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The Statesman

Sat, 06 June 2020

COVID-19: Scientists seek GoI funding to develop seabuckthorn immunity booster

Presently, over 55 countries are involved in scientific research and commercial utilization of seabuckthorn

Shimla: Scientists at Indian Institute of Technology, Mandi and CSK Himachal Pradesh Agriculture University Palampur, in collaboration with and five other institutes, have submitted a Rs 7.5 crore research project proposal to Ministry of AYUSH, Government of India to develop seabuckthorn immunity booster and anti-COVID 19 drug.

The fruit and leaves of seabuckthorn are quite rich in a variety of vitamins and antioxidants (vitamin C, A, E, K, carotenoids, polyphenols and sterols etc. The studies done in over 70 research organizations of India like Palampur University, DRDO, CSIR and AIIMS etc. have found its efficacy in gastric ulcer, diabetes, cardiovascular, wound healing and skin diseases etc, said Dr Virendra Singh, a seabuckthorn expert and General Secretary of Seabuckthorn Society of India.

Dr Singh said Seabuckthorn has a great potential in boosting immunity, besides strong antivirus activity. Seabuckthorn naturally grows in cold desert and dry temperate regions of Himachal Pradesh (Lahaul-Spiti and Kinnaur), Ladakh, Uttarakhand, Sikkim and Arunachal Pradesh.

Presently, over 55 countries are involved in scientific research and commercial utilization of seabuckthorn, he said.

Dr Singh said the scientific studies on seabuckthorn fruit oil and leaf extracts done in Finland, Russia, India and China have proven its strong immunity boosting and anti-viral properties. Seabuckthorn has been found to have much stronger activity against a broad spectrum of viruses, as per a team of Russian scientists at All Russian Research Institute of Medicinal and Aromatic Plants, Moscow, in 2001.

However, the first research breakthrough by using seabuckthorn against COVID 19 has been reported by South Korea, where a team of scientists at Ethwa Woman's University Medical Centre was successful in isolating anti-COVID19 compounds from seabuckthorn.

It is pertinent to mention that Indian private sector has also invested in seabuckthorn and established ultra-modern seabuckthorn processing industries at Baddi, Faridabad and Kochi and have launched over 120 sea buckthorn juice, cosmetics and oil health products in India.

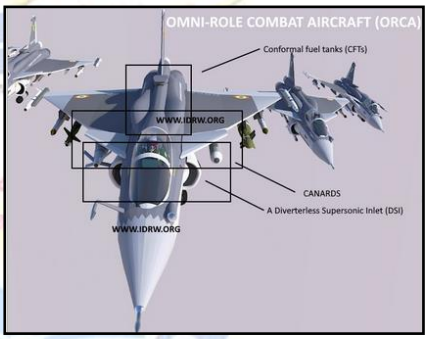
According to the Seabuckthorn Society of India, there are about 11,000 hectares natural forest of seabuckthorn in Ladakh, 1200 hectares in Himachal, 2000 hectares in Uttarakhand and about 1000 hectares in Sikkim and Arunachal Pradesh. The collection by local farmers is mere 800 tons and rest 20,000 tons goes waste, as it is very difficult to enter into the thick forest.

https://www.thestatesman.com/cities/shimla/covid-19-scientists-seek-goi-funding-develop-seabuckthorn-immunity-booster-1502896741.html

Sat, 06 June 2020

TEDBF: Navy and Air Force might have agreed to commit 150 jets

Aeronautical Development Agency (ADA) has been given go head by the Ministry of Defence (MOD) to start work on New Twin Engined Deck Based Fighter (TEDBF) jet as per latest media reports and as per information provided to idrw.org, Senior officials from both Indian Air Force (IAF) and Indian Navy (IN) were present at the meeting and both have agreed to commit 150 jets jointly before the MOD agreed to give Go head clearance for the New ADA project.



While actual numbers of a jet produced might vary since the jet in question is at least 10 years away from entering production. MOD needed a number before another fighter jet program could have got a clearance and as per information provided to idrw.org, the Navy has agreed to procure a minimum of 100 jets for its Carrier-based operations and IAF is willing to commit to procuring 50 jets if the jet meets its Operational requirements.

Navy and ADA will head the TEDBF program and most of the orders will come from the Navy, while IAF will be back seat driver in the program. Navy has decided that it now abandon its plans to acquire 57 new carrier-based fighter jets from foreign vendors and instead will buy TEDBF when it's ready for production from 2030 onwards and also plans to replace its current Mig-29k fleet with TEDBF from 2035-40 onwards.

IAF version of TEDBF called Omni Role Combat Aircraft (ORCA), will be the same aircraft minus TEDBF's landing gears, Tailhook, foldable wings some Navy instruments, and electronics. ORCA will also be lighter by 1.5tonnes due to lighter mid and rear fuselage section but there won't be any major design changes in IAF's version but it will be identical in terms of design, features, and performance if the project gets a go-head by IAF. The development of ORCA might not be done parallelly but only once TEDBF Prototype is available for testing and evaluation purposes for IAF.

IAF has given fully backing Tejas Mk2 and AMCA program and already has committed to procure 100 aircraft types each. Initially, IAF had agreed to procure 200 Tejas Mk2 jet but later curtailed it to 100 jets, which many see was possibly done to make room for ORCA in near future But people close to idrw.org believe that ultimately it will come down to Operational capabilities and cost at the end since both Tejas Mk2 and ORCA will have same avionics, Radar, electronics and engines, it will depend on which of the two will emerge as better aircraft at the end because Tejas Mk2 won't enter production till 2028 and TEDBF will be ready in 2026, IAF will be a good position to decide on procurement of ORCA by then or continue procurement of Tejas Mk2 beyond 100 jets which already has been committed.

https://idrw.org/tedbf-navy-and-air-force-might-have-agreed-to-commit-150-jets/#more-228637

Sat, 06 June 2020

IAF will have a Desi option for Rafale-Class fighter jet soon, but will it agree?

By Mahesha M

CDS General Bipin Rawat few weeks ago made a rather controversial statement when he said that Indian Air Force (IAF) has agreed to replace its fighter jets it had sought under MMRCA tender with locally made LCA-Tejas and soon his statement was rebutted by the Air Chief Marshal R.K.S. Bhadauria who later clarified that LCA-Tejas being a Lightweight class fighter it can't replace MMRCA requirement and specified need for "Rafale class" fighter jet but IAF will go ahead with its plans to acquire 83 Tejas Mk1A,100 Tejas Mk2, and another 100 AMCA in next two decades to replace its current fleet with locally developed fighter jets while still making a case to acquire 114 jets under MMRCA tender.

Earlier this year Aeronautical Development Agency (ADA) had offered to develop a 24.5-tonne Twin-engine fighter jet for Carrier-based operations to meet the requirement of the Indian Navy and also replace Russian developed Mig-29K fleet from 2030 onwards once Twin Engined Deck Based Fighter (TEDBF) jet goes into production. ADA also has offered IAF a lighter variant 23 tonnes Twin-engine fighter jet minus the heavy landing gears and strengthen rear fuselage thus putting the aircraft in "Rafale class", but since it was not clear if the project will be approved so it was assumed that IAF was not fully onboard, and was yet to comment officially on the program, so confusion remained.

As per the latest report of NDTV, Ministry of Defence (MOD) has officially given go head to ADA to work on design elements of the new proposed fighter jet which ADA claims will be ready for first flight in 2026 and ready to enter production in 2030 onwards in the Indian Navy. The report also confirms that the meeting was attended by MOD, ADA, Indian Navy and IAF officials which for the first time also in a way shows that IAF might come on board the project soon since it is pretty much occupied by Tejas Mk1A and Mk2 program at present. TEDBF will also face competition from Tejas Mk2 and AMCA which both will be pretty active programs at the time and IAF can simply choose between these two aircraft if for any chance MMRCA tender is canceled and never happens.

https://idrw.org/iaf-will-have-a-desi-option-for-rafale-class-fighter-jet-soon-but-will-it-agree/#more-228638

INDIAN DEFENCE RESEARCH WING

Sat, 06 June 2020

Here's why former Navy Chief wants India's next Raksha Mantri to personally guide Tejas

By Admiral Arun Prakash (Retd)

Having retired many years ago, my request to fly in the naval version of the light combat aircraft, also 'Tejas', may have seemed whimsical or eccentric to naval headquarters. Actually, it was motivated by intense curiosity to see for myself how an 'outlandish' concept visualised by the naval staff, a quarter of a century ago, in the face of scepticism and opposition, had survived many challenges to materialise into a flying prototype.

Given my long association with the light combat aircraft (LCA)-Navy project, now that a two-seat (trainer) version of the aircraft was available, I had an irresistible urge to get a feel of this 'dream machine'. The Navy Chief, very graciously, acceded to my request and I flew a quick sortie on the LCA-Navy, earlier this week.

In the early 1990s, when the LCA programme was languishing, the naval headquarters (NHQ) made enquiries about the possibility of a ship-borne version of the aircraft. On receiving a positive response about its feasibility, the NHQ formally sanctioned the LCA-Navy project. It soon emerged that a number of major design and engineering hurdles would have to be overcome, to make the land-based LCA carrier-capable. In addition to complex aerodynamic issues, the problem areas included insufficient engine thrust, a stronger undercarriage, installation of an arrester hook, and need for cockpit and fuselage re-design. Undaunted, the navy affirmed its faith in the Defence Research and Development Organisation (DRDO) by initiating a jointly-funded developmental programme and providing engineers and test pilots for the project.

An important spin-off of this project has been the creation of a 'shore-based test facility' (SBTF) in Goa. Just one of two such facilities worldwide (the other one is a Russian-owned complex at Saki in Ukraine), it offers a simulated aircraft-carrier flight-deck ashore, including a ski-jump for take-off, optical aids for landing, and arrester gear for 'trapping' aircraft. Complementary to the SBTF is a unique and highly sophisticated telemetry centre for real-time monitoring and analysis of flight-test parameters — created by Indian scientists.

Having surmounted huge challenges and suffered many delays, the Indian Air Force (IAF) version of Tejas was inducted into service in 2011 and is now in serial production. The prototype LCA-Navy had emerged in July 2010, and its first flight took place in April 2012. The complex flight-test programme is now at an advanced stage, and data is being gathered from ski-jump take-offs and high-speed arrester-wire engagements to validate its unique design and structural features. On successful completion of shore testing at the Goa facility, the LCA-Navy will commence extensive aircraft-carrier trials for obtaining 'initial/full operational clearances' (IOC/FOC) – a year or two from now.

By preferring a 'tail-less delta-wing' configuration and an aerodynamically 'unstable' design, for a 'light-weight fighter', Indian designers had chosen a thorny path. Since an 'unstable' aircraft can only be flown via a computerised flight control system (FCS), billions of lines of software programmes had to be written for this and other computers that process air-data, weapon-aiming, and navigational information. Weight shedding demanded development of pioneering carbon-fibre technology for airframe parts. To adapt this design for ship-borne operations added immense complexities.

Should it, then, have surprised anyone that a pioneering project of such difficulty (for a developing nation) should fall well behind schedule? In 2016, the navy, faced with uncertainties

related to development of the LCA-Navy and accord of shipborne IOC/FOC, reluctantly took a decision to exclude it, for the time being, as a contender for its future aircraft-carrier programmes. Does this mean that we should abandon the LCA-Navy project? Before addressing this question, let me describe my recent flight.

My brief exposure to the LCA-Navy was merely an 'experience flight' with a test-pilot at the controls; not quite a joyride, but certainly far from an 'evaluation' sortie. However, having undertaken similar flights over the past two decades in aircraft like the MiG-29 (M2), Sukhoi-27 (KUB), the Rafale-M and F/A-18(F) Hornet, it did provide useful insights into some characteristics of the LCA-Navy, which I summarise here.

Given its weight/size constraints, the LCA cockpit is a tight fit, but ergonomically designed, easily accessible and logically laid-out. Strapping into the (zero-zero) rocket ejection-seat and connecting up with aircraft services is swiftly accomplished. Multiple switches, buttons and toggles, have been squeezed in to provide the pilot a 'hands on throttle and stick' (HOTAS) facility for sensor-control and weapon-selection. The state of the art 'glass cockpit' has multi-function displays (MFD) to provide thousands of selectable pages of flight, navigation and sensor information as well as weapons/systems-status, emergency check-lists and much else.

The pre-start routine and start-up were crisp and simple, and sensible nose-wheel steering, via rudder-pedals, made for relaxed taxiing to the runway. I was shown a quick line-up and after-burner take-off, with the jet surging forward eagerly to get airborne. In the air, handling the Tejas was easy enough, given its responsive and well-harmonised controls and prompt engine-response. I lacked a head-up display (HUD) in the rear cockpit but an eye-level multi-function displays (MFD) made up somewhat.

A few turns and manoeuvres served to demonstrate the aircraft's agility and high instant turn-rates. I had been told that the flight computer would assure 'carefree handling', and at no stage did we encounter judder, wing-rock or instability under g-loading. I was shown a typical carrier approach and a 'touch and go' before coming in for a final landing. The aircraft was stable on both approaches and the front cockpit afforded good visibility.

I left the Tejas cockpit with a distinct feeling of elation, for three main reasons.

1. I had just flown an Indian designed, 'Made in India' fighter that incorporated contemporary technologies, and was as good (better?) as any of its peers world-wide.
2. Despite long delays and sustained scepticism, the LCA-Navy would soon embark the aircraft-carrier, making India one of four countries capable of designing and producing a carrier as well as a carrier-compatible aircraft.
3. The LCA's computers and avionics software have been designed by Indian programmers, using 'open architecture'. They can change, modify or update them in-house at will. We know that foreign companies guard such 'source codes' jealously and charge millions for modifying / updating them.

India's promising aeronautics industry has suffered from egregious neglect by users and politicians alike, allowing countries like China, Brazil and Turkey to overtake us. In the next few days, there will be a new Raksha Mantri in South Block and I would like to offer the following unsolicited advice to her/him:

1. The Ministry of Defence (MoD), and preferably the new RM personally, should monitor, guide and nurture the LCA programme so that the priceless experience and data generated by designers, engineers and flight-test teams does not go waste. This database should be used to sustain an ongoing, long-term fighter design/production process.
2. Even if the LCA-Navy does not come up to the navy's qualitative requirements for a 'deck-based fighter', its induction as a carrier-borne 'air-defence fighter' should be pursued as a prelude to development of the 'naval advanced combat aircraft'.
3. An issue related to the LCA that demands urgent attention of the MoD is that of the indigenous Kaveri turbo-jet engine – another unfinished DRDO project of national importance that must be taken to its logical conclusion.

https://idrw.org/heres-why-former-navy-chief-wants-indias-next-raksha-mantri-to-personally-guide-tejas/#more-228665

Sat, 06 June 2020

Need for Indigenous Jet engine grows louder as India now has 4 fighter jet program

By Deepak Hilori

India has given Clearance to start Country's fourth active fighter jet project recently which too will be powered by American F-414 afterburning turbofan engine, making it India's third jet to be powered by an American engine made by General Electric company. India's Tejas Mk1A jets will be powered by F404-GE-IN20 afterburning engines and Mk2 and TEDBF will be powered by F414-GE-INS6 engines.

IAF and Indian Navy will be looking at 300+ Jets which will be powered by American engines and equipping nearly 40% of your fighter jet fleet from a single-source vendor is also gamble which can backfire on India if the country doesn't work in developing alternative engines for this fleet. Air Chief Marshal R.K.S. Bhadauria in recent media interview urged DRDO to develop a local engine with a foreign vendor and is it likely Defence ministry too will agree to fast track successor to the Kaveri program soon even though previous talks with French and American engine tech giant have failed to conclude a joint venture proposal.

Developing modern-day afterburning engines is not easy but Japan has shown the way by successfully developing the XF9-1 engine which will be used to power its 5th Generation fighter jet even though the plane is still in the drawing board. IAF has allowed DRDO to use F414-GE-INS6 engines on the first 40 AMCA Mk1 jets produced which again shows India's dependence on American single-source vendor. India needs to start investing in the development of local engines soon so that technology is matured in the next 10-15 years and is ready to enter production for the AMCA fleet and later be used to replace engines from Tejas Mk1A, Mk2, and TEDBF fleet.

https://idrw.org/need-for-indigenous-jet-engine-grows-louder-as-india-now-has-4-fighter-jet-program/#more-228684

ZEENEWS

Sat, 06 June 2020

Sukhoi Su-30MKIs, Rafale, LCA Tejas, Mirage 2000, Mikoyan-Gurevich MiG-29, MiG-21, SEPECAT Jaguar: The Indian Air Force fighters

The IAF has almost 900 combat aircraft in it inventory while the total aeroplanes in active service with the force number over 1720. The Russian Sukhoi Su-30MKIs form the backbone of IAF fighter fleet and the force flies 272 of the twin-seater, twin-engine multirole combat aircraft

Indian Air Force (IAF) operates seven fighter aircraft out of which Sukhoi Su-30MKI, Light Combat Aircraft Tejas, Mirage 2000, Mikoyan-Gurevich MiG-29, MiG-21 and SEPECAT Jaguar are in active service while the first Rafale is all set to land in the country soon. The IAF has almost 900 combat aircraft in it inventory while the total aeroplanes in active service with the force number over 1720.

The Russian Sukhoi Su-30MKIs form the backbone of IAF fighter fleet and the force flies 272 of the twin-seater, twin-engine multirole combat aircraft. There are 272 Su-30MKIs in service and some of them have been modified to carry the supersonic BrahMos air-launched cruise missiles.

LCA Tejas, the indigenous supersonic fighter, entered service first in 2016 and the second squadron with the advanced Mk-1 version of the jet in Final Operational Clearance (FOC) joining the force on May 27, 2020, at Sulur Air Force Station in Tamil Nadu's Coimbatore.

Tejas has been primarily developed to replace the MiG-21 BISONs. The indigenous jet, designed and developed by the Aeronautical Development Agency (ADA) and Hindustan Aeronautics Limited (HAL), joined IAF's 45 Squadron IAF 'Flying Daggers' and is currently based at the Sulur Air Force Station while the Mk-1 version was inducted into IAF's 18 Squadron 'Flying Bullets'.

The IAF currently operates about 20 Tejas jets in the two squadrons. "While orders of 40 Tejas aircraft had been placed with HAL in initial configurations, DAC paved the way for procurement of 83 of the more advanced Mk1A version of the aircraft from HAL by finalising the contractual and other issues. The proposal will now be placed for consideration of Cabinet Committee on Security (CCS). This procurement will be a major boost to 'Make in India' as the aircraft is indigenously designed, developed and manufactured with participation of several local vendors apart from HAL," the Defence Ministry stated on March 18, 2020.

MiG-21 BISON, the first version of which joined the IAF way back in 1964, was India's most potent fighter for several decades before technological advancements brought combat aircraft with better radars, avionics, and armament on the horizon. The single-engine, single-seater multirole fighter/ground attack aircraft has the distinction of shooting down the much advanced F-16 Fighting Falcon of the Pakistani Air Force (PAF) during the aerial skirmish over the skies of Jammu and Kashmir on February 27, 2020. IAF Wing Commander Abhinandan Varthaman chased and shot down a PAF F-16 which was trying to enter the Indian airspace.

Mirage 2000, the jet which bombed Jaish-e-Mohammad terror camps in Pakistan on February 26, 2019, following the suicide bombing of a Central Reserve Police Force (CRPF) convoy in Jammu and Kashmir's Pulwama, is one of the most versatile combat platforms in the IAF arsenal which can launch precision-guided munitions from a standoff range to hit targets deep inside the enemy territory. IAF operates 57 Mirage 2000 jets.

Another potent combat aircraft from Russia, the MiG-29 is a twin-engine, single-seater air superiority jet which has been upgraded to increase its fighting capabilities. There are 69 MiG-29s active in the IAF fleet.

IAF's SEPECAT Jaguar is a twin-engine, single-seater deep penetration strike aircraft and there are 139 such combat aircraft in service currently.

Rafale jets, 36 of which have been ordered for two IAF squadrons, will join active service soon. A group of IAF pilots, engineers and technicians are undergoing training on Rafale jets in France. While IAF No. 17 Squadron 'Golden Arrows' based at Ambala Air Force Station in Haryana will be the first to be equipped with the Rafale, No. 101 Squadron Falcons at Hasimara Air Force Station in West Bengal will welcome the French omnirole fighters later.

https://zeenews.india.com/india/sukhoi-su-30mkis-rafale-lca-tejas-mirage-2000-mikoyan-gurevich-mig-29-mig-21-sepecat-jaguar-the-indian-air-force-fighters-2288084.html

Defence News

Defence Strategic: National/International

INDIAN DEFENCE RESEARCH WING

Sat, 06 June 2020

"Ladakh is a lakshman rekha, the Chinese must not be allowed to cross it"

Below is the interview with P. Stobdan on the India-China border standoff:

Q. Why have the Chinese come in the numbers that they have?

Many reasons have been attributed to the Chinese intrusions into eastern Ladakh since early May. Among them, one could be India's administrative consolidation of its far territories after the abrogation of Article 370 and the bifurcation of Ladakh from Jammu and Kashmir. As long as Ladakh was a part of J&K, China wasn't a major factor and its stance remained muted. But post the events of August 5, 2019, the Chinese have been making belligerent noises, almost trying to convey that they have a stake in Ladakh.

The government has of course clarified that our LAC with China will not change, but to me it looks like they suspect India's narrative would change from the LAC dispute to making a new assertion on the 37,000 sq. km Aksai Chin plateau now under their illegal occupation. We have changed the entire discourse on the PoK region beyond the LoC with Pakistan and have reaffirmed legal claims on the entire Gilgit-Baltistan area (now part of Ladakh province). Now our map shows UT Ladakh with a 106 km land border directly with Afghanistan's Badakhshan province. This may have hastened Pakistani and Chinese thinking.

Q. But incursions have been there in the past too

The present incursion is not a small one. But as I said, the Chinese may have suspected we have bigger geo-strategic plans. The issue of creating UT Ladakh was raised in the United Nations

Security Council on August 16 last year by foreign minister Wang Yi when he was backing the Pakistani position on J&K. So the fact on the ground is that we may have overlooked these issues but the Chinese have registered a protest. The issue featured in the Pakistan-China joint statement last August too. So, the Chinese may want to forestall India's move. On the ground, they are trying to push us from the Galwan Valley towards the Shyok valley. The Chinese could also fear that its regional connectivity projects in South Asia like CPEC through Pakistan and BRI through Nepal, with lots of investments at stake, may be affected. India has been active in constructing roads in Ladakh and in the Uttarakhand region bordering China.

Q. What is the significance of the Galwan Valley?

Ladakh is a lakshman rekha for us–we cannot afford to allow the Chinese in here. Aksai Chin is an extension of the dry Tarim Basin and is not part of the Himalayas. Now they are coming into a water-rich area with three rivers–the Shyok, Galwan and Chang-Chenmo. This is a hugely strategic move. On the map, it looks very complicated but they have a strategy, design and focus on the big picture.

Right now, all their connectivity is north of the Karakoram Valley. They are, for instance, building a new airport in Tashkurgan, north of the Siachen glacier. The mantra of the LAC has been chanted for so many years that we react only to Gilgit-Baltistan and not Aksai Chin. Why has the narrative of Aksai Chin not been kept alive? Right now, the Chinese show it as part of Xinjiang. Our intent to enhance connectivity projects in Ladakh should also have a forward objective to push for trade beyond the Karakoram pass into the Mazar Valley of Xinjiang province and revive the old Leh-Kashgar Silk Road. Through Lepulekh, we should be trying for a reopening of our traditional pilgrimage and border trade routes with Tibet.

Q. Why is this happening now?

If the reorganisation of J&K has given the Chinese a strategic opportunity to make Ladakh a Trojan horse, I'm quite confident we can also respond by reaching out to the world beyond Ladakh's borders.

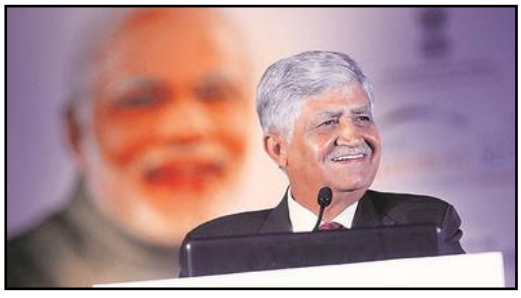
https://idrw.org/ladakh-is-a-lakshman-rekha-the-chinese-must-not-be-allowed-to-cross-it/#more-228657

INDIAN DEFENCE RESEARCH WING

Sat, 06 June 2020

'If LAC not marked soon, build-up like on LoC likely,' says ex-Army Chief

If the Line of Actual Control isn't delineated soon, it will remain vulnerable to face-offs and India and China may end up deploying more troops there, just like it is on the LoC with Pakistan, said Gen (retd) V P Malik who was Chief of Army staff when the Kargil intrusion took place in 1999. Gen Malik, who led the Army in the successful eviction of Pak troops, said, in an interview to The Indian Express, that an aggressive China, besides nibbling at Ladakh, could also attempt to take control of Karakoram Pass and the area between it and Shaksgam Valley ceded to it by Pakistan. Excerpts:



Do you think the Chinese posturing along LAC is linked to the action on Article 370, creation of Union Territories of J&K and Ladakh, as also India's current dispute with Nepal?

When India abrogated Article 370 and created Union Territories of J & K and Ladakh, China called it

"unacceptable." Development of infrastructure along the Northern border, including the road from Pithoragarh to Lipulekh Pass, indicates India's strategic intent to provide greater security to its territories. These activities by India close to LAC/India-China border could be part of the reasons for the current aggressive posturing. Another reason could be Xi Jinping's 'China Dream' losing credibility within and outside China post-Covid and his need to divert attention.

Infrastructure development in Eastern Ladakh has gained pace…Wouldn't it have been strategically prudent to factor in the Chinese response?

PLA violations of LAC in Galwan Valley and north of Pangong Tso are at the tactical level. With long gaps existing between posts held by our troops and inability to keep every bit of area under 24/7 surveillance, such tactical intrusions are always possible. Our troops, if ordered, can also do that.

However, when these intrusions are viewed along with other recent incident at Naku La and Chinese strategic behaviour vis a vis India and nexus with Pakistan, these tactical incidents need to be viewed strategically.

Have the Chinese troops occupied Indian Territory in Ladakh?

Any intrusion across the LAC and then trying to defend the area involved would be "'occupation." My impression is that north of Pangong Tso, PLA troops have occupied "disputed area" between Finger 4 and 8 where both sides were patrolling till recently. In Galwan valley, they have taken up positions along the track from Shyok River to the LAC thus denying our patrols the ability to move up to the LAC.

What strategic implications does an aggressive Chinese posture in Eastern Ladakh have vis-a-vis any potential advantage that accrues to Pakistan?

An aggressive China, besides nibbling at Ladakh territory, could attempt to take control of Karakoram Pass and the area between Karakoram Pass and Shaksgam Valley ceded to it by Pakistan. That would (a) ensure greater security to Aksai Chin already under its occupation (b) link western Tibet with Shaksgam Valley, and (c) make Siachen Glacier vulnerable to Pakistan-China nexus.

Some argue that the ambiguity about the LAC is responsible for the present situation.

Three decades of talks, including 22 sessions at the level of Special Representatives, have not succeeded in making China agree to the delineation of LAC on maps pending final boundary solution.

There is not even an agreed perception of "disputed areas." Until the LAC and disputed areas are delineated, we shall continue to see accidental or deliberate face-offs…Since 1993, India and China have signed five agreements and protocols on military-level confidence-building measures along the LAC. But the alarming number of recent incidents indicates that the mechanisms are no longer effective. If the LAC and "disputed areas" are not delineated soon, India and China may end up deploying much larger forces along the LAC — like what we have on the LoC with Pakistan.

Do you anticipate the Chinese will give up whatever advantage they may have seized along the LAC in Eastern Ladakh?

Resolution of this military engagement can only be return to status quo, pre- May 2020.

Do you see heightened hostility in the event of the talks breaking down…

As per reports, India and China are working to resolve the issue. Neither side seems interested in escalating the situation.

https://idrw.org/if-lac-not-marked-soon-build-up-like-on-loc-likely-says-ex-army-chief/#more-228659

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NEWS INDIA TIMES

Sat, 06 June 2020

CDS is the single point military advisor to Indian government

By Wing Commander Dinesh Mathur, VSM (Retd)

Towards the end of 2019, the government decided to appoint the Chief of Defence Staff (CDS), which is being considered as the most significant initiative during the past 50 years or so, to revamp India's defence establishment.

As widely expected, General Bipin Rawat was handed over the coveted new post, without making him a 5-star General. He will be the senior most defence officer, yet "first among equals" with the defence chiefs. He will also be the Secretary of the newly established Department of Military Affairs in the ministry of defence. Soon after his taking over on 01 January 2020, the CDS started a flurry of time-bound activity, which would eventually shake-up and reorganize the existing military organization of our country.

A large number of people are wondering as to what was the dire necessity of this upheaval at this point in time. But the fact remains, that the need for this upgrade had been discussed or demanded for quite sometime now, and certainly, not without adequate justification.

Following the Kargil Conflict in 1999, the Kargil Review Committee headed by K. Subrahmanyam, had officially suggested to appoint the CDS, but due to the lack of political consensus and apprehensions among defence services, the proposal could not be implemented. The CDS has now assumed the role of being the single point military advisor to the government.

Significantly, his charter of responsibilities also entails integrating operations of the three forces as required by modern warfare and creating theatre commands to augment combat capabilities. He is required to reduce wasteful expenditure and ensure optimal utilisation of infrastructure. These organizational changes are considered extremely essential to ensure jointness and synergy between the three services. Reasons for such restructuring certainly have two dimensions, economic and strategic.

Focussing on economic aspects, as of now, India remains the fourth largest defence spender as well as second largest importer of arms in the world. Defence allocation of Rs 4.7 Lakh Crore in India's budget for the year 2020-2021 is the highest among all ministries.

Yet, ballooning salary and pension bills, along with day-to-day running expenditure, does not leave much for new military modernization projects after "committed liabilities" are paid for arms deals earlier signed. Even prior to the outbreak of Covid-19, India's economy was not doing too well, and owing to enormous disruption caused by this pandemic, serious economic slowdown is here to stay for a while. Therefore, an urgent need is felt by the government to grossly cutdown costs by slashing the non-operational manpower and at the same time, integrating and optimally utilising the existing man and material resources currently available with our armed forces. The present hierarchical order and organization of our defence forces are obviously not in a position to sustain such drastic changes of integration.

Post Covid-19 pandemic, which may lead to emerging of new power- blocks in world politics, India's strategic needs to effectively deal with a dominant China, Kashmir- obsessed Pakistan and other not- so friendly neighbours, would certainly not reduce and may perhaps demand more focus and allocation of additional resources.

Presently, Indian defence forces have 19 military commands: (Army-7, Air Force-7 & Navy-3 and 2 Joint commands). All these are located at various locations and control different geographical zones or specialized activities without many common attributes between them. We need to compare this scenario with other military powers of the world, such as China and US etc., to realistically assess our need to reorganize.

To illustrate, aiming to give more teeth to its defence forces, in 2016, China restructured its three defence arms into only 5 "theatre commands". While China's western command is required to deal with India and South Asia, its Southern Command strategically focuses on maritime requirements of South China Sea.

Similarly, other commands have also been formed. In addition, while implementing this reorganization, China had also planned to substantially reduce manpower. Similarly, even though US defence forces have a global role to play, yet they have only 9 Combatant Commands, which include 3 functional Combatant Commands and only 6 geographical Combatant Commands. Similar situation exists in a large number of other military powers of the world. If we take clues from such strategic concepts, India certainly needs to undertake substantial reforms, both in terms of reorganization and operational functioning. Nations have now realised that warfare can no longer be pursued by a single force alone.

Therefore, for India, one such suggestion is to establish 3 theatre commands:

1. Western Theatre Command – Integrating all army, air assets facing Pakistan
2. Eastern Theatre Command – Integrating all army, air assets facing China
3. Southern Theatre Command – Integrating army, air & naval assets of peninsular India (India surrounded by Arabian Sea on west, Bay of Bengal on east & Indian Ocean down south)

Additional commands to include:

- Integrated Air Defence Command pooling all air defence assets
- Strategic Forces Command for nuclear delivery systems
- Integrated Logistics Command for moving men & material
- Cyber Command for offensive cyber operations
- Special Forces Command integrating special operations from 3 services
- Space Command integrating all satellite assets.

Towards achieving similar aims in a timebound manner, newly organized department of military affairs consists of a blend of military and civilian officers under the CDS. This department comprises 2 joint secretaries, 13 deputy secretaries and 25 under- secretaries.

In addition, a number of working groups have already been formed in Service HQs to work out the modalities of the proposed plans. Presently, proposals such as formation of a joint Air Defence Command, which combines army, navy and air force's anti-aircraft weapons and creating common logistics support in stations, where more than one service is present, are presumably under active consideration of the CDS. In addition, CDS has asked defence services to have a major re-look at their operational priorities and what they really require, and not to insist on arms imports, which have become increasingly cost-prohibitive.

While the appointment of the CDS has been ostensibly welcomed by the defence chiefs and others, some significant issues, which may impact effective functioning of the CDS, both adversely and positively, deserve a mention. Some of these are briefly enumerated below:

1. The concept of CDS being the 'first among equals' may not be the best option in a military set-up, where clear hierarchy and command are the bedrocks of the structured organization. Status of the CDS, one rank above the defence chiefs, would have certainly been more appropriate.
2. Reorganization of defence organization would lead to substantial sharing of material resources and manpower, which may lead to considerable disputes or arguments. CDS would need extra discretion and competence to deal with such problematic situations.
3. The 3 arms of defence forces are known to have different ways of functioning, varying perceptions, conceptions and loyalties. CDS will have to win the trust of the 3 services through skilful guidance and leadership to help men in different uniforms tide over inter-service rivalry on highest priority.

4. On a positive note, unlike service chiefs, CDS being the secretary of newly formed department of military affairs, need not route his files through a secretary, and can directly approach the defence minister. However, as secretary, his status will remain at par with a service chief.
5. CDS would not have any operational role and military command over the 3 service chiefs. However, he would be heading prestigious inter-service organizations and will also be performing vitally significant roles in the functioning of Defence Acquisition Council and Nuclear Command Authority.

Let us hope that CDS will be able to bring about the proposed revamping of the defence forces so that the Indian armed forces become additionally capable of meeting security challenges of the modern warfare by adopting an integrated approach towards defence strategy.

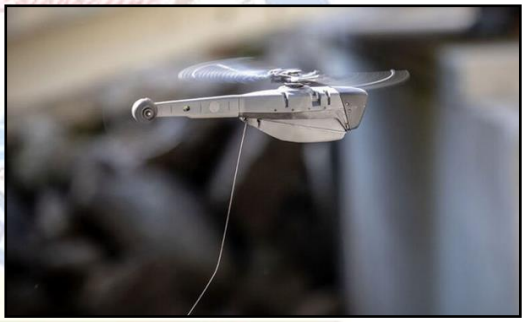
https://www.newsindiatimes.com/cds-is-the-single-point-military-advisor-to-indian-government/

DEFENCE AVIATION POST
Your Connect To The World Of Defence And Aviation

Sat, 06 June 2020

India plans to procure 150 micro drones for its army's special operations

India is scouting for Micro Remotely Piloted Aircraft System (Micro RPAS) for its army's infantry and plans to buy 150 of them through a tender that will be out by May 2021.



The Micro RPAS (Type B) will be used by the Indian Army's infantry men for situational awareness of their operational area and by Special Forces commandos during their operations such as the surgical strikes carried out in Sept. 2016 in Pakistan-occupied Kashmir.

The Indian Army seeks Micro RPAS "to have a light weight aerial surveillance platform with day and night sensors to enhance the situational awareness of the squad and troop involved in various special operations tasks," the Request for Information (RFI) document issued by the army said.

The army has stipulated that the Micro RPAS should be man portable, easy for a soldier to carry and operate. The system should have an operational range of up to five kilometres, weighing not more than six kilograms (All Up Weight) and endurance of not less than 60 minutes.

The system should be foldable and suitable to be carried on man pack basis. The Micro RPAS should be controlled by a ground controller with a data link established with Micro RPAS.

https://www.defenceaviationpost.com/2020/06/india-plans-to-procure-150-micro-drones-for-its-armys-special-operations/

INDIA TODAY

Sat, 06 June 2020

Exclusive: IAF gears up to fly India's VVIPs; Air India to 'co-pilot'

India Today TV has learnt that IAF will be operating the two newly-refurbished Boeing 777 that will be commissioned for VVIP services in the month of August. Initially, Air India pilots will be flying alongside their Air Force counterparts but eventually, the operations will be completely handed over to the IAF

By Poulomi Saha

New Delhi: The Indian Air Force is getting ready to fly India's top three dignitaries -- the President, the Vice-President, and the Prime Minister.

Unlike in the past, when both the Indian Air Force and national carrier Air India would fly the three VVIPs, henceforth it will only be the former that will be engaged in these services. This could possibly be because of plans to disinvest Air India, some sources suggested.

Indian Air Force is set to fly India's VVIPs in newly-refurbished dedicated Boeing-777s (File | PTI)

India Today TV has learnt that IAF will be operating the two newly-refurbished Boeing 777 that will be commissioned for VVIP services in the month of August. The new aircraft were expected to be commissioned by July, but they were delayed due to the Covid-19 outbreak.

Initially, Air India pilots will be flying alongside Air Force pilots as only the AI pilots have spent man-hours on the wide-bodied airliner.

In the process, Air India pilots will help their IAF counterparts clock sufficient flying hours on the B777 before "handing it over" to the latter, sources within the national carrier told India Today TV. Ground handling of the aircraft will remain with Air India, as before.

The national carrier invited applications on May 15 from its B777 Commanders, Line Training Captains (LTC), Type Rating Instructors and Designated Examiners for "hybrid operations with the IAF".

The letter, which India Today TV has in its possession, says that the pilots will be on deputation with Alliance Air for SESF or 'Special Extra Section Flights' which refers to VVIP aircraft.

So far, 40 of Air India's best pilots have been shortlisted for the job. Officials at Air India have confirmed that a group of 15-20 of these 40 senior-most pilots at the airline will finally land themselves the job.

Earlier, the VVIPs flew in B747-400s that were also flown by Air India pilots and B737s, flown by the IAF, used for short-haul flights.

According to Air India's invitation to its pilots, those selected will continue to be on the payrolls of Air India drawing salaries, allowance and annual increments as entitled to them.

Apart from the other benefits that they will be entitled to, the pilots will get a deputation allowance of 10 per cent of their basic pay, guaranteed 70 hours of flying allowance along with overtime, fixed layover allowance of $1200 per month, and LTC/Instructor/Examiner allowance as per applicable rates.

The invitation categorically states that "the pilots will undertake only IAF flight duties and shall undertake Air India flights only for the purpose of meeting license currency requirements if needed."

The deputation period has been stipulated to be two years, as per the invitation to apply.

So far, Indian Air Force sources have confirmed four of their pilots have been trained, and another group was in the process of getting trained when the Covid-19 outbreak halted plans. They hope to re-commence training soon, those privy to developments told India Today TV.

The two aircraft that will now be flying the VVIPs are refurbished B777-300ER. According to open-source intelligence inputs, the aircraft are not more than 2-3 years old and are part of Air India fleet.

These aircraft were sent to Dallas in the United States for military-grade upgradation. Experts say the aircraft will have the capability to counter missile attacks, and the features will be no less than those on the US President's jet, Air Force One.

The current VVIP planes, the ageing B747s known as 'Air India One', lack these enhanced features. They are also employed in regular commercial operations by Air India. The new aircraft though will be exclusively dedicated to flying the VVIPs.

Recently, a photograph emerged on the internet, clicked by a photographer Andy Golf who claimed to have caught one of the two aircraft mid-flight from San Bernardino to Fort Worth in the United States.

India Today TV cannot independently verify the authenticity of the photograph but Air India sources quipped that it'd be best to wait to see the aircraft as they touch down in India because even the livery on the alleged aircraft, they claimed, appeared incomplete.

https://www.indiatoday.in/india/story/exclusive-iaf-gears-up-to-fly-india-s-vvips-air-india-to-co-pilot-1685906-2020-06-05

THE FINANCIAL EXPRESS

Sat, 06 June 2020

Tour of Duty (ToD) entry scheme: Serious soldiering or trivial adventure?

As per the yet to be launched a scheme of entry, a person would serve for three years, including his training period, before being released from the Army to pursue work in the civil streets, most likely sans any post-retirement benefits

By Wing Commander Amit Ranjan Giri

A proposal by the armed forces about a very short tenure of duty, mainly to tide over the persistent manpower crisis and rising pension bills has found considerable support over the social media. As per the yet to be launched a scheme of entry, a person would serve for three years, including his training period, before being released from the Army to pursue work in the civil streets, most likely sans any post-retirement benefits. Industrial houses have also been quick to announce a possible recognition of the qualification for these individuals, post-retirement when they go on to join jobs outside.

Like all proposals, this too has had its fair share of criticism, especially from the veteran community who saw it merely as an extension of summer camps or extended adventure camps. Soldiering, they said, was much more serious business. Yes, soldiering is a serious business and though, reeks of romanticism when seen from outside, the story inside is contrary to the perception. Blood, sweat, toil and tears flow in the making of a soldier and it's not a short-lived adventure for him or her. Coming down to the specifics, the least amount of training to be an officer in the Indian Army is for a year, at the Officers' Training Academy (OTA) for Short Service Commission (SSC) cadre. The officers who pass out from the OTA are not finished product but only moulded raw material, just like their Indian Military Academy (IMA) counterparts.

The real training begins now, on the job, and many would agree never stops throughout the career. A year off for training from the three year period in the ToD scheme, would not make the

training cost-effective, neither would any reduction of training period make the person up to grade. The fact also remains that the entire exercise is based on voluntary service, which in any case, even now the forces are unable to find suitable volunteers for the SSC scheme. Does this mean, with this new proposal the Army would be ready to compromise on standards? Senior Army officials have also gone on record lauding and according to this scheme as an opportunity for the youth to taste the military way of life, which supposedly, has been the feedback from the various institution the publicity machinery of the Army visited.

Towards this, the existing projects funded by the government, the NCC and the Territorial Army being a couple of them, display adequacy. Why should a new scheme, albeit smaller, be more successful than these? Especially when a three-year tenure would be more or less compared to a passing affair. As far as the IAF and the Navy goes, the ToD scheme, in its present form, is virtually next to impossible to implement. Both being highly technology-intensive and equipment specific services, the training period to produce effective warriors is extensive. In the flying branch of the IAF, the gestation period for a pilot is anywhere from 3 to 6 years depending on the machine he flies and even then he is constantly learning, throughout his career.

"In one year we may make a pilot out of the boy, on a low tech trainer aircraft but teaching him the theories and tactical flying would take way longer than this, high-performance aircraft be it fighter, helicopters or transport is out of the question and once we complete, the service may have no defined gain from the entire exercise" opined an experienced Qualified Flying instructor, Group Captain Nair (Retd). The IAF could go the Coast Guard way of opening an SSC for Commercial Pilot Licence holders but even that was for 5 years and yes it did end for many individuals in sad stories sans any kind of post-retirement benefits. The entry has since been stopped. As far as the other branches of the IAF are concerned, training there too, is as extensive and like Army, the person learns mostly on the job, carefully guided by seniors, with requirements of passing internal assessments at every stage prior to new assignments. The Indian Navy too falls under the same category as the IAF.

"In three years he would barely learn to live with his seasickness let alone work" is a thought echoed by many sea-farers. The enthusiastic reaction of the Indian industries at this proposal is well-founded. During induction, they would get an individual who has had the privilege of organised group training and discipline. The ToD 'graduate' would have a better understanding of group dynamism and behaviour and the person would be more adept at crisis management than most of his peers who haven't undergone the ToD. All these for a three year older person surely is a win-win situation for the industry.

In its present format, if shown the light of day, the ToD would effectively remain an adventure camp, in the Army only. It is envisaged that the entrants would dwindle, over subsequent courses, some thwarted by the idea of a bullet flying at them in CI/CT ops and some by the idea of wasting three years of prime time, on a career they never want permanently. For those still seeking the adventure and adrenaline rush, avenues already exist. With no foreseeable advantage to the armed forces, the ToD scheme at present seems to be a juvenile proposal aimed at closing some unrelated HR gaps in the existing system.

(The author is an IAF veteran. Views expressed are personal.)

https://www.financialexpress.com/defence/tour-of-duty-tod-entry-scheme-serious-soldiering-or-trivial-adventure/1982527/

THE FINANCIAL EXPRESS

Sat, 06 June 2020

From 1962 to 2020: The battle hardened Indian Army

Our armed forces, in utter neglect of personal safety, went into battle in high altitude areas, under equipped and under clothed; they fought and gave their all for the country

By Brig Pradeep Bhatia

1962 saw an India emerging from the shadows of her struggle for Independence. The Nehruvian period with the Menons & Kauls in positions of leadership. The call for 'Hindi -Chini Bhai Bhai' resonated in the corridors of power. Somewhere someone made a remark suggesting that India did not require an Army!

Our armed forces, in utter neglect of personal safety, went into battle in high altitude areas, under equipped and under clothed; they fought and gave their all for the country.

Years later, taken by surprise at the sneaky manner in which the Pakistan Army Regulars mixed with Terrorists launched attacks on sensitive areas in 1999. We found ourselves pitched in Op Parakram, the Kargil War as it came to be known. The then Chief has been on record to say' We will fight with what we have' and we fought to eject the Pakistan forces with much success.

Intelligence and the ability to place under surveillance areas much beyond the line of sight was obviously the need of the hour in addition to the ability to pick up 'chatter ' in areas of communication, radio traffic, Internet, Satcom and more, apart from other means of purely military use.

Indo-Chinese Stand Off

Since 1962, India has a far improved infrastructure, stronger presence of 'Boots on Ground' better equipped and logistics.

Our ability to take on the Chinese was demonstrated in 1967 and is well documented, again in the year 1986, we experienced the Sumdorong Chu episode followed by Doclam in East Sikkim, and each of these was resolved to mutual satisfaction.

Admittedly, Doclam attracted much attention in the media and now we see much more about Ladakh!

Experts and Assessments

Reports of the numbers of Chinese troops, their Tanks and Artillery Guns being deployed are being debated by various media channels. 'Experts' some of whom have not even had the 'Honour' of serving or seeing that area and others quite insensitive to National Security talk of Strategy and India's Options as though these are an 'Over the Counter' drug which we can publicise! Some suggest that the Chinese have occupied a large chunk of Indian Territory while others deny this! Obviously these views are based on where you are looking at the issue from; if from an Indian perspective, then the Chinese have only come up to their claim lines, from the Indian perspective, they have violated a border understanding where in neither party should occupy an area under dispute! Had our troops occupied up to Finger 8 would the Chinese have accepted it?

Admittedly it does serve as a counter to Chinese propaganda and build a 'War Hysteria'.

Indian Army

The worlds 'Second Largest' and the most 'Battle Hardened Armies' in the modern world, Indian army today is not the Army of 1962 where our men fought with PT shoes on their feet in high mountains!

Spread across mountains, snow-clad areas, riverine terrain, jungles, deserts in addition to Cou8ter Terrorism and Responding to Disasters. World armies look to us for training! Our troops are in great demand for UN Missions too.

Campaigning Seasons and methodical systems of deployment have been arrived at and refined through the years, minimum force levels worked out in detail to thwart any surprise action by our adversaries. Be it 'Finger 4 'or elsewhere as in Naku La, areas which are being contested by both India and China as theirs.

The Military Leadership at the Levels of Command, Corps, Divisions, Brigades and below are par excellence. It is rare that one gets to see an army Commander who has fought a battle in Kargil, commanded a Division, the Corps and is now at the Command Headquarters in addition to his having been the Defence attaché to China.

Junior leadership at the levels of Commanding Officers and below, have proved their dedication and loyalty time over time even at the cost of lives, their commitment remains unquestionable.

The Indian Army is a funny animal if I may say so, troops on ground are committed to do their job regardless of what they have or do not have. It is called' Regimental Spirit & Regimental Pride'.

Intelligence, Build Up & War

Given modern-day technology, it is a given that almost all countries worth their salt have either their own ability to maintain a close watch on 'Units & Formations' which matter, this includes their move from permanent locations, forward deployment of aircraft, logistic build-up and so forth.

The agencies controlling such information as far as India is concerned, have state of art technology, in addition, there always is our 'super-spy organisation' and the NSA, Mr Ajit Doval who has more experience in such matters than anyone else in the country today. It needs to be said, however, that none of these is controlled by the Armed Forces.

Taking India by a surprise would appear a rather difficult task today and would require a very high degree of deception. I might add, apart from the Indigenous Technology available to India, there is every possibility of getting minute to minute inputs of every Chinese activity in the depth areas from our friendly countries. They need not be named.

Conclusion

Such incidents and events have a tendency to reoccur time and again. No one makes peace with a weak Nation and everyone wants peace with a strong one. The weak get what the strong give them and not what they desire!

With China and Pakistan adopting an aggressive stand, the encirclement of India by the Chinese along land borders, the Indian Ocean and South China Sea, Nepal taking a stand against India on territorial issues are likely to remain .The Dams planned by the Chinese in POK, Gilgit and North of Bhutan, the BRI in the West, Taiwan and Hong Kong, confrontation with the USA and our alignment with them, one can at best expect more tense moments.

India can ill afford to neglect her armed forces, in the foreseeable future, if at all, in the interest of National Security, our Armed forces require more muscle.

It is for the Government and policymakers to take a call and support the Defence Forces in a suitable manner. Our defence expenditure is therefore expected to rise until the 'Make In India' programme meet the requirement with suitable technology and equipment. A failure to do so may just prove more costly than spending on the desired equipment.

(The author is an Indian Army Veteran. Views expressed are personal.)

https://www.financialexpress.com/defence/from-1962-to-2020-the-battle-hardened-indian-army/1982575/

The Indian EXPRESS

Sat, 06 June 2020

Satellite imagery shows how Chinese changed status quo on Pangong bank

Colonel S Dinny, who was commanding officer of an Indian Army battalion at Pangong Tso between 2015 and 2017, told The Indian Express after looking at satellite images from May 27 that the structures were not there earlier

By Krishn Kaushik

New Delhi: An analysis of high-resolution satellite images of the Pangong Tso area in Ladakh shows that not only have the Chinese changed the status quo at the Fingers, the mountain spurs along the lake, but also built "substantial" structures in the contested region of the Line of Actual Control.

Colonel S Dinny, who was commanding officer of an Indian Army battalion at Pangong Tso between 2015 and 2017, told The Indian Express after looking at satellite images from May 27 that the structures were not there earlier.

"That definitely was not there before. It is not a normal thing that goes on between Finger 4 and Finger 8. It is what we call a change in status quo in the disputed area."

Satellite images from May 27 showing Chinese tents on the north bank of Pangong Tso. Planet Labs via Reuters

He said the Chinese have in the past pitched tents in the region but not on the scale as now, and this will not be acceptable to India. The structures visible now, he said, may not be able to house "thousands" of Chinese troops "but definitely a substantial number can be accommodated".

"This time, there is a substantial number (of tents), no doubt. One cannot make out how many troops are there. Have they been taken off? One cannot be sure. That kind of activity has happened before. In all probability, after the talks between the Generals, this will also be taken off. I don't see anything else being acceptable to our side," Dinny said.

The May 27 images by Planet Labs show dozens of new structures, most likely tents, that have come up between Finger 8 and Finger 4 on the north bank of Pangong Tso, one of the main points of contention in the current standoff.

The hills protrude into the lake like fingers, and are numbered 1 to 8 from west to east. According to India, the LAC lies at Finger 8, but China points to Finger 4.

The distance between Finger 4 and Finger 8, Dinny said, is about 8 km. It would mean that the Chinese have now camped 8 km inside the area which India claims.

He said India has a "proper post between Finger 3 and Finger 2" and an "administrative base between 3 and Finger 4," which is used during patrols. Similarly, China has "an administrative base on the other side of Finger 8".

Recalling his stint there, he said: "There was no construction between Finger 4 and Finger 8. No permanent construction, not even tents."

While Dinny is not sure if the Chinese have removed the tents since May 27, sources in Delhi told The Indian Express that the Chinese are now stationed till Finger 4, and are not allowing Indian troops to go beyond it.

https://indianexpress.com/article/india/satellite-imagery-shows-how-chinese-changed-status-quo-on-pangong-bank-6444803/

THE HINDU

Sat, 06 June 2020

China appoints new PLA commander for India border

Lieutenant General Xu Qiling has been appointed as the new commander of the PLA Western Theater Command Ground Force, or Army

By Ananth Krishnan

China has appointed a new Army General to oversee the People's Liberation Army (PLA) Ground Forces on the India border, amid ongoing tensions across the Line of Actual Control (LAC). The new appointment was first publicly confirmed in a report on June 1, that identified Lieutenant General Xu Qiling as the new commander of the PLA Western Theater Command Ground Force, or Army.

Army patrol teams along the Line of Actual Control with China. File | Photo Credit: Dinakar Peri

Lt Gen Xu will report to General Zhao Zongqi, who is commander of the Western Theater Command and oversees all forces there, including the Ground Force or Army, Air Force and Rocket Force. The command is responsible for the India border and is the biggest of five theater commands. Theater commands are usually headed by generals.

Gen. Zhao was also the Western Theater Commander during the 2017 Doklam stand-off. In October 2017, he was also appointed to the Communist Party's 19th Central Committee.

Gen. Zhao's counterpart in the Eastern Theater Command, General He Weidong, was previously in charge of the PLA's Ground Forces in the west, before his promotion in January to head the entire Eastern Theater Command.

Lt. Gen Xu's appointment can be thought of a lateral move, as he previously held the same position in the Eastern Theater Command as Commander of its Ground Forces.

Indian and Chinese forces have been in stand-offs along the LAC since early May. Talks will be held at the Lieutenant-General level on June 6 to resolve the situation.

Two former Indian Generals said Wednesday that the current stand-offs were different from past incidents, which were generally localised. The scale of the stand-offs in at least four different spots on the LAC and in two sectors suggested a higher level of planning, they said.

"The fact of the matter is some kind of planning has gone through before these multiple face-offs," said Lt Gen (retd) S.L. Narasimhan, Member, National Security Advisory Board. "Earlier, they used to take place in one place. This time there have been multiple face-offs and geographically spaced out, in Sikkim, Pangong Tso and Galwan. The kind of numbers we see is also not what we saw earlier, and the aggression has been more than normal."

"Normal face-offs happen every year, they don't lead to these kind of incidents," added Lt Gen (retd) D.S. Hooda, former Northern Army Commander. "This is much more serious. They have come completely well prepared and prepared to do things by force. We have never seen this level of violence."

The Western Theater Command will be the point of responsibility for managing the situation, and Lt Gen Xu and Gen Zhao are likely to be involved in the decision-making.

Only in January, India's then Northern Army Commander Lt Gen Ranbir Singh headed a delegation to China, and met with Gen Zhao at the command's headquarters in Chengdu in a visit aimed at improving communication between the militaries.

https://www.thehindu.com/news/international/china-appoints-new-pla-ground-forces-commander-for-india-border/article31755182.ece

TIMESNOWNEWS.COM

Sat, 06 June 2020

'Committed to resolve border dispute', says China ahead of key military talks with India

The two sides have already held at least 10 rounds of negotiations between local commanders as well as major general-rank officials of the two armies but the talks did not yield any positive result

Beijing: China on Friday said that it is committed to properly resolve the "relevant issue" with India ahead of the key talks between senior Indian and Chinese military officials on Saturday to end the border standoff.

PM Modi with Chinese President Xi Jinping | Photo Credit: PTI

Both the sides are expected to deliberate on specific proposals to end the month-long bitter standoff in eastern Ladakh during the first extensive talks between the Indian and Chinese military on Saturday, led by lieutenant generals from both the armies.

Chinese Foreign Ministry spokesman Geng Shuang told a media briefing here that "at the moment the situation in the boundary region between China and India is overall stable and controllable".

"We have full-fledged border-related mechanisms and we maintain close communications though military and diplomatic channels," he said when asked about reports that Indian and Chinese military officials are due to hold talks on Saturday.

"We are committed to properly resolve the relevant issue," Geng said.

The general officer commanding of Leh-based 14 Corps, Lt Gen Harinder Singh, is expected to represent India at the talks which is scheduled to be held at one of the border meeting points, the official sources in New Delhi said.

The Indian side is expected to present specific proposals at the talks to de-escalate tension in Pangong Tso, Galwan Valley and Demchok -- the three areas in eastern Ladakh where the two sides have been on a bitter standoff for the last one month, the sources said.

It is not immediately known what will be the proposals that the Indian military will take to the negotiating table but it is understood that it will insist on return to status quo in all the areas.

The two sides have already held at least 10 rounds of negotiations between local commanders as well as major general-rank officials of the two armies but the talks did not yield any positive result, they said.

It is learnt that two sides are also engaged in diplomatic talks to find a solution to the face-off which is turning out to be the most serious military standoff between the two armies after the Doklam episode of 2017.

After the standoff began early last month, the Indian military leadership decided that Indian troops will adopt a firm approach dealing with the aggressive posturing by the Chinese troops in all disputed areas of Pangong Tso, Galwan Valley, Demchok and Daulat Beg Oldie.

The Chinese Army is learnt to have deployed around 2,500 troops in Pangong Tso and Galwan Valley besides gradually enhancing temporary infrastructure and weaponry.

India has also been bolstering its presence by sending additional troops and artillery guns, the sources said.

The trigger for the face-off was China's stiff opposition to India laying a key road in the Finger area around the Pangong Tso Lake besides construction of another road connecting the Darbuk-Shayok-Daulat Beg Oldie road in Galwan Valley.

The troops of India and China were engaged in a 73-day stand-off in the Doklam tri-junction in 2017 which triggered fears of a war between the two nuclear-armed neighbours.

The India-China border dispute covers the 3,488-km-long LAC. China claims Arunachal Pradesh as part of southern Tibet while India contests it.

Both sides have been asserting that pending the final resolution of the boundary issue, it is necessary to maintain peace and tranquillity in the border areas.

https://www.timesnownews.com/india/article/china-says-committed-to-properly-resolve-border-standoff-with-india-ahead-of-key-military-talks/601981

Science & Technology News

Business Standard

Sat, 06 June 2020

ISRO turnover to zoom if units converted into separate entities: Official

The best of the efforts in innovation in such a large industry, the conversion in product outputs are meagre to the extent of 5 to 10 per cent, he adds

Chennai: The sum of the turnover of Indian space agency's various divisions if spun off into different business entities will surpass that of its behemoth parent owing to focused leadership and innovation, said a senior official of the Indian Space Research Organisation (ISRO).

He said the best of the efforts in innovation in such a large industry, the conversion in product outputs are meagre to the extent of 5 to 10 per cent.

"If ISRO is restructured in terms of smaller single-focus business entities like payload, satellite, rocket engine production, launcher integration and launch services, tracking and satellite maintenance services, the sum of turnovers of these individual entities will surpass substantially in comparison to the same by the ISRO behemoth," said Tapan Misra, Senior Advisor, ISRO and former Director, Space Applications Centre, ISRO.

"The reason for improvement will be the encouragement of innovation by single focus leaderships. Many mammoth MNCs like Google, Microsoft, Space X, Boeing, and many others co-opt or fund or usurp innovative startups to create and absorb innovations. In India to reach this level, we may have to wait a few more years," Misra said.

He said every industry will come to a saturation point in terms of product output and even an increase in input resource-capital and manpower, there will be hardly any increase in output beyond saturation point.

"Innovation in business processes or manufacturing methods and strategies can improve efficiency. It means the saturation point can be achieved with lesser input resources. On the other hand, innovation on simplification of product design or bringing in more productive capital goods, i.e., the more efficient machinery to manufacture the products will raise the saturation output at same or lesser resources," Misra said.

Behemoths like ISRO with multiple focus points will be resistant to innovations owing to inertia and occupation of leaders' mind, to run the behemoth industry itself in the present avatar, he added.

Pointing out technology will become stagnant and innovations discouraged in the absence of competition, Misra said that monopoly does not incentivise the emergence of capable, forward-looking and risk-taking innovative leadership.

According to him, many of the monopolies were established, with sagacious minds as leaders, with an aim to bring the country in the front line of strategic sectors.

"Unfortunately, many wise men prefer less competent subordinates and successors in order to satisfy their desire of stranglehold in the organisation when in service and out of service. This leads to the gradual degradation of the leadership quality with successive transitions, leading to stagnation in technology and services," he said.

Market forces can play a role in promoting effective leadership as the profit and expansion are the prime motivation. It leads to re-emphasis of merit and leads to a better innovative environment.

https://www.business-standard.com/article/companies/isro-turnover-to-zoom-if-units-converted-into-separate-entities-official-120060500599_1.html

Devdiscourse
Discourse on Development

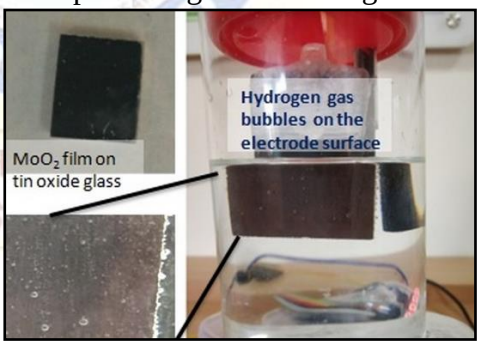
Sat, 06 June 2020

CeNS to generate hydrogen from water using Molybdenum dioxide as catalyst

The scientists have shown that Molybdenum dioxide (MoO2) nanomaterials annealed in hydrogen atmosphere can act as efficient catalysts to reduce the energy input to bring about water splitting with great efficiency

New Delhi: Scientists from The Centre for Nano and Soft Matter Sciences (CeNS), an autonomous institute of the Department of Science and Technology (DST), have found out a low cost and efficient way to generate hydrogen from water using Molybdenum dioxide as a catalyst.

The scientists have shown that Molybdenum dioxide (MoO2) nanomaterials annealed in hydrogen atmosphere can act as efficient catalysts to reduce the energy input to bring about water splitting with great efficiency. Electrolytic splitting of water is a promising method to generate hydrogen but requires energy input that can be brought down in the presence of a catalyst.



Molybdenum dioxide has the potential to replace the currently employed catalyst Pt, which is expensive and has limited resources. Image Credit: Twitter(@IndiaDST

Molybdenum dioxide has the potential to replace the currently employed catalyst Pt, which is expensive and has limited resources. MoO2 is a conducting metal oxide that is one of the low-cost catalysts with good efficiency and stability for hydrogen evolution.

The researchers were able to grow MoO2 directly on to tin oxide substrates for direct use as a catalyst in electrochemical cells, avoiding the need for any further electrode fabrication process. It can also be obtained as a powder in high yield from cheaper precursors in an aqueous medium. Their research has been published in Chemistry- a European scientific journal.

Dr Neena S John and co-workers from CeNS have been able to grow metallic MoO2 nanostructures on tin oxide glass and have shown that the voltage required to obtain high current density (or higher amount of hydrogen) is close to that of Platinum in acidic medium. The catalyst can be easily synthesized in the form of powder as well, with high yield from cheaper reagents such as ammonium molybdate and citric acid in water.

Mr Alex C., a research scholar, working on this material stresses that 'this metal oxide nanomaterial is a cheaper alternative to the precious noble metal catalysts such as Platinum, presently employed in industry for water electrolysis.' The catalyst is highly stable for a longer duration of reaction with sustained hydrogen evolution from water. About 80 % efficient conversion of electrical energy into hydrogen has been achieved using this catalyst.

Hydrogen is considered as the future of clean and sustainable energy as it can be generated from water and produces water on energy generation without any carbon footprint. Hydrogen can be directly used as a fuel similar to natural gas or as input for fuel cells to generate electricity. It is the future energy for a clean environment and an alternative to fossil fuels, underlining the necessity of low-cost catalysts for its production. (With Inputs from PIB)

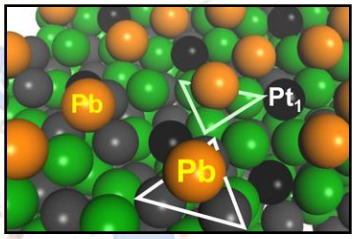
https://www.devdiscourse.com/article/science-environment/1080278-cens-to-generate-hydrogen-from-water-using-molybdenum-dioxide-as-catalyst

MIRAGE

Sat, 06 June 2020

Ultrastable, selective catalyst for propane dehydrogenation developed

A group of Japanese scientists has developed an ultrastable, selective catalyst to dehydrogenate propane – an essential process to produce the key petrochemical substance of propylene – without deactivation, even at temperatures of more than 600°C.



Propylene is an important raw material for plastics, synthetic rubber, surfactants, dyes and pharmaceuticals. In recent years, there has been an increased demand for propylene produced from cheaper, shale-originated propane. Reaction temperatures of more than 600°C are necessary to obtain sufficient propylene yields, but under these harsh conditions, severe catalyst deactivation is inevitable due to carbon deposition and/or sintering. Catalysts in practical use, therefore, must be regenerated either continuously or in short cycles, making the process inefficient and costly.

In the present study, the group, including a master's student Yuki Nakaya and Associate Professor Shinya Furukawa at Hokkaido University's Institute for Catalysis, focused on the intermetallics (PtGa) of platinum (Pt) and gallium (Ga), which have unique properties and structures. PtGa has a high thermal stability and its structure does not change even under high temperatures. It is also known to have two kinds of catalytic sites on its surface: a site with three Pt atoms (Pt_3 site) and one with single-atom-like isolated Pt (Pt_1 site).

The group hypothesized that if the Pt_3 sites – which facilitates carbon deposition in addition to producing propylene – is disabled to allow only the Pt_1 sites to function, the catalyst will be ultrastable and also able to prevent carbon deposition. The group tried various metals and catalyst synthesis methods to make only the Pt_1 site function.

On the surface of the newly developed catalyst (PtGa-Pb/SiO2), Pt1 sites remain exposed to facilitate catalytic reaction while Pt3 sites (and Ga3 sites) shown with triangles are blocked by Pb. (Yuki Nakaya, et al., Nature Communications, June 5, 2020)

The newly developed catalyst ($PtGa-Pb/SiO_2$), which is silica-supported and made by adding lead (Pb) to the surface of PtGa, exhibits no deactivation when dehydrogenating propane at 600°C. The catalyst maintained the initial conversion rate of 30 percent for 96 hours after the reaction started, which is significantly more stable than conventional catalysts. Propylene selectivity is as high as 99.6 percent with few side reactions, including carbon deposition. The results showed that this catalyst produces the world's best performance at temperatures of 580°C or higher. In particular, its life span is more than twice as long as the previous reported record longevity for such catalysts. Furthermore, the catalyst can be produced as cheaply as conventional catalysts. Their structural analysis confirmed Pt_3 sites, not Pt_1 sites, were covered and disabled by Pb, as they expected.

"Our finding could lead to a more efficient and cheaper industrial process to produce propylene from propane without the need for catalyst regeneration – which is far superior in selectivity and

stability than conventional ones," says Furukawa. "Moreover, this method could be applicable to dehydrogenation of other lower alkanes such as ethane and isobutane, thus contributing to the petrochemical industry's development."

Original article:

Yuki Nakaya, et al., Single-atom Pt in intermetallics as an ultrastable and selective catalyst for propane dehydrogenation, Nature Communications, June 5, 2020.

DOI: 10.1038/s41467-020-16693-9

https://www.miragenews.com/ultrastable-selective-catalyst-for-propane-dehydrogenation-developed/

Science Focus
THE HOME OF BBC SCIENCE FOCUS MAGAZINE

Sat, 06 June 2020

Faster-than-light travel: Is warp drive really possible?

A NASA scientist recently released a report analysing the feasibility of warp drive as a means of faster-than-light travel. Could this Star Trek technology really be possible?

By Sara Rigby

In the Universe of *Star Trek*, humanity ventures out into the Galaxy on 5 April 2063 with the first ever journey on a ship capable of faster-than-light travel. The newly-invented 'warp drive' not only lets humans explore the cosmos, but attracts the attention of Vulcans and brings about our first contact with an alien species.

It's been 54 years since we were first introduced to the *Enterprise*, and many of *Star Trek*'s futuristic technologies have since been invented, from handheld communicators to universal translators. Warp drive is the next obvious choice: the fastest human-built spacecraft so far is Voyager 1, which took nearly 35 years to leave the Solar System. Not exactly handy for interstellar travel.

Luckily for humanity, theoretical physicists have been working on it. In May 2020, NASA scientist Harold "Sonny" White released an internal feasibility report discussing the technology from the point of view of 'early mission planning'.

The first scientific theory of warp drive came about in 1994, when theoretical physicist Miguel Alcubierre used Einstein's theory of General Relativity to develop a framework that would allow faster-than-light travel within the confines of the laws of physics. The key that makes it possible is that, technically, the ship itself doesn't travel faster than light.

"What warp drive is doing is basically saying that there is no law of physics that says space-time itself can't go faster than the speed of light," says Dr Erin Macdonald, astrophysicist and science consultant for *Star Trek*.

"And so the concept of warp drive is to say, all right, let's take our ship, let's build a bubble of space-time around it, and then we'll have that propel us faster than the speed of light," she says. It's similar to the idea of a racecar driving onboard a train: someone standing by the tracks would see the car travelling much faster than its top speed.

According to General Relativity, the Universe is a flat sheet of space-time which is warped by any object with mass. "We think of the bowling ball on the trampoline and that bowling ball dips the trampoline down," says Macdonald, "and that's what mass does to space-time." This distortion of space-time is what we experience as gravity.

The Alcubierre drive uses the same concept. The 'bubble' surrounding the ship is an area of space-time that is compressed in front of the ship and expanded behind it. As with gravity, you could create this distortion using a large amount of mass. Alternatively, thanks to Einstein's $E = mc^2$ (energy is equal to mass, times the speed of light squared), you could equally use a huge amount of energy.

Inside the bubble, space-time is completely flat, meaning the space travellers wouldn't notice any strange, relativistic effects. The result is that the bubble of space-time is hurled across the Universe, with the travellers sitting comfortably inside their ship, speedometer still reading the same number.

Unfortunately, actually creating a warp drive is even harder than it sounds. "You have to have a very, very large amount of energy," says José Natário, Associate Professor in mathematics at the Instituto Superior Técnico in the University of Lisbon.

"To have the deformation that you need for this kind of thing to work, you'd need much, much more energy than the Sun or the Galaxy," he says. "But also, it's negative energy."

Negative energy is not something that we can currently create – certainly not in the quantities needed to power a warp drive. How could energy be negative at all?

One way to think about it is to consider a particle with negative mass. These particles would react to gravity in the exact opposite way to particles of positive mass. Instead of being pulled towards a planet or star, they would be thrown away.

"If we had some sort of component like that where we had a negative mass, whatever is keeping that mass together would be that negative energy," says Macdonald.

This isn't a problem that will go away with refining the idea, either: Natário proved mathematically that any form of warp drive will require negative energy.

Joseph Agnew is a graduate student at the University of Alabama in Huntsville whose undergraduate work on warp drive was published in the AIAA journal. He thinks that more research into the fundamentals of physics is the way forward for warp drive.

"Further experimental study of naturally occurring gravitational waves and perhaps a study on trying to generate artificial gravitational waves would really advance the understanding of gravity, and therefore spacetime and all the connected science," Agnew says.

Natário believes there's an even greater problem with the concept of the Alcubierre drive. Imagine a supersonic aircraft travelling faster than the speed of sound. You don't hear the aircraft until it has already gone past, because the sound waves can't keep up. The warp drive experiences the same effect with light waves, meaning there is no way to send a message ahead of you.

"I call it the 'you need one to make one' problem," says Natário. How do you create the warped space-time geometry around your ship? First, you would need to send a signal ahead of you to 'tell' space-time to warp, Natário says. "To make it go faster than light, you need something that would be going faster than light to begin with so that you'd be able to communicate outside the horizon."

These two problems – combined with the slight issue that the travelers would be bombarded with incredibly high-energy radiation – are the downfall of warp drive, Nátario believes. "The bottom line is, in my opinion, it's completely impossible," he says.

Agnew is more optimistic. "Many of these theoretical space transportation concepts rely extensively on a thorough understanding of gravity and spacetime, which just isn't the case currently," he says.

"I don't yet see any way we can say, with absolute certainty, that it will 'never happen in a million years'. When in doubt, history dictates it's better to err on the side of cautious, scientific optimism."

Macdonald, too, is hopeful. "I'm an eternal optimist with this because I want to join Starfleet," she says. "The way I think about it is it's like we never know what's going to come down the pipe with sort of these weird, exotic, fun thought experiments.

"I agree at this stage, right now, it's a fun thought experiment. But that's not to preclude some massive discovery that may happen that we can't predict."

https://www.sciencefocus.com/news/faster-than-light-travel-is-warp-drive-really-possible/

COVID-19 Research News

ThePrint

Sat, 06 June 2020

Sun Pharma gets approval to test plant-based dengue drug for Covid treatment

Sun Pharma said human safety study of AQCH already completed, clinical trials will be conducted across 12 centres on 210 patients. The treatment duration will be 10 days

By Himani Chandna

New Delhi: Sun Pharmaceutical, the country's largest drugmaker, has received permission from the country's apex drug regulatory body to start clinical trials of a plant-based drug, AQCH, to see if it can treat Covid-19 patients.

The Sun Pharmaceutical Industries Ltd. logo | Photographer: Jasper Juinen/Bloomberg

It is the first phytopharmaceutical drug that the Drug Controller General of India (DCGI) has approved for clinical trial for Covid-19. Meant for the treatment of dengue, AQCH is still in the trial stage.

"The clinical trial will be conducted across 12 centres in India in 210 patients. The treatment duration for patients will be 10 days. The results of the clinical trial are expected by October 2020," the company said in a press statement issued Friday.

"Human safety study of AQCH has already been completed and the drug has been found safe at the recommended dose for Phase II study," it said.

ThePrint reported in April the Mumbai-based drugmaker has submitted a proposal to the DCGI to conduct limited randomised trials to test the efficacy of the drug in treating Covid-19.

The company has been developing the phytochemical-based drug to treat dengue for the last four years in collaboration with the Department of Biotechnology International Centre for Genetic Engineering and Biotechnology (DBT-ICGEB) and the Council of Scientific and Industrial Research (CSIR).

The clinical trials will be conducted by Sun Pharma in collaboration with the DBT-ICBEB and CSIR.

Dengue drug to be repurposed

AQCH has shown broad antiviral effect in in-vitro studies and is, hence, being tested as a potential treatment option for Covid-19, the company said.

Since 2016, Sun Pharma has been working very closely with the Department of Biotechnology (DBT), which functions under the Ministry of Science and Technology, to develop a phytopharmaceutical drug for dengue.

Dilip Shanghvi, Managing Director, Sun Pharma, said in the statement: "This is the first phytopharmaceutical drug approved for clinical trials by the DCGI as a potential treatment for Covid-19."

Shanghvi added: "AQCH has shown anti-SARS-CoV-2 effects in in-vitro studies conducted in collaboration with ICGEB, Italy. These results combined with information on mechanism of action through in-vitro and small animal studies give us the confidence to evaluate this potential treatment option for Covid-19 patients."

Dr Renu Swarup, Secretary, Department of Biotechnology, said: "Our efforts to develop a safe, effective and affordable drug against dengue started about 13 years ago. The collaborating team quickly initiated studies for the development of a drug against Covid-19."

'Covid & dengue viruses behave similarly'

The plant-based drug is made by using cissampelos pareira (Cipa) plant variety, which is a natural source of potent antiviral activity against all four dengue virus serotypes.

The company had said coronavirus and dengue-causing viruses behave similarly in the human body.

According to a study published in the Public Library of Science in 2015: "Cipa in addition to inherent antipyretic activity in Wistar rats, it possessed the ability to down-regulate the production of TNF-α, a cytokine implicated in severe dengue disease. Importantly, it showed no evidence of toxicity in Wistar rats, when administered at doses as high as 2g/Kg body weight for up to 1 week."

The research concluded that it "warrants further work to explore Cipa as a source for the development of an inexpensive herbal formulation for dengue therapy. This may be of practical relevance to a dengue-endemic resource-poor country such as India".

https://theprint.in/health/sun-pharma-gets-approval-to-test-plant-based-dengue-drug-for-covid-treatment/436187/

THE LANCET

Sat, 06 June 2020

COVID-19 vaccine development pipeline gears up

By Asher Mullard

Vaccine makers are racing to develop COVID-19 vaccines, and have advanced ten candidates into clinical trials. But challenges remain. Asher Mullard reports.

Vaccine development is typically a long game. The US Food and Drug Administration only approved a first vaccine against Ebola virus last year, 43 years after the deadly virus was discovered. Vaccinologists have made little headway with HIV or respiratory syncytial virus, despite huge investments. On average, it takes 10 years to develop a vaccine. With the COVID-19 crisis looming, everyone is hoping that this time will be different.

It might be. Already, ten vaccines against severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) are in clinical trials (table), and researchers at the University of Oxford and AstraZeneca hope to have the first phase 3 data in hand this summer. Although many infectious disease experts argue that even 18 months for a first vaccine is an incredibly aggressive schedule, a few optimists believe that hundreds of millions of doses of vaccine might be ready for roll-out by the end of 2020.

"What's happened so far has been nothing short of amazing", says Penny Heaton, a vaccinologist and chief executive officer (CEO) of the Bill & Melinda Gates Medical Research Institute. Previous investments in new vaccine technology platforms made this possible, she adds.

Indeed, several of the most advanced vaccine candidates make use of emerging technology platforms. Moderna's mRNA-1273, which entered into clinical trials just 66 days after SARS-CoV-2 was first sequenced, showcases the potential for nucleotide-based vaccines. Like traditional live-virus vaccines, these vaccines deliver a genetic sequence into a host cell, and co-opt host machinery to express antigens of interest. However, rather than using a weakened SARS-CoV-2 to

transport the code, Moderna's vaccine uses a synthetic lipid nanoparticle to carry mRNA templates. Like most other COVID-19 vaccines in development, Moderna's candidate attempts to train the immune system to recognise SARS-CoV-2's spike protein, which the virus uses to bind to and enter host cells.

	Developer	Properties	Development status
mRNA-1273	Moderna and NIAID	mRNA vaccine	Phase 2
BNT162	BioNTech and Pfizer	mRNA vaccine	Phase 1/2
INO-4800	Inovio Pharmaceuticals	DNA vaccine	Phase 1
AZD1222	University of Oxford and AstraZeneca	Adenovirus vaccine	Phase 2b/3
Ad5-nCoV	CanSino Biologics	Adenovirus vaccine	Phase 2
Unnamed	Wuhan Institute of Biological Products and Sinopharm	Inactivated virus	Phase 1/2
Unnamed	Beijing Institute of Biological Products and Sinopharm	Inactivated virus	Phase 1/2
PiCoVacc	Sinovac	Inactivated virus, plus adjuvant	Phase 1/2
Unnamed	Institute of Medical Biology and Chinese Academy of Medical Sciences	Inactivated virus	Phase 1
NVX-CoV2373	Novavax	Protein subunit	Phase 1/2

Table: **COVID-19 vaccines in clinical trials**

The University of Oxford and AstraZeneca have embraced a recombinant vaccine called AZD1222 to achieve a similar effect, engineering a chimpanzee adenovirus to carry DNA for the spike antigen. Because adenoviruses are themselves immunogenic, such types of approach could generate robust memory B cell and T cell responses that might result in better prophylaxis with fewer doses.

But neither nucleotide-based nor adenovirus-based approaches have ever produced a vaccine that has been approved in the USA or the EU before. It remains to be seen whether mRNA-encoded antigens can confer sufficient protection against pathogens. Earlier attempts with adenovirus vaccines disappointed, at least partly because some recipients had pre-existing immunity to the first adenovirus vectors that were trialled. Additionally, although both platforms offer theoretical manufacturing advantages over established platforms, neither has ever been produced or distributed at scale before.

Others are focusing on more established technologies. Sanofi and GlaxoSmithKline, two of the four top vaccine producers, are working together on a protein subunit approach. Their lead vaccine

candidate consists of the spike antigen itself, combined with an immunogenic adjuvant to trigger a strong immune response. The two companies hope to start a phase 1 trial later this year.

A few companies are also focusing on whole-virus approaches, in which weakened or killed SARS-CoV-2 is used to teach the immune system what to recognise.

In total, WHO lists more than 100 candidates in preclinical development. Many of the preclinical programmes exist on paper rather than in reality, cautions Wayne Koff, CEO of the Human Vaccines Project. Nevertheless, he adds, it is encouraging to have multiple advanced options to choose from, given the relative pros and cons of each. “Everybody has their favourite horse”, says Koff. Everything else being equal, he adds, his preference is to err on the side of platforms that are tried and true.

While vaccinologists hope that multiple vaccines will make it to the finish line, in part to alleviate manufacturing challenges, the odds are stacked against success. “All the platforms will not work”, says Adrian Hill, a vaccinologist at the University of Oxford and part of the team developing AZD1222. The typical success rate for vaccine development is 6%.

With reassuring preliminary preclinical and phase 1 data starting to trickle in, larger trials are now needed to separate any contenders from pretenders. Despite the need for speed, though, caution is needed. A flurry of small and rapidly designed clinical trials of proposed COVID-19 drugs has left the medical community with as many questions as answers on the safety and efficacy of these agents. The stakes are higher still with vaccines. A key concern is that ineffective vaccines could exacerbate disease, through antibody-dependent enhancement or other mechanisms.

As the community grapples with how to quickly and efficiently generate high-quality data, a few questions loom large. “One of the most important things that we need to understand is what is the attack rate”, says Melanie Saville, director of vaccine development at the Coalition for Epidemic Preparedness Innovations (CEPI), which is working to coordinate global COVID-19 vaccine development. The higher the attack rate—the percentage of the population that will contract the disease over a given time—the faster a robust, event-based trial can get results.

Other factors are also in play. Some vaccinologists argue that vulnerable individuals and front-line health-care workers should be prioritised for any eventual vaccination. But vulnerable individuals, including older people, who are following physical-distancing recommendations should have lower event rates, increasing the sample size and time needed to collect efficacy data in these patients. Because aged immune systems are not as effective as younger ones, the results in one population might not translate to the other.

The University of Oxford and AstraZeneca, the first to begin phase 3 studies, are focusing primarily on healthy adults aged 18–65, both who work in front-line health-care settings and the general public. Their 10 000-participant trial is already underway in the UK. The trial is also recruiting a small number of older adults and children to start assessing efficacy in these cohorts. “We may not answer all the questions in one trial. But the absolutely key thing is to get enough efficacy data to figure out whether this works”, says Hill. A larger trial of this vaccine, in 30 000 volunteers in the USA, is also in the works for this summer.

Researchers at the US National Institutes of Health, WHO, and elsewhere are considering other options too. Challenge trials, in which volunteers are vaccinated and then treated with live virus, could speed things up. But the ethics and scientific merits of this approach remain up for debate. Umbrella trials, meanwhile, could be used to test multiple vaccines under a single trial protocol. By standardising decisions such as recruitment criteria and endpoints, these trials make it easier to compare and contrast any findings. There can also be pragmatic benefits, such as the ability to use a single placebo arm to reduce the overall size and cost of these trials.

However, umbrella trials are hard to coordinate at the best of times. “We tried to do this with tuberculosis vaccines, malaria groups tried to do it, HIV groups tried to do it. It just never happened”, says Thomas Evans, CEO at Vaccitech, an Oxford University spin-out that helped develop the platform on which AZD1222 is based. “It's difficult from both a regulatory and organisational point of view.”

And there is little time to spare. “When you find a high transmission place, you don't want to wait until the whole thing is coordinated to go in”, says Hill. His team is racing ahead while the virus is still raging in the UK.

It might be possible to get the best of these master protocols without the organisational pains they entail, adds Heaton. If the community can rally around agreed-on design features, such as endpoints and case definitions for adverse events at the outset, the results will be more comparable even if they are not officially from a single trial. “There are a lot of groups working towards that, so I'm hopeful”, says Heaton.

Vaccine developers will also need to align behind correlates of immunity, the immune response biomarkers that are measured in a laboratory to assess the effects of vaccination. When successes are claimed, independent validation will be needed to ensure that only the best candidates are moved forward. “I feel passionately that correlates of immunity should be tested in a centralised lab”, says Hill. “What I really want is head-to-head comparisons of the immune responses in different trials.“ At a minimum, he adds, correlates of immunity assays need to be standardised.

Global appetite for any successful vaccines, if and when they are ready, will bring its own difficulties. Developers are starting to scale up production even now, despite the risk that their favoured candidates will fall short. Distribution, delivery, and administration need to be worked out. And then there is the issue of access. With the public sector investing heavily in the development of these vaccines, there are growing calls for universal vaccine accessibility, but nationalistic, geographical, and commercial factors could stand in the way.

“We absolutely need COVID-19 vaccines available globally”, says Heaton. “We'll have to wait and see how things play out.”

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31252-6/fulltext