Sept
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CONTENT

S. No.	TITLE	Page No.
	DRDO News	**1-4**
	DRDO Technology News	**1-4**
1.	NEP focuses on multidisciplinary knowledge: DRDO Chairman	1
2.	DRL sounds epidemic alarm over oil poisoning	2
3.	Curiosity on the Aircraft's 37-year Journey	3
	Defence News	**5-18**
	Defence Strategic National/International	**5-18**
4.	Rajnath Singh leaves for Russia to attend SCO meet	5
5.	India bolsters presence in Pangong lake amid border tension with China; military talks inconclusive	6
6.	Indian Army ‘redeploys’ troops, reaches heights facing Finger 4 in Pangong Tso	8
7.	Indian army foils 3 attempts by China to change lac status quo	9
8.	China seeks to set up military logistic facilities in about a dozen countries: Pentagon	10
9.	China's test of radar plane for aircraft carriers should worry rivals	11
10.	After Galwan, India should turn its focus to Malacca, says expert	13
11.	IAF is key to India’s ‘deterrence by punishment’ plan against China. Now to wait for winter	14
12.	US says China now has world's largest Navy; here's what you need to know	16
13.	No more Rafales! India eyes US Stealth F-35 Jets As Washington loosens export policy? OpEd	17
	Science & Technology News	**19-30**
14.	Nanoparticle-based computing architecture for nanoparticle neural networks	19
15.	A molecular approach to quantum computing	22
16.	Exploring oxidative pathways in nuclear fuel	24
17.	Scientists find new way to measure important beam property	25
	COVID-19 Research News	**27-30**
18.	Virus in the blood can predict severe COVID-19, researchers find	27
19.	Why a single Coronavirus vaccine may be effective in combating the pandemic worldwide	28
20.	Vaccine for coronavirus is possible as virus has mutated minimally: Study	29
21.	IT firm launches Covid-19 vaccine and treatment tracker for India	30

DRDO News

DRDO Technology News

Telangana Today

Thu, 03 Sept 2020

NEP focuses on multidisciplinary knowledge: DRDO Chairman

Dr. G Sateesh Reddy was addressing a national webinar on "Strategies for Implementation of National Education Policy -2020 for Technical Education" was organised by Warangal NIT

Warangal Urban: The present education policy focuses on the marks secured by the students and not on the knowledge that the students have. The new National Educational Policy (NEP), which is completely different from the present education policy, focuses on multi-disciplinary knowledge that the students secure rather than the marks scored by them in their examinations, said Dr G Sateesh Reddy, Chairman DRDO & Secretary Department of Defence R&D.

A national webinar on "Strategies for Implementation of National Education Policy -2020 for Technical Education" was organised by National Institute of Technology (NIT), Warangal, on Wednesday.

Addressing the webinar, Sateesh Reddy said that the DRDO provides opportunities for the scholars who have multidisciplinary knowledge although it costs huge amounts of money.

Dr BVR Mohan Reddy of Cyient, Prof Anil D. Sahasra Buddhe, Chairman AICTE, Prof KK Agarwal Chairman, NBA, and Dr Minishaji Thomas, Director, NIT Trichy delivered their lectures. The organisers stated that the proceedings would be sent to the Ministry of Education Govt of India.

Prof Shivasharma, Dean Academic NIT, Prof M Saidulu, Prof KV Jaikumar, Prof CSRK Prasad, Dr P Venkateshwar Rao acted as moderators in this National Webinar.

Prof NV Raman Rao, Director NIT Warangal, stated that NIT Warangal ranks among the top engineering colleges in the country. He added that he was glad to say that NIT Warangal took the initiative to conduct a webinar on NEP.

https://telanganatoday.com/nep-focuses-on-multidisciplinary-knowledge-drdo-chairman

THE TIMES OF INDIA

Thu, 03 Sept 2020

DRL sounds epidemic alarm over oil poisoning

Guwahati: The Defence Research Laboratory (DRL), under the Defence Research Development Organisation (DRDO), based in northern Assam's Tezpur on Wednesday issued a warning of a possible repetition of katkar oil poisoning that has caused epidemic dropsy, of which the last major outbreak in India occurred in 1998.

DRL, which has completed analysis of some of the mustard oil samples available in the market of Tezpur, has confirmed to TOI that the tested mustard oil samples are adulterated with seed oil of Argemone maxicana which is toxic, pungent and similar to mustard oil. DRL director has advised that all the consumers be aware of this danger while purchasing mustard oil from the market. He also urged the state government department and the agencies concerned to take appropriate measures to prevent any unpleasant incidence due to consumption of adulterated mustard oil.

A statement by the premier defence lab said that Argemone mexicana seeds contain 22-36% of pale yellow non-edible oil, called Argemone oil or katkar oil, which contains the toxic alkaloids sanguinarine and dihydrosanguinarine, making it unsafe for human consumption. "It is therefore advised in the public interest that all the consumers must be aware of this danger while purchasing mustard oil from the market. The use of adulterated mustard oil is not recommended for consumption because it may result in serious health issues. All other related agencies may take appropriate measures to prevent any unpleasant incidence due to consumption of adulterated mustard oil," stated the advisory issued by scientist Ashok Naglot from DRL.

Even as the analyzed samples were collected from Tezpur, one of the investigators said there was a high possibility of such stocks present in markets in the northeast as well as some other parts of the country. The northeastern states are highly dependent on factories from western India for procurement of mustard oil consignments to cater its needs.

"The seeds resemble the seeds of Brassica nigra (mustard). As a result, mustard can easily be adulterated by argemone seeds, rendering it poisonous. Several significant instances of katkar poisoning have been reported in India in the past. Even one percent adulteration of mustard oil by argemone oil has been shown to cause clinical disease," he said.

According to the investigators, in India, Argemone oil is mixed with sunflower oil and sesame oil to increase the quantity. As this adulteration causes health disorders, many of the renowned brands display 'no argemone oil' to show purity.

https://timesofindia.indiatimes.com/india/drl-sounds-epidemic-alarm-over-oil-poisoning/articleshow/77896220.cms

NEWS 18

Wed, 02 Sept 2020

Curiosity on the Aircraft's 37-year Journey

If India wants to become a leading player in world affairs, it has to have an indigenous capability to manufacture its defence equipment. Importing this from other countries makes us dependent on them and only improves the standard of living of the nation exporting to us.

By Air Marshal Raghunath Nambiar (Retd.)

On August 27, well-known Indian film star Kangana Ranaut tweeted about the release of a motion picture starring her called 'Tejas'. This was the start of a frenzy on the Internet with Google alone receiving as many as 300,000 hits for information on the Tejas in under 3 hours.

The tweet also included a stylised picture, clearly made on CGI, and immediately attracted a million eyeballs. The magnetic pull of star power was clearly on display here, and the Tejas aircraft was finally receiving the attention it rightly deserved, despite it being in design and development for over 35 years.

I have been associated with the Tejas programme since 1992 after graduating from the Air Force Test Pilot School, and can speak with some authority on this aircraft. The Tejas is a grandiose programme intended to leapfrog India into the 4th generation fighter aircraft manufacturing field after a long hiatus in designing indigenous fighters. It all began in 1983, when the Indian Air Force, in anticipation of the life expiry of the MiG-21 fleet, requested the development of a Light Combat Aircraft or LCA as the Tejas was known then. Thirty-seven years have gone by and the Tejas has survived many trials and tribulations before finally metamorphising into a war machine. It has weathered the financial crisis of the 1980s, the atomic sanctions of the 90s and a thousand or more issues, before finally taking to the skies on January 4, 2001.

I vividly recall that day. Wing Commander Rajiv Kothiyal was the designated Test Pilot for the first flight and I was the back-up. I was to chase the LCA Technology Demonstrator-1 or TD-1 in short, in a Mirage 2000, while a second Mirage had the then CAS of the IAF, Air Chief Marshal AY Tipnis, onboard. The first prototype of the LCA, TD-1, had been made a few years earlier and had been rolled out in 1995. Since then it had undergone numerous tests and had been repeatedly stripped and rebuilt, as we were all doing this for the first time.

This repeated abuse, which aircraft are rarely subjected to, had resulted in all the removable panels being scratched and with a weathered look which did not inspire much confidence. The aircraft shin had the look of a well-used DTC bus, and we used to jokingly refer to TD-1 as a Khadi Gram Udyog product. The Programme Director of the LCA was Dr Kota Harinarayana. It was his dedicated effort which progressed Tejas to see the light of day. TD-1 was allotted the tail number of KH-2001 in his honour and the second prototype, TD-2, was named KH-2002 The first flight was near flawless.

The only major issue was we lost the telemetry signal the moment the LCA was airborne and the 600 odd critical parameters which were displayed to the scientist on the ground to monitor the flight suddenly ceased. This was a tense moment, and the planned flight was quickly cut short and a flawless landing executed. Wg Cdr Rajiv Kothiyal was awarded a Kirti Chakra for this pioneering flight fraught with so much of uncertainty. He was also awarded the 'Iven C Kincheloe Award', which is considered the equivalent of the Oscar in the field of flight testing.

The announcement of the movie 'Tejas' has given rise to a number of questions about the aircraft. Some of these are answered below.

What is the Tejas?

The Tejas is a single engine, supersonic, delta wing, fourth generation fighter aircraft. The aircraft was designed and developed by the Aeronautical Development Agency, which is a part of DRDO. The Tejas was inducted into squadron service in the IAF in 2016 and has successfully completed over 10,000 hours of flight testing and squadron flying without a single crash. This is indeed an outstanding and singular feat and we have much to be proud about, especially when compared to the peers of the Tejas.

Is Tejas better than the Rafale? The Tejas was designed to replace the MiG-21, so to compare it to the Rafale would be unfair. The Rafale is a much larger aircraft and with two engines. The max takeoff weight of the Rafale is about two times that of the Tejas.

Why is the Tejas a 4th generation aircraft and not a 5th generation aircraft? The design of the Tejas started in 1985 and does not incorporate many features which are considered essential for it to be a fifth generation aircraft. These include stealth and super cruise.

Is it better than the Pakistani JF-17? The JF-17 is to a large extent a highly upgraded and modified MiG-21 aircraft and cannot be considered a rival to the Tejas in technology. The Tejas is a 4 channel digital fly-by-wire aircraft with composite wing and fuselage. The JF-17 is in comparison more conventional in nature and is equipped with an old generation RD-93 engine from Russia, which is prone to failure and is inefficient, while the Tejas has the more modern and modular F-404 IN20 engine.

Is make-in-India the way ahead? If India wants to become a leading player in world affairs, it has to have an indigenous capability to manufacture its defence equipment. Importing this from other countries makes us dependent on them and only improves the standard of living of the nation exporting to us.

Will we have to compromise if we are stuck with make-in-India? 'Atmanirbharta' does not mean mediocrity. It means that we would be willing to pay more for a product which is made in India, with equal or better quality. Such a policy may result in higher cost in the short term, but will ultimately result in the setting up of infrastructure in India, which would help in the design of world-class products that are cost effective too.

(The author is a retired officer of the Indian Air Force, who served as Air Officer Commanding-in-Chief , Western Air Command from March 1, 2019, to October 31, 2019. Views expressed are personal)

https://www.news18.com/news/opinion/internet-frenzy-around-tejas-movie-triggers-curiosity-on-the-aircrafts-37-year-journey-2838553.html

Defence Strategic: National/International

THE HINDU

Thu, 03 Sept 2020

Rajnath Singh leaves for Russia to attend SCO meet

New Delhi: Defence Minister Rajnath Singh on Wednesday left for Russia on a three-day visit to attend a crucial meeting of the Shanghai Cooperation Organisation (SCO) and hold talks with his Russian counterpart Sergey Shoigu on further boosting bilateral defence cooperation.

The Defence Ministers of all eight SCO member nations are expected to deliberate on regional security challenges like terrorism and extremism and ways to deal with them "collectively" in Moscow on Friday, officials said.

Defence Minister Rajnath Singh. File | Photo Credit: PTI

Chinese Defence Minister Gen Wei Fenghe and Pakistan's Pervez Khattak are expected to attend the SCO meeting.

Asked about the possibility of a bilateral meeting between Singh and Wei on the sidelines of the SCO event, officials said there is no such plan. He said issues of mutual interest will figure in his talks with Shoigu.

In his meeting with Shoigu, Singh will press for expediting supply of a number of weapons systems, ammunition and spares to India by Russia under contracts which were concluded earlier, officials said.

In the talks, both sides are expected to officially finalise a long-pending proposal to produce AK 203 rifles in India. Officials said Singh is also likely to request the Russian side to ensure timely delivery of the S-400 missile defence systems to India. The delivery of the first batch of S-400 surface-to-air missile systems to India is scheduled by the end of 2021.

In October 2018, India had signed a $5 billion deal with Russia to buy five units of the S-400 air defence missile systems, notwithstanding a warning from the Trump administration that going ahead with the contract may invite U.S. sanctions.

Singh will depart for India from Moscow on the evening of September 5, they said.

The SCO Defence Ministers' meeting is taking place in the wake of fresh tension between India and China following the Chinese army's unsuccessful attempts to change the status quo on the southern bank of Pangong lake in eastern Ladakh.

It is Singh's second visit to Moscow since June. He had represented India at the Victory Day Parade in Moscow on June 24 that commemorated the 75th anniversary of the Soviet victory over Nazi Germany in the Second World War.

Russia has also invited External Affairs Minister S. Jaishankar to attend the SCO foreign ministers' meeting on September 10.

The SCO, seen as a counterweight to NATO, has emerged as one of the largest transregional international organisations which accounts for almost 44% of the world population stretching from the Arctic Ocean to the Indian Ocean and from the Pacific Ocean to the Baltic Sea. The aim of the

SCO is to maintain peace, stability and security of the region. India became a member of SCO in 2017.

https://www.thehindu.com/news/national/rajnath-singh-leaves-for-russia-to-attend-sco-meet/article32502008.ece

THE ECONOMIC TIMES
WWW.ECONOMICTIMES.COM

Thu, 03 Sept 2020

India bolsters presence in Pangong lake amid border tension with China; military talks inconclusive

Synopsis

Some "readjustments" in deployment of troops were also carried out on the northern bank of the Pangong lake on the Indian side of the Line of Control (LAC) as part of precautionary measures, they said. The situation in the area was said to be sensitive.

New Delhi: The Indian Army has further bolstered its presence in at least three strategic heights in the southern bank of Pangong lake in eastern Ladakh, days after foiling China's "provocative" actions to change the status quo in the area, government sources said on Wednesday.

Some "readjustments" in deployment of troops were also carried out on the northern bank of the Pangong lake on the Indian side of the Line of Control (LAC) as part of precautionary measures, they said. The situation in the area was said to be sensitive.

Another round of military talks between the two sides on Wednesday to defuse tensions in the area remained inconclusive.

The sources also said another round of military talks between the two sides on Wednesday to defuse tensions in the area remained inconclusive. The talks lasted nearly seven hours.

The talks at the Brigade Commander-level on Monday and Tuesday also did not yield any tangible outcome, the sources said.

Sources said India has achieved tactical gains in eastern Ladakh in the last few days by occupying a number of strategically important hill tops and locations.

The enhanced deployment came in the wake of unsuccessful attempts by China to change the status quo in the region.

The two sides were earlier engaged in a confrontation on the northern bank of Pangong lake but it flared up for the first time on its southern bank, sources said.

At the military talks, the Chinese side conveyed its objection to India occupying certain strategic heights in the region, sources said.

But, the Indian delegation maintained that the heights are on the Indian side of the LAC, the sources added.

They said India wants to resolve the border row through talks, but at the same time it will effectively deal with any "misadventure" by China along the LAC.

In the wake of the Chinese attempts, the Indian Army has alerted all its frontline bases along the 3,400 km-long LAC to remain vigilant round the clock.

India had rushed in additional troops and weaponry to all sensitive border areas including in Arunachal Pradesh and Sikkim sectors after the Galwan Valley clashes which significantly escalated the tensions.

On Monday, the Indian Army said the Chinese military carried out "provocative military movements" to "unilaterally" change the status quo on the southern bank of Pangong lake on the intervening night of August 29 and 30 but the attempt was thwarted by the Indian troops.

External Affairs Ministry Spokesperson Anurag Srivastava on Tuesday said the Chinese People's Liberation Army(PLA) was engaged in "provocative action" again a day earlier when the ground commanders of the two sides were holding talks to ease the situation.

"The situation in the area remained sensitive," said a source, adding India has significantly ramped up overall surveillance in the region.

In Beijing, Chinese Foreign ministry spokesperson Hua Chunying alleged that the responsibility for the border tensions lies entirely with the Indian side.

"The responsibility lies entirely with the Indian side. China has exercised great restraint to avoid escalation," Hua claimed at a media briefing in response to questions on the Sino- India border situation.

Defence Minister Rajnath Singh on Tuesday carried out a comprehensive review of the situation in eastern Ladakh at a high-level meeting attended by External Affairs Minister S Jaishankar, National Security Advisor Ajit Doval, Chief of Defence Staff Gen Bipin Rawat, Army Chief Gen MM Naravane and Air Chief Marshal RKS Bhadauria.

At the nearly two-hour-long meeting, it was decided that the Indian army will continue to maintain its aggressive posturing in all sensitive areas along the LAC to effectively deal with any Chinese "misadventure", the sources said. A battalion of the Special Frontier Force was also deployed in the area.

The sources said the Indian Air Force (IAF) has also been told to enhance its surveillance on increasing Chinese air activities along the LAC in eastern Ladakh.

There have been reports that China has deployed J-20 long-range fighter jets and several other key assets in the strategically located Hotan airbase, which is around 310 km from eastern Ladakh.

In the last three months, the IAF deployed almost all its frontline fighter jets like Sukhoi 30 MKI, Jaguar and Mirage 2000 aircraft in the key frontier air bases in eastern Ladakh and elsewhere along the LAC.

The fresh attempt by China to change the status quo in the Pangong lake area is the first major incident in the area after the Galwan Valley clashes on June 15 in which 20 Indian Army personnel were killed. China also suffered casualties but is yet to make the details public. According to an American intelligence report it was 35.

India and China have held several rounds of military and diplomatic talks in the last two-and-half months but no significant headway was made for a resolution to the border standoff in eastern Ladakh.

https://economictimes.indiatimes.com/news/defence/india-bolsters-presence-in-pangong-lake-amid-border-tension-with-china-military-talks-inconclusive/articleshow/77895037.cms

ThePrint

Thu, 03 Sept 2020

Indian Army 'redeploys' troops, reaches heights facing Finger 4 in Pangong Tso

The move by India, both in Southern and Northern banks of the Pangong Lake, comes after talks with China reached a stalemate with PLA refusing to budge from its positions

By Snehesh Alex Philip

New Delhi: Specialised units of the Indian Army have climbed up the heights, within Indian dominated territory facing the ridgelines of Finger 4 in the Northern Banks of Pangong Tso in Ladakh where the Chinese had built posts following their intrusion in April, ThePrint has learnt.

The development comes at a time when another set of specialised units of the Army has captured strategic heights in the Southern Bank as part of precautionary deployment on its own side of the Line of Actual Control (LAC), taking the Chinese by surprise.

Representational image taken from the southern bank of Pangong Tso, looking across to the 'fingers' on the northern bank | Photo: Visharad Saxena | By special arrangement

Sources in the defence and security establishment told ThePrint that it was in this week that a "readjustment of deployment" was carried out and soldiers reached "heights" and established posts.

"These are precautionary deployments well within the Indian side of the LAC," the source said.

"There is no point in sitting on the ground when the enemy is at the heights. It is readjustment of troop deployment," the source added.

"Reports of Indian troops occupying heights at Finger 4 are not correct. As part of the precautionary deployment carried out on 30 August, some readjustments of our positions on the Northern Bank of Pangong Tso on our side of the LAC had also been carried out," an Army source said. As reported by ThePrint earlier on multiple occasions, Chinese had intruded into the Indian side of the LAC in the Northern Banks of the lake.

China currently dominates areas between Finger 4 and Finger 8, a distance of about 8 km, which comes within the Indian side of the LAC.

Focus still on talks but India has 'better bargaining power'

India had moved the specialised units to the Pangong Lake way back in late April and multiple plans were made. However, the focus remained on talks, which have not made progress since July as the Chinese refused to budge from their positions.

With talks not making any progress and China's bid to capture more territory over the weekend in Southern Banks, the Army moved in and dominated heights within the Indian side of the LAC.

The soldiers were also working on reaching heights near the ridgelines of Finger 4 where the Chinese have camped even though they had pulled back some troops from the ground level to Finger 5.

Sources said that India has not been on the offensive, but is actually defending its interest in its own territory.

Sources indicated that the fresh developments in the Southern Bank give greater impetus for talks and resolving the issue by the Chinese, and that India now has "better bargaining power".

(This report has been updated to reflect the correct position of the Indian Army in the Northern Banks of Pangong Tso.)

https://theprint.in/defence/indian-army-reaches-dominating-heights-at-finger-4-facing-chinese-in-pangong-tso/494211/

IDN INDIAN DEFENCE NEWS
Global Defence, Aerospace & Security

Thu, 03 Sept 2020

Indian army foils 3 attempts by China to change lac status quo

India rejected Beijing's efforts to pin the blame on New Delhi for the spike in border tensions. New Delhi said it responded to Beijing's provocative actions through diplomatic and military channels

India on Tuesday said China has made three attempts to change the status quo along the Line of Actual Control (LAC) in as many days, while firmly rejecting Beijing's efforts to pin the blame on New Delhi for the spike in tensions over the weekend.

Indian foreign ministry spokesman Anurag Srivastava said China "engaged in provocative military manoeuvres in the late night of 29 and 30 August in an attempt to change the status quo in the South Bank area of Pangong Lake".

"(The Indian Army) responded to these provocative actions and took appropriate defensive measures along the LAC in order to safeguard our interests and defend the territorial integrity," he added.

"Furthermore, on 31 August, even as the ground commanders of the two sides were in discussions to de-escalate the situation, Chinese troops again engaged in provocative action. Due to the timely defensive action, the Indian side was able to prevent these attempts to unilaterally alter the status quo."

India has taken up the matter of "recent provocative and aggressive actions" with Beijing through diplomatic and military channels, Srivastava said, adding that India has also "urged them to discipline and control their front-line troops from undertaking such provocative actions".

China's actions since May along the LAC have been "in clear violation of the bilateral agreements and protocols concluded between the two countries to ensure peace and tranquillity along the border".

"Such actions are also in complete disregard to the understandings reached between the two foreign ministers as also the special representatives," he said, referring to telephone conversations in June and July.

India, he said, was "firmly committed to resolve all outstanding issues along the LAC in the Western Sector through peaceful dialogue". "In this context, we expect the Chinese side to sincerely abide by the understanding reached earlier and earnestly work with India to resolve the situation and restore peace in the border areas."

The developments show New Delhi is willing to change the rules of engagement along the border with China, with the Indian Army pushing back against Chinese troops seeking to open a new front along the LAC in Ladakh, besides strengthening its positions along strategic heights in the area.

The moves, seen as defensive by the Indian Army but considered provocative by China, "increases the chances of conflict between the two countries", said Srikanth Kondapalli, a professor of Chinese studies at Jawaharlal Nehru University. It's also because the Indian Army has taken up positions along dominating peaks on the Indian side of the LAC, but not very far from the Chinese posts, heightening the chances of a localized conflict, Kondapalli added.

On Tuesday, brigade commanders of the Indian Army and the Chinese People's Liberation Army met in Chushul on the Indian side of the LAC to defuse tensions after Chinese troops attempted to intrude into Indian territory on the south bank of the Pangong Tso lake in Ladakh. In New Delhi, the spike in tensions—the most serious incident after the violent clash between Indian

and Chinese soldiers at Galwan Valley on 15 June—was discussed at a meeting held by defence minister Rajnath Singh, national security adviser Ajit Doval and chief of defence staff Bipin Rawat, besides the three service chiefs.

Indian Army officials said the southern bank of Pangong Tso has always been controlled by India with a major presence of troops, unlike the Finger area on the northern bank, arousing suspicion that China was attempting to open a new front with the aim of changing the status quo on the ground.

http://www.indiandefensenews.in/2020/09/indian-army-foils-3-attempts-by-china.html

INDIA TODAY

Thu, 03 Sept 2020

China seeks to set up military logistic facilities in about a dozen countries: Pentagon

China is seeking to set up more robust logistics in about a dozen countries to allow its army to project and sustain its power at greater distances, a Pentagon report has said

Washington: China is seeking to set up more robust logistics in about a dozen countries, including three in India's neighbourhood, to allow its army to project and sustain its power at greater distances, a Pentagon report has said.

Image for Representation

In addition to the three Indian neighbours -- Pakistan, Sri Lanka and Myanmar -- the other countries where China is considering to base its military logistics and infrastructure are Thailand, Singapore, Indonesia, United Arab Emirates, Kenya, Seychelles, Tanzania, Angola, and Tajikistan, the report said on Tuesday.

In its annual report "Military and Security Developments Involving the People's Republic of China (PRC) 2020" that was submitted to the US Congress on Tuesday, the Pentagon said these potential Chinese military logistics facilities are in addition to the Chinese military base in Djibouti, which is aimed at supporting naval, air and ground forces projection.

"A global PLA (Peoples Liberation Army) military logistics network could both interfere with US military operations and support offensive operations against the United States as the PRC's global military objectives evolve," the Pentagon said in the report.

China has probably already made overtures to Namibia, Vanuatu, and the Solomon Islands, it said, adding the known focus areas of PLA planning are along the Seal Lines of Communication from China to the Strait of Hormuz, Africa, and the Pacific Islands.

Similarly, the Pentagon said, Beijing uses One Belt One Road (OBOR) to support its strategy of national rejuvenation by seeking to expand global transportation and trade linkages to support its development and deepen its economic integration with nations along its periphery and beyond.

"OBOR projects associated with pipelines and port construction in Pakistan intend to decrease China's reliance on transporting energy resources through strategic chokepoints, such as the Strait of Malacca," it said.

China leverages OBOR to invest in projects along China's western and southern periphery to improve stability and diminish threats along its borders, the report said.

First announced in 2013, China's OBOR initiative is a signature foreign and economic policy advanced by President Xi Jinping.

According to the Pentagon, a global PLA military logistics network could both interfere with the US military operations and support offensive operations against the United States as the Chinese global military objectives evolve.

"Host nations can perform an essential role in regulating the PRC's military operations as Chinese officials very likely recognise that a stable long-term relationship with the host nation is critical to the success of their military logistics facilities," it said.

Chinese military academics assert that bases abroad can enable forward deployment of its forces and support military conflict, diplomatic signalling, political change, bilateral and multilateral cooperation, and training.

They also suggest that a military logistic network could enable intelligence monitoring of the US military.

In August 2017, China officially opened its first military base in Djibouti.

Chinese Navy Marines are stationed at the base with wheeled armoured vehicles and artillery but are currently dependent on nearby commercial ports due to the lack of a pier on base, the report said.

Chinese personnel at the facility have interfered with US flights by lasing pilots and flying drones, and China has sought to restrict Djiboutian sovereign airspace over the base, the report said.

https://www.indiatoday.in/world/story/china-set-up-military-logistic-facilities-pentagon-1717675-2020-09-02

THE WEEK

Thu, 03 Sept 2020

Explainer: China's test of radar plane for aircraft carriers should worry rivals

The only early-warning aircraft operating from carriers today is the US E-2 Hawkeye

Chinese state media, effectively, confirmed on Tuesday what foreign media outlets and social media handles had been reporting for days: The first flight of a new airborne-early warning aircraft.

A collage showing the purported first flight of the KJ-600 on top (via Twitter) and a E-2 Hawkeye taking off from a US aircraft carrier (US Navy via Wikipedia)

The *Global Times* daily reported on Tuesday that the new airborne early-warning aircraft, "reportedly called the KJ-600", made its maiden flight in late August.

The only fixed-wing airborne early-warning aircraft operating from aircraft carriers today is the US Navy's E-2 Hawkeye. The Hawkeye, which is also used by the French Navy on its aircraft carrier, has been in operation for over five decades and has seen multiple upgrades of its radar.

The KJ-600 has a design that is similar to the E-2, with its radar mounted atop the fuselage.

(File) Ka-31

The KJ-600 has been designed specifically to operate off aircraft carriers. Wang Ya'nan, a defence expert, explained to *Global Times* the rationale behind the need for an airborne early-warning aircraft for aircraft carriers. "When China's aircraft carriers sail far away from inland to an extent that land-based early-warning aircraft cannot provide early-warning support, the

carriers would lose their full combat potential without a carrier-based fixed-wing early-warning aircraft... this kind of aircraft can quickly create an early-warning and control system to allow an aircraft carrier combat group to independently carry out missions."

"China's aircraft carriers currently rely on early-warning helicopters to do the job, but they can only carry smaller radars, have limited speed, and only cover a radius of about 200 kilometres, while a fixed-wing early-warning aircraft can cover about 400 to 500 kilometres," Wang was quoted as saying by *Global Times*.

The Indian Navy uses a helicopter-borne airborne-early warning system from Russia, mounted on the Ka-31 helicopter, for its aircraft carriers. In addition to the smaller size and power of radars mounted on helicopters, choppers are also hampered by slower speed, lower operating altitude and endurance than fixed-wing aircraft. One of the primary roles of airborne early-warning aircraft on aircraft carriers is to provide surveillance to prevent possible attacks on ships. A higher operating altitude for the plane would allow for attacking aircraft and enemy missiles to be detected at longer distances.

Interestingly, the E-2 Hawkeye has been offered to the Indian Navy several times. However, the E-2 Hawkeye, which has a loaded weight of over 20 tonnes, is typically operated off ships that have catapults, which impart higher momentum to the aircraft to take off. The E-2 would not be able to take off with full fuel load from the Indian Navy's current aircraft carrier, INS Vikramaditya, which lacks a catapult.

As China's two current aircraft carriers, the Liaoning and Shandong, also lack catapults, experts have opined the KJ-600 is meant for a third aircraft carrier that is under construction. The third aircraft carrier will displace over 80,000 tonnes and could incorporate catapults to launch heavy aircraft like the KJ-600.

The *Global Times* reported, "There is no evidence yet if the KJ-600 can operate on China's current two aircraft carriers, the Liaoning and the Shandong, which use ski-jump flight decks without catapults. China's third aircraft carrier is expected to use a flat flight deck with electromagnetic catapults, which will be compatible with the KJ-600..."

In 2017, *Popular Science* profiled the KJ-600 programme. "Given current Chinese combat datalinking capabilities and future plans, the KJ-600 will likely be able to guide aircraft as well as help target long-range Chinese missiles and integrate data from multiple platforms into a single stream," *Popular Science* noted.

Analysts have argued China is aiming to have six aircraft carriers in service by 2035. A robust airborne early-warning capability, offered by the KJ-600, would be intrinsic to China's attempts to rival the US Navy and also project power across the South China Sea and into the Indian Ocean.

Former Indian Navy chief admiral Arun Prakash tweeted the development of China's new aircraft carrier technology would represent a "huge stride" in high-tech for China. He also contrasted the rapid development of China's aircraft carriers to the slow pace of the Indian Navy's indigenous carrier project.

"Implications of KJ-600 AEW a/c: China’s next carrier will be equipped with catapult(s). Steam driven cat could mean nuclear-powered ship? If electro-magnetic, it represents huge stride in high-tech. Note impetus given to PLAN by CMC, even as our 2nd carrier languishes in Kochi," Prakash tweeted on Monday.

https://www.theweek.in/news/world/2020/09/02/explainer-china-test-of-radar-plane-for-aircraft-carriers-should-worry-rivals.html

THE NEW INDIAN EXPRESS

Thu, 03 Sept 2020

After Galwan, India should turn its focus to Malacca, says expert

Country should try to regain historical maritime influence in the region: Commodore Thomas

By C Shivakumar

Chennai: After the Galwan standoff with China, India now needs to assess its options to regain its maritime influence in the east of Malacca, notwithstanding Beijing's protest, says a recent paper published in the Journal of Defence of Studies. The paper titled 'Leveraging India's Maritime Diplomacy', authored by Commodore Roby Thomas, says a significant portion of China's energy requirements and trade passing close to the Indian Peninsula and onwards through the Malacca Strait, has been a concern for China.

Citizens burn posters of Chinese President Xi Jinping after twenty Indian army personnel were martyred during a clash with Chinese troops in Ladakh's Galwan valley, during the ongoing COVID-19 nationw

"It's therefore not without reason that Beijing has always been keen to offset this disadvantage, by developing relations of convenience with Indian Ocean littorals in India's sphere of influence," states the report. Stating that India's engagement with the countries in Southeast Asia underwent a strategic shift towards the end of the 20th century when India initiated the 'Look East' policy in 1991, later upgraded to the 'Act East' policy in 2014, the report said India now should try to regain historical maritime influence which include maritime cooperation in those areas and sectors where India can easily ramp-up the existing level of activities.

"India could also seek to deepen both its submarine and anti-submarine cooperation with Indonesia and Australia by increasing the complexity of these two components in the existing bilateral maritime exercises with both countries, as well as looking to institute a trilateral maritime exercise between the three nations," states Commodore Roby Thomas in the paper published in the July-September 2020 volume of the journal.

"It is also reasonable that India joins the Malacca Strait Patrol (MSP) as a partner navy with the existing countries of Indonesia, Malaysia, Thailand and Singapore. This would be logical due the close proximity of the southern tip of Andaman and Nicobar Islands to the Malacca Strait, making India a Malacca funnel state, and also because of its ongoing operational engagements with the MSP partner navies," the paper states.

The paper also states that the events at the Line of Actual Control in the union territory of Ladakh in May 2020 have definitely marked an inflection point in India's strategic worldview. This would need appropriate reflection in strategic literature, which would justify a review of the areas of strategic influence, with India's primary areas of interest expanding eastwards to encompass the South China Sea.

"This sentiment has been echoed by some American analysts who have reasoned that the Chinese-induced crisis in the Himalayas would have finally encouraged India to tilt in favour of an alliance to check Chinese expansionism. This would justify India aligning with Washington's Indo-Pacific strategy, while playing a 'pre-eminent role' in this largely maritime construct," states Commodore Roby Thomas in his paper.

https://www.newindianexpress.com/nation/2020/sep/03/after-galwan-india-should-turn-its-focus-to-malacca-says-expert-2191784.html

ThePrint

Thu, 03 Sept 2020

IAF is key to India's 'deterrence by punishment' plan against China. Now to wait for winter

China knows PLAAF doesn't match IAF, and is strengthening its air defence along LAC. The government's stance must stay focussed on punishment, not denial

By AVM Manmohan Bahadur (Retd)

There is a stalemate across India's northern frontier. Truth be told, we have lost some territory to China and the status quo at the Line of Actual Control or LAC has been disturbed to our disadvantage. The Indian Army seems to have taken some tactically vital ridges on the south bank of Pangong Tso in the last two days but, considering the larger canvas, something would have to give way, peacefully or otherwise. While the peaceful option, through diplomatic parleys, would be most welcome, it is the latter option that India should be worried about and plan for.

China's behaviour, in no way, sends a message of peace, as indicated by its feverish build-up and construction activity in the border areas, especially of infrastructure associated with its air defence network. It signals a plan to stay put.

An IAF fighter jet flies over Leh after fresh confrontation between India and China on the southern bank of the Pangong Tso, 2 Sept | PTI

This construction activity, while gaining time by prolonging discussions, is indicative of three things. First, an acknowledgment on the part of China that its air defence arrangements along the border with India have a porosity (aerial surveillance gaps) that the Indian Air Force (IAF) can exploit. Second, an acceptance of the fact that the IAF would be the vanguard of an Indian response if push comes to shove. And third, building up its deterrence quotient through a strategy of denial whereby it feels that India would be forced to re-think using its air force due the threat of an impenetrable air defence network put in place.

But India no longer needs to play to the strategy of deterrence by denial.

A message needs to be sent

Defence Minister Rajnath Singh has admitted that "talks are underway to resolve the border dispute…but to what extent it can be resolved, I cannot guarantee."

So, the IAF is key to India's offensive plans against China. It has an edge over the People's Liberation Army Air Force (PLAAF) for many reasons. The foremost being the fact that Chinese airfields are at high altitudes, which results in drawbacks in terms of what its air force can throw at the IAF and the Indian Army. China knows that and is trying to overcome it with its new radar and surface-to-air missile deployments – in effect, putting in place a dense, ground-based, air defence network.

It seems to be following the doctrine that Pakistan has used in its attempt to blunt the offensive foundation of Indian air power. Could the Pakistan Air Force (PAF) be giving China inputs and playing an active role behind the scenes? While this might be true, Beijing is playing the psy-war to the hilt by parking its frontline assets, including the latest J-20 stealth fighters, on the tarmac in forward airfields — in full view of satellites scouring the area from high above so as to send a message to New Delhi. Some may say that there are no hard shelters to park the aircraft there, but that is only part of the argument because there are always options to get around it.

Chinese Ambassador Sun Weidong terming the Galwan clash and loss of 20 Indian soldiers as "..a brief moment from the perspective of history", besides being disdainful, is also an example of classic deception at work.

A message needs to be sent back. It has to be one of substance, and not of rhetoric meant for a domestic audience; adversaries see through these very easily.

Deterrence by denial

Winter is approaching and China would have studied the weather pattern that affects our airfields up north. The weather conditions that exist in the Himalayan foothills, where all our airbases are located, and those on the Tibetan plateau, which hosts the PLAAF airfields, would have been fed into war games and simulations by both India and China.

As the IAF would give top cover to any Indian riposte on ground against any action by China — and to action that India might take to push the Chinese back — it is vital that this protective umbrella not be diluted.

In a very prescient 2018 study of India's strategic dilemmas vis-à-vis China, scholars Anit Mukerjee and Yogesh Joshi wrote in the journal Asian Security that New Delhi had moved from a strategy of 'deterrence by denial' to 'deterrence by punishment' for various reasons. It means that India intends to prevail through offensive action and take the battle to the adversary now. And China must beware of the damage that would be caused to its forces if it decides to use hard power.

Beijing feverishly strengthening its air defence network has to be seen in this light. The message it is sending to New Delhi is one of deterrence by denial – why send your Air Force if it will suffer huge damage?

Deterrence by punishment

The appropriate reply to China in this situation must be a transmission of capability and intent — the IAF would communicate the capability and the intent would be discerned through the actions and statements of our political leadership.

The IAF should maintain its alert status and conserve its forces for the coming cold weather. Deployments would surely be getting reviewed and offensive assets, other than fighters (that require airfields to operate from), would also be getting tasked for a greater role in case of a shooting war. We have the aerial resources to operate in those high altitude areas – we also have (always had) crew who must be straining at the leash to help restore the *status quo ante.*

The government's stance must stay focussed on deterrence by punishment. Simultaneously, New Delhi must gainfully use the interlude to push through the agenda of augmenting indigenous defence R&D and manufacturing capacities. This needs decisive decision-making, clinical implementation of policy catalysts (to kickstart the stuttering process that has been attempted for decades) and shunning faux publicity that only ends up in reducing credibility. The fact is that neither can we change our neighbours nor should we be naïve enough to expect them to change their outlook towards India — if anything, the events of the past few months have confirmed that, and we must plan accordingly.

(The author, a retired Air Vice Marshal, is Addl Director General, Centre for Air Power Studies, New Delhi. Views are personal.)

https://theprint.in/opinion/iaf-key-to-indias-deterrence-by-punishment-plan-against-china/494600/

JAGRAN English

Thu, 03 Sept 2020

US says China now has world's largest Navy; here's what you need to know

In its annual report to the Congress on Chinese military power, the Pentagon warned that China has an "increasingly modern and flexible" Navy which is focused on "replacing previous generations of platforms with limited capabilities in favour of larger, modern multi-role combatants"

Washington: In what could be a huge concern for India and countries across the south-east Asia region, the United States (US) Department of Defence has warned that Beijing now has the largest Navy in the world.

In its annual report to the Congress on Chinese military power, the Pentagon warned that China has an "increasingly modern and flexible" Navy which is focused on "replacing previous generations of platforms with limited capabilities in favour of larger, modern multi-role combatants", reported *Forbes*.

According to the report, China currently has an overall battle force of approximately 350 ships and submarines which includes more than 130 major surface combatants while the US has 293 ships as of early 2020.

The report, however, noted that the US is ahead of China in terms of tonnage as it has larger warships, including 11 aircraft carriers. "As of 2019, the PLAN is largely composed of modern multi-role platforms featuring advanced anti-ship, anti-air, and anti-submarine weapons and sensors," the Pentagon report said, as reported by the *Forbes*.

The Pentagon, as reported by *Forbes*, has warned that China will field land-attack cruise missiles (LACMs) "on its newer cruisers and destroyers and developmental Type 093B nuclear attack submarines".

"The PLAN could also retrofit its older surface combatants and submarines with land-attack capabilities as well. The addition of land-attack capabilities to the PLAN's surface combatants and submarines would provide the PLA with flexible long-range strike options. This would allow the PRC to hold land targets at risk beyond the Indo-Pacific region," the Pentagon warned, as reported by *Forbes*.

The warning from the US comes at a time when tensions between India and China have escalated across the Line of Actual Control (LAC) over land disputes. Looking at the situation, India has increased its alertness across the region. India has increased its presence in south-east Asia to counter the dragon. India on September 4 and 5 will also carry a naval exercise with Russia.

US Aims for NATO-like alliance with India, Japan and Australia

Amid the dragon's increasing presence in the region, the US is aiming to form an alliance, like the North Atlantic Treaty Organisation (NATO), with India, Australia and Japan to counter China in the south-east Asia region.

"The Indo-Pacific region is lacking in strong multilateral structures. They do not have anything of the fortitude of NATO or the European Union. The strongest institutions in Asia oftentimes are not, I think, not inclusive enough and so ... there is certainly an invitation there at some point to formalise a structure like this," US Deputy Secretary of State Stephen Biegun said.

"Remember, even NATO started with relatively modest expectations and several countries (initially) chose neutrality over NATO membership," he added.

However, Biegun cautioned that the US would keep its ambitions for a Pacific NATO "checked", asserting such an alliance "will happen only if the other countries are as committed as the US".

Biegun said the grouping of four countries are expected to meet in New Delhi this autumn and cited Australia's possible participation in India's Malabar naval exercise as an example of progress towards a formal defence bloc, according to SCMP.

"India is indicating an intention to invite Australia to participate in the Malabar naval exercises, which will be a tremendous step forward in ensuring the freedom of passage and the security of the seas in the Indo-Pacific," he said.

https://english.jagran.com/world/us-says-china-now-has-worlds-largest-navy-heres-what-you-need-to-know-10016153

The EurAsian Times

Thu, 03 Sept 2020

No more Rafales! India eyes US Stealth F-35 Jets As Washington loosens export policy? OpEd

Amid reports suggesting the US could supply F-35 fighters to the United Arab Emirates (UAE), could India be next in line for finally landing a deal for the induction of the fifth-generation, stealth fighter jets amid continuing hostilities with China?

According to reports, Senior Advisor to the President of the United States, Jared Kushner recently arrived in the UAE to finalize terms on the contract which would supply an unspecified number of the stealth fighters to the Gulf nation, much to the disapproval of some of the American allies, especially Israel.

Al-Dhafra base in the UAE has hosted the F-35 for years, besides surveillance aircraft, drones, and refueling planes. The US delegation's visit to the base during suggests the F-35 sale remains an important part of the deal. A US official said that although the possible F-35 deal was not on the agenda for the visit to the base, the possibility it would happen could not be ruled out.

The US-UAE deal looks to be going through, speculations are rife whether India, which has been having prospering relations with Donald Trump, successive US governments', and Israel, could be the next customer for the F-35s considered one of the most advanced fighter jets ever to be seen on the face of the planet.

Before India finalized the deal to bring in 36 French Dassault Rafales in a deal worth Rs. 60,000 Cr, the initial bidders Lockheed Martin's (developer of F-35s) F-16s competed against the likes of Boeing's F/A-18s, Eurofighter Typhoon, Russia's MiG-35, and Sweden's Saab's Gripen. However, after a meticulous analysis of the bids, the Indian Air Force (IAF) chose to shortlist the Eurofighter and Rafales.

The 4.5 generation French Rafale combat jets are renowned for possessing the unmatched ability to carry out a variety of roles. The twin-engine, canard-delta wing aircraft is equipped with a wide range of weapons and boasts the firepower to perform air supremacy, interdiction, aerial reconnaissance, ground support, in-depth strike, anti-ship strike, and nuclear deterrence missions, thereby bolstering India's air combat capabilities against neighbors China and Pakistan.

However, an area where it significantly lags behind is the stealth technology employed by the F-35s, making it one of the most sought-after fighter jets in the world. The fighters use advanced stealth with fighter speed and agility, fully fused sensor information, network-enabled operations, and advanced sustainment, which if possessed by the aerial squadrons of the IAF, will give them superior abilities to outperform untested China's J-20s.

With India already fighting on two fronts with Beijing and Islamabad on each of their sides and the US also looking to corner China and supporting its regional allies, the costly-but significant

purchase of the F-35s will give them an aerial presence possessed by neither of the nations, according to aviation experts.

In 2018, there were reports in the Indian media regarding the nation's interest in possessing the stealth fighter with IAF asking Lockheed Martin to brief them of F-35's capabilities.

"The IAF top brass is formally requesting for a classified briefing by the F-35's prime builder, Lockheed Martin, on the capabilities of the sophisticated, fifth-generation fighter developed under the US Joint Strike Fighter program," as reported by Indian Publication Business Standard

With the F-35s garnering worldwide interest due to their supreme capabilities in the air, India's interest shouldn't come out as a surprise but as a nation, which has been a big customer of Russian arms, the nation would need to surpass certain hurdles if it were to really get its hands on the stealth fighter.

According to Timothy Hoyt, Co-Chairman of U.S. Naval War College's Indian Ocean Regional Studies Group, the deal will not happen any time soon. "I doubt an F-35 purchase would happen soon for a number of reasons," said Hoyt.

He also believes that Prime Minister Narendra Modi's nation will have to boost defense spending significantly if it is to raise funds for a fighter jet, which costs $100 million.

"(Even if India goes ahead with the purchase) India's procurement process is abysmally slow." "Despite all of the publicity given to the Medium Range Combat Aircraft acquisition about a decade ago, that decision has never been fully implemented," Hoyt added.

Despite the objections, it still cannot be said that the Indian government might not end up opting out for the jets, if offered, with tensions along the border mounting high with China along the Line of Actual Control (LAC).

Currently, South Korea, Japan, and Singapore are the three Asian countries showcasing an interest in the fighters, with Seoul looking to purchase the F-35B jets, which have short takeoff and vertical landing capability, compatible with a small aircraft carrier.

In December 2018, Japan's declaration to refit its Izumo-class helicopter destroyers to carry the F-35Bs was also a significant movement in the direction, with the decision coming as a momentous transit with the country not putting aircraft carriers to sea since World War II.

F-35Bs are fifth-generation jets, proficient of flying at Mach 1.6 — more than one-and-a-half times the speed of sound — and landing vertically. The planes possess the capabilities of carrying two air-to-air missiles and two 1,000-pound guided bombs in their internal weapons bays.

https://eurasiantimes.com/no-more-rafales-india-eyes-us-stealth-f-35-jets-as-washington-loosens-export-policy-oped/

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Thu, 03 Sept 2020

Nanoparticle-based computing architecture for nanoparticle neural networks

By Thamarasee Jeewandara

Scalable nanoparticle-based computing architectures have several limitations that can severely compromise the use of nanoparticles to manipulate and process information through molecular computing schemes. The von Neumann architecture (VNA) underlies the operations of multiple arbitrary molecular logic operations in a single chip without rewiring the device. In a new report, Sungi Kim and a team of scientists at the Seoul National University in South Korea developed the nanoparticle-based VNA (NVNA) on a lipid chip. The nanoparticles on the lipid chip functioned as the hardware—featuring memories, processors and output units. The team used DNA strands as the software to provide molecular instructions to program the logic circuits. The nanoparticle-based von Neuman architecture (NVNA) allowed a group of nanoparticles to form a feed-forward neural network known as a perceptron (a type of artificial neural network). The system can implement functionally complete Boolean logical operations to provide a programmable, resettable and scalable computing architecture and circuit board to form nanoparticle neural networks and make logical decisions. The work is now published on *Science Advances*.

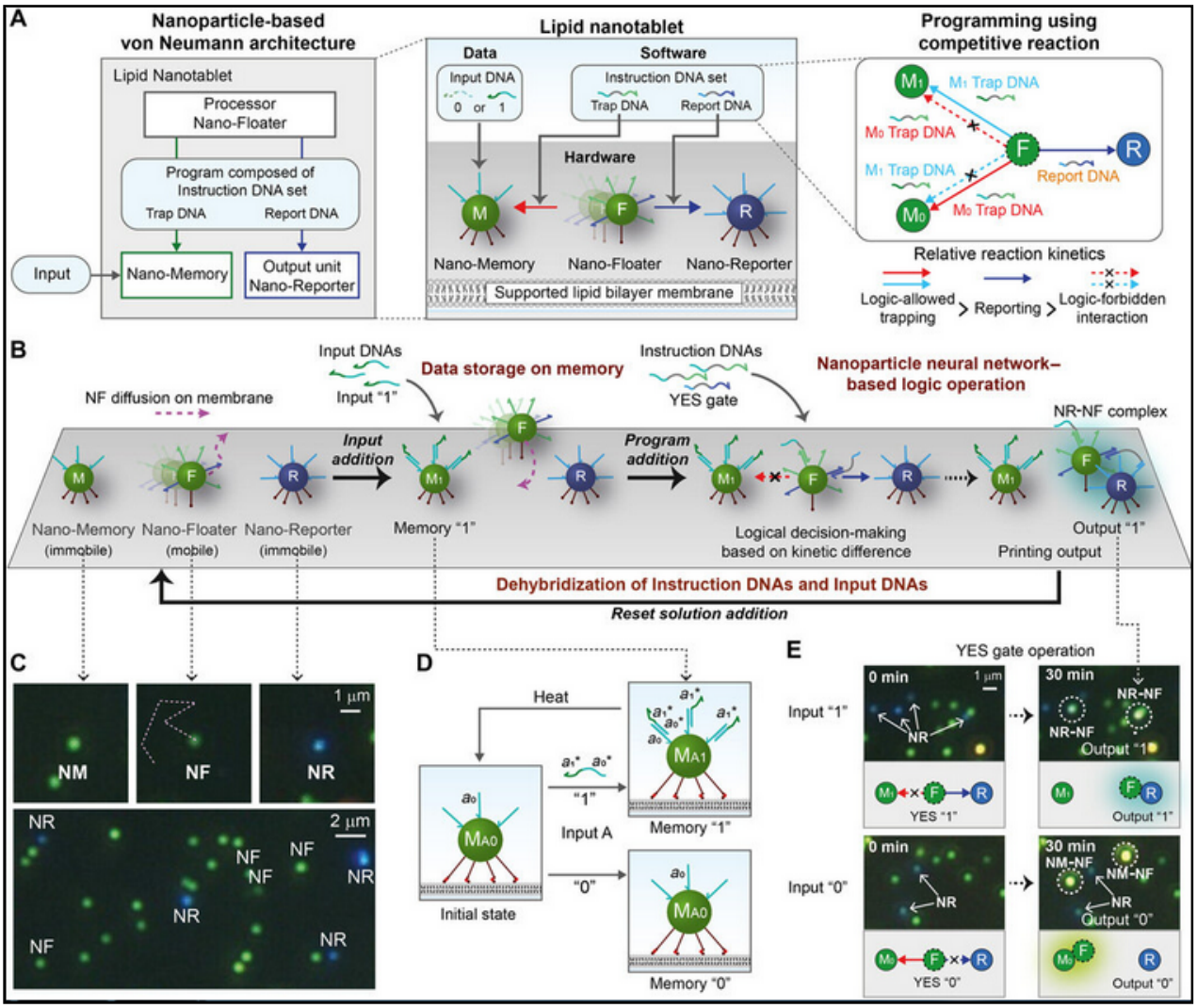
The von Neumann architecture in modern computing and molecular computing

Electronic computers of the past could only run a fixed program and researchers had to physically rewire and restructure processes to reprogram such machines. The von Neumann architecture (VNA) developed by John von Neumann in 1945 and later cited by Alan Turing in his proposal for the automatic computing engine, details a stored-program computer to execute a set of instructions. The system processed information by sequentially fetching the stored data and instructions from the memory to generate outputs. The powerful programmability of the VNA is applicable for modern computers and in quantum computing.

Molecular computing with nanostructures can allow a variety of technologies such as nanoparticle logic gates, single-molecule biosensors and logic sensing, although such systems are limited to a single program much like early electronic computers. The limits arose since researchers incorporated the software (function) and nanostructural hardware as a single unit. To overcome this challenge, they can include lipid bilayers to compartmentalize molecules and nanoparticles. Kim et al. had previously developed a computing platform with nanoparticles on a lipid bilayer to form a nano-bio-computing lipid nanotablet (LNT). In this work, they designed and realized a nanoparticle-based von Neuman architecture (NVNA) platform for molecular computing on a lipid nanotablet (LNT).

The team created a stored-program device to implement molecular computing via the von Neumann architecture with nanoparticles, while including the concept of memory to store molecular information. They separated the software and hardware for scalability of information processing in the lipid nanotablet (LNT) to perform multiple computational tasks without developing a new device each time. To compose the LNT hardware chip, they used three types of DNA-modified nanoparticles, including the nano-memory (NM), nano-floater (NF), and nano-reporter (NR). The nano-memory and nano-reporter were immobile nanoparticles that functioned as a molecular information storage device and output unit, respectively. They referred to the mobile nanoparticles as nano-floaters that freely diffused and collided with immobile particles. The

scientists functionalized the plasmonic nanoparticles by modifying them with thiolated DNA oligonucleotides. Then for data storage, they loaded different concentrations of NF, NM and NR nanoparticles on to the lipid nano-tablet (LNT). To develop the software, Kim et al. used a set of instruction DNAs in solution, and the logic operation followed three steps.



The team first stored the molecular information on the nano-memory (NM) unit via DNA hybridization. For example, a single NM particle could form a one-bit memory device in which zero or one represented the bistable state. In the second step, they performed the logic operation as a combination of instruction DNAs, to initiate competitive nanoparticle-nanoparticle assembly with different kinetics based on the nano-memory state. To reset the computer chip to its initial state, Kim et al. added a reset solution (low salt buffer and high temperature), which detached the input and instructional DNA base pairings on the chip.

Programming strategy

Kim et al. used two types of instruction DNAs named Trap and Report DNAs to provide instructions for the nano-floaters. They specifically designed Trap DNA to bind the nano-floaters to form logical decision making nanoparticles. The team optimized the concentration of instruction DNAs and the density of each nanoparticle to induce fast trapping kinetics compared with reporting. The competitive trapping and reporting behaviors resulted in binding kinetics expressed as an if-then-else statement, allowing them to first search whether the If condition satisfied TRUE or FALSE operations and then operate the "then" or "else" statement. The scientists implemented the logical operation by mixing trap DNA and Report DNA in the NVNA-LNT chip. During the process, they noted the assembly of a few logically forbidden states, which they further optimized.

Nanoparticle neural network with reset and reusability

The team represented the reaction network between multiple nanoparticles connected via instruction DNAs, using a perceptron—a type of artificial neural network for a binary classifier. They expanded the programming strategy to construct the nanoparticle neural network (NNN) on the LNT platform and implemented arbitrary Boolean logic circuits for two-bit inputs. Then they calculated the number of nanoparticle nodes needed to functionally complete Boolean logic operators on the neural network. The hardware relied on covalently modified nanostructures on a lipid chip for multiple executions. They tested the reset function of the system for reusability by dehybridizing all DNA assemblies after exchanging the buffer solution in the setup. The reset allowed thiolated DNAs alone to remain on the nanoparticles, thereby returning to the initial state for the next function.

The decision-making process and the fan-out logic gate

Kim et al. then explored the system with a sequential decision tree. The decision tree resembled a flowchart to produce a final decision of YES or NO in the nanoparticle neural network. Due to their nanoscale geometric features and optical properties, the plasmonic nanoparticle core of the lipid nanotablet was critical for computing. As the number of nanoparticle nodes and the accompanying complexity of the logic circuit increased, the reaction kinetics remained identical due to parallel reactions of the multilayer perceptron. The team used powerful programmability and the reset function of the setup to sequentially operate the two-bit comparator.

In this way, Sungi Kim and colleagues developed a nanoparticle perceptron with the nanoparticle-based von Neuman architecture (NVNA) on a lipid nanotablet (LNT) chip and explored the system with a sequential decision-making tree. The setup included a reset function for reusability. The nanoparticle-based computing architecture and the nanoparticle neural network (NNN) provided a platform for molecular computing alongside instruction DNAs. The process allowed scalability and paves the way to use nanoparticles in deep learning, neural interfaces and neuromorphic computing to manage and analyze complex biomolecular information. This computing architecture can be embedded in microfluidics to mimic and interrogate complex living systems to develop smart drug screening systems.

More information: Sungi Kim et al. Nanoparticle-based computing architecture for nanoparticle neural networks, *Science Advances* (2020). DOI: 10.1126/sciadv.abb3348

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https://phys.org/news/2020-09-nanoparticle-based-architecture-nanoparticle-neural-networks.html

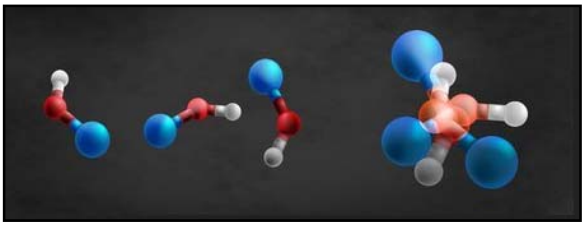
PHYS.ORG

Thu, 03 Sept 2020

A molecular approach to quantum computing

By Whitney Clavin

The technology behind the quantum computers of the future is fast developing, with several different approaches in progress. Many of the strategies, or "blueprints," for quantum computers rely on atoms or artificial atom-like electrical circuits. In a new theoretical study in the journal *Physical Review X*, a group of physicists at Caltech demonstrates the benefits of a lesser-studied approach that relies not on atoms but molecules.



In a new theoretical study, Caltech physicists have shown how molecules can, in theory, be used to reduce errors in quantum computing. This strategy would involve placing a rotating molecule in "superposition," which means that it would exist in multiple orientations at once. In this illustration, three different molecular orientations are shown at left; the drawing at far right signifies a superposition of these molecular states. Credit: Caltech

"In the quantum world, we have several blueprints on the table and we are simultaneously improving all of them," says lead author Victor Albert, the Lee A. DuBridge Postdoctoral Scholar in Theoretical Physics. "People have been thinking about using molecules to encode information since 2001, but now we are showing how molecules, which are more complex than atoms, could lead to fewer errors in quantum computing."

At the heart of quantum computers are what are known as qubits. These are similar to the bits in classical computers, but unlike classical bits they can experience a bizarre phenomenon known as superposition in which they exist in two states or more at once. Like the famous Schrödinger's cat thought experiment, which describes a cat that is both dead and alive at the same time, particles can exist in multiple states at once. The phenomenon of superposition is at the heart of quantum computing: the fact that qubits can take on many forms simultaneously means that they have exponentially more computing power than classical bits.

But the state of superposition is a delicate one, as qubits are prone to collapsing out of their desired states, and this leads to computing errors.

"In classical computing, you have to worry about the bits flipping, in which a '1' bit goes to a '0' or vice versa, which causes errors," says Albert. "This is like flipping a coin, and it is hard to do. But in quantum computing, the information is stored in fragile superpositions, and even the quantum equivalent of a gust of wind can lead to errors."

However, if a quantum computer platform uses qubits made of molecules, the researchers say, these types of errors are more likely to be prevented than in other quantum platforms. One concept behind the new research comes from work performed nearly 20 years ago by Caltech researchers John Preskill, Richard P. Feynman Professor of Theoretical Physics and director of the Institute of Quantum Information and Matter (IQIM), and Alexei Kitaev, the Ronald and Maxine Linde Professor of Theoretical Physics and Mathematics at Caltech, along with their colleague Daniel Gottesman (Ph.D. '97) of the Perimeter Institute in Ontario, Canada. Back then, the scientists proposed a loophole that would provide a way around a phenomenon called Heisenberg's uncertainty principle, which was introduced in 1927 by German physicist Werner Heisenberg. The principle states that one cannot simultaneously know with very high precision both where a particle is and where it is going.

"There is a joke where Heisenberg gets pulled over by a police officer who says he knows Heisenberg's speed was 90 miles per hour, and Heisenberg replies, 'Now I have no idea where I am,'" says Albert.

The uncertainty principle is a challenge for quantum computers because it implies that the quantum states of the qubits cannot be known well enough to determine whether or not errors have

occurred. However, Gottesman, Kitaev, and Preskill figured out that while the exact position and momentum of a particle could not be measured, it was possible to detect very tiny shifts to its position and momentum. These shifts could reveal that an error has occurred, making it possible to push the system back to the correct state. This error-correcting scheme, known as GKP after its discoverers, has recently been implemented in superconducting circuit devices.

"Errors are okay but only if we know they happen," says Preskill, a co-author on the Physical Review X paper and also the scientific coordinator for a new Department of Energy-funded science center called the Quantum Systems Accelerator. "The whole point of error correction is to maximize the amount of knowledge we have about potential errors."

In the new paper, this concept is applied to rotating molecules in superposition. If the orientation or angular momentum of the molecule shifts by a small amount, those shifts can be simultaneously corrected.

"We want to track the quantum information as it's evolving under the noise," says Albert. "The noise is kicking us around a little bit. But if we have a carefully chosen superposition of the molecules' states, we can measure both orientation and angular momentum as long as they are small enough. And then we can kick the system back to compensate."

Jacob Covey, a co-author on the paper and former Caltech postdoctoral scholar who recently joined the faculty at the University of Illinois, says that it might be possible to eventually individually control molecules for use in quantum information systems such as these. He and his team have made strides in using optical laser beams, or "tweezers," to control single neutral atoms (neutral atoms are another promising platform for quantum-information systems).

"The appeal of molecules is that they are very complex structures that can be very densely packed," says Covey. "If we can figure out how to utilize molecules in quantum computing, we can robustly encode information and improve the efficiency in which qubits are packed."

Albert says that the trio of himself, Preskill, and Covey provided the perfect combination of theoretical and experimental expertise to achieve the latest results. He and Preskill are both theorists while Covey is an experimentalist. "It was really nice to have somebody like John to help me with the framework for all this theory of error-correcting codes, and Jake gave us crucial guidance on what is happening in labs."

Says Preskill, "This is a paper that no one of the three of us could have written on our own. What's really fun about the field of quantum information is that it's encouraging us to interact across some of these divides, and Caltech, with its small size, is the perfect place to get this done."

The *Physical Review X* study is titled "Robust encoding of a qubit in a molecule."

More information: Victor V. Albert et al. Robust Encoding of a Qubit in a Molecule, *Physical Review X* (2020). DOI: 10.1103/PhysRevX.10.031050

Journal information: *Physical Review X*

https://phys.org/news/2020-09-molecular-approach-quantum.html

PHYS.ORG

Thu, 03 Sept 2020

Exploring oxidative pathways in nuclear fuel

By Tim Ledbetter

Powerful atomic-resolution instruments and techniques at Pacific Northwest National Laboratory (PNNL) are revealing new information about the interaction of uranium dioxide (UO2) with water. These new insights will improve the understanding of how spent nuclear fuel will degrade in deep geologic repository environments.

UO2 is the primary form of fuel used in commercial nuclear power reactors. During nuclear fission in a reactor, various radionuclides are created within the fuel. Researchers want to know more about UO2, particularly the dissolution mechanisms that come into play when the ceramic material's surface contacts water. These mechanisms control the release of the majority of the radionuclides, which could have implications for the environment.

The Radiochemical Processing Laboratory at PNNL is home to a JEOL GrandARM-300F scanning transmission electron microscope, here operated by materials scientist Steven Spurgeon. This specialized facility allows unprecedented atomic-scale characterization of nuclear materials, structural alloys, and functional systems in dynamic conditions. RPL is a Hazard Category II non-reactor nuclear research facility. Credit: Andrea Starr | PNNL

Many laboratory instruments today lack the sensitivity, resolution, and radiological controls necessary to effectively explore UO2 surfaces. However, a one-of-a-kind instrumentation suite at PNNL recently enabled a multi-institute research team to take a closer look at surface areas. The team, representing the University of Cambridge, the European Commission's Joint Research Center, and PNNL, uncovered key revelations for nuclear energy.

Geologic disposal and science challenges

Deep geologic repository concepts being proposed around the world are focused on the saturated zone, where the water is reducing—which can eventually lead to a loss of oxygen—and where UO2 is thermodynamically stable. The challenge remains to develop an approach to examine UO2 with sufficient chemical resolution and fidelity to predict how it might behave in these environments.

"We're just now developing the tools we need to answer longstanding questions about nuclear materials," explains PNNL materials scientist Edgar Buck.

New techniques produce new information

In the study, researchers from the University of Cambridge collaborated with PNNL scientists to explore UO2 samples exposed to controlled anoxic corrosion using PNNL's flagship instrumentation in the Radiochemical Processing Laboratory's Radiological Microscopy Suite. Also called the "quiet suite," this belowground room is home to the JEOL GrandARM 300F scanning transmission electron microscope (STEM). Using aberration-corrected scanning transmission electron microscopy and electron energy loss spectroscopy (EELS), the team examined the progression of atomistic structure and defects.

The PNNL team has previously shown that EELS can map nonequilibrium pathways for oxidation in UO2 that are difficult to probe using other methods.

"Our approach provides direct information at the atomic scale to improve our models for dissolution," explains PNNL materials scientist Steven Spurgeon. In turn, better models can help make more accurate, long-term predictions regarding the fate of spent nuclear fuel under anoxic disposal conditions.

Instruments inform dissolution questions

In their study, the researchers determined that dissolution initiates at material surface grain boundaries and film cracks. Importantly, they observed no amorphous surface layer formation—or, no loss of its crystalline structure— during the dissolution process. This points to a different process for oxygen substitution. Rather, oxygen substitution occurs at sites in the surface layers of the UO2 lattice. This substitution mechanism appears to create an oxidized passivating layer, which would be responsible for the observed reduction in uranium release as a function of leaching time.

"The collaboration with PNNL provided us with unique tools to uncover a behavior that would be inaccessible by other means," says co-author Prof. Ian Farnan of Cambridge. "Through our shared expertise, we were able to show how subtle changes in the surface chemistry of used nuclear fuel can control its dissolution and the release of radioactive elements to the environment—a fundamental requirement for safe disposal."

The findings from the study are reported in the team's paper, "An Atomic-Scale Understanding of UO2 Surface Evolution During Anoxic Dissolution," published in *ACS Applied Materials & Interfaces*.

More information: Aleksej J. Popel et al. An Atomic-Scale Understanding of UO2 Surface Evolution during Anoxic Dissolution, *ACS Applied Materials & Interfaces* (2020). DOI: 10.1021/acsami.0c09611

Journal information: *ACS Applied Materials and Interfaces*

https://phys.org/news/2020-09-exploring-oxidative-pathways-nuclear-fuel.html

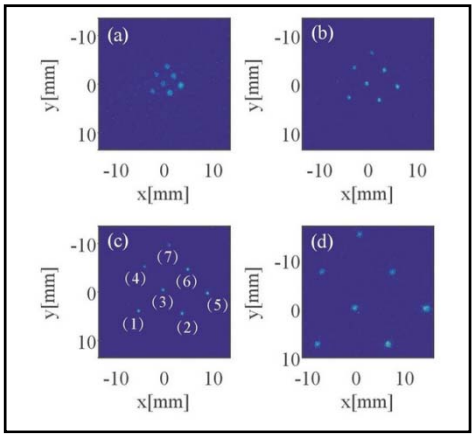
Thu, 03 Sept 2020

Scientists find new way to measure important beam property

By Jared Sagoff

For a wide variety of high-powered scientific instruments, from free-electron lasers to wakefield accelerators to electron microscopes, generating a bright electron beam that has specific properties represents one of the most significant challenges. These instruments can be used for investigating the atomic level properties of matter or for accelerating particles to high energies.

Scientists seeking to create the best beams possible are interested in two particular qualities that determine how well the photocathodes that generate beams work—their quantum efficiency and their intrinsic emittance.



Beam images as a function of solenoid strength. Credit: Jiahang Shao / Argonne National Laboratory

Quantum efficiency measures the ratio of the number of produced photoelectrons to the photons that strike the cathode. Intrinsic emittance, on the other hand, describes the beam divergence when electrons emit.

Scientists are most interested in cathodes that have high quantum efficiency and low intrinsic emittance. But that's not all—they also want the quantum efficiency and intrinsic emittance to be constant across the entire cathode. "You can think of our cathode like a TV screen," said accelerator physicist Jiahang Shao of the U.S. Department of Energy's (DOE) Argonne National Laboratory. "Our cathode is made up of 'pixels,' and like on a TV screen you want each pixel to be of a similar brightness."

In a new study from Argonne, researchers at the Argonne Wakefield Accelerator facility have found a new and faster way to simultaneously measure the distribution of quantum efficiency and intrinsic emittance of a photocathode, and have related the distributions to better understand the emission mechanism of cesium telluride cathodes, a principal type of photocathode.

Measuring the intrinsic emittance of each point on the cathode—essentially going pixel-by-pixel—is an extremely time-consuming process, Shao said. To speed things up, the researchers used a device called a microlens array to create multiple small beamlets that they could measure simultaneously, essentially creating a pattern instead of doing individual measurements.

"The pattern dramatically reduces the time it takes to do our measurements of the entire cathode surface, because instead of having to go step by step we can sample different regions at the same time," Shao said.

To take measurements of the emittance of the beamlets, the researchers used a device called a solenoid that focuses the beam on a screen. By adjusting the focusing strength of the solenoid and measuring the corresponding beam size, researchers can construct in reverse the emittance of the beam.

Intrinsic emittance is one component of the measured total emittance, which contains growth factors due either to effects resulting from the clustering of electrons—called space charge—or other aberrations introduced as the beam propagates. Scientists seeking to understand the intrinsic emittance of the cathode itself have to somehow reduce these compounding effects. In this study, such effects were eliminated by careful simulation and experiment effort.

In studying the properties of the different beamlets, the researchers noticed that beamlets with higher quantum efficiency also tended to typically have higher intrinsic emittance, complicating efforts to design the best possible beams. "It seems that we are always going to have some kind of a trade-off between quantum efficiency and intrinsic emittance," Shao said. "The question is how we balance the two."

A paper based on the study, "Rapid thermal emittance and quantum efficiency mapping of a cesium telluride cathode in an rf photoinjector using multiple laser beamlets," was published in the May 4 edition of *Physical Review Accelerators and Beams*.

More information: Lianmin Zheng et al. Rapid thermal emittance and quantum efficiency mapping of a cesium telluride cathode in an rf photoinjector using multiple laser beamlets, *Physical Review Accelerators and Beams* (2020). DOI: 10.1103/PhysRevAccelBeams.23.052801

https://phys.org/news/2020-09-scientists-important-property.html

ScienceDaily

Thu, 03 Sept 2020

Virus in the blood can predict severe COVID-19, researchers find

Summary:
A blood test on hospital admission showing the presence or absence of SARS-CoV-2 can identify patients at a high risk of severe COVID-19, according to researchers. Admitted patients without virus in their blood have a good chance of rapid recovery.

A blood test on hospital admission showing the presence or absence of SARS-CoV-2 can identify patients at a high risk of severe COVID-19. Admitted patients without virus in their blood have a good chance of rapid recovery. This according to researchers at Karolinska Institutet and Danderyd Hospital in a new study published in the scientific journal *Clinical Infectious Diseases*.

Blood samples were taken from patients with a confirmed COVID-19 infection within three days of admission to the Department of Infectious Diseases, Danderyd Hospital, Sweden. Patients with measurable levels of the new coronavirus SARS-CoV-2 in their blood were seven times more likely to develop critical symptoms and eight times more likely to die within 28 days.

"This readily available test allows us to identify patient groups at high or low risk of severe COVID-19, which enables us to better guide the treatment and monitoring of these patients," says the study's lead author Karl Hagman, infectious diseases consultant at Danderyd Hospital and doctoral student at Karolinska Institutet's Department of Clinical Sciences at the same hospital.

The researchers analysed the presence of viral RNA in the blood using a standard hospital technique called PCR on samples taken from a total of 167 patients. Sixty-one patients had measurable levels of the virus in their blood and 15/61 (25 per cent) died within 28 days of blood sampling. This can be compared with three deaths (three per cent) amongst the 106 patients who did not have measurable levels of virus in their blood. The presence of virus in the blood increased with age and was much more common in patients over the age of 60.

The researchers received no specific funding for this study. The paper's last author, Johan Ursing, has a clinical research position financed by Region Stockholm. One of the co-authors has reported receipt of payment from pharmaceutical company Pfizer outside this current study. No other potential conflicts of interest are declared in the paper.

Story Source:

Materials provided by **Karolinska Institutet**. *Note: Content may be edited for style and length.*

Journal Reference:

1. Karl Hagman, Magnus Hedenstierna, Patrik Gille-Johnson, Berit Hammas, Malin Grabbe, Joakim Dillner, Johan Ursing. **SARS-CoV-2 RNA in serum as predictor of severe outcome in COVID-19: a retrospective cohort study**. *Clinical Infectious Diseases*, 2020; DOI: 10.1093/cid/ciaa1285

https://www.sciencedaily.com/releases/2020/09/200902091108.htm

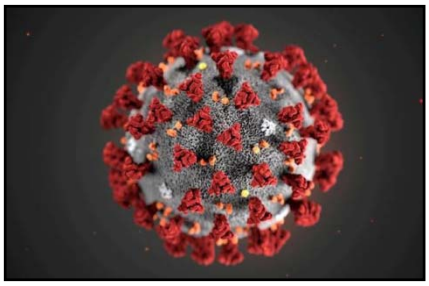
FINANCIAL EXPRESS
Read to Lead

Thu, 03 Sept 2020

Why a single Coronavirus vaccine may be effective in combating the pandemic worldwide

The study characterised the diversification of the coronavirus, and to do so, it aligned as many as 18,514 independent genome sequences of the virus

Coronavirus research: Assessment of the genome sequences of SARS-CoV-2 in over 27,000 people infected with COVID-19 has led scientists to finding that the novel coronavirus has undergone minimal mutation since the outbreak first began in China at the end of 2019. This is a significant assessment, as it indicates that a single vaccine would be effective in combating infections worldwide, according to a report by news agency PTI. The report stated that the study was published in PNAS journal.



The study was published in PNAS journal.

The study characterised the diversification of the coronavirus, and to do so, it aligned as many as 18,514 independent genome sequences of the virus. These sequences were taken into account since the beginning of the pandemic and they were collected from across 84 countries. The scientists then scanned them for variations.

The scientists included those from the US' Walter Reed Army Institute of Research (WRAIR) and they said that the analyses showed low estimates of differentiation in the genetics of the virus after its initial outbreak in China's Wuhan. They added that from the study, they have found that so far the genome has evolved mostly randomly and not by adapting to the human hosts encountered by it.

Previously, some studies had stated that in several parts of the world, a mutant form of the virus was dominating. In this mutant form, the molecule aspartic acid D in the spike protein of the virus was replaced by another molecule glycine G. The researchers who carried out this latest study have, however, said that the mutation D614G highlighted earlier could not be taken as an evidence of the virus' adaptation to humans, the report stated.

The current study's co-author Morgane Rolland was quoted by the report as saying that like other reports, they notice a rapid increase in the frequency of D614G mutation since the pandemic began, but they were not able to link this mutation to any specific adaptive forces. Roland added that some mutations were to be expected when viruses replicated and spread across the population.

The report added that scientists said that linking of genotypes of the various strains to their traits was complicated, and more research was needed to completely understand the functional impact of the mutation in the virus.

The scientists also stated that considering the low genetic variation, a single promising vaccine candidate would possibly be equally effective against all the strains that are currently going around.

https://www.financialexpress.com/lifestyle/health/why-a-single-coronavirus-vaccine-may-be-effective-in-combating-the-pandemic-worldwide/2072824/

livemint

Thu, 03 Sept 2020

Vaccine for coronavirus is possible as virus has mutated minimally: Study

- ***The minimal diversity of coronavirus suggests global vaccine is feasible***
- ***The scientists behind the current study said this 'D614G' mutation cannot be seen as evidence of the virus adapting to humans***

Washington: Scientists have assessed the genome sequences of the novel coronavirus from more than 27,000 individuals with COVID-19, and found that the virus has mutated minimally since the beginning of the outbreak in China in December 2019, suggesting one vaccine would be sufficient to combat global infections.

The study, published in the journal PNAS, characterised the diversification of the novel coronavirus SARS-CoV-2 since the beginning of the pandemic by aligning 18,514 independent virus genome sequences sampled from individuals in 84 countries, and scanned them for variations.

According to the scientists, including those from the Walter Reed Army Institute of Research (WRAIR) in the US, the analyses reveal low estimates of genetic differentiation of the virus following the initial outbreak in Wuhan, China.

Based on the study, they said, so far, the SARS-CoV-2 genome has evolved through a mostly random process rather than through adaptation to the human hosts it encounters.

Earlier studies had pointed to the domination of a mutant form of the virus in several parts of the world in which a molecule aspartic acid -- denoted as D -- in the viral spike protein, which it uses to enter host cells, is replaced by another molecule glycine (G).

However, the scientists behind the current study said this 'D614G' mutation cannot be seen as evidence of the virus adapting to humans.

"Like other reports, we noticed that the D614G mutation in the Spike has rapidly increased in frequency since the beginning of the epidemic, but we could not link this mutation to specific adaptive forces," said Morgane Rolland, a co-author of the study from WRAIR.

"When viruses replicate and spread in the population, we expect to see some mutations and some can become fixed very rapidly in an epidemic just by random chance," Rolland added.

The scientists said linking genotypes of the different strains to their traits is complicated, adding that more research is needed to fully understand the functional consequences of the D614G mutation in SARS-CoV-2.

Given the low level of genetic variation, the researchers said, a promising vaccine candidate would likely be equally efficacious against all currently circulating strains of the novel coronavirus.

"Viral diversity has challenged vaccine development efforts for other viruses such as HIV, influenza and dengue, but global samples show SARS-CoV-2 to be less diverse than these viruses," Rolland said.

"We can therefore be cautiously optimistic that viral diversity should not be an obstacle for the development of a broadly protective vaccine against COVID-19 infection," she added.

The researchers believe the current findings may lead to the development of a vaccine that is rapidly scalable and universally applicable to all populations.

(This story has been published from a wire agency feed without modifications to the text. Only the headline has been changed.)

https://www.livemint.com/science/health/a-global-vaccine-is-sufficient-to-combat-covid-19-infection-suggests-study-11599034111636.html

BusinessLine
THE HINDU

Thu, 03 Sept 2020

IT firm launches Covid-19 vaccine and treatment tracker for India

'CoVaTrack' aggregates public data to keep tabs on vaccine and therapy development

By Hemani Sheth

Bhubaneswar-based IT firm CSM Technologies has launched a Covid-19 vaccine and treatment tracker for India.

Launched under CSM Technologies' CSR programme, the 'CoVaTrack' website aggregates public data to track vaccine and therapy development in India. It also provides statistics on vaccines at various stages of clinical trials across the globe.

According to the website, CoVaTrack "aggregates publicly available information on the progress of Covid-19 related vaccines & treatment. CoVaTrack's sources for data include official websites of Centre for Disease Control & Prevention (CDC), World Health Organisation (WHO), Milken Institute, Cytel and New York Times. Utmost care is taken to rely on credible data sources."

Indian vaccines

The website currently tracks the development of seven vaccines in various trial stages in India. This includes vaccines from Cadila Healthcare Ltd, Green Signal Biopharma Ltd, Serum Institute of India & AstraZeneca, Haffkine Institute for Training Research & Testing and Bharat Biotech International Ltd. It also includes Serum Institute of India's vaccine being developed in collaboration with National Institute for Research in Tuberculosis along with Cadila Pharmaceuticals Ltd and CSIR's vaccine candidate.

It also has a dedicated section on news articles related to vaccine development. It can be accessed on https://www.covatrack.in/.

CSM technologies had also recently provided a data valuation dashboard to help the Odisha government track measures to combat Covid-19 across several KPIs through interactive charts, graphs, diagrams, etc.

https://www.thehindubusinessline.com/info-tech/it-firm-launches-covid-19-vaccine-and-treatment-tracker-for-india/article32503783.ece#