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# समाचार पत्रों से चयित अंश
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moneycontrol

*Fri, 26 Feb 2021*

# Balakot, two years on: What changed for Indian Air Force since the airstrike

***Since the Balakot airstrike in 2019, the Indian Air Force has undertaken several reformative measures to bolster its operational capabilities***

***By Megha Mishra***

Two years ago on February 26, the Indian Air Force (IAF) conducted an airstrike in Balakot, Pakistan in response to the death of over 40 CRPF personnel on February 14, 2019, in a suicide terror attack conducted by Pakistan-based terror organisation Jaish-e-Mohammad (JeM).

Since then, a lot has changed for the IAF. The force has undertaken several reformative measures to bolster its operational capabilities. Since February 2019, India has acquired several fighter jets, assault weapons and missile systems.

File image: Twitter @IAF_MCC

**Induction of Rafale fighter jets**

The induction of Rafale aircraft was expedited post the Balakot strike. India received the first batch of five Rafale aircraft on July 29, 2020, which were, subsequently, inducted into the 17 'Golden Arrows' Squadron on September 10 at the Ambala Air Base. The Medium Multi-Role Combat Aircraft has given a boost to IAF's air dominance.

The second batch of three Rafale combat aircraft arrived in India on November 4, 2020. Three more combat aircraft landed in India on January 27, taking the fleet size to 11.

Manufactured by the French company Dassault Aviation, the Rafale is a 4.5 generation combat aircraft and has the latest weapons, superior sensors and fully integrated architecture. It is an omni-role aircraft, meaning it can carry out at least four missions in one sortie.

The fighter jet also has HAMMER missiles. It is armed with beyond visual range missiles like Meteor, SCALP and MICA, increasing its ability to take on incoming targets from a distance.

The IAF also received a second airborne warning plane in 2019. Netra, an Airborne Early Warning and Control (AEWC) aircraft, had played a crucial role during the Balakot airstrikes. It had provided surveillance and radar coverage to the five Mirage jets that bombed the JeM facility in Balakot in Khyber-Pakhtunkhwa province in Pakistan.

Designed and developed by the DRDO, Netra is fitted with indigenously developed electronics and hardware. It is useful for surveillance, tracking, identification and classification of airborne and sea surface targets and is useful in detecting incoming ballistic missile threats.

**Tejas Mark-1A, anti-airfield weapons and more**

Over the course of two years, India placed several procurement orders to boost IAF's capabilities and strengthen its squadrons. In January this year, the Cabinet Committee on Security

(CCS), headed by Prime Minister Narendra Modi, approved the largest indigenous defiance procurement deal to strengthen the IAF fleet of home-grown Light Combat Aircraft (LCA).

The cabinet approved the purchase of 83 Tejas Mark-1A variants, including 10 trainers for the IAF for Rs 48,000 crore from HAL. The 83 jets will help fill the gaps in the IAF as its fleet is down to 30 squadrons, way below the sanctioned strength of 42. Each squadron comprises 18 fighter jets.

The order is in addition to the 40 LCA Mark-1 order the IAF placed in 2016 with HAL to deliver for setting up two squadrons of the fighters. Of the 40 LCA Mark-1, the company has delivered 23 and ramped up its production to deliver the remaining 17 fighters, including eight trainer versions by 2023-24, with six this year and the remaining 11 by 2024.

Of the 83 Tejas Mark-1A, HAL is all set to manufacture 73 Mark 1-A, the new variant of the Tejas which will be more potent and effective than the previous Mark-1. Ten others will be Mark-1 trainers.

Light Combat Aircraft Mk-1A variant is an indigenously designed, developed and manufactured state-of-the-art modern 4+ generation fighter aircraft.

A proposal to purchase static HF tans-receiver sets and smart anti-airfield weapons for the Indian Air Force was also approved in 2020. The HF radio sets will enable seamless communication for the field units of the Army and the Air Force, while the smart anti-airfield weapons will add to the firepower of the Air Force.

In addition to combat aircraft and weapons, the government has also upped the number of trainer planes. In August 2020, the Defence Acquisition Council (DAC), chaired by Defence Minister Rajnath Singh, approved the purchase of 106 HTT-40 trainers for the IAF for Rs 7,600 crore.

In a push for the Make-in-India initiative, the IAF has opted for the indigenous basic trainer. The HTT-40 aircraft has undergone elaborate tests to demonstrate its safety for rookie pilots.

**Successful missile tests**

Since 2019, India has successfully tested several missile systems for the Indian Air Force. The most notable ones include Dhruvastra and Rudram 1.

Dhruvastra was tested from the Advanced Light Helicopter (ALH) platform in the desert ranges.

Designed and developed by the Defence Research and Development Organisation (DRDO), the missile system has all-weather day and night capability and can defeat battle tanks with conventional armour as well as with explosive reactive armour.

Meanwhile, the Anti-Radiation Missile (Rudram-1) can hit any radio frequency emitting target. The successful test firing of Rudram-1 was seen as a major milestone as it is India's first indigenously developed anti-radiation weapon.

The missile is integrated on the Su-30 MKI fighter aircraft as the launch platform, having the capability of varying ranges based on launch conditions. It has INS-GPS navigation with Passive Homing Head for the final attack. It hit the radiation target with pin-point accuracy.

The Passive Homing Head can detect, classify and engage targets over a wide band of frequencies as programmed. The missile is a potent weapon for the IAF for suppression of enemy air defence effectively from large stand-off ranges.

**Integration of BrahMos missile with Su-30MKI**

Post the Balakot strike, IAF fast-tracked the integration of the Brahmos missile with Sukhoi-30 MKI fighter jets. In May 2019, the Indian Air Force for the first time successfully test-fired the aerial version of the BrahMos missile from a Su-30 MKI fighter aircraft.

The BrahMos missile provides the IAF with a much-desired capability to strike from large stand-off ranges on any target at sea or land with pinpoint accuracy by day or night and in all weather conditions.

**Chief of Defence Staff**

In a landmark decision, the government created the post of Chief of Defence Staff (CDS) in the rank of a four-star General in 2019. The CDS is the single-point military adviser to the government.

Prime Minister Narendra Modi had on August 15 announced that India will have a CDS heading the tri-services. General Bipin Rawat was appointed as India's first Chief of Defence Staff (CDS) in December 2019.

*https://www.moneycontrol.com/news/india/balakot-two-years-on-what-changed-for-indian-air-force-since-the-airstrike-6567801.html*

THE TIMES OF INDIA

***Fri, 26 Feb 2021***

# Chenab bridge: World's highest rail bridge set to complete big engineering milestone; details

***By Smriti Jain***

Chenab bridge, the world's highest railway bridge, is all set to complete an important construction milestone by March 2021. As part of the Udhampur-Srinagar-Baramulla rail link project (USBRL), Indian Railways is constructing a bridge over the Chenab river. The Chenab bridge is being made at a height of 359 metres above the river bed - making it the highest railway bridge in the world. Railway Minister Piyush Goyal has tweeted an image of the Chenab bridge stating that the steel arch of the bridge is nearing closure.

According to Deepak Kumar, Chief Public Relations Officer, Northern Railway, the arch closure will be complete by March 2021. "Chenab bridge is expected to be complete by year end," Deepak Kumar said. The railway bridge is being built to cross the deep gorge, and the main arch has a span length of 467 metres, which Indian Railways claims is the largest in the country. Once the arch is complete, viaduct and track laying work will start, learns TOI.

**Chenab bridge salient facts:**

- At 359 metres height above the river bed, Chenab bridge will be 35 metres taller than the Eiffel tower.
- Chenab bridge will be 1.315 kilometres long. It will have stations at both the ends.
- The Chenab bridge will be an engineering marvel - it has already missed several deadlines for completion owing to challenging terrain in young fold mountains of Himalayas and inclement climate.
- The bridge has been built in an earthquake prone Seismic Zone IV. The seismic analysis for the project has been carried out by various IITs. The bridge has been designed to withstand earthquake forces up to Seismic Zone V.
- Given the fact that the area is prone to terrorist attacks the Chenab bridge has been designed to be "blast-proof" in consultation with Defence Research and Development Organisation (DRDO).
- The bridge will have a design speed of 100 kilometres per hour and a lifespan of 120 years.
- Chenab bridge is made up of steel arches and the slopes of the mountains supporting the foundations of the main arch have been stabilised.

- Since the bridge is over a very deep gorge, wind will have a very significant effect on the stability of the bridge. Modern wind tunnel tests were performed in Denmark to finalise the design. The bridge will be able to withstand wind velocity up to 266 kmph.

**Udhampur-Srinagar-Baramulla rail link project:**

The USBRL is a 272 kilometres long railway link project being built at a cost of Rs 28,000 crore under the Northern Railway zone. The project will connect Kashmir to the rest of India and is expected to be completed by 2022. Out of 272 kilometres, the Quazigund-Baramulla (118 kms) and Banihal-Quazigund (18 kms) and Udhampur-Katra (25 kms) sections have already been commissioned. The Katra-Banihal section which is 111 kilometres long is under construction.

Apart from the Chenab bridge, the USBRL rail link will also have India's longest railway tunnel (T-49) at 12.75 kilometres. Pirpanjal tunnel (11.215 kms), the longest rail tunnel as of date, is also part of the USBRL project and has already been commissioned. Yet another engineering marvel under construction is the Anji bridge which will be the first cable-stayed bridge of Indian Railways. The bridge is being constructed over Anjikhad, a tributary of Chenab river.

*https://timesofindia.indiatimes.com/business/india-business/chenab-bridge-completion-date-indian-railways-world-highest-rail-bridge-usbrl-project/articleshow/81213882.cms*

THE TIMES OF INDIA

***Fri, 26 Feb 2021***

# Surat sniffs opportunity in supply to armed forces

Surat: Weeks after Surat's famed textile industry expressed willingness to supply materials to the armed forces. The Ministry of Defence (MoD) and Defence Research and Development Organization (DRDO) have shared details of technical textile requirements with industries based in the city and South Gujarat.

Surat is the country's largest man-made fabric (MMF) hub with the daily production pegged at 3.5 crore metres, which is around 40% of the country's total production.

The requirement includes those of trousers, coats, glacier mattresses, sleeping bags, extreme weather clothing system, special woollen two-layer gloves and socks among others.

"South Gujarat Chamber of Commerce and Industry (SGCCI) had requested the defence ministry to provide a list of textile material required for armed forces which the textile industry here can provide. This will not only boost the local industry but also give the 'Make in India' mission a push," Ashish Gujarat, vice-president, SGCCI, told TOI.

"Some units from Surat city and Umbergaon in Valsad district supply specialized materials to the armed forces and this can be increased in coming days. We will share the specific requirements which MoD has given with local manufacturers," Gujarati added.

Textile units in Surat manufacture strong glass fabrics that are used to produce helmets, gloves and base for plane landings using carbon yarn.

*https://timesofindia.indiatimes.com/city/surat/surat-sniffs-opportunity-in-supply-to-armed-forces/articleshow/81214744.cms*

# Defence News

## Defence Strategic: National/International

Press Information Bureau
Government of India

**Ministry of Defence**

***Thu, 25 Feb 2021 4:30PM***

# 24th India-USA Executive Steering Group (ESG) Meeting

Rear Admiral Ajay Kochhar, NM took over as the Flag Officer Commanding Western Fleet (FOCWF) from Rear Admiral Krishna Swaminathan, AVSM, VSM at a formal ceremony held onboard the aircraft carrier INS Vikramaditya on 24 Feb 21. The 24th edition of the India-USA Executive Steering Group (ESG) meeting was held at New Delhi from 22 to 24 Feb 2021. The meeting was attended by a 12 member delegation from the US Army in person and virtually by 40 officers from different locations from the USA.

Major General Daniel McDaniel, Deputy Commanding General, US Army Pacific (USARPAC) was the Head of delegation from the US side. Indian Army delegation comprised of 37 officers.

The forum is an Army to Army engagement that meets every year alternately in India and USA to discuss Army to Army cooperation.

A number of contemporary issues of mutual interests where discussed with an aim to enhance the engagements in diverse fields. For the first time the meeting was held both in person and through virtual mode owing to restrictions of COVID-19.

Relevant issues of defence cooperation and common subjects of Interest where discussed between both sides during the meet.

*https://pib.gov.in/PressReleasePage.aspx?PRID=1700779*

पत्र सूचना कार्यालय
भारत सरकार

**रक्षा मंत्रालय**

***Thu, 25 Feb 2021 4:30PM***

# 24वीं भारत-यूएसए कार्यकारी संचालन समूह (ईएसजी) की बैठक

भारत-यूएसए कार्यकारी संचालन समूह (ईएसजी) की बैठक का 24वां संस्करण दिनांक 22 से 24 फरवरी 2021 तक नई दिल्ली में आयोजित किया गया था। इस बैठक में अमरीकी सेना के 12 सदस्यीय शिष्टमंडल ने भाग लिया और अमरीका के विभिन्न स्थानों से लगभग 40 अधिकारियों ने आभासी रूप से भाग लिया।

मेजर जनरल डेनियल मैकडेनियल, डिप्टी कमांडिंग जनरल, यूएस आर्मी पैसिफिक (यूएसएआरपीएसी) अमेरिका की ओर से प्रतिनिधिमंडल के प्रमुख थे। भारतीय सेना के प्रतिनिधिमंडल में 37 अधिकारी शामिल थे।

यह सेना से सेना के संबंधों के लिए एक मंच है जो हर साल बारी-बारी से भारत और अमेरिका में सेना से सेना के सहयोग के विषय पर चर्चा करने के लिए मिलता है।

आपसी हितों के कई समकालीन मुद्दों पर विविध क्षेत्रों में आपसी तालमेल बढ़ाने के उद्देश्य से चर्चा की गई। कोविड-19 के प्रतिबंधों के कारण पहली बार यह बैठक वैयक्तिक और आभासी तरीक़े के माध्यम से आयोजित की गई थी।

दोनों पक्षों के बीच रक्षा सहयोग के प्रासंगिक मुद्दों और हित के साझा विषयों पर इस बैठक के दौरान चर्चा की गई।

Press Information Bureau
Government of India

**Ministry of Defence**

***Thu, 25 Feb 2021 12:00PM***

# Joint Statement

The Director Generals of Military Operations of India and Pakistan held discussions over the established mechanism of hotline contact. The two sides reviewed the situation along the Line of Control and all other sectors in a free, frank and cordial atmosphere.

In the interest of achieving mutually beneficial and sustainable peace along the borders, the two DGsMO agreed to address each other's core issues and concerns which have propensity to disturb peace and lead to violence. Both sides agreed for strict observance of all agreements, understandings and cease firing along the Line of Control and all other sectors with effect from midnight 24/25 Feb 2021.

Both sides reiterated that existing mechanisms of hotline contact and border flag meetings will be utilised to resolve any unforeseen situation or misunderstanding.

*https://pib.gov.in/PressReleasePage.aspx?PRID=1700682*

पत्र सूचना कार्यालय
भारत सरकार

**रक्षा मंत्रालय**

***Thu, 25 Feb 2021 12:00PM***

# संयुक्त वक्तव्य

भारत और पाकिस्तान के सैन्य अभियानों के महानिदेशकों (डीजीएमओ) ने हॉटलाइन संपर्क के स्थापित तंत्र के बारे में विचार-विमर्श किया। दोनों पक्षों ने नियंत्रण रेखा और अन्य सभी क्षेत्रों में एक खुले, स्पष्ट और सौहार्दपूर्ण वातावरण में स्थिति की समीक्षा की।

दोनों देशों की सीमाओं के साथ-साथ पारस्परिक रूप से लाभदायक और स्थायी शांति अर्जित करने के हित में दोनों डीजीएमओ एक-दूसरे के उन प्रमुख मुद्दों और चिंताओं के बारे में चर्चा करने पर सहमत हुए जिनमें शांति को भंग करने और हिंसा को बढ़ावा देने की प्रवृत्ति है। दोनों पक्षों ने सभी अनुबंधों और समझौतों का कड़ाई से पालन करने और 24/25 फरवरी 2021 की मध्यरात्रि से नियंत्रण रेखा और अन्य सभी क्षेत्रों में युद्धविराम का पालन करने पर सहमति व्यक्त की।

दोनों पक्षों ने यह दोहराया कि हार्डलाइन संपर्क के मौजूदा तंत्र और सीमा पर फ्लैग बैठकों का किसी अप्रत्याशित स्थिति या गलतफहमी का समाधान करने में उपयोग किया जाएगा।

*https://pib.gov.in/PressReleasePage.aspx?PRID=1700722*

TIMESNOWNEWS.COM

***Fri, 26 Feb 2021***

# A day after ceasefire agreement with Pakistan, Indian Army says 'always prepared to meet any eventuality'

***Both countries agreed to strictly observe all ceasefire agreements along the LoC and other bordering sectors, effective from Wednesday midnight***

***Key Highlights***

- ***India and Pakistan had signed a ceasefire agreement back in 2003, but that was hardly followed in letter or in spirit***
- ***Director Generals of Military Operations of India and Pakistan established mechanism of hotline contact and reviewed the situation along the LoC***

New Delhi: Even though India and Pakistan have agreed to observe all agreements on ceasefire along the Line of Control, the Indian Army is a bit skeptical about a belligerent Pakistan Army toeing the line of the pacts.

A cautious Indian Army is walking the path carefully and is prepared for any untoward eventuality.

"Peace processes in the past derailed either because of acts of terror or Pakistan Army's belligerence. We always remain prepared to meet any eventuality. But, we remain cautiously optimistic," Army officials said when asked on whether India was committing mistake by having a ceasefire agreement with Pakistan.

Both countries agreed to strictly observe all ceasefire agreements along the LoC and other bordering sectors, effective from Wednesday midnight, during a meeting between Director

Generals of Military Operations (DGMOs) of India and Pakistan, a joint statement released on Thursday stated.

Visuals from an incident of ceasefire violation by Pakistan along the Line of Control. | File photo | Photo Credit: IANS

It is to be noted here that India and Pakistan had signed a ceasefire agreement back in 2003, but that was hardly followed in letter or in spirit over the years as more and more border violations disrupted the pact.

"Our actions in the past few instances have clearly indicated our resolve. We retain the right to respond," the Army officials said on India's course of action in case of another terror attack.

The DGMOs discussed the established mechanism of hotline contact and reviewed the situation along the LoC.

"In the interest of achieving mutually beneficial and sustainable peace along the borders, the two DGMOs agreed to address each other's core issues and concerns which have propensity to disturb peace and lead to violence. Both sides agreed for strict observance of all agreements, understandings and cease firing along the Line of Control and all other sectors with effect from midnight of February 24/25," the joint statement read.

*https://www.timesnownews.com/india/article/ceasefire-agreement-with-pakistan-a-mistake-indian-army-says-always-prepared-to-meet-any-eventuality/725077*

THE HINDU

***Fri, 26 Feb 2021***

# Global military spending hit record levels

***The U.S. remained the world's largest defence spender in 2020, IISS said, accounting for 40% of $738 billion globally***

Global military spending, driven in part by Chinese naval expansion, reached record levels in 2020 despite the impact of the coronavirus pandemic and ensuing economic contraction, a British think-tank said on Thursday.

The International Institute for Strategic Studies (IISS) said military spending reached $1.8 trillion last year — a 3.9% increase in real terms over figures for 2019.

The U.S. remained the world's largest defence spender in 2020, IISS said, accounting for 40% of $738 billion globally.

China, by comparison, accounted for 10.6 percent or $193.3 billion.

Beijing's military spending was the driving force behind growth in Asia's overall defence expenditure, and accounted for 25% of the continent's spending in 2020.

The IISS also highlighted Chinese military expansion and the significant growth of its naval fleet, a response driven in part by to Beijing's ambitions in the South China Sea.

Total European defence spending grew by 2% in real terms in 2020.

*https://www.thehindu.com/news/international/global-military-spending-hit-record-levels/article33935104.ece*

Naval
Technology

*Fri, 26 Feb 2021*

# Secon to build MCA barge for Indian Navy

***The U.S. remained the world's largest defence spender in 2020, IISS said, accounting for 40% of $738 billion globally***

***The Indian Ministry of Defence (MoD) has announced that a contract has been signed with local manufacturer Secon for a missile cum ammunition (MCA) barge.***

The Indian Ministry of Defence (MoD) has announced that a contract has been signed with local manufacturer Secon for a missile cum ammunition (MCA) barge.

Secon will build and deliver eight MCA barges to the Indian Navy. Financial details of the award have not been disclosed.

Delivery of the units will take place from July this year.

The Indian Navy will use the barges for embarking and disembarking missile, gunnery and ASW ammunition to ships.

**Officials during the contract signing with Secon. Credit: Ministry of Defence/Press Information Bureau/Government of India.**

The contract is part of the government's 'Make in India' efforts to boost local manufacturing capabilities in the defence sector.

According to the MoD's Request for Information (RFI) for the procurement, the barges are required to have a total cargo tonnage capacity of up to 100t with no lifting gear.

The barge should have a minimum life of 30 years. It should be capable of operating in Indian tropical environment conditions.

In addition, the length, breadth and height of the cargo hold of the barge should not be less than 25m x 6.5m x 4m. It should also be of double hull construction in way of hold.

Meanwhile, in a separate development, Turkish shipbuilding firm Anadolu Shipyard is reportedly said to support Hindustan Shipyard Limited (HSL).

As part of a technical collaboration agreement signed between the parties last year, Anadolu Shipyard will transfer technology to build five fleet support vessels (FSV) for the Indian Navy.

Anadolu Shipyard is part of Turkey's TAIS consortium.

The project is estimated to cost between $1.5bn and $2bn.

The 230m-long FSVs will have a displacement capacity of 45,000t and provide fuel and other supplies for ships.

*https://www.naval-technology.com/news/secon-to-build-missile-cum-ammunition-barge-for-indian-navy/*

## Science & Technology News

INDIA TODAY

***Fri, 26 Feb 2021***

# ISRO gearing up to launch SSLV, its new-generation mini rocket launch system, in maiden flight

***ISRO is targeting to launch the SSLV by march end or early April***

The Indian Space Research Organisation (ISRO) is all set to add another feather in its cap, as it gets ready to launch a new-generation compact rocket on its maiden orbital test flight.

So far, ISRO has developed five generation of launch vehicles -- SLV-3, ASLV, PSLV, GSLV and GSLV-MkIII. It started working on developing a new launch vehicle of mini rockets - Small Satellite Launch Vehicle (SSLV) - to meet needs of the emerging global small satellite launch service market.

In a report, news agency PTI said several sources in Isro have said that SSLV-D1 is targeted to be launched towards the end of March or early April. However, there is no official confirmation on the date so far.

"We are flying an earth observation satellite (EOS-02) on board the first development flight of SSLV," ISRO Chairman and Secretary in the Department of Space, K Sivan was quoted as saying by PTI.

**Why have an SSLV?**

Reports suggest that SSLV has been designed to meet "launch on demand" requirements in a cost-effective manner for small satellites in a dedicated and rideshare mode.

SSLV is a three-stage all solid vehicle and has a capability to launch up to 500 kg satellite mass into 500 km low earth orbit (LEO) and 300 kg to Sun Synchronous Orbit (SSO).

"By comparison, PSLV -- the workhorse of ISRO -- can take up to 1,750 kg payload into SSO of 600 km altitude," PTI reported quoting Isro sources.

Apart from the capability to launch upto 500kg of satellite mass, the SSLV will have the option of multiple satellite mounting options for nano, micro and small satellites.

In the past, Isro chief Sivan had said SSLV would be an innovative vehicle that can be assembled in just 72 hours.

"Instead of 60 days (for building a PSLV), it (SSLV) will be assembled in three days; instead of 600 people (needed to build a PSLV), it (SSLV) will be done by six people", he had told PTI.

**Rising global demand**

Meanwhile, Chairman and Managing Director of Isro's commercial arm, NewSpace India Limited (NSIL), G Narayanan said, "World over there is a big boom for small launch vehicles and that's why we are focusing on that"."As soon as SSLV-D1flight is over successfully, further roadmap (for SSLV) will be charted out", Narayanan told PTI.

In fact, Seattle, US-based satellite rideshare and mission management provider, Spaceflight Inc., has already purchased the first commercial launch of the SSLV (SSLV-D2) from NSIL for launch from the Satish Dhawan Space Centre in Sriharikota. *(With inputs from PTI)*

*https://www.indiatoday.in/science/story/isro-gearing-up-to-launch-sslv-its-new-generation-mini-rocket-launch-system-in-maiden-flight-1773080-2021-02-25*

Hindustan Times

***Fri, 26 Feb 2021***

# ISRO to launch Amazonia-1, 18 co-passenger satellites onboard PSLV-C51 on Feb 28

***Amazonia-1 is the optical earth observation satellite of the National Institute for Space Research (INPE)***

Primary satellite Amazonia-1 of Brazil and 18 co-passenger satellites onboard the Polar Satellite Launch Vehicle (PSLV-C51) are scheduled to be launched from Satish Dhawan Space Centre (SDSC) Sriharikota Range (SHAR) on February 28, the Indian Space Research Organisation (ISRO) said here on Thursday.

"PSLV-C51, which is the 53rd mission of PSLV, will launch Amazonia-1 of Brazil as primary satellite and 18 Co-passenger satellites from Satish Dhawan Space Centre (SDSC) SHAR, Sriharikota. The launch is tentatively scheduled at 1024 Hrs IST on February 28, 2021, subject to weather conditions," the space agency said.

ISRO also confirmed that the launch rehearsal of PSLV-C51 was completed today.

PSLV-C51/Amazonia-1 is the first dedicated commercial mission of NewSpace India Limited (NSIL), a Government of India company under the Department of Space. The NSIL is undertaking this mission under a commercial arrangement with Spaceflight Inc. USA.

Amazonia-1 is the optical earth observation satellite of the National Institute for Space Research (INPE). This satellite would further strengthen the existing structure by providing remote sensing data to users for monitoring deforestation in the Amazon region and analysis of diversified agriculture across the Brazilian territory.

The 18 co-passenger satellites include four from IN-SPACe (three UNITYsats from the consortium of three Indian academic institutes and One Satish Dhawan Sat from Space Kidz India) and 14 from NSIL.

*https://www.hindustantimes.com/india-news/isro-to-launch-amazonia-1-18-co-passenger-satellites-onboard-pslv-c51-on-feb-28-101614252735151.html*

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*Fri, 26 Feb 2021*

# Researchers send entangled qubit states through a communication channel for the first time

*By Emily Ayshford*

In a breakthrough for quantum computing, University of Chicago researchers have sent entangled qubit states through a communication cable linking one quantum network node to a second node.

The researchers, based in the Pritzker School of Molecular Engineering (PME) at the University of Chicago, also amplified an entangled state via the same cable first by using the cable to entangle two qubits in each of two nodes, then entangling these qubits further with other qubits in the nodes.

The results, published February 24, 2021 in *Nature*, could help make quantum computing more feasible and could lay the groundwork for future quantum communication networks.

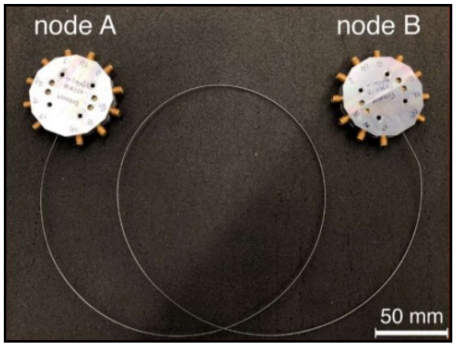
"Developing methods that allow us to transfer entangled states will be essential to scaling quantum computing," said Prof. Andrew Cleland, who led the research.

**Sending entangled photons through a network**

Qubits, or quantum bits, are the basic units of quantum information. By exploiting their quantum properties, like superposition, and their ability to be entangled together, scientists and engineers are creating next-generation quantum computers that will be able solve previously unsolvable problems.

Cleland Lab uses superconducting qubits, tiny cryogenic circuits that can be manipulated electrically.

To send the entangled states through the communication cable—a one-meter-long superconducting cable—the researchers created an experimental set-up with three superconducting qubits in each of two nodes. They connected one qubit in each node to the cable and then sent quantum states, in the form of microwave photons, through the cable with minimal loss of information. The fragile nature of quantum states makes this process quite challenging.




**Prof. Andrew Cleland's lab sent entangled qubit states through a communication cable, laying the groundwork for future quantum communication networks. Credit: Cleland Lab**

Cleland's former postdoctoral fellow, paper first author Youpeng Zhong, was able to develop a system in which the whole transfer process—node to cable to node—takes only a few tens of nanoseconds (a nanosecond is one billionth of a second). That allowed them to send entangled quantum states with very little information loss.

The system also allowed them to "amplify" the entanglement of qubits. The researchers used one qubit in each node and entangled them together by essentially sending a half-photon through the cable. They then extended this entanglement to the other qubits in each node. When they were finished, all six qubits in two nodes were entangled in a single globally entangled state.

**Creating a scaled, networked quantum computer**

In the future, quantum computers will likely be built out of modules where families of entangled qubits conduct a computation. These computers could ultimately be built from many such networked modules, similar to how supercomputers today conduct parallel computing on many central processing units connected to one another. The ability to remotely entangle qubits in different modules, or nodes, is a significant advance to enabling such modular approaches.

"These modules will need to send complex quantum states to each other, and this is a big step toward that," Cleland said. A quantum communication network could also potentially take advantage of this advance.

Cleland and his group hope to next extend their system to three nodes to build three-way entanglement.

"We want to show that superconducting qubits have a viable role going forward," he said.

**More information:** Youpeng Zhong et al. Deterministic multi-qubit entanglement in a quantum network, *Nature* (2021). DOI: 10.1038/s41586-021-03288-7

**Journal information:** Nature

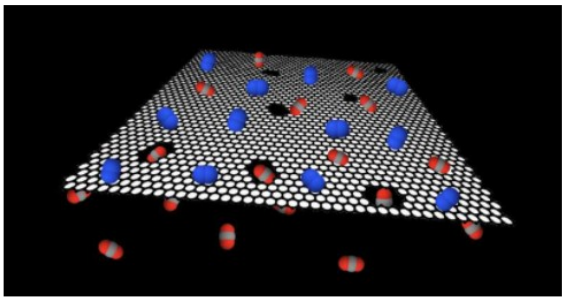
*https://phys.org/news/2021-02-entangled-qubit-states-channel.html*

***Fri, 26 Feb 2021***

# Graphene filter makes carbon capture more efficient and cheaper

***By Ecole Polytechnique Federale de Lausanne***

Chemical engineers at EPFL have developed a graphene filter for carbon capture that surpasses the efficiency of commercial capture technologies, and can reduce the cost carbon capture down to $30 per ton of carbon dioxide.



**An illustration of the graphene carbon dioxide filter. Credit: KV Agrawal, EPFL**

One of the main culprits of global warming is the vast amount of carbon dioxide pumped out into the atmosphere mostly from burning fossil fuels and the production of steel and cement. In response, scientists have been trying out a process that can sequester waste carbon dioxide, transporting it into a storage site, and then depositing it at a place where it cannot enter the atmosphere.

The problem is that capturing carbon from power plants and industrial emissions isn't very cost-effective. The main reason is that waste carbon dioxide isn't emitted pure, but is mixed with nitrogen and other gases, and extracting it from industrial emissions requires extra energy consumption—meaning a pricier bill.

Scientists have been trying to develop an energy-efficient carbon dioxide-filter. Referred to as a "membrane," this technology can extract carbon dioxide out of the gas mix, which can then be either stored or converted into useful chemicals. "However, the performance of current carbon dioxide filters has been limited by the fundamental properties of currently available materials," explains Professor Kumar Varoon Agrawal at EPFL's School of Basic Sciences (EPFL Valais Wallis).

Now, Agrawal has led a team of chemical engineers to develop the world's thinnest filter from graphene, the world-famous "wonder material" that won the Physics Nobel in 2010. But the graphene filter isn't just the thinnest in the world, it can also separate carbon dioxide from a mix of gases such as those coming out of industrial emissions and do so with an efficiency and speed that surpasses most current filters. The work is published in *Science Advances*.

"Our approach was simple," says Agrawal. "We made carbon dioxide-sized holes in graphene, which allowed carbon dioxide to flow through while blocking other gases such as nitrogen, which are larger than carbon dioxide." The result is a record-high carbon dioxide-capture performance.

For comparison, current filters are required to exceed 1000 gas permeation units (GPUs), while their carbon-capturing specificity, referred to as their "carbon dioxide/nitrogenseparation factor"

must be above 20. The membranes that the EPFL scientists developed show more than ten-fold higher carbon dioxidepermeance at 11,800 GPUs, while their separation factor stands at 22.5.

"We estimate that this technology will drop the cost of carbon capture close to $30 per ton of carbon dioxide, in contrast to commercial processes where the cost is two-to-four time higher," says Agrawal. His team is now working on scaling up the process by developing a pilot plant demonstrator to capture 10 kg carbon dioxide per day, in a project funded by the Swiss government and Swiss industry.

**More information:** Shiqi Huang et al. Millisecond lattice gasification for high-density CO2- and O2-sieving nanopores in single-layer graphene, *Science Advances* (2021). DOI: 10.1126/sciadv.abf0116

**Journal information:** Science Advances

*https://phys.org/news/2021-02-graphene-filter-carbon-capture-efficient.html*

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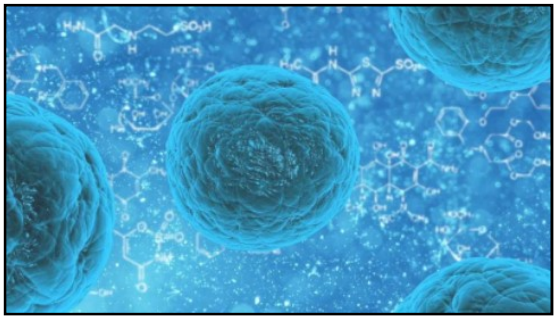
***Fri, 26 Feb 2021***

# Optimality in self-organized molecular sorting

***By Politecnico di Torino***

The eukaryotic cell is the basic unit of animals and plants. Through the microscope, it looks highly structured and subdivided in many membrane-bound compartments. Each compartment has a specific function, and its membrane is populated by specific molecules. How does the cell preserve this amazing internal order, and (in the absence of pathologies) not degrade into a shapeless bunch of molecules? Such degradation is countered by a continuous process of molecular sorting by which similar molecules are collected and dispatched to the 'right' destinations, similarly to what happens when a house is kept clean and tidy by daily chores. It's still mysterious, however, how a living cell may achieve this task without a supervisor directing it.



Credit: CC0 Public Domain

In a recent *Physical Review Letters* paper, a collaboration of researchers from Politecnico di Torino, Università di Torino, Italian Institute for Genomic Medicine—IIGM, Istituto Nazionale di Fisica Nucleare—INFN, and Landau Institute for Theoretical Physics (Moscow), hypothesizes that this process of molecular sorting emerges from the combination of two spontaneous mechanisms. The first mechanism is the propensity of similar molecules to aggregate on membranes in the form of 'patches,' or 'droplets,' in the same way as water droplets form in a vapor cloud that is cooled down. The second mechanism is the tendency of such droplets to bend the membrane, leading to the formation and further detachment of small vesicles enriched in the molecular components of the original droplets. The various membrane compartments of the eukaryotic cell act thus similarly to the vessels and tubes of a natural distiller, or alembic, that continuously sorts and redirects molecular components toward the appropriate destinations.

In the published work, this process of molecular sorting is studied with mathematical tools and computer simulations, showing that the propensity to aggregation is the main control parameter of the process. For each group of molecules there exists an optimal value of this parameter (neither too large, nor too small), such that the sorting process takes place with the maximum possible speed. Actually, some propensity to molecular aggregation is needed to drive the process, but when the propensity to aggregation is too large, the molecules 'freeze' in a large number of small droplets that grow very slowly, and the overall sorting process slows down. Experimental observations of this distillation process in cells isolated from the blood vessels of

human umbilical cords confirm this theoretical picture, and suggest that evolution may have led the cells to work in the optimal parameter region, where the sorting process achieves maximum efficiency.

These findings are of particular interest, since the misregulation of molecular sorting is a hallmark of severe pathologies, such as cancer. The theoretical identification of the parameters that control the process is an important first step toward a better understanding of the origin of such disruptions and the development of therapies.

**More information:** Marco Zamparo et al, Optimality in Self-Organized Molecular Sorting, *Physical Review Letters* (2021). DOI: 10.1103/PhysRevLett.126.088101

**Journal information:** Physical Review Letters

*https://phys.org/news/2021-02-optimality-self-organized-molecular.html*

# COVID-19 Research News

Telangana Today

***Fri, 26 Feb 2021***

# Hyderabad doctors' study says Vitamin D can fight Covid better

***Vitamin D administered in the right quantities among patients 'has significantly reduced the inflammatory markers associated with Covid-19 without any side-effects, said a study by nine senior doctors from NIMS and Gandhi Hospital***

***By M. Sai Gopal***

Hyderabad: City doctors from Nizam's Institute of Medical Sciences (NIMS) and Gandhi Hospital in cutting-edge research have established that Vitamin D can modulate the body's immunity and help Covid-19 positive patients recover quickly.


The research carried out by nine senior doctors from NIMS and Gandhi Hospital which is available in preprint at Research Square, an online preprint platform, said Vitamin D administered in the right quantities among patients 'has significantly reduced the inflammatory markers associated with Covid-19 without any side-effects. Hence, Vitamin D therapy can be added safely to the existing treatment protocols of Covid-19 for improved outcomes," the researchers said.

NIMS Associate Professor, Orthopaedics, Dr Mahesh Lakkireddy, who was part of the research teams, said 130 Covid patients between the age of 20 and 60 at Gandhi Hospital were part of the study. Of them, 87 patients, including 65 men and 22 women, completed the study.

Doctors said inflammatory markers like Procalcitonin (PCT), serum ferritin, C-reactive protein (CRP), IL-6 are traditionally associated with a high risk of development of severe Covid-19 infections. The research group demonstrated that with the proper intake of Vitamin D, there was a highly significant reduction in inflammatory markers among Covid patients, which enabled them to recover at a quicker pace.

Researchers pointed out that worldwide, mortality and morbidity is high among Covid positive patients who suffer from Vitamin D deficiency. A low level of Vitamin D was also proposed to be an independent risk factor for Covid-19 infection, hospitalisation and Covid-related mortality. There is a lot of evidence in the past that the vitamin decreases the incidence of flu and other

respiratory infections, which prompted the city researchers to explore the link between Vitamin D and Covid-19 recovery.

"Vitamin D is a potential immunomodulator, and its adjunctive role in the Covid treatment has been firmly established by this study. Improvement of serum vitamin D level to 80-100 ng/ml (nanograms per millilitre) has significantly reduced the inflammatory markers of Covid-19 without any side-effects. Hence, adjunctive Vitamin D therapy can be added safely to the existing treatment protocols," the researchers concluded.

The study is available at: https://doi.org/10.21203/rs.3.rs-152494/v1

*https://telanganatoday.com/hyderabad-doctors-study-says-vitamin-d-can-fight-covid-better*