds with high potential of harming other satellites.

As of January 2020, there are around 2,000 active satellites orbiting the earth. There are also more than 23,000 pieces of debris larger than 10cm (4inches) in orbit, according to NASA.

According to ISRO, Network for space object TRacking and Analysis (NETRA) project is initiated as a first step towards meeting this goal. NETRA's main elements would be a radar, an optical telescope facility, and a control centre. ISRO's SSA Control Centre, "NETRA", is now set up within the ISTRAC campus at Peenya, Bangalore.

ISRO has envisaged the control centre to function as a hub of all SSA activities within India. Concurrent processing of data from the upcoming observational facilities for space objects' orbit determination, correlation and catalogue generation will take place here. There will be provision to schedule and remotely operate the observational facilities from the control centre.

Some core SSA activities will comprise close approach analysis between ISRO's satellite and launch vehicles, timely dissemination of advance alerts on collision avoidance of space assets, prediction of atmospheric re-entry of derelict satellites and rocket bodies.

In addition, dedicated labs will also be set up in this control centre for Space Debris mitigation and remediation, compliance verification of UN/IADC guidelines and various R&D activities.

The R&D activities will encompass space object fragmentation and break up modeling, space debris population and micrometeoroid environment modeling, Space Weather studies, Near Earth Objects and planetary defence studies etc.

It is notable that, (according to the Russian Space agency), India's Cartosat 2F weighing over 700kg dangerously approached the Kanopus-V spacecraft at 01:49UTC, on November 27. In a tweet, Roscosmos has said that the minimum distance between both Russian and foreign satellite was 224 meters. Both the satellites are meant for earth's remote sensing.

According to a source that spoke to Zee media earlier, on the condition of anonymity, 1 Kilometer is an ideal distance between satellites in orbit, whereas 224 meter is scary and can be counted as a near miss. Generally, when two satellites are predicted (based on calculations) to make a close pass, a decision is taken to maneuver one of them away in advance (usually days ahead).

<https://zeenews.india.com/india/explained-all-about-isro-s-new-center-dedicated-to-space-situational-awareness-2331190.html>

ThePrint

Thu, 17 Dec 2020

ISRO set to launch satellite CMS-01 tomorrow, improve telecom coverage for Indian islands

CMS-01 will be India's 42nd communication satellite to be placed into orbit and will provide improved telecom services for Andaman & Nicobar Islands and Lakshadweep

By Sandhya Ramesh

Bengaluru: The Indian Space Research Organisation (ISRO) is set to launch CMS-01 communication satellite Thursday from the second launch pad at Satish Dhawan Space Centre (SDSC) at Sriharikota.

The satellite to be launched at 3.41 pm as a sole payload on the PSLV-C50 mission will provide telecommunication services including television, tele-education, tele-medicine, and disaster management support.

The 1,410-kg CMS-01 satellite will provide services in the Extended-C band of the frequency spectrum, and will include expanded and improved telecommunication coverage for both Andaman & Nicobar Islands as well as Lakshadweep. It will also provide improved coverage over the Indian mainland.



PSLV-C50 is scheduled to launch CMS-01, a communication satellite, on 17 December from the Satish Dhawan Space Centre at Sriharikota | [Twitter/@isro](https://twitter.com/isro)

CMS-01 to replace GSAT-12 telecommunication satellite

CMS-01 will be India's 42nd communication satellite to be placed into orbit.

The satellite, formerly known as the GSAT-12R, will replace the GSAT-12 telecommunication satellite currently in orbit, which was launched in 2011 and has functioned beyond its expected lifetime. GSAT-12 itself was a replacement for the INSAT-3B telecommunication satellite.

CMS-01 will be inserted into the higher, extremely elliptical geosynchronous transfer orbit with an apogee (farthest distance from earth) of almost 42,164 km, before which it settles into its final geostationary orbit of 35,000km and 83 degrees inclination. At this orbit, the satellite revolves around the Earth at the same speed as Earth's rotation, and appears stationary in the sky when observed from Earth.

The satellite has an expected mission life of seven years.

To launch the satellite, the PSLV launcher will fly in its XL configuration with six strap-on boosters. This is the 52nd flight of the PSLV, and the 22nd in its XL configuration. This will also be the 77th launch from Sriharikota.

ISRO Chairman K. Sivan had earlier said the mission rocket will be followed soon by the launch of ISRO's new launcher for small satellites, the Small Satellite Launch Vehicle (SSLV),

which will carry the EOS-02 (Earth Observation Satellite). The launch of the Geosynchronous Satellite Launch Vehicle-F10 (GSLV) carrying EOS-3 is expected to follow after that.

<https://theprint.in/science/isro-set-to-launch-satellite-cms-01-tomorrow-improve-telecom-coverage-for-indian-islands/567712/>



Thu, 17 Dec 2020

Quantum insulators create multilane highways for electrons

New energy-efficient electronic devices may be possible thanks to research that demonstrates the quantum anomalous Hall (QAH) effect—where an electrical current does not lose energy as it flows along the edges of the material—over a broader range of conditions. A team of researchers from Penn State has experimentally realized the QAH effect in a multilayered insulator, essentially producing a multilane highway for the transport of electrons that could increase the speed and efficiency of information transfer without energy loss.

"Low energy consumption is key in electronic devices, so there is a lot of research into materials that can improve the efficiency of electron flow," said Cui-Zu Chang, assistant professor of physics at Penn State who led the research. "Increasing the number of electrons in most metals results in a sort of traffic jam because electrons moving in different directions get scattered and repel each other. But in QAH insulators, electron flow is constrained to the edges, and electrons on one edge can only go in one direction and those on the other edge can only go the opposite direction, like splitting a road into a two-lane highway. In this study, we fabricated QAH insulators that could be layered to essentially create parallel highways on top of each other."

QAH insulators are created in a material called a topological insulator—a thin layer of film with a thickness of only a couple dozen atoms—that have been made magnetic so that they only conduct current along the edges. To make topological insulators magnetic, researchers add magnetic impurities into the material in a process called diluted magnetic doping. In this study, the Penn State research team used a technique called molecular beam epitaxy to fabricate multilayered topological insulators, carefully controlling where magnetic doping occurred.

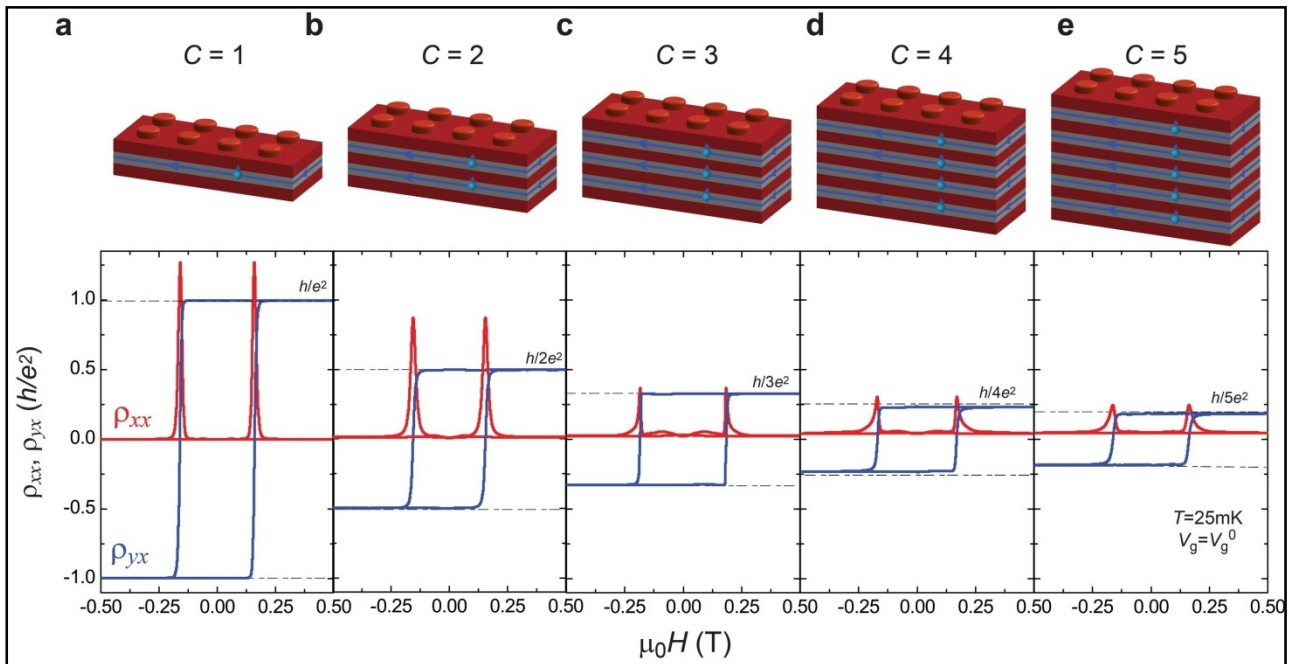
"QAH insulators are of particular interest because they theoretically have no energy dissipation, meaning that electrons do not lose energy in the form of heat as electrical current flows along the edges," said Chao-Xing Liu, associate professor of physics at Penn State and coauthor of the paper. "This unique property makes QAH insulators a good candidate for use in quantum computers and other small, fast electronic devices."

In prior studies, the QAH effect had been experimentally realized only in materials where an important quantity called the Chern number had a value of 1, essentially with a single two-lane highway for electrons. In this study, the researchers stacked alternating layers of magnetic and non-magnetic topological insulators and were able to realize the QAH state with Chern numbers up to 5, essentially constructing 5 parallel highways for electrons on each side of the material for a total of 10 lanes. They present their results in a paper appearing online Dec. 16 in the journal *Nature*.

"We do see some dissipation of current at connection points between QAH insulators and metallic electrodes, which occurs in the form of heat," said Liu. "You can think of it like the on and off ramps of a busy highway, where the narrow merge lane into local traffic slows you down. By building more parallel highways, more merge lanes can connect the highways to local traffic, so that the overall speed of the whole traffic system can be greatly improved."

The researchers found that by increasing the thickness of the QAH insulator layers, or by manipulating the concentration of magnetic doping in the QAH layer, they could tune the Chern number of the sample. "In other words, we could change the number of lanes in the highway with

an external knob," said Chang. "Even at high Chern numbers, the QAH insulators had no dissipation along the edge channels. This provides a proof-of-concept for devices that take advantage of this dissipationless edge current."



A team of researchers from Penn State has experimentally demonstrated a quantum phenomenon called the high Chern number quantum anomalous Hall (QAH) effect. They stacked alternating layers of magnetic and non-magnetic topological insulators, illustrated here as stacked Legos, and manipulated a topological quantity called the Chern number (C) to create as many as 5 parallel highways for electrons on each side of the material. Bottom: experimental results demonstrating the QAH effect with Chern number of 1 to 5. Credit: Zhao et al., Nature

In this study, the researchers carefully fabricated separate QAH insulators with different Chern numbers. In the future, they hope to develop a technique to tune the Chern number of an already fabricated sample, for "real-time" control of the electron traffic in an information highway.

Translating the fundamental advance made in this study into a practical technology is still a challenge since the phenomena studied here are limited to very low temperatures—about a hundredth of a degree Kelvin above absolute zero. But Chang is optimistic: "Through creative material synthesis, we can envision scenarios that might help us realize these effects under technologically relevant conditions."

More information: Tuning the Chern number in quantum anomalous Hall insulators, *Nature* (2020). DOI: [10.1038/s41586-020-3020-3](https://doi.org/10.1038/s41586-020-3020-3) , www.nature.com/articles/s41586-020-3020-3

Journal information: [Nature](https://www.nature.com)
<https://phys.org/news/2020-12-quantum-insulators-multilane-highways-electrons.html>

Researchers develop new combined process for 3-D printing

Chemists at Martin Luther University Halle-Wittenberg (MLU) have developed a way to integrate liquids directly into materials during the 3-D printing process. This allows, for example, active medical agents to be incorporated into pharmaceutical products or luminous liquids to be integrated into materials, which allow monitoring of damage. The study was published in *Advanced Materials Technologies*.

3-D printing is now widely used for a range of applications. Generally, however, the method is limited to materials which are liquefied through heat and become solid after printing. If the finished product is to contain liquid components, these are usually added afterwards. This is time-consuming and costly. "The future lies in more complex methods that combine several production steps," says Professor Wolfgang Binder from the Institute of Chemistry at MLU. "That is why we were looking for a way to integrate liquids directly into the material during the printing process."

To this endeavor, Binder and his colleague Harald Rupp combined common 3-D printing processes with traditional printing methods such as those used in inkjet or laser printers. Liquids are added drop by drop at the desired location during the extrusion of the basic material. This allows them to be integrated directly and into the material in a targeted manner.

The chemists have been able to show that their method works through two examples. First, they integrated an active liquid substance into a biodegradable material. "We were able to prove that the active ingredient was not affected by the printing process and remained active," explains Binder. In the pharmaceutical industry, such materials are used as drug depots which can be slowly broken down by the body. They can be used after operations, for example, to prevent inflammation. This new process could facilitate their production.

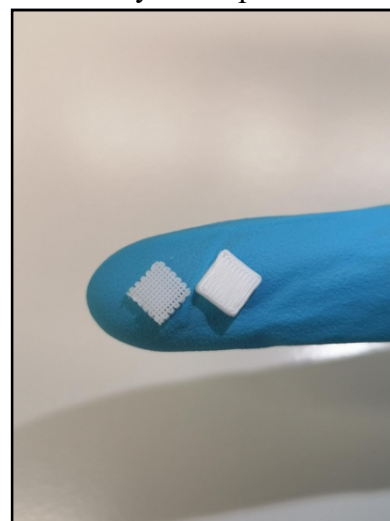
Secondly, the scientists integrated a luminous liquid into a plastic material. When the material becomes damaged, the liquid leaks out and indicates where the damage has occurred. "You could imprint something like this into a small part of a product that is exposed to particularly high levels of stress," says Binder. For example, in parts of cars or aircraft that are under a lot of strain. According to Binder, damage to plastic materials has so far been difficult to detect—unlike damage to metals, where X-rays can expose micro-cracks. The new approach could therefore increase safety.

The combined process is also conceivable for many other areas of application, says the chemist. The team soon plans to use the method to print parts of batteries. "Larger quantities cannot be produced in the laboratory with our setup," Binder explains. In order to produce industrial quantities, the process must be further developed outside the university.

More information: Harald Rupp et al, 3D Printing of Core–Shell Capsule Composites for Post-Reactive and Damage Sensing Applications, *Advanced Materials Technologies* (2020).

[DOI: 10.1002/admt.202000509](https://doi.org/10.1002/admt.202000509)

<https://phys.org/news/2020-12-combined-d.html>



Inside the 3-D-printed material (right) a lattice structure (left) contains the added liquids. Credit: Harald Rupp/Uni Halle

Information transport in antiferromagnets via pseudospin-magnons

A team of researchers from the Technical University of Munich, the Walther-Meissner-Institute of the Bavarian Academy of Sciences and Humanities, and the Norwegian University of Science and Technology in Trondheim has discovered an exciting method for controlling spin carried by quantized spin wave excitations in antiferromagnetic insulators.

Elementary particles carry an intrinsic angular momentum known as their spin. For an electron, the spin can take only two particular values relative to a quantization axis, letting us denote them as spin-up and spin-down electrons. This intrinsic two-valuedness of the electron spin is at the core of many fascinating effects in physics.

In today's information technology, the spin of an electron and the associated magnetic momentum are exploited in applications of information storage and readout of magnetic media, like hard disks and magnetic tapes.

Antiferromagnets: future stars in magnetic data storage?

Both, the storage media and the readout sensors utilize ferromagnetically ordered materials, where all magnetic moments align parallel. However, the moments may orient in a more complex way. In antiferromagnets, the antagonist to a ferromagnet, neighboring moments align in an anti-parallel fashion. While these systems look "non-magnetic" from outside, they have attracted broad attention as they promise robustness against external magnetic fields and faster control. Thus, they are considered as the new kids on the block for applications in magnetic storage and unconventional computing.

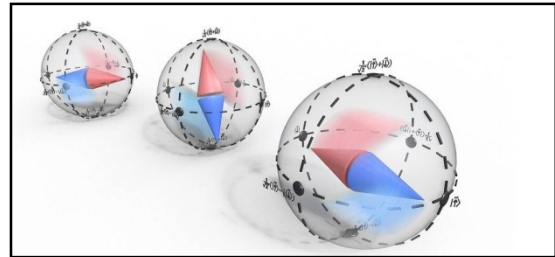
One important question in this context is, whether and how information can be transported and detected in antiferromagnets. Researchers at the Technical University of Munich, the Walther-Meissner-Institute and the Norwegian University of Science and Technology in Trondheim studied the antiferromagnetic insulator hematite in this respect.

In this system, charge carriers are absent and therefore it is a particularly interesting testbed for the investigation of novel applications, where one aims at avoiding dissipation by a finite electrical resistance. The scientists discovered a new effect unique to the transport of antiferromagnetic excitations, which opens up new possibilities for information processing with antiferromagnets.

Unleashing the pseudospin in antiferromagnets

Dr. Matthias Althammer, the lead researcher on the project describes the effect as follows: "In the antiferromagnetic phase, neighboring spins are aligned in an anti-parallel fashion. However, there are quantized excitations called magnons. Those carry information encoded in their spin and can propagate in the system. Due to the two antiparallel-coupled spin species in the antiferromagnet the excitation is of a complex nature, however, its properties can be cast in an effective spin, a pseudospin. We could experimentally demonstrate that we can manipulate this pseudospin, and its propagation with a magnetic field."

Dr. Akashdeep Kamra, the lead theoretician from NTNU in Trondheim adds that "this mapping of the excitations of an antiferromagnet onto a pseudospin enables an understanding and a powerful approach which has been the crucial foundation for treating transport phenomena in



A research team from the Technical University of Munich (TUM), the Bavarian Academy of Sciences and Humanities, and the Norwegian University of Science and Technology (NTNU) in Trondheim has succeeded in creating excitations in the magnetic order in a thin layer of hematite that can be moved through the layer in order to transmit information. Credit: Christoph Hohmann/MCQST

electronic systems. In our case, this enables us to describe the dynamics of the system in a much easier manner, but still maintain a full quantitative description of the system. Most importantly, the experiments provide a proof-of-concept for the pseudospin, a concept which is closely related to fundamental quantum mechanics."

Unlocking the full potential of antiferromagnetic magnons

This first experimental demonstration of magnon pseudospin dynamics in an antiferromagnetic insulator not only confirms the theoretical conjectures on magnon transport in antiferromagnets, but also provides an experimental platform for expanding towards rich electronics inspired phenomena.

"We may be able to realize fascinating new stuff such as the magnon analogue of a topological insulator in antiferromagnetic materials" points out Rudolf Gross, director of the Walther-Meissner-Institute, Professor for Technical Physics (E23) at the Technical University of Munich and co-speaker for the cluster of excellence Munich Center for Quantum Science and Technology (MCQST). "Our work provides an exciting perspective for quantum applications based on magnons in antiferromagnets"

More information: T. Wimmer et al, Observation of Antiferromagnetic Magnon Pseudospin Dynamics and the Hanle Effect, *Physical Review Letters* (2020). [DOI: 10.1103/PhysRevLett.125.247204](https://doi.org/10.1103/PhysRevLett.125.247204)

Akashdeep Kamra et al. Antiferromagnetic magnon pseudospin: Dynamics and diffusive transport, *Physical Review B* (2020). [DOI: 10.1103/PhysRevB.102.174445](https://doi.org/10.1103/PhysRevB.102.174445)

Journal information: [Physical Review Letters](#) , [Physical Review B](#)
<https://phys.org/news/2020-12-antiferromagnets-pseudospin-magnons.html>



Thu, 17 Dec 2020

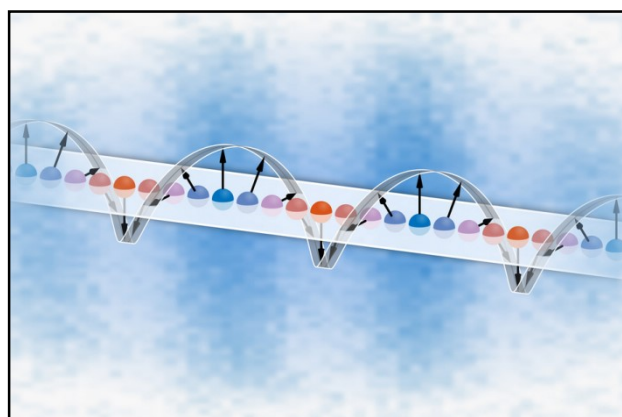
Ultracold atoms reveal a new type of quantum magnetic behavior

By Jennifer Chu

A new study illuminates surprising choreography among spinning atoms. In a paper appearing in the journal *Nature*, researchers from MIT and Harvard University reveal how magnetic forces at the quantum, atomic scale affect how atoms orient their spins.

In experiments with ultracold lithium atoms, the researchers observed different ways in which the spins of the atoms evolve. Like tippy ballerinas pirouetting back to upright positions, the spinning atoms return to an equilibrium orientation in a way that depends on the magnetic forces between individual atoms. For example, the atoms can spin into equilibrium in an extremely fast, "ballistic" fashion or in a slower, more diffuse pattern.

The researchers found that these behaviors, which had not been observed until now, could be described mathematically by the Heisenberg model, a set of equations commonly used to predict magnetic behavior. Their results address



MIT and Harvard researchers have studied how elementary units of magnetism, called spins (the black arrows), move around and interact with other spins, in a chain of single atoms (the colored spheres). The background shows a real image of the spins, revealing a high contrast periodic modulation of the blue (spin up) atoms. Credit: Courtesy of the researchers

the fundamental nature of magnetism, revealing a diversity of behavior in one of the simplest magnetic materials.

This improved understanding of magnetism may help engineers design "spintronic" devices, which transmit, process, and store information using the spin of quantum particles rather than the flow of electrons.

"Studying one of the simplest magnetic materials, we have advanced the understanding of magnetism," says Wolfgang Ketterle, the John D. Arthur professor of physics at MIT and the leader of the MIT team. "When you find new phenomena in one of the simplest models in physics for magnetism, then you have a chance to fully describe and understand it. This is what gets me out of bed in the morning, and gets me excited."

Ketterle's co-authors are MIT graduate student and lead author Paul Niklas Jepsen, along with Jesse-Amato Grill, Ivana Dimitrova, both MIT postdocs, Wen Wei Ho, a postdoc at Harvard University and Stanford University, and Eugene Demler, a professor of physics at Harvard. All are researchers in the MIT-Harvard Center for Ultracold Atoms. The MIT team is affiliated with the Institute's Department of Physics and Research Laboratory of Electronics.

Strings of spins

Quantum spin is considered the microscopic unit of magnetism. At the quantum scale, atoms can spin clockwise or counterclockwise, which gives them an orientation, like a compass needle. In magnetic materials, the spin of many atoms can show a variety of phenomena, including equilibrium states, where atom spins are aligned, and dynamic behavior, where the spins across many atoms resemble a wave-like pattern.

It is this latter pattern which was studied by the researchers. The dynamics of the wavelike spin pattern are very sensitive to the magnetic forces between atoms. The wavy pattern faded away much faster for isotropic magnetic forces than for anisotropic forces. (Isotropic forces don't depend on how all the spins are oriented in space).

Ketterle's group aimed to study this phenomenon with an experiment in which they first used established laser-cooling techniques to bring lithium atoms down to about 50 nanokelvin—more than 10 million times colder than interstellar space.

At such ultracold temperatures, atoms are frozen to a near standstill, so that researchers can see in detail any magnetic effects that would otherwise be masked by the thermal motion of the atoms. The researchers then used a system of lasers to trap and arrange multiple strings with 40 atoms each, like beads on a string. In all, they generated a lattice of about 1,000 strings, comprising about 40,000 atoms.

"You can think of the lasers as tweezers that grab the atoms, and if they are warmer they would escape," Jepsen explains.

They then applied a pattern of radio waves and a pulsed magnetic force to the entire lattice, which induced each atom along the string to tilt its spin into a helical (or wavelike) pattern. The wave-like patterns of these strings together corresponds to a periodic density modulation of the "spin up" atoms that forms a pattern of stripes, which the researchers could image on a detector. They then watched how the stripe patterns disappeared as the individual spins of the atoms approached their equilibrium state.

Ketterle compares the experiment to plucking the string of a guitar. If the researchers were to look at the spins of atoms at equilibrium, this wouldn't tell them much about the magnetic forces between the atoms, just as a guitar string at rest wouldn't reveal much about its physical properties. By plucking the string, bringing it out of equilibrium, and seeing how it vibrates and eventually returns to its original state, one can learn something fundamental about the string's physical properties.

"What we're doing here is, we're kind of plucking the string of spins. We're putting in this helix pattern, and then observing how this pattern behaves as a function of time," Ketterle says. "This allows us to see the effect of different magnetic forces between the spins."

Ballistics and ink

In their experiment, the researchers altered the strength of the pulsed magnetic force they applied, to vary the width of the stripes in the atomic spin patterns. They measured how quickly, and in what ways, the patterns faded. Depending on the nature of magnetic forces between atoms, they observed strikingly different behavior in how quantum spins returned to equilibrium.

They discovered a transition between ballistic behavior, where the spins shot quickly back into an equilibrium state, and diffusive behavior, where the spins propagate more erratically, and the overall stripe pattern spread slowly back to equilibrium, like an ink drop slowly dissolving in water.

Some of this behavior has been theoretically predicted, but never observed in detail until now. Some other results were completely unexpected. What's more, the researchers found their observations fit mathematically with what they calculated with the Heisenberg model for their experimental parameters. They teamed up with theorists at Harvard, who performed state-of-the-art calculations of the spin dynamics.

"It was interesting to see that there were properties which were easy to measure, but difficult to calculate, and other properties could be calculated, but not measured," Ho says.

In addition to advancing the understanding of magnetism at a fundamental level, the team's results may be used to explore the properties of new materials, as a sort of quantum simulator. Such a platform could work like a special-purpose quantum computer that calculates the behavior of materials, in a way that exceeds the capabilities of today's most powerful computers.

"With all of the current excitement about the promise of quantum information science to solve practical problems in the future, it is great to see work like this actually coming to fruition today," says John Gillaspay, program officer in the Division of Physics at the National Science Foundation, a funder of the research.

More information: Spin transport in a tunable Heisenberg model realized with ultracold atoms, *Nature* (2020). DOI: [10.1038/s41586-020-3033-y](https://doi.org/10.1038/s41586-020-3033-y) , www.nature.com/articles/s41586-020-3033-y

Journal information: [Nature](https://www.nature.com)
<https://phys.org/news/2020-12-ultracold-atoms-reveal-quantum-magnetic.html>

Simultaneously measuring absolute and relative delay of laser pulses

By Zhang Nannan

Recently, researchers from the Shanghai Institute of Optics and Fine Mechanics (SIOM) of the Chinese Academy of Sciences (CAS) have made new progress in the timing measurement and control of ultrashort laser pulses.

The researchers proposed to use the double-hump laser spectrum to obtain a near-field interference pattern, which could simultaneously measure the absolute and relative delay of the laser pulses. The time jitter was compensated by a feedback loop. The results were published in *Optics Express* on November 10, 2020.

Owing to the advantages of high precision, fast response speed and high signal-to-noise ratio, laser synchronization technology has been used in precision synchronization and control in various fields, such as optical parametric amplification, laser coherent beam combination, and coherent synthesis. The previous technologies can measure the relative delay between laser pulses but are not able to measure the absolute delay accurately.

In this study, the researchers used the double-hump spectrum to obtain the near-field interference pattern of two beams. The absolute delay between laser pulses was accurately measured by the effective recognition of the interference pattern envelope, and the time jitter was controlled by a closed-loop feedback system. A sub-femtosecond synchronization accuracy was achieved.

The proposed scheme avoids the influence of absolute delay in the applications of laser synchronization and coherent synthesis and reaches higher synchronization accuracy and peak intensity.

This study has developed a new way of measuring and controlling the absolute delay of laser pulses, that provides a solution for related applications.

More information: Keyang Liu et al. Simultaneous measurement of the absolute and relative time delay of a tiled-aperture coherent beam combination via the double-humped spectral beam interferometry, *Optics Express* (2020). DOI: [10.1364/OE.405430](https://doi.org/10.1364/OE.405430)

Journal information: [Optics Express](#)

<https://phys.org/news/2020-12-simultaneously-absolute-relative-laser-pulses.html>



Credit: CC0 Public Domain

First week after discharge from Covid-19 hospitalization crucial: Study

The survivors could face dangerous and exacerbating aftereffects of the infection, especially during the first week

By Prashast Awashti

New research has found that the first week and a half is sensitive and crucial for Covid-19 positive patients after getting discharged from the hospital.

The Covid-19 survivors could face dangerous and exacerbating aftereffects of the infection, especially during the first week, as per the study published in the journal JAMA.

Earlier studies have shown that the first few months after the Covid-19 infection signals a high risk of health problems that can lead to readmission and even death.

Covid-19 patients had a 40 per cent to 60 per cent higher risk of ending up back in the hospital or dying in the first ten days, compared with similar patients treated at the same hospitals during the same months for heart failure or pneumonia, the study stated.

By the end of 60 days, the Covid-19 patients' overall risk of readmission or death was lower than that for the other two severe conditions.

Even so, in the first two months, nine per cent of the Covid-19 patients, who survived hospitalization had died, and almost 20 per cent had suffered a setback that sent them back to the hospital. That's on top of the 18.5 per cent who had died during their hospitalization.

Study author from the University of Michigan in the US said: "By comparing Covid-19 patients' long-term outcomes with those of other seriously ill patients, we see a pattern of even greater-than-usual risk right in the first one to two weeks, which can be a risky period for anyone."

The researchers also stated the most common reasons listed for rehospitalization were Covid-19, cited in 30 per cent of patients, and sepsis is seen in 8.5 per cent. While more than 22 per cent of the readmitted veterans went to the intensive care unit.

"Unfortunately, this is yet more evidence that Covid-19 is not 'one and done.' For many patients, Covid-19 seems to set off cascades of problems that are every bit as serious as those we see in other diseases," the team wrote.

The research team will continue to study new data from Veterans Affairs (VA) and non-VA hospitals as it becomes available and to compare Covid-19 post-hospital outcomes with those for other serious conditions.

"Comparisons with patients hospitalized for influenza and other viral illnesses would be important to study, given the widespread false claims that Covid-19 is just a minor illness," they noted.

<https://www.thehindubusinessline.com/news/science/first-week-after-discharge-from-covid-19-hospitalization-crucial-study/article33342323.ece>

