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CONTENTS

S. No.	TITLE	Page No.
DRDO News		1-14
DRDO Technology News		1-14
1.	DRDO Chief flags off Varunastra	1
2.	स्वदेशी हैवीवेट टॉरपीडो वरुणास्त्र नौसेना में शामिल, विशाखापत्तनम में हरी झंडी दिखाकर किया रवाना	2
3.	DRDO flags off first Varunastra, a heavy weight torpedo	3
4.	DRDO Chairman inaugurates air launch test facility in Vizag	3
5.	भारत डिफेंस टेक्नोलॉजी में आगे, अब लीडर बनने की जरूरत: DRDO चीफ	4
6.	In the next test, HSTDV will fly without upper stage fairings HSTDV series Part-3	6
7.	Philippines set to be first buyer of India-Russia cruise missile	8
8.	Astra air combat missile to be soon tested from Tejas fighter	10
9.	India to launch deep sea mission in 3-4 months: MoES official	11
10.	Rlys" use of bio-toilets: Lessons in innovation, sustainability now part of B-school classrooms	12
11.	Centre gives 250 ventilators to DRDO's Delhi Hospital	13
Defence News		14-32
Defence Strategic National/International		14-32
12.	Indian Army takes a leaf out of Chinese warfare, deploys tunnel defences in Ladakh	14
13.	IAF has enhanced India's deterrent and coercive posture in Ladakh	15
14.	IAF Chief Bhadauria flies Light Combat Helicopter over Bengaluru	17
15.	After Apache, IAF Chief flies desi attack helicopter. How the 2 choppers differ	18
16.	Moving in elite company, Indian Navy grapples with serious shortfalls	19
17.	An approach to cost effective transformation of the Indian Army: Version 1.0 model (2030-2035) Part 1	21
18.	An approach to cost effective transformation of the Indian Army: Version 1.0 model (2030-2035) Part 2	24
19.	"Extraordinary degree of intra-operability": Navy on Malabar exercise	26
20.	SITMEX 2020: India, Singapore, Thailand naval exercise begins	27
21.	Exclusive: Satellite images hint at renewed China threat in Doklam	28
22.	Chinese Army is installing and upgrading its radars along the India-China border	32
Science & Technology News		33-46
23.	India becomes 4th nation to get IMO nod for navigation satellite system	33
24.	Explained: The regional navigation satellite system or IRNSS that India is the fourth nation to have	34
25.	ISRO to launch satellite for Bhutan next year and train four Bhutanese space engineers	35
26.	Australia to temporarily host ISRO satellite tracking facilities	36
27.	Expert panel recommends 5 technologies for drinking water, sanitation	37
28.	Improving quantum dot interactions, one layer at a time	38
29.	A Plug-and-play approach to integrated nanoacoustics	39
30.	A mechanism for designing high-entropy alloys with improved magnetic properties	40
31.	Enhancing quantum dot solar cell efficiency to 11.53%	41
32.	Measuring pH locally with terahertz spectroscopy	43

COVID-19 Research News**44-46**

33. Coronavirus: Infectiousness peaks earlier in Covid-19 patients than thought, study says 44
34. Covid-19 vaccination programme to be examined by parliamentary committee 45

DRDO Chief flags off Varunastra

The torpedo has been designed and developed by NSTL

Visakhapatnam: Secretary, Department of Defence R&D and Chairman, DRDO, G. Satheesh Reddy, flagged off the first Varunastra, the heavy weight torpedo, which was delivered to the Indian Navy, at a ceremony held at BDL, Visakhapatnam unit, here on Saturday.

Varunastra has been designed and developed by NSTL, Visakhapatnam. BDL, being the production agency, is manufacturing Varunastra at its Visakhapatnam unit for the Indian Navy. This product is also being offered for export.

BDL is associated with the DRDO for its various missile programmes. BDL is also the production agency for Quick Reaction Surface to Air Missile (QRSAM), for which, trials were conducted successfully recently.

BDL is also the production agency for Astra Air- to- Air Missile System and has commenced manufacturing of these missiles.

The missile system will be fully indigenous and has been developed by the DRDO for the Indian Air Force. Dr. Satheesh Reddy appreciated the synergy between all stakeholders, especially the design agency NSTL and the production agency BDL, in completion of the manufacture of the first Varunastra.

He said that BDL should gear up for new programmes of ALWT and EHWT.

Commodore Siddharth Mishra, CMD, BDL, said that BDL is poised to take on the manufacture of futuristic weapon systems. Towards this the BDL team is committed to hone new skills and create the necessary infrastructure.

Dr. Sateesh also laid the foundation stone for setting up of state-of-the-art Central Stores at BDL, Visakhapatnam Unit.

Vice Admiral K. Srinivas, Project Director, Ship Building Centre, Samir V. Kamat, Director General, Naval Systems & Materials (NS&M), DRDO, O.R. Nandagopan, Director, Naval Science and Technological Laboratory, and other dignitaries from DRDO were present.

<https://www.thehindu.com/news/national/andhra-pradesh/drdo-chief-flags-off-varunastra/article33151869.ece>



Secretary, Department of Defence R&D and DRDO Chairman G. Satheesh Reddy at BDL, Visakhapatnam unit on Saturday.

स्वदेशी हैवीवेट टॉरपीडो वरुणास्त्र नौसेना में शामिल, विशाखापत्तनम में हरी झंडी दिखाकर किया रवाना

विशाखापत्तनम: भारतीय नौसेना का स्वदेशी टॉरपीडो 'वरुणास्त्र' के लिए इंतजार खत्म हो गया है। 'वरुणास्त्र' की पहली खेप नौसेना के लिए रवाना कर दी गई है। इसे चलाए जाने के बाद 40 किलोमीटर के दायरे में किसी भी जहाज या पनडुब्बी की तबाही निश्चित मानी जाती है।

भारत डायनामिक्स लिमिटेड ने बताया कि हैवीवेट टॉरपीडो वरुणास्त्र की पहली खेप को भारतीय नौसेना में शामिल किया जा रहा है। शनिवार को रक्षा अनुसंधान एवं विकास विभाग के सचिव डॉ. जी सतीश रेड्डी और डीआरडीओ के अध्यक्ष ने आंध्र प्रदेश के विशाखापत्तनम में आज एक समारोह में इसे हरी झंडी दिखाकर रवाना किया।



varunastra - फोटो : DRDO

जीपीएस से लक्ष्य खोजने वाला वरुणास्त्र

वरुणास्त्र नामक यह पनडुब्बी रोधी टॉरपीडो जीपीएस की मदद से अपने लक्ष्य को भेद सकता है। एक टन से अधिक वजनी वरुणास्त्र अपने साथ 250 किलो तक का वॉरहेड ले जा सकता है। उसका गाइडेंस सिस्टम भी उन्नत है। भारत के पास ब्रह्मोस सुपरसोनिक एंटी-शिप और लैंड-अटैक क्रूज मिसाइल भी हैं।

नौसेना की ताकत बढ़ाएगा पूर्ण स्वदेशी टारपीडो 'वरुणास्त्र'

पूरी तौर पर स्वदेशी टारपीडो 'वरुणास्त्र' 74 किमी प्रति घंटे की रफ्तार से हमला करता है। इस स्वदेशी टॉरपीडो से भारतीय जंगी जहाजों और सिंधु क्लास सबमरीन को लैस किया जाएगा। इसका वजन लगभग डेढ़ टन है। इसमें 250 किलो के हाई लेबल एक्सप्लोसिव लगे हैं। 'वरुणास्त्र' में लगे ट्रान्सड्यूसर्स इसको हमले के ज्यादा बड़ा एरिया प्रदान करते हैं। यही कारण है कि 'वरुणास्त्र' किसी भी सबमरीन पर ऊपर या नीचे दोनों तरफ से हमला कर सकता है। इसमें जीपीएस लोकेटिंग सिस्टम लगा हुआ है, जिसकी वजह से इसका निशाना अचूक हो जाता है।

भारतीय नौसेना ने 1187 करोड़ रुपये में 63 'वरुणास्त्र' का ऑर्डर दिया है। इसमें जहाज और सबमरीन दोनों से फायर होने वाले टॉरपीडो शामिल हैं। 'वरुणास्त्र' को कोलकाता क्लास, राजपूत क्लास और डेल्ही क्लास डिस्ट्रायर्स के अलावा कमोर्ता क्लास कार्वेट्स और तलवार क्लास फ्रिगेट्स में भी लगाए जाने की योजना है। इसे सिंधु सीरिज की सबमरीन में भी लगाया जाएगा।

डीआरडीओ का उत्पाद है 'वरुणास्त्र'

'वरुणास्त्र' का निर्माण रक्षा अनुसंधान एवं विकास संगठन (DRDO) के भारतीय नौसेना के विज्ञान और तकनीकी प्रयोगशाला ने किया है। इसे बनाने में डीआरडीओ की मदद नेशनल इंस्टीट्यूट ऑफ ओशियन टेक्नोलॉजी ने भी की है। यह हथियार युद्ध के दौरान पैदा होने वाली कई स्थितियों के अनुकूल है।

'वरुणास्त्र' के जहाज संस्करण को औपचारिक रूप से 26 जून 2016 को तत्कालीन रक्षा मंत्री मनोहर पर्रिकर ने नौसेना में शामिल किया था। अभी तक भारतीय नौसेना विदेश से खरीदे गए टॉरपीडो का ही

इस्तेमाल कर रही थी, लेकिन अब वरुणास्त्र के शामिल होने के बाद भारतीय नौसेना स्वदेशी विध्वंसक से लैस हो जाएगी।

<https://www.amarujala.com/india-news/first-varunastra-the-heavyweight-torpedo-deliver-to-the-indian-navy>

BusinessLine

Sun, 22 Nov 2020

DRDO flags off first Varunastra, a heavy weight torpedo

By V Rishi Kumar

Hyderabad: G. Sateesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO flagged off the first Varunastra, the heavy weight torpedo that was delivered to the Indian Navy at a ceremony held at BDL, Visakhapatnam Unit today.

He later laid the foundation stone for setting up of a state-of-the-art central stores at BDL, Visakhapatnam Unit.

Varunastra, the heavy weight torpedo, has been designed and developed by NSTL, Visakhapatnam. BDL, being the production agency, is manufacturing Varunastra at its Visakhapatnam Unit for the Indian Navy. This product is also being offered for export, according to a BDL statement.

BDL is associated with DRDO for its various missile programmes and it is the production agency for Quick Reaction Surface to Air Missile (QRSAM), for which, trials were conducted successfully recently. BDL is also the production agency for Astra Air- to- Air Missile System and has commenced manufacturing of these missiles. These missile systems are developed indigenously by the DRDO for the Indian Air Force. Sateesh Reddy appreciated the synergy between all stakeholders, especially the design agency NSTL and the production agency BDL for the manufacture of the first Varunastra. He suggested that BDL should gear up for new programs of ALWT and EHWT.

Siddharth Mishra, CMD BDL said BDL is poised to take on the manufacture of futuristic weapon systems. Towards this, the BDL team is committed to hone new skills and create the necessary infrastructure.

<https://www.thehindubusinessline.com/news/drdo-flags-off-first-varunastra-a-heavy-weight-torpedo/article33150441.ece>



G Sateesh Reddy, Chairman of DRDO - NAGARA GOPAL, THE HINDU

The Siasat Daily

Sun, 22 Nov 2020

DRDO Chairman inaugurates air launch test facility in Vizag

Visakhapatnam: Defence Research and Development Organisation (DRDO) Chairman G. Sateesh Reddy inaugurated air launch test facility at Naval Science and Technological Laboratory (NSTL) in Vizag on Saturday.

“The air launch test facility will enable faster execution of various defence projects of NSTL and will also be made available for the use of industry,” said a Ministry of Defence official.

NSTL is a premier laboratory working towards excellence in design, development and testing of surface and sub-surface vehicles and weapon control systems.

It is also engaged in conforming surface and submerged platforms to state-of-the-art technology, including rendering expert services in all grey areas associated with science and technology.

Earlier, Reddy, who is also the secretary of the department of defence R&D had flagged off the first Varunastra, a heavy weight torpedo being delivered to Indian Navy at a ceremony at Bharat Dynamics Limited's (BDL) unit in the city.

Reddy also checked out some projects being developed at BDL and interacted with the officials.

(Disclaimer: This story is auto-generated from IANS service.)

<https://www.siasat.com/drdo-chairman-inaugurates-air-launch-test-facility-in-vizag-2028655/>



Sun, 22 Nov 2020

India Today Defence Summit: भारत डिफेंस टेक्नोलॉजी

में आगे, अब लीडर बनने की जरूरत: DRDO चीफ

इंडिया टुडे डिफेंस समिट में DRDO के चेयरमैन जी. सतीश रेड्डी ने कहा कि भारत टेक्नोलॉजी के लिहाज से काफी आगे रहा है। हमें ऐसी टेक्नोलॉजी की पहचान करने की जरूरत है जिनकी भविष्य में जरूरत हो और जिन पर हमें काम करना होगा।

स्टोरी हाइलाइट्स

- इंडिया टुडे डिफेंस समिट में शामिल हुए कई एक्सपर्ट
- डिफेंस में भविष्य की टेक्नोलॉजी को लेकर चर्चा
- दुश्मनों से मुकाबले के लिए टेक्नोलॉजी पर जोर

नई दिल्ली: तेजी से बदल रहे डिफेंस सेक्टर में भारत को किस तरह की आधुनिक टेक्नोलॉजी की जरूरत है ताकि भविष्य की जंगों के लिए तैयार हुआ जा सके? इंडिया टुडे डिफेंस समिट में इस सवाल पर डिफेंस क्षेत्र के कई एक्सपर्ट ने अपनी बात रखी। रक्षा अनुसंधान एवं विकास संगठन (DRDO) के चेयरमैन जी सतीश रेड्डी ने कहा कि भारत डिफेंस टेक्नोलॉजी में आगे है, लेकिन अब इसे लीडर बनने की जरूरत है।

'फ्यूचर रेडी: इन्वेस्टिंग इन फ्यूचर डिफेंस टेक्नोलॉजी' सत्र को संबोधित करते हुए DRDO के चेयरमैन जी. सतीश रेड्डी ने कहा, 'भारत टेक्नोलॉजी के लिहाज से काफी आगे रहा है। हमें ऐसी टेक्नोलॉजी की पहचान करने की जरूरत है जिनकी भविष्य में जरूरत हो और जिन पर हमें काम करना होगा। बहुत से इक्विपमेंट आ रहे हैं।



डिफेंस टेक्नोलॉजी के विकास में भारत आगे है (फाइल फोटो)

अब इसमें हमें लीडर बनने की जरूरत है। बहुत से नए मिसाइल, रडार, तारपीडो, सोनार, अवाक्स, कम्युनिकेशंस सिस्टम का विकास हो रहा है।

स्वदेशी उत्पादन बढ़ाना होगा

डॉ रेड्डी ने कहा कि अब हाइपर सोनिक मिसाइल, कई तरह के रडार फोटानिक्स रडार, इलेक्ट्रोमैग्नेटिक पावर, इलेक्ट्रोमैग्नेटिक एनर्जी, लेजर एनर्जी जैसे कई महत्वपूर्ण सेक्टर हैं जिनमें हमें काम करना है। लाइटवेट न्यू जनरेशन टैंक की बात हो रही है। भारत में निजी क्षेत्र के सहयोग से हल्के तोपों का निर्माण किया गया है। इसके साथ ही साइबर सिक्योरिटी में बहुत से युवा और स्टार्टअप काम कर रहे हैं। पहले हम इसमें डिफेंसिव थे, लेकिन अब एग्रेसिव भी हो रहे हैं। एकेडमिक क्षेत्र के साथ मिलकर रिसर्च वर्क किया जा रहा है।

उन्होंने कहा, 'देश के रक्षा साजो-सामान में स्वदेशी निर्भरता को 80 से 90 फीसदी तक ले जाना होगा। इसलिए जिस टेक्नोलॉजी में हम पिछड़े रहे हैं उनका भी भारत में विकास करना होगा ताकि हम इनके आयात की जगह इनका निर्यात कर सकें।'

चीन से मुकाबला करना है तो सबको जुटना होगा

इस समिट में निजी कंपनी भारत फोर्ज के CMD बाबा कल्याणी ने कहा, 'चीन 2027 तक अपनी सेना को पूरी तरह से मॉडर्न बना रहा है। भारत को यदि उभरती नई विश्व व्यवस्था में प्रासंगिक रहना है तो देश के हर नागरिक, संस्था को तैयार होकर ऐसी टेक्नोलॉजी के विकास में लगना होगा जिससे हमारे डिफेंस सेक्टर को मदद मिले।'

उन्होंने कहा, 'डीआरडीओ एडवांस टेक्नोलॉजी का विकास कर रहा है लेकिन इस टेक्नोलॉजी और रिसर्च को उत्पादन में बदलना हम निजी क्षेत्र के लोग कर सकते हैं। हमने 100 फीसदी स्वदेश तोप बनाई हैं। हमने इलेक्ट्रॉनिक्स में कई स्वदेशी उत्पादों का भी विकास किया है। डिफेंस और स्पेस सेक्टर में विकसित बहुत सी ऐसी टेक्नोलॉजी हैं जिनकी सिविल क्षेत्र में भी इस्तेमाल हो सकता है जैसे ऑटोमोटिव, इंडस्ट्रियल, मशीनरी टेक्नोलॉजी।

भविष्य की टेक्नोलॉजी में महारत लेनी होगी

उन्होंने कहा कि टेक्नोलॉजी में भारत काफी कुछ करने वाला है और यह डिफेंस एवं स्पेस सेक्टर में होगा। भविष्य की बात करें तो जैसे जेड इंजन भविष्य के फाइटर एयरक्रॉफ्ट के लिए चाहिए, यह महत्वपूर्ण टेक्नोलॉजी है जिसमें भारत को महारत हासिल करनी होगी। अगले 5-7 साल में भारत की रक्षा टेक्नोलॉजी का 10 गुना तक विकास होगा।

आईआईटी चेन्नै में प्रोफेसर (एयरोस्पेस) लेफ्टिनेंट जनरल पी रविशंकर ने कहा, 'हम फ्यूचर रेडी नहीं हैं, लेकिन हम फ्यूचर डिफेंस टेक्नोलॉजी में निवेश कर रहे हैं। आज मल्टी डोमेन वारफेयर होते हैं। अब स्पेस, हेल्थ, एयर, लैंड, साइबरस्पेस, न्यूक्लियर जैस न जाने कितने क्षेत्रों में जंग होती है। बहुत सारी विनाशक टेक्नोलॉजी भी आ गयी है।'

लद्दाख से क्या सबक मिले

प्रोफेसर रविशंकर ने हाल में सीमा पर लद्दाख की घटना से हमें कई सबक मिले हैं। उन्होंने कहा, 'हमें बैटलफील्ड ट्रांसपैरेंसी की जरूरत थी। हमें प्रोपल्सन, नेविगेशन, सेंसर, प्रीसीजन, आईएसआर, साइबर जैसी कई तरह की नई टेक्नोलॉजी की जरूरत है। मैन या अनमैन्ड एरियल सिस्टम, इन विजन सेंसर, एआई की जरूरत है। हमें रीच बढ़ाने की जरूरत है, हमें प्रीसीजन और नेटवर्क, एनर्जी, मोबिलिटी और सर्वाइविबिलिटी के लिए टेक्नोलॉजी की जरूरत है।'

<https://www.aajtak.in/india/news/story/india-today-defence-summit-india-ahead-technology-need-to-be-leader-drdo-chief-tutd-1165441-2020-11-21>

In the next test, HSTDV will fly without upper stage fairings | HSTDV series Part-3

Bengaluru: While the success of India's recent flight-test of the Hypersonic Technology Demonstrator Vehicle (HSTDV) using the indigenously developed scramjet propulsion system is being hailed as a major technological breakthrough, scientists who are a part of the mission say that there are several challenging milestones that will be achieved in the days ahead.

In this final part of the Onmanorama series 'HSTDV Story', we look at some of the coming stages for this mission, the future of hypersonic research and the roles of academic institutions in providing support for the mission so far.

Missile scientists say that the immediate stage will be to launch HSTDV without upper stage fairings, exposing the cruise vehicle (CV) to the atmosphere.

DRDO scientists are now working on a new rocket motor that will reduce aerodynamic forces and lower kinetic heating. This will enable the CV to withstand the thermal and structural loads during launch.



Nose tip thermal test

"We are aiming to achieve this, and it will be another milestone for DRDO and the nation," said a scientist who is in the HSTDV mission.

As things stand now, India is poised to test an indigenously developed hypersonic missile by the end of 2024.

A hypersonic mission is a different ball game altogether as it is an air-breathing system which operates at very high velocity, which is over five times the speed of sound.

Normally in jet engines and other piston engines, combustion takes place at low subsonic speeds, giving sufficient time for the fuel and air to mix, ignite, evaporate and combust. The scramjet engine doesn't have more than 1.0–1.5 milliseconds for the fuel to mix with air and ultimately produce thrust.

"There are several intake non-start incidents worldwide in hypersonic missions as intake functions at a very specific window of flight conditions. HSTDV has done it at the very first attempt and crowned our indigenous efforts," said the scientist.

Hypersonic research

A scientist, who has been a part of the HSTDV mission for the past several years told Onmanorama that there are several areas of futuristic hypersonic research that must be taken up by young scientists.

"The world of hypersonics is extremely fascinating, and there are several challenging areas that youngsters must dive into to make India self-reliant," the scientist said.

Among the key areas offering challenges in the research space are: the effect of shockwave boundary layer interaction on the hypersonic regime, experimental studies on scramjet intake with wide range of entry Mach numbers, endothermic fuel development, ignition delay prediction, active cooling designs for scramjet engine, non-intrusive sensors, multi-disciplinary optimization techniques and material technologies.

Over the years, DRDO has made several modifications to the existing facilities to undertake work linked to the HSTDV mission.

“A few hypersonic test facilities like hypersonic wind tunnel and shock tunnel are available in India. Academic institutions (IIT Madras, IISc Bengaluru) and DRDL Hyderabad have wind tunnels and shock tunnels for R&D. HSTDV cruise vehicle and launch vehicle testing were carried out at these institutions,” said a scientist.

DRDO has recently developed a hypersonic wind tunnel facility in Hyderabad which will be used for future hypersonic missions.

The Rail Track Rocket Sled facility at Terminal Ballistics Research Laboratory (TBRL) Chandigarh has helped in demonstrating the panel separation at dynamic conditions.

“The scramjet connect pipe test facility provided the opportunity to carry out ground tests of the scramjet combustor. Thermo-structural facilities were upgraded to carry out thermo-structural test of sections,” the scientist added.

Role of Academic Institutions

The HSTDV mission involves almost every branch of engineering as it requires fundamental studies of different fields of science — physics, chemistry and mathematics. Subsequently it needs different technologies to convert fundamental studies into applied research and make it into the product. “A very complex mission that needs engineers from aerospace, mechanical, computer science, electronics, communication, electrical and material science streams. In addition, we also had huge support from thermal, propulsion and structural engineering wings,” the scientist added. Several academic institutions played a part in paving the way for the successful HSTDV mission. The Aerospace Department of IISc Bengaluru did the panel separation and scramjet related studies, IIT Bombay did the heat transfer and computational studies for the HSTDV fore body, IIT Madras undertook propulsion studies and shock tunnel experiments, IIT Kharagpur did the risk assessment studies and National Aerospace Laboratories (NAL) Bengaluru did the upper stage carbon epoxy nose cone design and development. The HSTDV team also fondly remembers the role played by Missile Man Dr APJ Abdul Kalam, who inspired several missile scientists to take up next-gen technologies within India.

“During a conference at Hyderabad in 2007, Dr Kalam had said that by 2020 India’s technological capabilities will overpower the world. His words became true and we had the successful flight of HSTDV in September 2020,” recalled a scientist.

In short, the HSTDV is a successful mission so far, though there are several boxes to be ticked ahead of the actual hypersonic missile’s flight in 2024.

Scientists are of the opinion that the recent success of the HSTDV mission is a big milestone in India’s quest to develop a homegrown hypersonic missile.

They say the future wars will be dictated by hypersonic missiles. And, the project is slowly and steadily moving into a full-edged hypersonic cruise missile flagship programme.

(The writer is an independent aerospace and defence journalist, who blogs at Tarmak007 and tweets @writetake.)

<https://www.onmanorama.com/news/nation/2020/11/20/hstdv-upper-stage-fairings-fly-part-3.html>

Philippines set to be first buyer of India-Russia cruise missile

BrahMos will boost Manila's coastal defenses, raising concern for China

By Kiran Sharma and Cliff Venzon

New Delhi/Manila: India and Russia are looking to export to the Philippines their jointly developed BrahMos supersonic cruise missile, a move that may unnerve Beijing, given its border standoff with New Delhi and territorial disputes with other neighbors in the South China Sea.

The BrahMos takes its name from two rivers -- the Brahmaputra in India and the Moskva in Russia. The missile is manufactured by an Indo-Russian joint venture, BrahMos Aerospace, which was set up in India in 1998 and is responsible for designing, developing and marketing the missile.

"All tests of contemporary versions [of the missile] are successful," said Roman Babushkin, Russia's No. 2 diplomat in New Delhi, in a recent online briefing. Babushkin added that Russia and India are "planning to gradually increase the range of these exclusive missiles and, of course, [to] begin exporting to third countries, starting with the Philippines."



A BrahMos supersonic cruise missile launcher rolls past during a Republic Day parade in New Delhi in January 2014. © Getty Images



China has built a military installation on Fiery Cross Reef, located in the western part of the Spratly Islands group, in the South China Sea. © Getty Images

Asked if it had already ordered the weapons, Arsenio Andolong, a spokesman at the Philippine Department of National Defense, told Nikkei Asia that the Southeast Asian nation had inquired about the missile but that the purchase "is still under evaluation." Adding, "It is part of our modernization program to enhance our territorial defense capability."

Last December, the Philippines said that it planned to buy the BrahMos for the army and air force to boost its coastal defenses. Defense Secretary Delfin Lorenzana said the contract would be signed by the second quarter of 2020, and consist of "two batteries," according to the state-run Philippine News Agency.

A BrahMos missile battery comprises three mobile autonomous launchers. The BrahMos would be the Philippines' first weapons system with deterrent capability, Lorenzana said.

Equipped with stealth technology and an advanced guidance system, the BrahMos can be launched from air, land, sea and underwater platforms and can carry conventional warheads weighing 200 kg to 300 kg. It has a range of 290 km and is supersonic, shortening flight and engagement time. The missile's speed makes it difficult for targets to disburse. No known weapon can intercept it, according to BrahMos Aerospace.

However, the COVID-19 pandemic appears to have delayed the purchase and some reports say the deal may now be signed early next year.

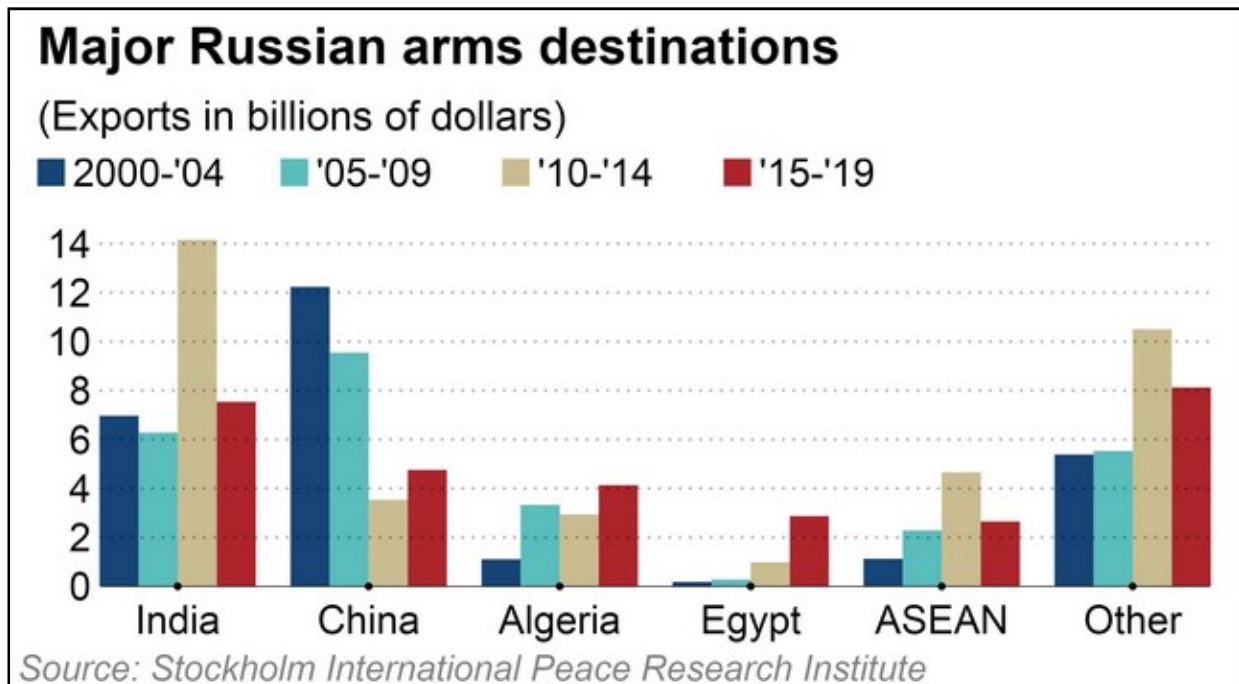
New Delhi and Manila earlier this month held an online meeting of their commission on bilateral cooperation, co-chaired by India's External Affairs Minister S. Jaishankar and Teodoro Locsin Jr., his Philippine counterpart. They agreed to strengthen the two countries' defense engagement and maritime cooperation, especially in military training, capacity-building, goodwill visits and procurement of equipment.

China is likely to view these developments with concern, including the involvement of its ally Russia in supplying the BrahMos to the Philippines.

Asked if the missiles are intended to boost the Philippines' defense posture in the South China Sea, Andolong told Nikkei that they "can be used anywhere, actually. That's included in the evaluation [as to] what role will it play in our territorial defense."

India has conducted several tests of the latest versions of the missile recently, amid monthslong tensions with China in eastern Ladakh, along their disputed Himalayan border.

On Oct. 18, the missile was successfully test-fired from the Indian Navy's indigenously built stealth destroyer INS Chennai, hitting a target in the Arabian Sea "with pinpoint accuracy," a Defense Ministry statement said. On Sept. 30, a BrahMos surface-to-surface ground attack cruise missile featuring many Indian-made subsystems was flight-tested. During the test, the missile cruised at a top speed of Mach 2.8, nearly three times the speed of sound.



Harsh V. Pant, head of the strategic studies program at New Delhi-based think tank Observer Research Foundation, pointed out that Russia plays an interesting role in the enterprise.

"Russia clearly sees China as a useful partner when it comes to their posturing vis-a-vis the West. But they are also being pragmatic when it comes to [their] defense exports," which are falling, Pant told Nikkei. He observed that apart from the Philippines, others, including Indonesia, Thailand and Vietnam, have also shown interest in the BrahMos. "If you have to make this defense venture economically viable, then exports are very important."

Under the Missile Technology Control Regime that India joined in 2018, avenues for selling the BrahMos overseas have opened up, said Pankaj Jha, a professor of defense and strategic affairs at O.P. Jindal Global University, pointing out that its range is being extended to 400 km from the original 290 km.

"The Philippines will be supplied with the land component of the missile," Jha told Nikkei, saying it was possible that it might acquire the naval version later.

"It is technically seen a 'carrier killer' sort of a missile if it is used from naval platforms," he said. If the Philippines buys the naval variant, "China will be paranoid. [They would] have a very potent killer in the South China Sea."

<https://asia.nikkei.com/Politics/International-relations/Philippines-set-to-be-first-buyer-of-India-Russia-cruise-missile>

THE TIMES OF INDIA

Mon, 23 Nov 2020

Astra air combat missile to be soon tested from Tejas fighter

By Rajat Pandit

New Delhi: India's first indigenous air-to-air missile Astra will soon be tested from the first home-grown fighter Tejas, in yet another major step towards making the weapon the mainstay of the country's combat fleet against hostile jets in the years ahead.

The integration of the Astra beyond visual range air-to-air missile (BVRAAM), which flies over four times the speed of sound at Mach 4.5, on the Tejas and the "initial ground trials" are virtually complete now. "The flight trials of the indigenous missile on the indigenous fighter will begin within the next few months," said a source on Thursday.

The all-weather day and night capable Astra, which currently has a strike range of around 100-km, will eventually replace the expensive Russian, French and Israeli BVRAAMs that are currently imported to arm IAF fighters.

DRDO also plans to begin testing the Mark-2 version of Astra, with a range of 160-km, in the first half of next year. Plans are concurrently underway for a 350-km range Astra Mark-3 as well, said the sources.

With the sleek Astra Mark-1 already "proven" on the Russian-origin Sukhoi-30MKI fighters, the Rajnath Singh-led Defence Acquisitions Council granted "acceptance of necessity" for an initial order of 288 missiles in July.

"Once the flight trials on Tejas are completed, large-scale orders will follow," said a source. Defence PSU Bharat Dynamics is slated to produce the missiles in bulk at a unit cost of about Rs 7.5 crore.

This comes at a time when the over Rs 37,000 crore order for 83 Tejas Mark-1A fighter jets from defence PSU Hindustan Aeronautics Ltd is also on the verge of being approved, in what will then be the biggest-ever deal in the indigenous military aviation sector.

Air Chief Marshal R K S Bhadauria last month said the 83-Tejas deal will be inked before the ongoing fiscal ends on March 31. IAF is currently getting deliveries, albeit slowly, of the first 40 Tejas Mark-1 jets under two contracts worth Rs 8,802 crore inked earlier.

India may have developed intercontinental ballistic missiles like the nuclear-capable Agni-V, which can strike targets over 5,000-km away, but the technical struggle to develop Astra has taken 16 long years.



But India has now finally joined the ranks of the US, Russia, France and Israel in developing such complex BVRAAMs capable of detecting, tracking and destroying highly-agile hostile supersonic fighters packed with “counter-measures” at long ranges.

DRDO says Astra has “excellent” ECCM (electronic counter-counter measures) to tackle jamming by hostile aircraft, active radar terminal guidance and other features for “high single-shot kill probability” in both “head-on and tail-chase” modes. The IAF, too, has now given it a thumbs-up!

<https://timesofindia.indiatimes.com/india/astra-air-combat-missile-to-be-soon-tested-from-tejas-fighter/articleshow/79357258.cms>



Mon, 23 Nov 2020

India to launch deep sea mission in 3-4 months: MoES official

The mission, which is expected to cost over ₹4,000 crore, will give a boost to efforts to explore India’s vast Exclusive Economic Zone and Continental Shelf, he said

New Delhi: India will soon launch an ambitious ‘Deep Ocean Mission’ that envisages exploration of minerals, energy and marine diversity of the underwater world, a vast part of which still remains unexplored, a top official of the Ministry of Earth Sciences said.

The ministry’s secretary, M Rajeevan, said required approvals are being obtained for the “futuristic and game-changing” mission, and it is likely to be launched in the next 3-4 months.

The mission, which is expected to cost over ₹4,000 crore, will give a boost to efforts to explore India’s vast Exclusive Economic Zone and Continental Shelf, another senior official of the MoES said.

Mr. Rajeevan said the mission will also involve developing technologies for different deep ocean initiatives.

The multi-disciplinary work will be piloted by the MoES and other government departments like the Defence Research and Development Organisation, Department of Biotechnology, Indian Space Research Organisation (ISRO), Council for Scientific and Industrial Research (CSIR) will be stakeholders in this mission, Mr. Rajeevan added.

Some of the technologies involved will be developed by organisations such as the ISRO and DRDO.

One of the main aspects of the mission will be design, development and demonstration of human submersibles, the MoES official said.

Another aspect is exploring the possibility of deep sea mining and developing necessary technologies, the official added.

The official said the move strategically significant as it will enhance India’s presence in the Indian Ocean where other players like China, Korea and Germany are active.

Last week, China live-streamed footage of its new manned submersible parked at the bottom of the Mariana Trench. This was part of its mission into the deepest underwater valley on the planet.

India has been ear-marked nearly 1.5 lakh square kilometres of area in the central Indian Ocean for exploration.

In September 2016, India signed a 15-year contract with the International Seabed Authority (ISA) for exploration of Poly-Metallic Sulphides (PMS) in the Indian Ocean.



Dr. M. Rajeevan, Secretary, Ministry of Earth Sciences, Government of India. | Photo Credit: Supreet Sapkal

The ISA is an institution set up under the Convention on Law of the Sea to which India is a Party.

The 15-year contract formalised India's exclusive rights for exploration of PMS in the allotted area in the Indian Ocean.

The ISA earlier approved 10,000 sq. km for India with a 15-year PMS exploration plan along the Central Indian Ridge (CIR) and Southwest Indian Ridge (SWIR) region of the Indian Ocean.

Poly-Metallic Sulphides (PMS), which contain iron, copper, zinc, silver, gold, platinum in variable constitutions, are precipitates of hot fluids from upwelling hot magma from deep interior of the oceanic crust, discharged through mineralized chimneys.

PMS in the Ocean Ridges have attracted worldwide attention for their long term commercial as well as strategic values.

The aim is to be prepared when rules are formalised in this area. The deep oceans frontier is yet to be explored. We have been working on it on a piecemeal basis but the thrust is to carry out work on mission mode, the official added. The mission will also involve procurement of more advanced deep sea vessels for explorations. The existing vessel Sagar Kanya is nearly three-and-half decades old.

<https://www.thehindu.com/news/national/india-to-launch-deep-sea-mission-in-3-4-months-moes-official/article33154559.ece>

Outlook

Mon, 23 Nov 2020

Rlys'' use of bio-toilets: Lessons in innovation, sustainability now part of B-school classrooms

By Ananya Sengupta

New Delhi: The railways'' use of bio-toilets in its coaches will now be part of management school classrooms as a case study on its development and installation has been approved by the national transporter to be used as study material, according to a document accessed by PTI.

According to the document, the railways has given its nod to Indian School of Business (ISB) to use the study by them on the IR bio-toilets as curriculum for business schools.

"Based on our review of the attached case and other associated material, we hereby confirm that the Indian School of Business has the authority to use the case study and to authorize other educational institutions or organizations to use the case study. We further approve the use of our images and logos as displayed within the case," the approval letter from the railways said.

Senior officials involved in the process confirmed that the use of bio-toilets, the technology developed with DRDO and the association with private entities to install them in the coaches of IR was an achievement, accomplished over a decade was ready material for management schools to learn about coordination between different departments and also a lesson in sustainability.

"There are two major takeaways from the bio-toilet project. One is that it's environment-friendly and their installation has resulted in cleaner stations and rails. The second is that due to the use of bio-toilets, the corrosion in rails has reduced and will eventually lead to extending the life of the rails. We have signed an MOU with ISB and based on that they can also take it to other management schools," said a senior official.

He also said that the bio-toilet model was perfect for management schools as it highlighted the development of sustainable technology and how the national transporter has managed to go big with the concept.

"We have taken this on the largest scale possible and perhaps nowhere in the world has this been used at such a large scale," the official said.

The study, which will be part of business school curriculum, mentions how in 2011 the first prototype train with bio-toilets started from Gwalior and how the project was scaled up by 2014. In less than ten years (between 2011 and 2020), 245,775 bio-toilets were installed in 68,694 coaches.

Tata Energy Research Institute (TERI) studied the impact of bio-toilets' fitment and found that with bio-toilets' adoption, the burden of cleaning the tracks and subsequent manual scavenging was eliminated. The study said that this, in turn, improved the respect for labor, and the alternate jobs that manual scavengers were provided improved their livelihood.

This resulted in saving 5.4 million litres of water per day spent earlier on track washing at the train stations, the study said. TERI estimated that this energy-saving benefit was of the order of reduction of carbon dioxide equivalent of 155 tonnes per annum.

"The bio-toilets initiative served as a source of open innovation. It significantly expanded the markets to produce and sell bio-toilets to improve small and medium enterprises segment. The successful implementation of bio-toilets in the passenger trains demonstrated a critical message that while technical innovation is essential, its solution must be grounded in reality. That capability to carry out innovations in an evolutionary mode is -necessary to bring a change at the grass-root level. To make a fundamental social impact, considering the socio-economic factors becomes essential," the study says.

(Disclaimer: This story has not been edited by Outlook staff and is auto-generated from news agency feeds. Source: PTI)

<https://www.outlookindia.com/newscroll/rlys-use-of-biotoilets-lessons-in-innovation-sustainability-now-part-of-bschool-classrooms/1980181>



Mon, 23 Nov 2020

Centre gives 250 ventilators to DRDO's Delhi Hospital

New Delhi: The Centre on Sunday said that 250 ventilators have been delivered to the DRDO hospital here as part of its promise to help the Delhi government in the fight against Covid-19 pandemic.

The Ministry of Home Affairs (MHA), the nodal central agency to help the Delhi government during the coronavirus crisis, said that these ventilators will be installed at the Defence Research and Development Organisation (DRDO) hospital near the Delhi airport.

MHA spokesperson Nitin Wakankar shared the information in a series of tweets.

The Bharat Electronics Limited had dispatched these 250 ventilators from Bengaluru three days ago and arrived here early on Sunday, said another official.

The Health Ministry has also delivered 35 BIPAP machines to the DRDO's Covid facility.

As many as 125 BEL ventilators that reached Delhi on Saturday along with 116 oxygenated beds were installed in central government hospitals and the All India Institute of Medical Sciences (AIIMS).

After Delhi witnessed a surge in corona cases from October 28, crossing the 8,000-mark on November 11, Union Home Minister Amit Shah held a review meeting on November 15 in the presence of Chief Minister Arvind Kejriwal and assured that the DRDO would add 250 ICU beds to its existing 250, besides 35 BIPAP (Bilevel Positive Airway Pressure) beds at its Covid-19 hospital.

At the high-level meeting chaired by Shah, Delhi was also assured that 750 more ICU beds will be provided in the city.

As per the MHA, these latest steps follow Shah's lead to ramp up Delhi's medical infrastructure and devise a new strategy to combat Covid surge in Delhi.

"For the first time, the number of RT-PCR tests in Delhi have exceeded the Rapid Antigen Tests."

Delhi has so far recorded 5,23,117 coronavirus 19 ases, including 39,741 active cases and 8,270 deaths. A total of 4,75,106 patients have so far recovered.

<https://www.daijiworld.com/news/newsDisplay.aspx?newsID=774070>

Defence News

Defence Strategic: National/International



Mon, 23 Nov 2020

Indian Army takes a leaf out of Chinese warfare, deploys tunnel defences in Ladakh

On August 29-30, the Indian Army troops along with Special Frontier Force (SFF) occupied positions on the Line of Control (LoC) south of Pangong Tso lake on the Kailash Range ridgeline for the first since 1962. Indian Army has already dismissed the PLA energy weapon report as fake news

By Shishir Gupta

New Delhi: While the People's Liberation Army (PLA) propagandist machinery has reported frying of Indian troops by futuristic energy weapons on August 29 in East Ladakh, the Indian Army has dug into Chinese warfare manuals and deployed "tunnel defences" to pre-empt any further transgressions from the adversary.

On August 29-30, the Indian Army troops along with Special Frontier Force (SFF) occupied positions on the Line of Control (LoC) south of Pangong Tso lake on the Kailash Range ridgeline for the first time since 1962. Indian Army has already dismissed the PLA energy weapon report as fake news.

The Chinese successfully used tunnel defences against Japanese in Second Sino-Japanese war, the Vietcong used the same tactics at against Americans in the guerrilla war and North Korean in Korean war in 1960s. The PLA has built tunnel shelters to house aircraft at Lhasa air base and underground pens to house nuclear ballistic missile submarines in Hainan Islands in South China Sea.

According to senior military commanders, the Indian Army has deployed large diameter Hume reinforced concrete pipes in dug in tunnels to shelter the troops from enemy attack and surprise the adversary in the case of a worst -case scenario. The reinforced concrete pipes have diameter from six to eight feet, which allows troops to easily move underground from one location to other



The Indian Army is not only defending the Ladakh LAC but also keeping a close watch on PLA moves in Central, Sikkim and Eastern sectors with the Chinese army continuing to build military infrastructure in Tibet.(Twitter/@ADGPI)

without being exposed to enemy fire. The other benefit of tunnels is that they can be heated and shelter the troops from polar temperatures and snow blizzards.

While the ninth round of India-China military dialogue to disengage and de-escalate from the friction points is expected to take place soon, the Indian Army has settled down to defend the LAC from any further transgression by the PLA. The Indian security planners are quite clear that the restoration of status quo ante has to begin with PLA, which started the entire build-up by transgressing on the north banks of Pangong Tso early May 2020. The PLA then followed the Pangong Tso aggression by making similar moves in Galwan river valley and Gogra-Hot Springs area near Kongka La.

The Indian Army is not only defending the Ladakh LAC but also keeping a close watch on PLA moves in Central, Sikkim and Eastern sectors with the Chinese army continuing to build military infrastructure in Tibet.

The Indian diplomacy is also in no hurry to negotiate an early withdrawal of PLA from east Ladakh and believes that restoration of status quo ante is the only just solution even if it takes a long time. “The PLA always like a staring match waiting for adversary to blink. But this aggressive tactic will not succeed with India,” said a senior official.

<https://www.hindustantimes.com/india-news/indian-army-take-a-leaf-out-of-chinese-warfare-deploys-tunnel-defences-in-ladakh/story-4RVVPMjeofhzB9kUOCKTeL.html>



Mon, 23 Nov 2020

IAF has enhanced India’s deterrent and coercive posture in Ladakh

Whatever transpires on the ground during the coming weeks, the aerospace segment of deterrence, intelligence gathering, surveillance and reconnaissance must act as the strategic establishment’s eyes and first responder in any future responses along the LAC, particularly in Ladakh

By Arjun Subramaniam

After almost two decades, the wider citizenry has been exposed to several facets of how India’s armed forces are deployed in warlike conditions in Eastern Ladakh. The deliberate and decisive deployment of the Indian Army, with its entire range of combat and engineering capabilities including tanks, towed heavy artillery guns, special forces and hardy troops in protective winter gear, has sent a strong message to the People’s Liberation Army (PLA). An even more deterrent signal has been the willingness of the Indian Army to occupy tactically advantageous heights along the north and south banks of Pangang Tso. It has forced the Chinese to reevaluate their strategic game-plan, which was expected to unfold by the time winter set in. This strategic pause has helped the Indian Army dig in along the LAC and consolidate its deterrent posture.

However, what has slipped under the radar is the massive effort by the Indian Air Force in enabling, supporting and complementing this effort, both in real terms as well as coercive posturing. Never has so much load and so many personnel been flown into Ladakh by the IAF, not even in 1962. The skies over Ladakh now reverberate with the sound of Sukhois, MiG-29s, Rafales, C-17s, C-130s, Chinooks and Apaches as Leh emerges as among the busiest IAF airfields. Images of Special Forces training with



An IAF jet in Leh amid the prolonged India-China face-off. (PTI/File)

aviation elements of the Army and the IAF in the rugged terrain bear testimony to the improving synergy between the two services.

For decades, the airspace over Ladakh has remained muted with only the bare minimum transport and helicopter support being undertaken for sustenance, stocking and casualty evacuation. Lulled and even intimidated for decades by the strictures imposed on it by the various border protocols and confidence-building measures, Sub-Sector North and Eastern Ladakh were literally quasi no-fly zones for IAF fighters. Whatever little fighter flying comprised mainly of Combat Air Patrols over Siachen and some familiarisation in other parts of Ladakh.

The government seems to have realised two important facets of any future limited conflict scenarios across the LAC, particularly in Ladakh. The first is given the dense and almost mirror-image ground deployments of the Indian Army and the PLA, force-on-force engagements are not likely to lead to any decisive outcomes that could result in an alteration of status quo for either side. With human capacity significantly diminished by altitude and terrain, air power can cause significant psychological degradation in an adversary. The Kargil conflict was a case in point.

Second, given that the PLA's capacity to absorb punishment in a limited but high intensity conflict is untested in recent times, the ability of airpower to cause significant attrition and destruction of combat potential must be factored in. This is essential if a weaker power (India) is to seize the initiative early on in a conflict to shape a desirable outcome. Given the sparsely populated battle-space, both precision attacks and area bombing are not likely to cause any collateral damage, thereby allowing airpower to operate without any major shackles.

Modern air power is all about targeting and targeting is all about building a proper intelligence mosaic. The principal medium to create this mosaic is space and the platforms used are imaging, infrared, communication and navigation-enabling satellites. It will take decades for India to match China's superiority in this realm. While India has wisely chosen not to engage in a space race with China, there is a need to accelerate the military segment of India's space programme. The creation of a Defence Space Agency is a step in this direction. In the meantime, Unmanned Aerial Vehicles and other air-based surveillance systems need to fill the gap. Space-based communication and signal intelligence satellites are key to create an electronic orbit (order of battle) of the adversary.

Whatever transpires on the ground during the coming weeks, the aerospace segment of deterrence, intelligence gathering, surveillance and reconnaissance must act as the strategic establishment's eyes and first responder in any future responses along the LAC, particularly in Ladakh. Air and space power are extensions of the same continuum and that ought to be reason enough to invest more effort and resources in sharpening them.

(This article first appeared in the print edition on November 23, 2020 under the title 'Power in The Air'. Subramaniam, a retired Air Vice Marshal, is the author of India's Wars.)

<https://indianexpress.com/article/opinion/columns/power-in-the-air-7061634/>

IAF Chief Bhadauria flies Light Combat Helicopter over Bengaluru

Story Highlights

The Air Chief Marshal was airborne for an hour during his maiden flight sortie as a co-pilot, dressed in an olive green suit

Bangaluru: Indian Air Force (IAF) Chief of Air Staff Air Chief Marshal Rakesh Kumar Singh Bhadauria flew the home-grown Light Combat Helicopter (LCH) over this aerospace city, an official said on Friday.

"Bhadauria flew the twin-seater LCH for the first time, taking off at 11:45am from our airport in the city's eastern suburb, with our deputy chief test pilot Wing Commander (Retd) S.P. John," a Hindustan Aeronautics Ltd (HAL) official told IANS here.

The Air Chief was airborne for an hour during his maiden flight sortie as a co-pilot, dressed in an olive green suit.



"It was a very good sortie. I was able to look at the important flying characteristics and status of sensors installed," said Bhadauria in a statement later.

Noting that the LCH was a potent platform due to excellent design and development efforts and well-supported flight test team, the Air Chief said the IAF was looking forward to its induction soon.

"I am sure HAL will give required focus on its production at a fast pace," Bhadauria said.

HAL Chairman R. Madhavan thanked the Air Chief and said the aerospace major would gear up to roll out the LCH for meeting the IAF needs.

Designed and developed by the city-based state-run defence behemoth (HAL), LCH is the world's multi-role lightest attack helicopter, with a highest flight ceiling.

"The LCH has been certified by the relevant agency for induction into the IAF and the Indian Army soon," said the official.

The Defence Acquisition Council (DAC) had approved the proposal for the initial batch of 15 LCHs.

The IAF issued the Request for Proposal (RFP) for 15 limited series production of the helicopter, including 5 for the Army in 2017.

Drawing from the company's multi-role Advanced Light Helicopter (ALH) Dhruv and its weaponised version Rudra, LCH's first prototype was test flown in March 2010.

Bhadauria, who took over as the Indian Air Force (IAF) in September 2019, also flew the HAL-made Light Combat Aircraft (LCA) Tejas on May 27, 2020 when it was inducted into the IAF's 18 Squadron (Flying Bullets) at the Sulur air base near Coimbatore in the neighbouring Tamil Nadu state.

The Air Chief was in the city to unveil the 59th annual conference of the Indian Society of Aerospace Medicine near the HAL airport.

<https://www.wionews.com/india-news/iaf-chief-bhadauria-flies-light-combat-helicopter-over-bengaluru-344349>

After Apache, IAF Chief flies desi attack helicopter. How the 2 choppers differ

The Apache is the latest attack helicopter in the Indian Air Force

On Thursday, the Indian Air Force had announced that its Chief, Air Chief Marshal R.K.S. Bhadauria, had flown a sortie on the US-built AH-64 Apache attack helicopter. Bhadauria flew the Apache during a two-day tour of airbases of the Western Air Command on November 17 and 18.

The Apache is the latest attack helicopter in the Indian Air Force, and the force received the first batch of 22 aircraft last year. The Apache has been deployed to Ladakh to support Indian forces moved there against the Chinese People's Liberation Army. The Indian Army is buying six Apache helicopters.

On Friday, news agency ANI reported Bhadauria had flown on the indigenously designed Light Combat Helicopter (LCH) while in Bengaluru. ANI reported that Bhadauria's sortie took 45 minutes. In August, HAL sent two LCHs to Ladakh. At the time, reports said the deployment of the LCH was 'symbolic' in nature.

Hindustan Times had quoted officials as saying, "The LCH holds a lot of promise but is not really capable of carrying out missions in its current configuration. It lacks anti-armour and air-to-air weapons. That's work in progress."

The LCH made its first flight in 2010 and HAL is awaiting a formal order of 15 aircraft—10 for the Indian Air Force and 5 for the Indian Army. The Indian Army and the Indian Air Force have a projected combined requirement of over 160 LCHs.

How they are different

The AH-64 Apache has been in service with the armed forces of over a dozen nations since the first helicopter was delivered to the US Army in 1984. The Apache, which was built to destroy tanks of the Soviet Union, has seen multiple conflicts, including the US invasion of Panama, the Gulf War of 1991 and Afghanistan and Iraq invasions.

The LCH had its genesis in the requirement for an attack helicopter optimised for high altitudes. This requirement emerged from the lessons of the Kargil War in 1999. At that time, the Indian Air Force's fleet of Russian-built Mi-35 attack helicopters could not operate effectively at the altitudes in Kargil, given the strain their engines faced due to lower air density. The Indian Air Force announced a requirement for an attack helicopter suitable for high altitudes in 2003.

HAL has touted the LCH as being the only attack helicopter in the world capable of landing and taking off with considerable payload at high altitudes such as the Siachen Glacier.

The LCH is considerably lighter than the Apache, having a maximum take-off weight of about 5.5 tonnes, while the US-built helicopter can take off at a maximum weight of over 10 tonnes. This means the Apache can carry a heavier load of weapons. The Apache can carry up to 16 anti-tank missiles; the LCH can only carry eight such weapons. Moreover, the Apache is more heavily armoured than the LCH. The Apache has a 30mm gun, and has provision to carry over 1,000 rounds of ammunition for the gun. The LCH carries a smaller-calibre 20mm gun.

The Apache has a sophisticated radar mounted atop its rotor mast called the Longbow. The Longbow is a 'millimetre wave' radar that uses short-wavelength waves. The Longbow can



A collage of an Apache with Longbow radar atop its rotor mast (Boeing) and an LCH in Ladakh (HAL)

simultaneously detect over 100 targets on the ground and in the air; the LCH lacks such a capability.

The LCH is not meant to be a heavy hitter carrying a large number of anti-tank missiles. On the other hand, its high-altitude performance characteristics make it well placed to combat UAVs.

Explaining the features of the LCH to *onmanorama* in 2019, an HAL official said, "This is the first attack helicopter with us, which has aerial combat capabilities. A moving UAV can be taken on easily with an air-to-air missile or with the front gun. This was a capability gap the services had and LCH will fill it now."

Writing in an online publication in February this year, retired air chief marshal Fali Homi Major noted that the Apache would "do well in the plains," but stressed it would have performance limitations in the high-altitude regions of the Himalayas.

Major, incidentally, was the first helicopter pilot to become chief of the Indian Air Force. Major argued the relatively low number of Apache helicopters on order by the Indian Army and Air Force, as of now, would be "grossly inadequate" for missions in multiple operational theatres. Major argued that the LCH could prove to be a 'game changer' if its development progressed smoothly.

<https://www.theweek.in/news/india/2020/11/20/after-apache-iaf-chief-flies-desi-attack-helicopter-how-the-2-choppers-differ.html>

Business Standard

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Moving in elite company, Indian Navy grapples with serious shortfalls

There is concern in South Block at the poor state of readiness of the navy's 140-odd warships, which face severe shortages in sonar equipment, helicopters and torpedoes

By Ajai Shukla

New Delhi: The quadrilateral Exercise Malabar, involving the American, Australian, Japanese and Indian navies, terminates on Saturday and, by the accounts of India's Ministry of Defence (MoD), has been a thumping success.

With two aircraft carrier battle groups participating – one American and one Indian – the three Indian capital warships that exercised, along with an Indian Scorpene submarine and a P-8I maritime reconnaissance aircraft, got a valuable opportunity to train with the best equipped navies of the world.

Yet, there is concern in South Block at the poor state of readiness of the navy's 140-odd warships, which face severe shortages in sonar equipment, helicopters and torpedoes – equipment critical for a warship's survival and combat power.

Like almost every Indian warship built after 1997, the aircraft carrier INS Vikramaditya and the two destroyers, INS Kolkata and INS Chennai, participated in Malabar without "advanced towed array sonar" (ATAS), essential for detecting enemy submarines in the shallow Arabian Sea where the peculiar temperature and salinity gradients sharply limit the effectiveness of conventional sonars.

Without ATAS, enemy submarines can sneak up to within 50-80 kilometres of these warships and launch their torpedoes from standoff ranges.



Most Indian warships also function without another vital anti-submarine warfare (ASW) platform: Naval Multi-Role Helicopters (NMRH), which fly low over the sea and lower “dunking sonar” into the water in order to listen for audio signals from enemy submarines.

While the navy signed a contract for 24 MH-60 Romeo multi-role choppers in February, it is currently left with just about 10 obsolete Seaking helicopters, of which no more than four-to-five are usually operational at any time. In addition, there are eight Kamov-28, of which four-to-five are available. These 10-odd choppers must be distributed amongst the navy’s 40-odd capital warships.

Sonars

In 2014, towards addressing the dire shortage of ATAS sonars, the MoD signed a contract with German marine electronics leader, Atlas Elektronik, for six advanced towed array sonar. Six years later, just two ATAS have been installed on warships so far. One major reason is that the navy keeps changing the warships on which they are to be installed. For example, with INS Mysore going into medium refit and likely to be out of action for a couple of years, its ATAS is being transferred to the destroyer, INS Delhi.

Transferring an ATAS from one ship to another is costly and painstaking. Cutting the helicopter deck to install the winch inside could take three months. Another six months or so are spent on pre-harbour trials harbour trials and field evaluation trials.

Nine more ATAS sonars are being procured from Atlas Elektronik in a contract that is before a cost negotiating committee. Even though this is a “follow-on contract” to the six ATAS already bought, the Defence Acquisition Procedure requires that it goes through the entire procurement procedure, except for field evaluation trials (FET). Were there an options clause in the earlier contract, the next tranche of procurement would be classified as a “repeat contract”, and would have followed a greatly simplified procedure.

Another four ATAS sonars are going through the glacial procurement procedure for the four Project 1135.6 Krivak-class frigates, the first two of which are being manufactured in Russia and the other two in Goa Shipyard Ltd, India. Bids have been submitted for the first two sonars, but the process drags on.

Torpedoes

Given ongoing tensions with China, the navy urgently needs to equip its submarines with state-of-the-art torpedoes. But the heavyweight torpedoes (HWT) needed to equip the navy’s frontline Scorpene submarines have not been procured.

The urgency of this requirement was underlined in August 2014 when the on-going procurement of 98 Black Shark torpedoes for the Scorpene from Italian marine specialist, Whitehead Alenia Sistemi Subacquel (WASS), was scrapped after its parent company, Finmeccanica, was banned by the MoD in the wake of the VVIP helicopter scandal.

When the Black Shark contract was put on hold, it became obvious that India’s vintage arsenal of 98 old SUT torpedoes, would be required to arm the Scorpene-class. The SUT torpedoes were bought in the 1980s and 1990s for the navy’s four Type 209 submarines. However, with some modifications, they could be used from the Scorpene as well.

Atlas Elektronik was called in to carry out a life-cycle extension that would extend the service life of 64 SUT torpedoes by 15 years. This week, another contract was signed by the Indian Navy with Atlas Elektronik to extend the life of the remaining 32 SUT.

With the army facing off against China in Ladakh, New Delhi has urged Atlas to hasten the life-extension of the remaining 32 torpedoes. However, Berlin requires mandatory procedures, such as the issue of a contract, for granting an export licence.

Meanwhile the procurement of new HWTs drags on, the choice reduced to a two-horse race between Atlas Elektronik’s Seahake torpedo; and French firm, Naval Group’s F-21.

As defence minister, Manohar Parrikar pushed in 2015-16 for a straightforward government-to-government arrangement with Berlin to buy Atlas Elektronik’s Seahake. That was scuttled by his return to Goa as chief minister in 2017. Arun Jaitley, who succeeded him, was too preoccupied

with his finance portfolio. Nirmala Sitharaman, the next defence minister, took time to settle down, by when the elections took place and Rajnath Singh replaced her. He has reverted to pursuing a global tender.

However, the procurement has been derailed by the Covid-19 pandemic. The technical evaluation of the torpedoes has been completed, but the live testing, which has to be done in Germany, is held up since no foreign visitors are being permitted into German military facilities.

Submarines

Also floundering is the Project 75I project to construct six submarines with air independent propulsion (AIP) in India. With slow progress, the navy is considering upgrading and giving life cycle extensions to the Kilo-class, Type 209 and Scorpene submarines, to maintain capability till the Project 75I submarines are inducted.

Many believe it is unrealistic to plan to fit lithium-iron batteries and AIP into these old submarines. Even so, this is now probably inescapable since, even if the RFP is released immediately for Project 75I and the procurement goes according to plan it would still be 10-12 years before the first Project 75I submarine becomes operationally available.

https://www.business-standard.com/article/current-affairs/moving-in-elite-company-indian-navy-grapples-with-serious-shortfalls-120112001371_1.html

THE TIMES OF INDIA

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An approach to cost effective transformation of the Indian Army: Version 1.0 model (2030-2035)

Part 1

By Anil Kumar Lal

(The Present Standoff Has Identified Our Weak Spots, Which Need Dedicated Funding for the Next 10 Years for Immediate Rectification and Should Support India's Rising Aspirations as an Asian Power. Need For Bold Institutional Changes, Force Structuring By Rightsizing and Including Segregating the Head of Defence Pensions from the Defence Budget and Bringing It, Under the Central Government Retired Employees Head of National Budgeting)

There have been a flurry of articles on issues like doing away with bands, canteens or at times even about pensions, which become a burden to the Defence Budget towards modernization. Let us not get swayed by superficial and cosmetic changes like the issue of Ceremonials/Military Bands or staffing the Unit Canteens etc. Let us not tinker with the ethos and micromanagement of units and their modus operandi. Let us transform force structures for the end effect of war by synergizing state of the art technologies and initiating own R&D capacities based on a war fighter's field experience. All transformations need to occur against the backdrop of a 'Rising China' in a twin attack mode as against India's shrinking budgets. The whole process can only be done in phases keeping the existing legacy systems, which need to be modernized and then should transit to next generation systems. Before kick starting the transformation process, it is mandatory to do the foundational work as discussed below. The aspect of leapfrogging or Pole-vaulting methodology will depend on many factors, thus we should create models for Version 1.0, (Build up on Legacy systems), Version 2.0 (Leap-frogging) or even Version 3.0 (Pole-vaulting model) as a starting point. (Version 2.0 and Version 3.0 will be covered in subsequent articles)

Foundational Work Required For Resetting the Approach to Transformation

India needs to do foundational work before embarking on a transformation drive. It has to change direction towards self-sufficiency and a new defence strategy, fresh doctrines, organisations and enable 'Make in India' manufacturing. First need, is to re-orientate our strategic direction and

review India's 'National Security Strategy' (NSS) and downwards to Joint Military Doctrines. The operating 'Defence Policy Guidelines' (DPG) should shift to a more proactive stance and India's war strategy should transit to an 'Offensive-Defensive' principle of war. To build and evolve national strategies, we should encourage the raising of Indian Defence University (INDU), and within it, we should create a Military Science College. We should thereafter, spin out PhDs from these centres of excellence to enable cultivating a strategic culture with Indian characteristics. The thrust of warfare will continue to be based on networked technology supported by artificial intelligence and robotics. The above-mentioned capabilities warrant jointness at all levels. Therefore, there is a strong case to pass an 'Armed Forces Joint Act' in the Indian Parliament. This should be on the same line as the Goldwater-Nichols Act of 1986 passed in US senate to force the spirit of Jointness in the US Armed Forces and streamline the command chains. India should institutionalise a 'Strategic Defence Review' (SDR) periodically to cater to emerging threats including the impact of Covid-19 Pandemic scenario and the emerging alliances. New alignments of nations and a changed world order need to be re-calibrated. New geo-political and geo-strategic realities may compel military alliances, to rebalance the power matrix in this region. The voids in the military power equation will have to be addressed through various asymmetric strategies akin to what the Chinese played to face US superiority. One has to locate multiple weak links of the adversary, akin to the chakras in a human body. For example, a strike at the solar plexus chakra can make the strongest also reel back in pain. Obviously, this implies the need for a very sophisticated architecture for harnessing the space and near earth surveillance assets. If help on this aspect has to be taken from strategic allies then it should be standardised by a 'Memoranda of Understanding' (MOU) and joint exercises in peacetime. In fact, such a "Real Time" Information based network should be the heart of future campaigns to give India the decisive edge. Additionally, there is a need to upgrade our spectrum warfare capability. For asymmetric threats, this is the best solution. The newer concept of using state of the art 'Non-Nuclear Electromagnetic-Pulse' (NNEMP) weapons or maybe similar weapons, can blackout the battlefield for both sides paralysing all communication networks and causing a systems failure of all entities like the artillery support, air support and missile firing. Thus, the Cyber-war/social media domain should also be strengthened by an institutional support. Thus, there is a need to redefine the evolving threats before giving the strategic direction to the transformation plan.

Redefining the Threats: Shaping A New Strategic Direction (under direct Chairmanship of the CDS)

The concept of 'strategic space' of India's interest, as defined on the Ministry of Defence website: "India's size, strategic location, trade interests in a security environment that extends from Persian Gulf in the West, to the Straits of Malacca in the East and from the Central Asian Republic (CAR) in the North to near the equator in the South, underpin India's security response. In view of the strategic spread, it is essential for the country to maintain a credible land, air and maritime force to safeguard its security interests." The threats range from the LAC to the non-contact domain. Therefore, the spectrum of threats for which the nation must prepare, besides the collusive and collaborative threats from its two major adversaries were broadened to include technological threats such as cyber, space and information warfare besides non-contact or non-conventional threats and security within the geographic space as described above. Nevertheless this, the current military standoff between India and China demands more focussed analyses of the military transformation.

The present Line of Actual Control (LAC) tensions and the existing protracted standoff have again confirmed the reality of a twin threat to India, from Pakistan and China. There is no need for any more speculation of this grim reality in front of us today. Challenges to global threats are being re-defined due to the fast pace of changing technology, geopolitical realignments and many other factors. Correspondingly, there is a need for a change in military organizational structures. The increased impact of Precision Guided Munitions (PGMs) with higher Lethality and longer ranges dictates the reduction in manpower. Even assimilation of the force multiplication effect of the 'Space Based Assets' needs to be factored in. This leads to the necessity of restructuring and

resizing manpower in these legacy based ossified organizations. Simple analyses will lead to reduction in manpower all across the army and other services, while embedding force structure with niche technologies. Manpower reduction will save recurring revenue. The budgets, thus saved can enable better modernization in weapons and equipment or maybe for raising additional structures as per the changing threat perceptions.

Relook & Implementation of Various Reports

Post Kargil war, the Kargil Review committee (KRC) had suggested many structural changes, however only some points were addressed. Similarly, in 2015, a Shiketkar committee was formulated for cost effective reforms. Thereafter, the Shiketkar report was published some time back in 2016. The it now needs a fast relook to draw out fresh lessons out of the current impasse. Necessary amendments therefore need to be made and implemented under the direct Chairmanship of the Chief of Defence Staff (CDS) to prevent delays, and bureaucratic hurdles. Moreover, with the creation of the institution of a CDS, the Strategic Direction for re-orbating and restructuring could become seamless for the inter-service joint enabled transformations. The Shiketkar report has specifically pointed out and highlighted the methodology for improving the teeth to tail ratio. However, there are some transforming issues, which can be added to this report to rationalize and reorganize the teeth itself and create better cutting edge by pruning and rightsizing the present force structuring especially of combat elements. For instance, the organization and War Equipment Table (WET) of existing Infantry battalions can be made more lethal and agile with better firepower and mobility, which should allow rightsizing by downsizing yet obtain better end effect on operations. This will allow a cascading effect for release of trained manpower. Additional formations can then be recreated, restructured, equipped, and tasked for Special Offensive Operations, without any major costs.

Transformation by rightsizing

This means changing the military from the existing ‘Conventional-Clausewitz a-Classical – Continental’ (C4) model to an ‘Effect Based Operations’ (EBO) capable structure in a 2035 and beyond time span. This philosophy in turn should convert numbers to impact, with better precision and lethality of weapons; the impact on a ground target can be same with lesser Number of troops. This should drive us towards reduction of manpower, which is substituted by better technology, mobility and enhanced firepower. For instance ,looking at the Infantry Battalion, which is the teeth of combat- can a platoon in assault be guaranteed almost twice the firepower than hitherto- fore due to better precision technology and thus more accurate direct and indirect fire.

(Disclaimer: Views expressed above are the author's own.)

<https://timesofindia.indiatimes.com/blogs/rakshakindia/an-approach-to-cost-effective-transformation-of-the-indian-army-version-1-0-model-2030-2035-part1/>

An approach to cost effective transformation of the Indian Army: Version 1.0 model (2030-2035)

Part 2

By Anil Kumar Lal

Transforming by Rightsizing

As a corollary is there a case for reducing an Infantry Section strength by one/two soldiers each and that of a platoon strength by one/two soldiers in lieu or so instead? For instance, a reduction of four soldiers per platoon would mean a cumulative reduction of 48xsoldiers per battalion. The Army has 400 battalions i.e. strength of 19200/40,000x soldiers' reduction could be offset by recycling saved budget for better weaponry or may be side step in raising new structures like the Mountain Strike Corps etc. It is reiterated again that in spite of this reduction, if the EBO of a Platoon is same, then the analogy is true that there is a case for reduction of manpower in the existing organizations and that the savings be re-cycled towards modernization followed by transformation progressively correspondingly. A similar look is required in other arms and services as well. Even the Assam Rifles need a relook for rightsizing and releasing troops due to better weaponry and surveillance equipment. This analogy may be applied selectively for units in operational roles/ troops deployed in counter-Insurgency and counter-terrorism role. For such areas, reduction can be caused by a different yardstick. This can be worked out. Broadly, 75000-90,000 of troops can be restructured to create better teeth (This is necessary against the PLA). This translates to creating additional three strike corps equivalent or so, which in turn can transit India's dissuasive deterrence stance to an upgraded strategic deterrence military strategy.

Creating Strategic Deterrence Capability

This trained manpower can be reorganized also into a Special Force Strike Division for expeditionary tasks or as a counter-offensive Formation across the LAC/China. In addition about two similar strike Brigades are also recreated by recycling the above strength. This small little miniscule reorganization will have gigantic impact on India's military strategy from existing 'Passive Defense' to an 'Active Defense' posturing. This also should be in consonance with the right sizing of the other two services.

The above-mentioned downsizing can therefore can be converted into more specialist offensive formations. These newly reorganized Formations can work in tandem with the already created Strike Mountain Corps (hopefully, it is completed immediately).

Remember, China can be only managed by creating more counter-offensive Formations rather than trying to hold in defensive role, not all across the LAC.Chinese are not ready to accept any penetration in their area, more as an ego rather than any military strategy. These additional offensive Formations as discussed can be nominated as Central Reserves of the Nation. These, not only have the capability of counter-penetration along the border but also can strike/interdict the Chinese-Pakistan Economic Corridor (CPEC) and could even be structured as Airborne assault Formations. In addition, recent reports have indicated PLA build up in depth areas. This signifies Chinese intention of consolidating adjacent to the LAC before the winter's sets in and shows Chinese aims of furthering operations in the next season beyond the Khunjerab pass astride the CPEC and attempt to expand towards Ladakh.

Budgeting and Phasing

Because the reality is that, no country can afford in today's time the large conventional type standing armies (based on the number theory rather than being Effect Based) with shrinking budgets. Last year we just got about 1.7% of GDP and this year even lesser, whereas the requirement has always been 3% of GDP with existing strength and responsibilities. Can we

therefore embrace new technologies and whilst doing that, cause appropriate reductions in a very measured way across the army? This fine balance is the need of the hour. Thus it needs to have a long term plan for the necessary transition.

The Long Term Integrated Perspective Plan (LTIPP) as practised entails five stages. The first stage comprises of articulation of a National Security Strategy. The CCS assisted by the National Security Adviser (NSA) would conceptualize this. The second stage would be formulation of Defence Planning Guidelines visualised by the MOD and these would state the contingencies the services would be expected to respond in the next 15 years, the third stage would be formulation of a Defence Capability Strategy. The 'LTIPP' would be the extension of the Defence Capability Plan and would contain the programmes and projects required to be undertaken to reach the targets of the Defence Capability Plan.

The BJP's seventh regular budget on February 1, 2020, earmarked Rs. 4, 71,378 Crore (US\$ 66.9 billion) for the Ministry of Defence (MoD). Of the MoD's total allocations, Rs. 3,23,053 crore (\$45.8 billion) has been provided under the Defence Services Estimates (DSE), an annual publication of the finance wing of the MoD that primarily deals with the expenses of the three armed forces and the Defence Research and Development Organisation (DRDO), and is popularly considered as India's defence budget. The balance allocation is distributed between defence pensions (Rs. 1, 33,825 Crore or \$19.0 billion) and MoD (Civil) (Rs. 14,500 crore or \$2.1 billion). This pension bill is paid under the Defence budget. The reform, which is required, is to merge the Defence Pension Head with the Central Government Pension Head, thus delinking the defence budget from being underfunded due to rising pensions. This change of sub-head is permissible under Article 150 of the constitution as deemed necessary by appropriate authorities.

A portion of the budget should cater for 'Research and Development'(R&D).The 'LTIPP' Documents be promulgated in the form of Technology Perspective Capability Road Map (TPCRM) to enable the DRDO, Defence Public Sector Unit and the private industry to plan their research and development road map.

Army Transformation Campaign

Army transformation campaign-should aim to shape a future Force (Can be called as a 'Lakshaya Force XXX' and abbreviated as "LFXXX") in 10-15 years from now. This force should be compact, responsive, deployable, agile, versatile, survivable, and sustainable. The 'LFXXX' should be able to leverage western-technological superiority and industrial might of allies by an extended Multi-National –Military Industrial Complex (MN-MIC).The goal should be to field the LFXXX in telescoped Phases: Phase 1 By 2023; Phase 2 by 2027; Phase 3 by 2030 or so as to offset the new emerging threat levels in the neighborhood including the IOR.Time lines are corresponding to China's latest declaration of having their Military comparable to the U.S. by 2027.This would necessitate separate budgeting for next 10 years in a telescoped time frame.(How this can be done is covered in a separate article as Version 2.0 for transformation).

The transformation campaign should plan for reaching the goal with a three-pronged approach:

(a) Build the Strategic Tools-NSS-NMS-Joint Legislation and Doctrines. (Like the US-Goldwater Act). The RM can initiate this landmark initiative during his stint.

(b) Plan the limited modernization and recapitalization of existing forces and weapons systems or the legacy force. This will retain current capabilities to conduct possible major theater war or selected small-scale contingencies to bridge the gap between the legacy and Lakshaya force.

(c) The third and critical path- use emerging science and technology to reshape units, doctrine, and infrastructure to ensure the Lakshaya force is a capability based i.e. full spectrum dominance over the enemy.

Avoid Tinkering with Existing Unit Traditions/facilities

Indian Army like all great armies stands on its history and ethos. Soldiers die for their units first and then nation. The root and bedrock of the Indian army has been the institution of the 'Commanding Officer' (CO) of the unit. The buck stops at the 'CO Sahib' level, whom the

infantry troops consider as God, even in the modern times of social media and Whatsapp. We have to strengthen the hands of the 'CO' for micromanagement of his unit. The unit CSD canteen for instance gives him just enough finances to give direct help on unit affairs. An outside Chartered Account audits the accounts. He therefore need not burden the government for such petty and urgent expenses. Similarly, the band is important for the morale of the units. Persons from a medical platoon of an infantry battalion operate the bands. Two persons who are Low medical Category (LMC) operate the CSD. There have also been unnecessary aspersions made on the traditional Buddy system, who is a companion in war to the officer. Such like unit traditions and micro management should not be interfered by any body, as the present system has created a very strong Indian army or in fact the best army in the world.

Conclusion

Finally, the ongoing effort to transform the current force structures in the army by formulating Brigade sized combat bricks is the right approach. In addition, many other transformational changes are being implemented organizationally, which is a positive sign. The creation of the Theatre Commands is a work at hand and may take a few years. In addition, the aspects as discussed above needs to be deliberated and implemented to make the Army leaner but with more agility. The creation of more counter-offensive Formations, which can be deployed at short notice, would become the key issue to raise India's strategic deterrence against China and thus prevent a war.

(Disclaimer: Views expressed above are the author's own.)

<https://timesofindia.indiatimes.com/blogs/rakshakindia/an-approach-to-cost-effective-transformation-of-the-indian-army-version-1-0-model-2030-2035-part-2/>



Mon, 23 Nov 2020

"Extraordinary degree of intra-operability": Navy on Malabar exercise

The 24th edition of the Malabar series of multilateral naval exercises concluded in the Arabian Sea yesterday with the navies of India, America, Japan and Australia taking part in it

New Delhi: Seen as the coming together of four navies against growing hegemonic tendencies of China in oceans, a senior commander of the Indian Navy on Saturday said the Malabar-2020 wargames have shown an "extraordinary degree of interoperability" among the four participating forces.

The 24th edition of the Malabar series of multilateral naval exercises concluded in the Arabian Sea yesterday with the navies of India, America, Japan and Australia taking part in it.

Elaborating the unique features of the wargames, Rear Admiral Krishna Swaminathan, Flag Officer Commanding Western Fleet said, "Malabar 2020 was the 24th edition of the Malabar series of the multilateral naval exercises that the Indian Navy participated in."



He further said, "Although there were many unique aspects of this particular edition, three stood out as being extraordinary. First, it was pronounced for the first time that the exercise was conducted in two phases. The first phase in the Bay of Bengal and the second in the Arabian Sea. Thereby, locating the exercise in both seaports in the Indian peninsula for the first time. Second, it saw the participation of all four possible member navies -- the US Navy, the Japanese maritime

self-defence force, the Royal Australian Navy and the Indian Navy. Thereby, making the quorum complete for the first time after a long gap. Third, it is on the extraordinary degree of what we call intra-operability among forces of the various nations."

"Exercise #Malabar has been a resounding success. I thank the Indian Navy for their warm hospitality & for their planning, leadership, & execution of the Exercise Malabar," said Antony Pisani, Commanding Officer, HMAS Ballarat of Royal Australian Navy, in a tweet.

Calling the Malabar exercise a success, Rear Admiral James A Kirk, Commander CSG-11 (Nimitz group), in his video message said that that the US, India, Japan and Australian naval forces have proved "the ability to operate together across a broad range of missions".

"Malabar 2020 has been a success. US and Indian naval forces alongside Japanese and Australian partners have proved the ability to operate together across a broad range of missions...US and Indian maritime patrol aircraft have integrated with our ships and aircraft effectively demonstrating our ability to hunt submarines and execute live fire. During this 24th Malabar exercise our navies have achieved an impressive level of inoperability. As fellow democracies we share values," he said.

Meanwhile, the Indian Navy tweeted, "Seamless coordination & swift execution of complex exercises further enhanced synergy & mutual understanding amongst the 4 navies in undertaking joint #MaritimeSecurity Ops & will go a long way in further strengthening their already close #strategic partnership."

<https://www.ndtv.com/india-news/navy-on-malabar-exercise-extraordinary-degree-of-intra-operability-2328514>



Sun, 22 Nov 2020

SITMEX 2020: India, Singapore, Thailand naval exercise begins

The two-day long exercise, SITMEX-2020, is scheduled in a “non-contact, at sea only format”, in wake of the Covid-19 restrictions

New Delhi: A trilateral naval exercise involving India, Singapore and Thailand commenced in the Andaman Sea on Saturday.

The two-day long exercise, SITMEX-2020, is scheduled in a “non-contact, at sea only format”, in wake of the Covid-19 restrictions.

The primary aim of the exercise is to further consolidate interoperability between the three navies and also enhance understanding, sharing best practices and procedures for multi-faceted maritime operations.

This edition of the exercise would involve a war-at-sea exercise, naval manoeuvres, weapon firing on the surface and aerial targets, seamanship evolutions, and coordinated navigation operations.

The Indian Navy is represented by two indigenous warships -- an ASW corvette, INS Kamorta, and a guided Missile corvette, INS Karmuk. The force would also include the ships' integral air assets.



The primary aim of SITMEX 2020 is to further consolidate interoperability between the three navies and also enhance understanding, sharing best practices and procedures for multi-faceted maritime operations.(ANI Twitter)

The Republic of Singapore Navy (RSN) is represented by RSS Intrepid, a formidable class stealth frigate, and RSS Endeavour, an Endurance class landing platform dock. The Thailand Navy is being represented by HTMS Kraburi, a Chao Phraya class frigate.

The exercise despite the challenging times posed by the pandemic is a direct testimony to India's long-standing friendship with Singapore and Thailand with special emphasis on strong military cooperation in the Maritime domain. The exercise is envisaged to see greater cooperation in the coming years with the participation of advanced platforms in complex exercises spanning over the entire spectrum of warfare at sea. On conclusion of SITMEX, participating ships from RSN will exercise with the Indian Navy as part of SIMBEX 20, in the Bay of Bengal.

Prime Minister Narendra Modi, during his keynote address at Shangri-La Dialogue in June 2018, announced the conduct of a trilateral naval exercise between India, Singapore, and Thailand.

The maiden edition of the exercise was conducted off Andaman and Nicobar Islands in September 2019 with the harbour phase conducted at Port Blair and a sea phase in the Andaman Sea spanning over five days.

<https://www.hindustantimes.com/india-news/sitmex-2020-india-singapore-thailand-naval-exercise-begins/story-zwfE9hUcZk7iFxGgRTAcHM.html>



Mon, 23 Nov 2020

Exclusive: Satellite images hint at renewed China threat in Doklam

It is believed that this road could ultimately give the Chinese forces an alternate route to the Zompelri ridge, which the Indian Army had prevented Chinese forces from accessing in 2017 when the two sides faced off on the Doklam plateau

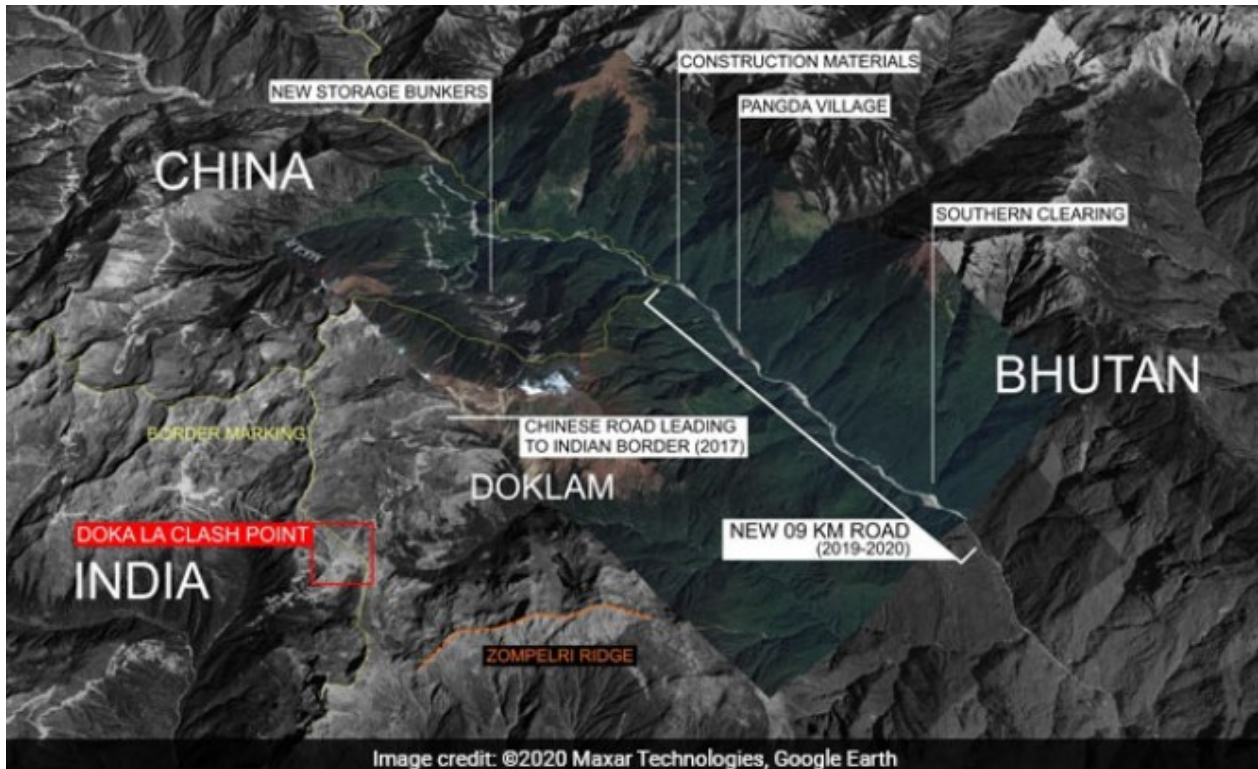
By Vishnu Som

New Delhi: High resolution satellite imagery accessed by NDTV indicates that in addition to setting up a village more than two kilometres within Bhutanese territory on the eastern periphery of the contested Doklam plateau, China has built a road in the same area that stretches approximately 9 kilometres inside Bhutanese territory.



Chinese village 'Pangda' on Oct 28, 2020 compared to construction on Dec 8, 2019. High-res: [here](#) and [here](#)

It is believed that this road could ultimately give the Chinese forces an alternate route to the Zompelri ridge, which the Indian Army had prevented Chinese forces from accessing in 2017 when the two sides faced off on the Doklam plateau.



Map showing extent of Chinese construction in Doklam area. Copyright: Maxar Technologies 2020. [Click here for high resolution image.](#)



Map showing China-Bhutan border region. Construction activity in Pangda village. Copyright: Maxar Technologies 2020. [Click here for high resolution image](#)

On that occasion, Chinese construction workers had attempted to access the ridge by extending their existing track near the Indian Army's post at Doka La which lies on the boundary between Sikkim and Dokala.

Soldiers of the Indian Army had then physically blocked Chinese road construction workers on grounds that access to the Zompelri ridgeline (which lies further south) was unacceptable since it would allow Chinese forces a clear sight of the "Chicken's Neck", the vulnerable sliver of land that links the northeast of India with the rest of the country.

Now, three years later, Chinese construction workers, working on a different axis, have built a new road along the banks of the Torsa river, which extends southwards from the border between China and Bhutan.

This lies less than 10 km from the site of the 2017 face-off between Indian and Chinese forces which lasted more than two months and was only resolved when Prime Minister Narendra Modi and President Xi Jinping of China met in Wuhan in April 2018 where they agreed on de-escalating tensions.

"The Chinese have left untouched the 2017 stand-off site, which is located in one corner of Doklam," says strategic affairs expert, Dr Brahma Chellaney. "But, step by step, they have been changing the status quo in the rest of Doklam, including by building permanent structures and roads and even setting up villages on a plateau that was uninhabited until three years ago."

Clear evidence of Chinese road and village construction on the eastern periphery of the Doklam plateau emerged on Thursday when Shen Shiwei, a senior producer with CGTN, China's state-sponsored media, showcased several images of a village with several chalets by the side of a river.

He tweeted, "Now, we have permanent residents living in the newly established Pangda village. It's along the valley, 35 km south to Yadong country. Here is a map to show the location."

The new images shown in this report are from Maxar which provides some of the most comprehensive satellite imagery commercially available. According to Maxar, "There has clearly been significant construction activity this year all along the Torsa River valley area with extensive road-building/construction activity underway as well as new military storage bunkers being built in China near the Doklam area".

The lead image in this report, contradicts a statement by the Bhutanese Ambassador to New Delhi, Major General Vetsop Namgyel.

In a statement to NDTV on November 19, Major General Namgyel said, "There is no Chinese village inside Bhutan".

Asked whether Bhutan and China had reached any understanding on realigning the border in the contested area, the Ambassador said he "does not comment on border matters." He did, however, confirm that Bhutan and China were involved in border talks.





Road construction along Torsa river, Bhutan. Copyright: Maxar Technologies 2020. [Click here for high resolution image](#)

Bhutan and China have been involved in border disputes for decades. According to Tenzing Lamsang, the Editor of The Bhutanese, "Bhutan and China recognise the 269 sq km in the west and 495 sq km in north-central Bhutan as [being] disputed and so while there are maximalist claim lines from both sides, there is no mutually accepted international border there yet".

What seems clear though is that Beijing's policy, referred to in 2017 as "salami slicing" by General Bipin Rawat, now the Chief of Defence Staff, remains a reality, not just in Eastern Ladakh but in Doklam and in other parts of the Sino-Indian boundary as well.

Contrary to rhetoric in 2017 that India forced China to 'withdraw' from the Doklam stand-off site, the new images seem to indicate that Beijing's determination to make probes in the contested area continues with utter disregard to New Dehi and Thimpu's sentiments.

For the Indian Army, any Chinese push southwards is bound to raise red-flags since Chinese forces will potentially have clear line-of-sight to sensitive areas in the "Chicken's Neck" for the first time.

"It is past time for India to call China out on its expansionism in Doklam by pointing out how it is encroaching on the territories of one of the world's smallest countries," says Brahma Chellaney. "As Bhutan's de facto security guarantor, India cannot turn a blind eye to China's aggressive activities in Doklam," he added.

<https://www.ndtv.com/india-news/exclusive-satellite-images-hint-at-renewed-china-threat-in-doklam-2328660>

Chinese Army is installing and upgrading its radars along the India-China border

China has also created a radar site at Linzhi and Ngiti which is opposite Arunachal Pradesh

New Delhi: China is upgrading and installing radars swiftly along India-China border, the 3,488-km Line of Actual Control (LAC) even though it is engaged in talks with India to resolve the border dispute. China has also created a radar site at Linzhi and Ngiti which is opposite Arunachal Pradesh.

China has also created a radar site at Linzhi and Ngiti which is opposite Arunachal Pradesh. “Linzhi/ Ngiti radar is located approximately 21 kilometre north west of Linzhi and comprises two radomes, one radar along with a large shed building connected by a covered corridor,” the sources.

Further, China is also aggressively developing infrastructure along the Line of Control. China has developed infrastructure near Karakoram Pass and Rechin La, the disputed site at LAC.

Top sources said that at Yecheng a medium-sized building and a watch tower have come up at the facility.

The number of radars installed has also increased from three to four which include one JY-9 radar, one JY-26 radar, one HGR-105 radar and one JLC-88B radar.

At Pali and Phari Kyarang La, which is opposite Sikkim, the radar site is located two kilometers west of Kyarang La, and comprises four radars.

“Infrastructure development has been witnessed at surveillance facility at At Yamdrok Tso which is opposite Central Bhutan,” the top source said,

Around six km northeast of Tsona is the Cuona electronic warfare station. This site has three radomes, three radars and five support buildings.

Infrastructure development has been discerned at the surveillance facility located 2.6 kilometer North West of Tsona Dz Heli base.

Sources said that a radome site is located 6 kilometer south west of Kechen Tsho. It comprises radome, control building and antenna masts within a perimeter wall.

At Qomo Dz the radar site comprises one radome atop a double-storied building, one control building and one medium building, all enclosed by a perimeter wall.

“JY-24 radar is deployed at the site,” the source said.

<https://northeastindia24.com/chinese-army-is-installing-and-upgrading-its-radars-along-the-india-china-border/>



Representational Image

India becomes 4th nation to get IMO nod for navigation satellite system

The other three countries that have its navigation systems recognised by the IMO are the US, Russia and China

By Mayura Janwalkar

Mumbai: India has become the fourth country in the world to have its independent regional navigation satellite system recognised by the International Maritime Organisation (IMO) as a part of the World Wide Radio Navigation System (WWRNS).

The other three countries that have its navigation systems recognised by the IMO are the US, Russia and China.

The Indian Regional Navigation Satellite System (IRNSS) was designed to provide accurate position information services to assist in the navigation of ships in Indian Ocean waters. The Director General of Shipping (DGS) had approached the IMO for granting recognition to the IRNSS as a component of the WWRNS, similar to the US-owned Global Position System (GPS) or Russia's Global Navigation Satellite System (GLONASS) – a process that took two years.



The Indian Regional Navigation Satellite System (IRNSS) was designed to provide accurate position information services to assist in the navigation of ships in Indian Ocean waters. (Representational image: NASA)

On Friday, Director General of Shipping Amitabh Kumar told The Indian Express, “Overdependence on any one system is not safe. The IMO has encouraged various countries to design their own satellite navigation systems. The IMO has now accepted IRNSS as an alternative navigation module. It was in use only on a pilot basis earlier but now all merchant vessels are authorised to use it, even small fishing vessels.”

Kumar said the IRNSS was a modern and more accurate navigation system and at any given time, there are at least 2,500 merchant vessels in Indian waters that will now be able to use the system. The IRNSS will be used to assist in the navigation of ships in ocean waters within the area of approximately 1,500 km from the Indian boundary, the DGS said in a statement.

The statement said, “Details of the tests carried out on merchant ships with regard to the accuracy of the system were included in the report prepared by Indian Space Research Organisation (ISRO) which was submitted to IMO for consideration.”

Calling it a significant achievement towards the ‘Atmanirbhar Bharat’ initiative of the Union government, the statement said, “The Maritime Safety Committee of IMO during its recent meeting held from 4 to 11 November 2020 has approved the recognition of the IRNSS as a component of the World-wide radio navigation system.”

<https://indianexpress.com/article/technology/science/india-becomes-4th-nation-to-get-imo-nod-for-navigation-satellite-system-7059589/>

Explained: The regional navigation satellite system or IRNSS that India is the fourth nation to have

The navigation system can now replace GPS in the Indian Ocean waters upto 1500 km from the Indian boundary

By Mayura Janwalkar

Mumbai: On November 11, India became the fourth country in the world to have its independent regional navigation satellite system recognised by the International Maritime Organisation (IMO) as a part of the World Wide Radio Navigation System (WWRNS).

The navigation system can now replace GPS in the Indian Ocean waters upto 1500 km from the Indian boundary. The process of getting the recognition for the Indian Regional Navigation Satellite System based on satellites of the Indian Space Research Organisation took about two years. Merchant vessels in Indian waters can now use the “modern and more accurate” system as an alternative navigation module, said Director General of Shipping, Amitabh Kumar.

What is the Indian Regional Navigation Satellite System?

The IRNSS is an independent regional navigation satellite system developed by India. It is designed to provide accurate position information service to assist in the navigation of ships in the Indian Ocean waters. It could replace the US-owned Global Positioning System (GPS) in the Indian Ocean extending up to approximately 1500 km from the Indian boundary.

What does the International Maritime Organisation’s (IMO) recognition of the IRNSS mean?

The IMO is the United Nations’ specialised agency responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. The Maritime Safety Committee (MSC) of the IMO recognised the IRNSS as a component of the World-wide Radio Navigation System (WWRNS) during its 102nd session held virtually from November 4 to November 11. With the recognition as a component of the of the WWRNS, the Indian navigation system is similarly placed as GPS, most commonly used by marine shipping vessels across the world or the Russian Global Navigation Satellite System (GLONASS). After the US, Russia and China that have their own navigation systems, India has become the fourth country to have its independent regional navigation system. Unlike GPS, however, IRNSS is a regional and not a global navigation system. According to the Directorate General of Shipping under the Union Ministry of Ports, Shipping and Waterways, this is also a “significant achievement” towards the ‘Atmanirbhar Bharat’ initiative.

Who can make use of the IRNSS?

While the system will be open to all including security agencies, officials of the Directorate General of Shipping said as of now, all merchant vessels including small fishing vessels are authorised to use the system. Vessels that have transponders installed in them will be tracked by satellite navigation showing accurate position in the Indian Ocean region. According to Director General of Shipping Amitabh Kumar, at any given time, there are at least 2,500 merchant vessels in Indian waters that can all use the IRNSS. The IRNSS, he said, is a modern and more accurate system of navigation. The system is based on the Indian Space Research Organisation’s (ISRO) satellites that are used for navigation.

Why was it necessary for India to have its own navigation system?

Kumar said an overdependence on one system (GPS) cannot be safe. The IMO, he said, had encouraged countries to design their own navigation systems. The recognition accorded to IRNSS

was in the process for two years. Details of the tests carried out on merchant ships with regard to the accuracy of the system were included in the report prepared by ISRO which was submitted to IMO for consideration. After a detailed analysis, the sub-committee on Navigation, Communications and Search and Rescue (NCSR) of the IMO, during its 7th session held in January 2020, recommended to the MSC of IMO that it accepts the IRNSS as a component of the WWRNS. The recognition was accorded earlier this month. The IMO issued a circular on November 11 announcing the recognition of the IRNSS to its member states.

<https://indianexpress.com/article/explained/explained-what-is-irns-regional-navigation-satellite-system-7060146/>



Sat, 21 Nov 2020

ISRO to launch satellite for Bhutan next year and train four Bhutanese space engineers

Launching the second phase of RuPay card, Prime Minister Narendra Modi on Friday announced that India will soon be sending Bhutanese satellite to space.

"India opened its space sector for private enterprises. It will boost innovation, capacity and skills. ISRO will be sending Bhutan's satellite next year and work on that is progressing fast," He said.

"Like other Indians I have great love and friendship with Bhutan, when I meet you all its like meeting our own," Prime Minister told the Bhutanese audience on the occasion.

"The relation between India and Bhutan is important and best example for the world," the prime minister added.

He said he is happy that 11,000 transaction took place through RuPay card in Bhutan, and if the Covid pandemic would not have hit the volume could have been greater.

"From my visit to Bhutan, in the phase-1 of RuPay card launch, till now, 11,000 successful RuPay transactions have taken place in Bhutan. Today with the launch of phase-2, we welcome Bhutan as a full-time partner in the RuPay network," Modi said.

Prime Minister along with Bhutan Prime Minister had launched the first phase of RuPay card last year during his visit.

Prime Minister of Bhutan lauded Modi's efforts in tackling the pandemic.

"The Excellency's (Prime Minister Narendra Modi) leadership in tackling the pandemic at home is highly commended," Lotay Tshering said.

"I am sure India will come out much stronger from the pandemic. The lead that India is taking in developing vaccines is source of hope for all of us."

The Bhutan Prime Minister thanked India for promising to provide vaccine when it is ready.

<https://www.businessinsider.in/science/space/news/isro-to-launch-satellite-for-bhutan-next-year-and-train-four-bhutanese-space-engineers/articleshow/79319113.cms>

Australia to temporarily host ISRO satellite tracking facilities

This would support India's planned human space flight programme

By Dinakar Peri

New Delhi: As part of steps to deepen cooperation in civil space activities, the space agencies of India and Australia were working together to position temporarily Indian tracking facilities in Australia, said Australian Minister for Industry, Science and Technology Karen Andrews on Friday. This would support India's planned human space flight programme.

"These include earth observation and data analytics, robotics, and space life sciences. This mission will see India become just the fourth nation to send a crew into space," Ms. Andrews said virtually speaking at the Bengaluru Tech Summit 2020.

The Indian Space Research Organisation (ISRO) has embarked on an ambitious plan to put an Indian in space by 2022 under Gaganyaan mission.

"There are significant opportunities for space agencies, research organisations, and commercial sectors in both of our countries", she stated.

2012 MoU

India, Australia space cooperation is underpinned by a formal Memorandum of Understanding signed between the two countries in 2012.

Australian Deputy Consul General Michael Costa said both nations have been collaborating since 1987 to "support data calibration and laser ranging for Indian satellites, launching Australian satellites, and conducting joint research".

At a virtual summit in June, both countries elevated the bilateral relationship to a Comprehensive Strategic Partnership, and put in place practical agreements on cybersecurity, emerging technology and critical minerals.

Since the summit, Ms. Andrews said, they have announced \$15 million for extending the Australia-India strategic research fund for another four years to facilitate collaboration between researchers on strategically focused, leading-edge science and technology projects. The fund, the Australian government's largest bilateral science programme, has seen a total commitment of nearly \$100 million since 2006.

Cyber cooperation

Tobias Feakin, Australia's Ambassador for Cyber Affairs and Critical Technology, said India and Australia concluded a framework arrangement on cyber and cyber-enabled critical technology cooperation. This was enhancing how the two countries collaborated to promote and preserve an open, free, safe and secure Internet.

On the advantages Australia has for space cooperation, Lloyd Damp, CEO of Southern Launch, a company that provides rocket launch infrastructure and associated services, said: "Australia has many unique advantages in space, from our geographical position in the southern hemisphere, to our wide-open spaces and relatively low light pollution, to our expertise in satellite data applications." This made Australia an ideal partner for space debris tracking and space traffic management activities, world-leading earth observation services, efficient rocket technology and launch services, and remote asset management, he added.

<https://www.thehindu.com/news/national/australia-to-temporarily-host-isro-satellite-tracking-facilities/article33141647.ece>



Hon Karen Andrews, Minister for Industry, Science & Technology, Govt of Australia | Photo Credit: Twitter/@blrtechsummit

Expert panel recommends 5 technologies for drinking water, sanitation

New Delhi: A high-level multi-disciplinary technical panel in the Department of Drinking Water and Sanitation has recommended five technologies, three for safe drinking water and two for sanitation, an official statement said on Sunday.

According to the Jal Shakti Ministry, the committee focussed on application of science and technology for providing field-level solutions.

The technologies include Grundfos AQPure, a solar energy based water treatment plant based on ultra-filtration, Janajal Water on Wheel, an Internet of Things (IoT) based electric vehicle to deliver safe water to households and Presto Online Chlorinator, a non-electric online chlorinator for disinfection of water for removal of bacterial contamination.

The other two are Johkasou technology, an inbuilt packaged black (sewage) and grey water (kitchen and bath water) treatment system having advanced anaerobic-aerobic configuration that can be installed underground, while FBTEC is a site assembled decentralised sewage treatment system using fixed filter media.

The states and union territories can adopt the technologies depending on their requirement and suitability, the ministry said.

The panel was headed by K VijayRaghavan, the Principal Scientific Adviser to the Government, members from NITI Aayog, Department of Science and Technology, Department of Bio-Technology, CSIR, DRDO, NEERI, IIT, National Institute of Ocean Technology, states.

"A multi-disciplinary technical committee in the Department of Drinking Water and Sanitation, Ministry of Jal Shakti has recommended five technologies, specifically three technologies for drinking water and two technologies for sanitation as innovative technologies out of the ten technologies considered by it and these technologies would now be listed in the innovation portal of the department," the ministry said.

These technologies were appraised at different levels before consideration and recommendation by the committee and would be helpful to the implementing agencies in the states and UTs, the ministry said.

Under the Jal Jeevan Mission, innovative proposals are sought online for assisting the states/UTs to adopt innovative technologies to deliver drinking water services to rural communities of adequate quantity and prescribed quality, it said.

Various challenges being faced during implementation of the mission include variations in regional endowment of water resources and levels of service provision, water quality challenges, convergence with the sanitation sector and dealing with grey water/sludge issues, the ministry said.

A two stage screening process was carried out for shortlisting the applicants. Out of the 87 applications received, the initial short listing was done by the Technical Unit based on online submissions of technology.

In the second stage, response was sought as a questionnaire followed by a detailed online presentation by shortlisted applicants.

Second stage was carried out in lieu of the field evaluation owing to COVID-19 lockdown and travel restrictions.

Final shortlisted 10 technologies were considered by the committee out of which five have been recommended, the ministry said.

(Disclaimer: This story has not been edited by Outlook staff and is auto-generated from news agency feeds. Source: PTI)

<https://www.outlookindia.com/newscroll/expert-panel-recommends-5-technologies-for-drinking-water-sanitation/1980449>



Sat, 21 Nov 2020

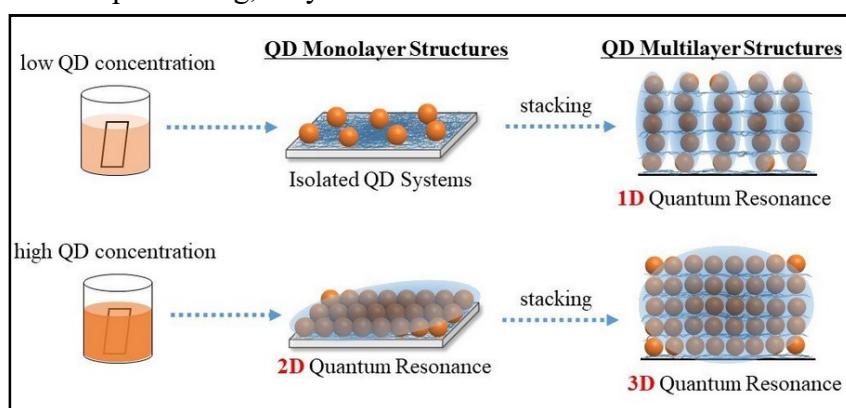
Improving quantum dot interactions, one layer at a time

Osaka City University scientists and colleagues in Japan have found a way to control an interaction between quantum dots that could greatly improve charge transport, leading to more efficient solar cells. Their findings were published in the journal *Nature Communications*.

Nanomaterials engineer DaeGwi Kim led a team of scientists at Osaka City University, RIKEN Center for Emergent Matter Science and Kyoto University to investigate ways to control a property called quantum resonance in layered structures of quantum dots called superlattices.

"Our simple method for fine-tuning quantum resonance is an important contribution to both optical materials and nanoscale material processing," says Kim.

Quantum dots are nanometer-sized semiconductor particles with interesting optical and electronic properties. When light is shone on them, for example, they emit strong light at room temperature, a property called photoluminescence. When quantum dots are close enough to each other, their electronic states are coupled, a phenomenon called quantum



Low quantum dot concentrations during superlattice fabrication suppresses quantum resonance between dots in the same layer, while high concentrations activates it. Credit: DaeGwi Kim, Osaka City University

resonance. This greatly improves their ability to transport electrons between them. Scientists have been wanting to manufacture devices using this interaction, including solar cells, display technologies, and thermoelectric devices.

However, they have so far found it difficult to control the distances between quantum dots in 1D, 2-D and 3-D structures. Current fabrication processes use long ligands to hold quantum dots together, which hinders their interactions.

Kim and his colleagues found they could detect and control quantum resonance by using cadmium telluride quantum dots connected with short N-acetyl-L-cysteine ligands. They controlled the distance between quantum dot layers by placing a spacer layer between them made of oppositely charged polyelectrolytes. Quantum resonance is detected between stacked dots when the spacer layer is thinner than two nanometers. The scientists also controlled the distance between quantum dots in a single layer, and thus quantum resonance, by changing the concentration of quantum dots used in the layering process.

The team next plans to study the optical properties, especially photoluminescence, of quantum dot superlattices made using their layer-by-layer approach. "This is extremely important for realizing new optical electronic devices made with quantum dot superlattices," says Kim.

Kim adds that their fabrication method can be used with other types of water-soluble quantum dots and nanoparticles. "Combining different types of semiconductor quantum dots, or combining semiconductor quantum dots with other nanoparticles, will expand the possibilities of new material design," says Kim.

More information: TaeGi Lee et al. Controlling the dimension of the quantum resonance in CdTe quantum dot superlattices fabricated via layer-by-layer assembly, *Nature Communications* (2020). DOI: [10.1038/s41467-020-19337-0](https://doi.org/10.1038/s41467-020-19337-0)

Journal information: *Nature Communications*
<https://phys.org/news/2020-11-quantum-dot-interactions-layer.html>

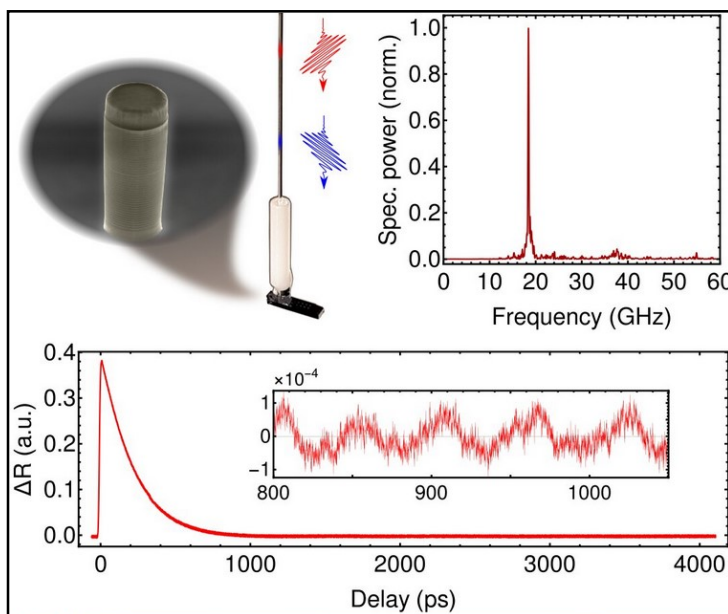


Sat, 21 Nov 2020

A Plug-and-play approach to integrated nanoacoustics

From taut strings vibrating in musical instruments to micro-electro-mechanical systems for optoelectronics, vibrations cover an extensive range of applications. At the nanoscale, the study of mechanical vibrations poses several challenges and opens up a virtually infinite playground for nanotechnologies. Exciting potential benefits of controlled vibrations in the GHz-THz frequency range include better thermal transport management, novel quantum acoustic technologies, improved optoelectronic devices, and the development of novel nanoscale sensors.

However, the standard optical techniques used to generate, detect and manipulate these vibrations suffer from mechanical stability issues, limited reproducibility of experimental results, and usually require large optical power densities that many samples do not withstand. Researchers from the Centre de Nanosciences et de Nanotechnologies—C2N (CNRS / University Paris Saclay) and Quandela SAS, have proposed a novel strategy that simultaneously solves these problems by integrating fibered systems into pump-probe experiments, replacing complex optical alignments protocols with a plug-and-play device.



The researchers tested the new approach with a single-mode fiber glued onto an opto-phononic micropillar. They realized pump-probe experiments without the need for any further optical alignment beyond plugging fiber connectors by spatially overlapping the micropillar's optical mode with the core of the fiber and gluing them together. A critical requirement in pump-probe experiments is to detect the probe beam exclusively and reject any contribution from the pump beam on the optical detector. The usual way to achieve this condition is to use cross-polarized pump and probe beams. To overcome the polarization rotation due to the single-mode fiber, the researchers combined their fiber approach with optical polarization control, resulting in a fibered cross-polarization scheme. The fibered device allows

Top-left : SEM image of the micropillar optophononic resonator, and fibered device. **Top-right:** Acoustic spectrum of the nanomechanical resonator. **Bottom:** time trace measured using a fibered pump-probe coherent phonon generation scheme. Credit: Centre for Nanoscience and Nanotechnology

stable pump-probe signals for more than forty hours and can operate at very low excitation powers below 1mW to detect vibrations at the nanoscale. The work was published in *Applied Physics Letters*.

The fibered optophononic micropillar constitutes a much-improved platform for reproducible plug-and-play pump-probe experiments in individual microstructures. It lifts the necessity of complex optical setups to couple into microstructures. In addition, the demonstrated stability and the convenience of a fiber connector as the only necessary element to interface a sample with an existing experimental setup make it transportable and allows obtaining consistent measurements from the same device at any laboratory in the world. These results demonstrate the synergy present at the C2N, where united efforts of internationally leading nanofabrication facilities, research groups and private companies create a remarkable impact in the science world.

More information: O. Ortiz et al. Fiber-integrated microcavities for efficient generation of coherent acoustic phonons, *Applied Physics Letters* (2020). DOI: [10.1063/5.0026959](https://doi.org/10.1063/5.0026959)

Journal information: *Applied Physics Letters*
<https://phys.org/news/2020-11-plug-and-play-approach-nanoacoustics.html>

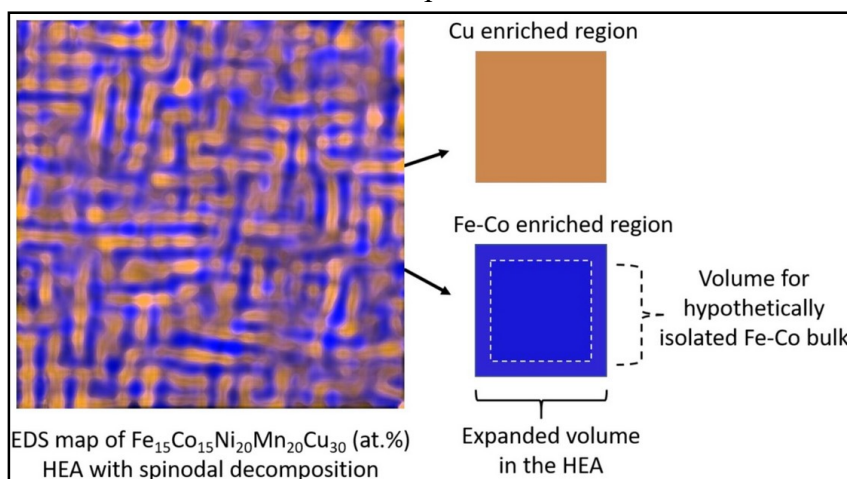


Sat, 21 Nov 2020

A mechanism for designing high-entropy alloys with improved magnetic properties

Magnetic materials are everywhere—in engines, wind turbines, electronic devices and refrigerators—so materials with better magnetic properties are highly desirable. TU Delft researchers Biswanath Dutta and Fritz Körmann of the department of Materials Science and Engineering have revealed a mechanism for improving the magnetic properties of a relatively new class of multicomponent alloys known as HEAs. Their work is published this week in *Advanced Functional Materials*.

High-entropy alloys (HEAs) were first proposed about 15 years ago and since then, have aroused a lot of interest within the materials science community because of their excellent physical, mechanical and functional properties e.g. greater strength, promising magnetic properties, and better resistance to rusting and corrosion. "The focus of this project was to find new mechanisms with which we could improve the magnetic properties of an HEA," says Dutta. "And to do this, you have to play with the chemistry so change the composition of the alloy."



Credit: Delft University of Technology

Unlike traditional alloys, which usually consist of one major component with a small amount of another added element e.g. steel, which is an alloy of iron mixed with 1% carbon, HEAs consist of five or more elements in more-or-less equal proportions. In this study, the team played around with the composition of a FeCoNiMnCu HEA, which contains iron, cobalt, nickel, manganese and copper. "Our colleagues at the Max-Planck-Institut für Eisenforschung in Germany heated this material at a particular fixed temperature for different lengths of time," says Dutta. "And they

noticed two things: one was that heating the HEA for 240 hours improved its magnetic properties. And two, that within the material, the different elements became segregated into different regions within the alloy."

Using this information, Dutta ran theoretical simulations and was ultimately able to explain why, after prolonged heating, you get improved magnetic properties: "Copper doesn't like to make a solid homogenous mixture with the other elements and so the more you heat the sample, the more the copper tries to separate out from the other four elements, leading to different regions with different compositions—for example, an iron-cobalt rich region and a copper rich region." These different regions have unequal volumes causing what is known as coherency stress between a bigger volume and a smaller one. "And if one of these regions is particularly important for the magnetic properties, a volume expansion can improve those magnetic properties."

So in fact there are two mechanisms at work here: one is the formation of two regions with different chemical compositions—a phenomenon known technically as spinodal decomposition—and the other factor is the resulting difference in volume and therefore coherency stress between the different regions.

With a better understanding of these mechanisms, researchers can begin to investigate other magnetic HEAs and multicomponent alloys to determine whether this same behavior occurs causing an improvement in their magnetic properties. "This concept of trying to improve magnetic properties through spinodal decomposition is very new," says Dutta, "And these new mechanisms will help us to find new magnetic material for potential use in, for example, refrigeration systems based less on gasses and more on solid-state magnetic materials which will be much more environmentally friendly."

More information: Ziyuan Rao et al. Beyond Solid Solution High-Entropy Alloys: Tailoring Magnetic Properties via Spinodal Decomposition, *Advanced Functional Materials* (2020). DOI: [10.1002/adfm.202007668](https://doi.org/10.1002/adfm.202007668)

Journal information: [Advanced Functional Materials](https://phys.org/news/2020-11-mechanism-high-entropy-alloys-magnetic-properties.html)
<https://phys.org/news/2020-11-mechanism-high-entropy-alloys-magnetic-properties.html>



Sat, 21 Nov 2020

Enhancing quantum dot solar cell efficiency to 11.53%

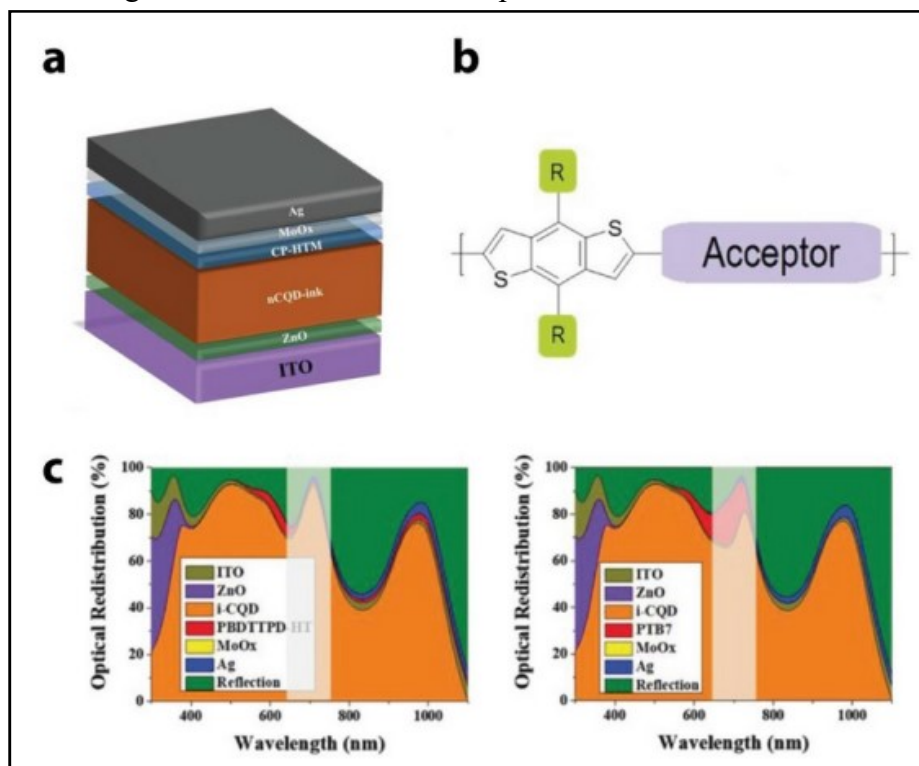
A novel technology that can improve the efficiency of quantum dot solar cells to 11.53% has been unveiled. Published in the February 2020 issue of *Advanced Energy Materials*, it has been evaluated as a study that solved the challenges posed by the generation of electric currents from sunlight by solar cells by enhancing the hole extraction.

A research team, led by Professor Sung-Yeon Jang in the School of Energy and Chemical Engineering at UNIST has developed a photovoltaic device that maximizes the performance of quantum dot solar cells by using organic polymers.

Solar cells use a characteristic of which electrons and holes are generated in the absorber layer. The free free electrons and hole then move through the cell, creating and filling in holes. It is this movement of electrons and holes that generate electricity. Therefore, creating multiple electron-hole pairs and transporting them are an important consideration in the design of efficient solar cells.

The research team switched one side of the quantum dot solar cells to organic hole transport materials (HTMs) to better extract and transport holes. This is because the newly-developed

organic polymer not only possesses superior hole extracting ability, but also prevents electrons and holes from recombining, which allow efficient transport of holes to the anode.



Shown above is the structure of CQDSC and the optical redistribution profiles of devices by TMF optical simulation. Credit: Professor Sung-Yeon Jang, UNIST

Generally, quantum dot solar cells combine electron-rich quantum dots (n-type CQDs) and hole-rich quantum dots (p-type QDs). In this work, the research team developed organic π -conjugated polymer (π -CP) based HTMs, which can achieve performance superior to that of state-of-the-art HTM, p-type CQDs. The molecular engineering of the π -CPs alters their optoelectronic properties, and the charge generation and collection in colloidal quantum dot solar cells (CQDSCs), using them are substantially improved.

As a result, the research team succeeded in achieving power conversion efficiency (PCE) of 11.53% with decent air-storage stability. This is the highest reported PCE among CQDSCs using organic HTMs, and even higher than the reported best solid-state ligand exchange-free CQDSC using pCQD-HTM. "From the viewpoint of device processing, device fabrication does not require any solid-state ligand exchange step or layer-by-layer deposition process, which is favorable for exploiting commercial processing techniques," noted the research team.

"This study solves the problem of hole transport, which has been the major obstacle for the generation of electric currents in quantum dot solar cells," says Professor Jang. "This work suggests that the molecular engineering of organic π -CPs is an efficient strategy for simultaneous improvement in PCE and processability of CQDSCs, and additional optimization might further improve their performance."

More information: Muhibullah Al Mubarak et al. Molecular Engineering in Hole Transport π -Conjugated Polymers to Enable High Efficiency Colloidal Quantum Dot Solar Cells, *Advanced Energy Materials* (2020). DOI: [10.1002/aenm.201902933](https://doi.org/10.1002/aenm.201902933)

Journal information: *Advanced Energy Materials*
<https://phys.org/news/2020-11-quantum-dot-solar-cell-efficiency.html>

Measuring pH locally with terahertz spectroscopy

Researchers at Ruhr-Universität Bochum have developed a new method to determine a local pH value near a specific site of a biomolecule. A reliable measurement with a pH meter is only been possible in a larger ensemble, or homogeneous bulk. The new procedure, which is based on terahertz spectroscopy, is described by the team from Resolv in the journal *Angewandte Chemie International Edition*, published online in advance on 6 November 2020.

The teams from the Chair of Physical Chemistry II led by Professor Martina Havenith and from the Chair of Theoretical Chemistry led by Professor Dominik Marx cooperated during the work. "There is increased evidence that biological reactions do not depend so much on the global chemical properties of a solution but rather that the local conditions in the immediate vicinity of an enzyme are crucial," says Martina Havenith. This includes, for example, the pH value or local charge state.

"It is important for us to be able to not only measure these local properties but also to compute predictively—for instance, if we want to optimize solvation conditions for using enzymes as biocatalysts," says Dominik Marx.

Tests with the amino acid glycine

The scientists worked with a solution of the amino acid glycine. It has two functional groups that can pick up or release protons. The acid can therefore be present in different protonation states, which can be varied by changing the pH of the solution.

The chemists examined glycine solutions using terahertz (THz) spectroscopy. They use transmit radiation in the THz frequency in the solution, which absorbs part of the radiation. The researchers present the absorption pattern in a given frequency range in the form of a spectrum. At the same time, they also simulate the THz spectra of these aqueous solutions for different pH conditions.

Different spectra depending on pH value

The spectra differed significantly depending on the protonation state of glycine. The two groups investigated why this was the case using complex computer simulations, called ab initio molecular dynamics simulations. This method allows researchers to assign certain areas of a spectrum—called bands—to the movements of different bonds in the molecule. In this way, they showed how the different protonation states were reflected in the spectrum. While deprotonated glycine (high pH) causes almost no absorption in this part of the terahertz spectrum, protonated glycine (low pH) produces clearly visible absorption bands. The spectrum of an intermediate state, the glycine zwitterion (neutral pH), was in between. The researchers thus obtained a kind of fingerprint of protonation, measured as a function of pH. They showed that the intensity of the spectrum in the range of 0 to 15 terahertz correlates with the pH.

In further experiments, the researchers demonstrated that the method also works for other biomolecules, i.e. the amino acid valine and for small peptides. "In the future, this fundamental finding will open up new opportunities for us to non-invasively determine local states of charge on the surface of biomolecules," summarises Martina Havenith.

More information: Martina Havenith-Newen et al. Probing local electrostatics of glycine in aqueous solution by THz spectroscopy, *Angewandte Chemie International Edition* (2020). DOI: [10.1002/anie.202014133](https://doi.org/10.1002/anie.202014133)

Journal information: [Angewandte Chemie International Edition](https://phys.org/news/2020-11-ph-locally-terahertz-spectroscopy.html)
<https://phys.org/news/2020-11-ph-locally-terahertz-spectroscopy.html>

Covid-19 vaccination programme to be examined by parliamentary committee

By Anuja, Gyan Varma

- *The standing committee on chemicals and fertilizers will on Monday outline the criteria to decide on the issues related to vaccine production to be discussed by the panel*
- *The panel's remit could increase with representatives from pharma companies likely to appear before its members*

New Delhi: The ambitious adult vaccination programme for Covid being finalised by the National Democratic Alliance (NDA) government is likely to come under discussion and scrutiny by a parliamentary committee. This will be the first time India will try to administer a vaccine to a large section of population.

As the office of Prime Minister Narendra Modi gears up for one of its largest adult vaccination programmes for covid-19 pandemic in the world, its production will be discussed by the standing committee on chemicals and fertilizers is holding a meeting on Monday to get representation from officials of Department of Pharmaceuticals on the 'status of covid-19 vaccine production in India'.

"This is the biggest vaccination programme that would be undertaken by the country and the PMO is directly monitoring the preparations. The officials working in the health departments in various state governments will have to work along with central authorities if this programme is to be a success and a large section of people need to be given the vaccine. This is the first meeting and there would be several such meetings that would include representatives from health ministry and different pharmaceutical companies," said a person with knowledge of the developments.

The development comes in the backdrop of at least two other parliamentary committees—one on health and family welfare and another on science and technology—have taken up for discussion over India's preparedness for pandemics like covid-19 and its health impact.

"It is obvious that when such a huge vaccination programme will be undertaken, it is bound to face challenges. We want to understand these challenges and recommend some concrete solutions to the Union government after talking to experts," said a person with knowledge of the developments.

According to people aware of the developments, the meeting on Monday of the standing committee on chemicals and fertilizers, chaired by Dravida Munnetra Kazhagam (DMK) lawmaker Kanimozhi Karunanidhi, will lay the outline for ascertaining which are the key issues related to vaccine production that the committee will take up in the coming days.

"One of the priority issues chosen during a meeting last month of the panel on selection of subjects for this year was the progress of the covid-19 vaccine. While Monday's meeting more or less sets the ground for what are the key issues the panel will take up around vaccine production, we are expecting that more such meetings will be lined up in the coming days," a person aware of developments said.



The magnitude of the adult vaccination programme being finalised by the Centre has prompted the parliamentary committee try and understand the potential challenges and recommend some concrete solutions to the Union government after talking to experts. (Priyanka Parashar/Mint)

The ambit of the committee is likely to increase with the possibility of more representatives from government departments, private companies and any other related stakeholders likely to be called. This is the first time that the standing committee on chemicals and fertilizers will be taking up the issue of vaccination.

“It is a very sensitive and significant issue where developments are very rapid. We want to understand what the progress on its production in India is and in the coming days some of the big pharma companies involved in the process could also be asked to appear in front of the panel,” the person quoted above added.

Significantly, the parliamentary panel on health and family welfare became the first one to submit its report on the outbreak and management of covid-19 pandemic to Rajya Sabha chairman M. Venkaiah Naidu on Saturday. Some of the key suggestions made by the committee include need for creation of an Indian Health Service (IHS) on the lines of the civil services for streamlining public healthcare as well as suggesting that there should be an increase in health sector budget and investment in health infrastructure.

“The committee strongly emphasizes on the need for ensuring the highest level of ethical and procedural standards in the vaccine research studies. The vaccine should pass the strictly regulated route of all phases of clinical trials and the data should be made available in the public domain. The committee strongly recommends the ministry to follow a transparent approach so that any irregularity in the approval/production of vaccine is avoided,” the committee said on vaccine production in its report according to an official press release.

<https://www.livemint.com/news/india/covid-19-vaccine-production-comes-under-parliamentary-scrutiny-11606023208713.html>



Sat, 21 Nov 2020

Coronavirus: Infectiousness peaks earlier in Covid-19 patients than thought, study says

People infected with the SARS-CoV-2 virus, that causes COVID-19, are most likely to be highly infectious in the first week after symptom onset, highlighting the need to identify and isolate cases early, according to a study

Washington DC: People infected with the SARS-CoV-2 virus, that causes Covid-19, are most likely to be highly infectious in the first week after symptom onset, highlighting the need to identify and isolate cases early, according to a study.

The research, published in The Lancet Microbe journal, says that although the genetic material of the novel coronavirus may still be detected in the respiratory or stool samples of Covid-19 patients for several weeks, no infectious virus particle was found beyond nine days of symptom onset.

“This is the first systematic review and meta-analysis that has comprehensively examined and compared viral load and shedding for these three human coronaviruses,” said study lead author Muge Cevik from the University of St Andrews in the UK.

“It provides a clear explanation for why SARS-CoV-2 spreads more efficiently than SARS-CoV and MERS-CoV and is so much more difficult to contain,” Cevik said.

According to the researchers, majority of viral transmission events occur very early, and especially within the first five days after symptom onset, indicating the importance of self-isolation immediately after symptoms start.

“We also need to raise public awareness about the range of symptoms linked with the disease, including mild symptoms that may occur earlier on in the course of the infection than those that are more prominent like cough or fever,” Cevik said.

In the research, the scientists specifically looked at people infected with SARS-CoV-2 and mainly those who were hospitalised.

They said the results are only relevant for the period of self-isolation for people with confirmed Covid-19, and do not apply to people quarantining who may or may not have been exposed after contact with someone infected.

With many countries currently recommending that people with a SARS-CoV-2 infection should self-isolate for 10 days, the scientists said this is in line with their findings.

They assessed key factors involved in the period of infectiousness of Covid-19 patients such as viral load, the length of time someone sheds viral genetic material (RNA) of the pathogen, and isolation of the live virus.

In their analysis, the researchers included 98 studies that had five or more participants, cohort studies and randomised controlled trials -- 79 focussed on SARS-CoV-2, 73 of which included hospitalised patients only -- eight on the 2002-03 SARS pandemic virus, and 11 on the MERS coronavirus infection.

From these studies, the scientists calculated the average length of viral RNA shedding and examined the changes in viral load and the success of isolating the live virus from different samples collected throughout an infection.

The findings revealed that the average length of time of viral RNA shedding into the upper respiratory tract, lower respiratory tract, stool and serum were 17 days, 14.6 days, 17.2 days and 16.6 days, respectively.

“These findings suggest that in clinical practice, repeat PCR testing may not be needed to deem that a patient is no longer infectious, as this could remain positive for much longer and does not necessarily indicate they could pass on the virus to others,” Cevik said.

“In patients with non-severe symptoms, their period of infectiousness could instead be counted as 10 days from symptom onset,” he added.

The study noted that the highest viral load of SARS-CoV-2 RNA were detected early in the course of the disease -- at the time symptoms begin, or before day five of symptoms.

Asymptomatic infection may clear the virus faster, the researchers said, suggesting that those without symptoms may be as infectious as those with symptoms at the beginning of infection, but may remain so for a shorter period.

However, Cevik added that there are limited data available on the shedding of infectious virus in asymptomatic individuals to inform any policy change on quarantine duration in the absence of testing.

Citing the limitations of the research, the scientists said many of the patients across the different studies included in the analysis were hospitalised and received a range of treatments that may affect the course of their infection.

They said the studies included different populations who were followed up and managed differently.

The period of infectiousness may also not exactly align with the successful culturing of the live virus from samples, although these are likely to broadly overlap, the scientists added.

“The majority of studies included in our review were performed in patients who were admitted to hospital. Therefore, our findings may not apply to people with milder infection although these results suggest those with milder cases may clear the virus faster from their body,” said study senior author Antonia Ho of MRC-University of Glasgow Centre for Virus Research in the UK.

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

<https://www.hindustantimes.com/health/coronavirus-infectiousness-peaks-earlier-in-covid-19-patients-than-thought-study-says/story-6tG8IIVsQUe0xwLdhpkYK.html>

