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

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Ministry of Defence

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Host of activities by DRDO during Aero India 2021

During the 13th edition of Aero India international air show, scheduled to be held from February 3 to 5, 2021 at Air Force Station Yelahanka, Bengaluru; Defence Research and Development Organisation (DRDO) will exhibit its latest defence technologies and demonstrate many systems. Organised biennially, Aero India is a platform for aerospace enthusiasts, prospective defence industries, aspirant start-ups and all other stakeholders to participate and witness the advances in global defence and aerospace fields and interact with many national and international delegations and industries.

The DRDO is developing technologies for all major defence domains and has been participating in this exhibition in a big way in all its editions. The Organisation with its vast defence design and development capability has been working towards Atmanirbhar Bharat and has taken up many policy initiatives to work closely with all stakeholders of the ecosystem. More than thirty laboratories of DRDO connected to aeronautical development are exhibiting their products and technological achievements in this mega event.

More than 300 products, technologies and innovations are being presented in indoor, outdoor, static and flying displays. The models and exhibits are shown in various technology categories and thrust is on digital display of data to highlight the product details. Keeping in view of all COVID-19 guidelines, multimedia-based presentations and product and technology brochures are being provided digitally for download based on QR code.

During a ceremony on February 03, 2021, Raksha Mantri Shri Rajnath Singh will release DRDO export compendium, New Procedure for Design, Development and Production of Military Aircraft and Airborne Stores (DDPMAS) document for air worthiness certification, Aeronautical Research & Development Board (AR&DB) Golden Jubilee Stamp & documents on Journey of the board towards Golden Jubilee of AR&DB.

The major attraction of DRDO's participation in the event is the flying display of Airborne Early Warning & Control (AEW&C) system, Light Combat Aircraft (LCA) Tejas and LCA Navy. While the air display will show the aerodynamic capabilities of the aircrafts, LCA Navy will also be on Tarmac for static display. The highlights of indoor systems include Combat Free Fall System, models of Advanced Medium Combat Aircraft (AMCA), ABHYAS - High-speed Expendable Aerial Target, Twin Engine Deck Based Fighter (TEDBF), FCS System for LCA and Aerostat Systems.

The displays will also include Nirbhay missile, P-16 Heavy Drop System, AWACS India Aircraft Model, Kaveri Dry Engine Prototype, Gas turbine blade and Pilotless Target Aircraft Engine (PTAE), etc. In the area of materials, titanium sponge being developed for INS Vikrant, the aircraft carrier will be shown along with other important products for aeronautics applications.

Among the engineering products, the exhibits include Aircraft Mounted Accessory Gear Box (AMAGB), AWAGB Bearing, MRSAM Launcher and Two-stroke single/double/four-cylinder engines for UAVs etc. The armament related products being showcased are 250kg pre-fragmented bomb, 450Kg HSLD Bomb, INS GPS Guidance Kit for 450Kg HSLD Bomb, Missile warhead models of Astra, Helina, Canopy Severance System (CSS) for Tejas Aircraft, IR flare for PTA.

Among the missiles, full scale models of various surface to air missiles like, Astra, LRSAM, QRSAM, Air to Air Missile Astra, Anti-Radiation Missile NGARM and Smart Anti Airfield Weapon SAAW are being shown. Besides the missiles, technology sub-systems like RF Seeker, IIR Seeker, PINAKA Guidance Kit, Model of rail track rocket sled (RTRS) facility and exploder for naval warheads etc will also be on display.

In the area of electronics and communications, various mission and radar computers, laser warning sensors, AEW&CS data links, various SDR models, light weight portable laser target designator, radars and antennae will be displayed. Integrated life support system, emergency survival rations, NBC Suit Mk-5, personal decontamination kit and other life sciences products will be shown.

Indian Maritime Simulation System (IMSAS), Air Warfare Simulation System and the Air Defence Simulation System are also planned to be demonstrated as working systems. Outdoor exhibits of DRDO include ADFCR (radar vehicle), ADTCR (sensor and power systems), Anti Drone System, QRSAM, Rustom-1, Mobile Launcher Vehicle, MARS, Akash, and Rudram (NGARM) missile among others.

For India Pavilion, keeping in view the theme of Rotary Wing Platforms, over seventeen products applicable to helicopters are exhibited. The products include Low Frequency Dunking Sonar (LFDS) on Advanced Light Helicopter (ALH), torpedoes that can be launched from helicopters, Airborne Software Defined Radio, Radar for Naval Utility, Light-weight Electro Optical Payload (LEOP), Dual Colour Missile Approach Warning System (DCMAWS), and Digital RWR. The other systems applicable for rotary wing platforms include IFF Mk XII, Combat Search & Rescue (CSAR), Heli-Net, SANT Missile and NASM-SR Dummy Model.

A seminar on 'Energising the R&D Capabilities of Industry for 'Atmanirbhar Bharat' is being organised by DRDO on 4th February 2021. DRDO perspectives on industry participation, proactively in defence R&D and manufacturing will be discussed in the seminar. Speakers from India and overseas will deliver talks on various aspects of industry expectations from Government setups and DRDO. On the valedictory day, DRDO will transfer more than ten technologies to various industry partners. This year Aero India 2021 would be a hybrid show and DRDO exhibits can also be seen virtually while interacting with the exhibitors.

With an endeavour to integrate various stakeholders of defence systems development in the country, the DRDO has planned an enriching experience of indigenous defence technologies and systems. As many as 30 first time models/full scale systems are on display. Various interactions are expected with the scientists to explain and demonstrate the systems and exhibits.

The exhibition of DRDO at Aero India 2021 is an excellent opportunity for Indian aerospace community to foster the cause of indigenous development of military systems and technologies with the spirit of self-reliance and national pride.

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पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

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एरो इंडिया 2021 के दौरान डीआरडीओ द्वारा अनेक गतिविधियों का संचालन किया जाएगा

एयरो इंडिया इंटरनेशनल एयर शो के 13वें संस्करण के दौरान, जो 3 से 5 फरवरी, 2021 तक वायु सेना स्टेशन येलहंका, बेंगलुरु में आयोजित किया जाएगा; रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) अपनी नवीनतम रक्षा प्रौद्योगिकियों और कई प्रणालियों का प्रदर्शन करेगा। द्विवार्षिक रूप से आयोजित, एयरो इंडिया एयरोस्पेस के क्षेत्र में उत्साही लोगों, भावी रक्षा उद्योगों, आकांक्षी स्टार्ट-अप्स और अन्य सभी हितधारकों के लिए रक्षा और एयरोस्पेस के क्षेत्रों में हो रही वैश्विक प्रगति में भाग लेने तथा उनका साक्षी बनने एवं अनेक राष्ट्रीय और अंतरराष्ट्रीय प्रतिनिधिमंडलों और उद्योगों के साथ बातचीत करने का एक मंच है।

रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) सभी प्रमुख रक्षा डोमेन के लिए प्रौद्योगिकियों का विकास कर रहा है और अपने सभी संस्करणों में इस प्रदर्शनी में बड़े पैमाने पर भाग ले रहा है। अपनी विशाल रक्षा डिजाइन और विकास क्षमता के साथ संगठन आत्मनिर्भर भारत की दिशा में काम कर रहा है एवं उसने इस पारितंत्र के सभी हितधारकों के साथ मिलकर काम करने के लिए अनेक नीतिगत पहल की है। एयरोनॉटिकल डेवलपमेंट से जुड़ी डीआरडीओ की तीस से अधिक प्रयोगशालाएं इस मेगा इवेंट में अपने उत्पादों और तकनीकी उपलब्धियों का प्रदर्शन कर रही हैं।

इनडोर, आउटडोर, स्थैतिक और फ्लाइंग डिस्प्ले में 300 से अधिक उत्पादों, प्रौद्योगिकियों और नवाचारों को प्रस्तुत किया जा रहा है। विभिन्न प्रौद्योगिकी श्रेणियों में मॉडल और प्रदर्शन दिखाए जाते हैं और उत्पाद विवरणों को उजागर करने के लिए डेटा के डिजिटल प्रदर्शन पर जोर दिया जाता है। सभी कोविड-19 दिशानिर्देशों को ध्यान में रखते हुए, क्यूआर कोड के आधार पर मल्टीमीडिया आधारित प्रस्तुतियों और उत्पादों और प्रौद्योगिकी ब्रोशर को डिजिटल रूप से डाउनलोड हेतु प्रदान किया जा रहा है।

दिनांक 03 फरवरी, 2021 को एक समारोह के दौरान रक्षा मंत्री श्री राजनाथ सिंह डीआरडीओ निर्यात संग्रहण, नई प्रक्रिया डिजाइन, वायु योग्यता प्रमाणन के लिए सैन्य विमान और एयरबोर्न स्टोर्स (डीडीपीए) दस्तावेज, एयरोनॉटिकल रिसर्च एंड डेवलपमेंट बोर्ड (एआरएंडबी) गोल्डन जुबली स्टांप और एआर एंड डीबी की गोल्डन जुबली तक बोर्ड की यात्रा पर दस्तावेज जारी करेंगे।

इस कार्यक्रम में डीआरडीओ की भागीदारी का प्रमुख आकर्षण एयरबोर्न अर्ली वार्निंग एंड कंट्रोल (एईडब्ल्यूएंडसी) प्रणाली, लाइट कॉम्बैट एयरक्राफ्ट (एलसीए) तेजस और एलसीए नेवी का उड़ान प्रदर्शन है। एयर डिस्प्ले जहां विमानों की एयरोडायनामिक क्षमताओं को दिखाएगा, वहीं एलसीए नेवी भी स्टेटिक डिस्प्ले के लिए मौजूद होगा। इनडोर सिस्टम की मुख्य विशेषताएं कॉम्बैट फ्री फॉल सिस्टम, एडवांस्ड मीडियम कॉम्बैट एयरक्राफ्ट (एमसीए), अभ्यास-हाई-स्पीड एक्सपेंडेबल एरियल टारगेट, ट्विन इंजन डेक बेस्ड फाइटर (टेड-बीएफ), एलसीए और एयरोस्टेट सिस्टम्स के लिए एफसीएस सिस्टम शामिल हैं।

प्रदर्शित किए जाने वालों में निर्भय मिसाइल, पी-16 हैवी ड्रॉप सिस्टम, अवाक्स इंडिया एयरक्राफ्ट मॉडल, कावेरी ड्राई इंजन प्रोटोटाइप, गैस टरबाइन ब्लेड और पायलटलेस टारगेट एयरक्राफ्ट इंजन (पीटीआई) आदि भी शामिल होंगे।

मटेरियल्स के क्षेत्र में विमानवाहक पोत आईएनएस विक्रांत के लिए विकसित किया जा रहा टाइटेनियम स्पंज एयरोनॉटिक्स अनुप्रयोगों के लिए अन्य महत्वपूर्ण उत्पादों के साथ प्रदर्शित किया जाएगा।

इंजीनियरिंग उत्पादों में प्रदर्शित किए जाने वालों में एयरक्राफ्ट माउंटेड एक्सेसरी गियर बॉक्स (एएमएजीबी), एडब्ल्यूएजीबी बीयरिंग, एमआर-सैम लांचर और यूएवी के लिए दो स्ट्रोक एकल/ डबल/ फोर-सिलेंडर इंजन आदि शामिल हैं। प्रदर्शित किए जाने वाले आयुध से संबंधित उत्पादों में 250 किलो प्री-फ्रैग्मेंटेड बम, 450 किलोग्राम एचएसएलडी बम, 450 किलो एचएसएलडी बम के लिए आईएनएस जीपीएस गाइडेंस किट, अस्त्र के लिए मिसाइल वॉरहेड मॉडल, हेलिना, तेजस विमान के लिए कैनोपी सीवियरेंस सिस्टम (सीएसएस), पीटीए के लिए आईआर फ्लेयर।

मिसाइलों में अस्त्र, एलआर-सैम, क्यूआर-सैम, एयर टू एयर मिसाइल अस्त्र, एंटी रेडिएशन मिसाइल एनजीएआरएम और स्मार्ट एंटी एयरफील्ड हथियार एसएएडब्ल्यू जैसी विभिन्न सतह से हवा में मार करने वाली मिसाइलों के पूर्ण विकसित मॉडल दिखाए जा रहे हैं। मिसाइलों के अलावा तकनीक आधारित उप-प्रणालियां जैसे आरएफ सीकर, आईआईआर सीकर, पिनाका गाइडेंस किट, रेल ट्रैक रॉकेट स्लेड (आरटीआरएस) सुविधा का मॉडल और नौसैनिक हथियारों के लिए एक्सप्लोडर इत्यादि भी प्रदर्शित होंगे।

इलेक्ट्रॉनिक्स और संचार के क्षेत्र में विभिन्न मिशन और रडार कंप्यूटर, लेजर वार्निंग सेंसर, एडब्ल्यू एंड सीएस डाटा लिंक, विभिन्न एसडीआर मॉडल, लाइट वेट पोर्टेबल लेजर टारगेट डेसिग्नेटर, रडार और एंटीना प्रदर्शित किए जाएंगे। एकीकृत जीवन सहायता प्रणाली, जीवित रहने के लिये आपातकालीन राशन, एनबीसी सूट एमके-5, व्यक्तिगत विसंदूषण किट एवं अन्य जीवन विज्ञान उत्पादों को दिखाया जाएगा।

भारतीय समुद्री सिमुलेशन प्रणाली (आईएमएसएस), एयर वारफेयर सिमुलेशन सिस्टम और एयर डिफेंस सिमुलेशन सिस्टम को भी वर्किंग सिस्टम के रूप में प्रदर्शित करने की योजना है। रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) के आउटडोर प्रदर्शनों में एडीएफसीआर (रडार वाहन), एडीटीसीआर (सेंसर और पावर सिस्टम), एंटी ड्रोन सिस्टम, क्यूआर-सैम, रुस्तम-1, मोबाइल लॉन्चर व्हीकल, मार्स, आकाश और रुद्रम (एनजीएआरएम) मिसाइल शामिल हैं।

इंडिया पवेलियन के लिए रोटरी विंग प्लेटफॉर्म की थीम को ध्यान में रखते हुए हेलीकॉप्टरों के लिये सत्रह से अधिक उत्पादों का प्रदर्शन किया जाता है। इन उत्पादों में उन्नत हल्के हेलीकॉप्टर (एएलएच) पर कम आवृत्ति डंकिंग सोनार (एलएफडीएस), टारपीडो शामिल हैं जिन्हें हेलीकॉप्टर से लॉन्च किया जा सकता है, एयरबोर्न सॉफ्टवेयर डिफाइंड रेडियो, नौसेना के उपयोग के लिए रडार, लाइट वेट इलेक्ट्रो ऑप्टिकल पेलोड (एलईओपी), डूल कलर मिसाइल अप्रोच वॉर्निंग प्रणाली (डीसीएमएडब्ल्यूएस), और डिजिटल आरडब्ल्यूआर शामिल हैं। रोटरी विंग प्लेटफार्मों के लिए लागू अन्य प्रणालियों में आईएफएफ एमके XII, कॉम्बैट सर्व एंड रेस्क्यू (सीएसएआर), हेली-नेट, एसएएनटी मिसाइल एवं एनएसएम-एसआर डमी मॉडल शामिल हैं।

रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) द्वारा दिनांक 4 फरवरी 2021 को 'आत्मनिर्भर भारत' के लिए 'उद्योगों की अनुसंधान और विकास क्षमताओं को ऊर्जावान बनाना' विषय पर एक संगोष्ठी का आयोजन किया जा रहा है। इस सेमिनार में उद्योगों की भागीदारी पर, विशेषकर रक्षा अनुसंधान एवं विकास और विनिर्माण के क्षेत्र में, डीआरडीओ के दृष्टिकोण पर चर्चा की जाएगी। भारत और विदेशों के वक्ता सरकारी सेटअप और रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) से उद्योग की अपेक्षाओं के

विभिन्न पहलुओं पर बातचीत करेंगे। समापन के दिन डीआरडीओ दस से अधिक तकनीकों को विभिन्न उद्योग भागीदारों को हस्तांतरित करेगा । इस वर्ष एयरो इंडिया 2021 एक हाइब्रिड शो होगा और डीआरडीओ द्वारा प्रदर्शित वस्तुओं को उनके प्रदर्शकों के साथ बातचीत के साथ साथ आभासी रूप से भी देखा जा सकता है।

देश में रक्षा प्रणालियों के विकास के विभिन्न हितधारकों को एकीकृत करने के प्रयास के साथ, रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) ने स्वदेशी रक्षा प्रौद्योगिकियों और प्रणालियों का समृद्ध अनुभव करने की योजना बनाई है। लगभग 30 मॉडल/ पूर्ण प्रणालियां पहली बार प्रदर्शन पर हैं। वैज्ञानिकों के साथ प्रणालियों और प्रदर्शनों को समझाने और प्रदर्शित करने के लिए अलग अलग अनेक वार्ताओं की संभावना है।

एयरो इंडिया 2021 में रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) की प्रदर्शनी भारतीय एयरोस्पेस समुदाय के लिए आत्मनिर्भरता और राष्ट्रीय गौरव की भावना के साथ सैन्य प्रणालियों और प्रौद्योगिकियों के स्वदेशी विकास को बढ़ावा देने का एक उत्कृष्ट अवसर है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1693519>

THE TIMES OF INDIA

Sun, 31 Jan 2021

Defence budget and quest for 'atamnirbhar' modernisation

India is grappling with an aggressive Dragon in the north, with uneasy stalemate on LAC beginning to acquire LoC type character. Hence, expectations from defence budget are indeed very high. These are further fuelled by the stark reality that challenges have multiplied, with no resolution in sight on the western border. They are further exacerbated by China and Pakistan acting in collusive mode. Even internally, quest for conflict resolution in proxy war in J&K, simmering insurgency in NE and LWE affected areas has met with only incremental success. It is also fairly apparent that diplomacy and alliances, like Quad, have limitations. The only recourse in dealing with China is to follow West African proverb, quoted by former US President Theodore Roosevelt, "speak softly and carry a big stick".

The stick translates to two primary manifestations — defence modernisation and infrastructure in border areas. The current government, with its muscular approach was naturally expected to accelerate the process. There is discernible progress on connectivities, accompanied by fanfare, which has served to ruffle sensitivities across. It is axiomatic that infrastructure is matched with capabilities and modernisation, which entail long term planning and higher budgetary allocations. Much needed rebalancing of force has been ordered and other optimisation measures are under consideration. However, optimisation and modernisation are not zero-sum functions. The government in its first term opted for 'bread-and-butter' development issues with defence budget pegged below 1.5% of GDP. Defence modernisation barely found mention in budgetary speeches.

Defence planning has remained largely an annual exercise, anchored to budget, peppered with knee jerk emergency procurements. The only achievement seems to be production of another 657 pages long manual, titled as Defence Acquisition Procedure (DAP)-2020 with distinct 'Atamnirbhar' slant. There have been many versions of Defence Procurement Procedure (DPP) since 2002, but unfortunately, in post Bofors and Rafael era, process and procedures have become an end in themselves. Long Term Integrated Perspective Plan (LTIPP) and Defence plans, spread over 15 and 5 years, respectively. These are essentially theoretical articulation of wish list, with no assurance on funding. The current Defence plan, promulgated in 2017 has an outlay of Rs 26.84

lakh crore. This would imply doubling of budgetary allocations with roll over budgeting and entailing non-lapsing capital fund. Both remain logical prerequisites, yet to find approval from financial czars.

The obvious question is why such outlandish planning, especially when average decadal growth in defence outlay has been limited between 8 to 10%? The answer to this lies in successive governments asserting that there is no resource crunch for forces, primarily to pander to domestic constituency. This is further amplified by skilfully projecting each acceptance of necessity (AON) as acquisition. With dysfunctional procurement system, it only adds to burgeoning pile of such proposals, which even with assured funding can take 5-8 years to enter operational service.

One such emphatic assertion was made in parliamentary standing committee on defence (SCoD), in response to my briefing on hollowness in the aftermath of leaked DO letter of COAS in 2011. It was again reiterated in July 18 by Raksha Mantri, “there is neither a shortage of funds nor ammunition”. This was after the Vice Chief had told SCoD that budgetary allocations for the Army at Rs 21,388 crore are insufficient even to cater to committed liabilities in 125 schemes of Rs 29,033 crore. He even flagged that equipment profile was 68% vintage, 24% current and only 8% state of art or modern. To inject objectivity in this debate, this dismal state has been reached due to inadequate funding by successive regimes. As per informed opinion, India has the lowest per capita expenditure on defence, amongst the top six clubs.

It will be appropriate to compare gap between projections by Armed Forces, against actual budgetary allocations in last decade. Shortfall was Rs 23,104 crore in 2011-12, peaking in 2018-19 to Rs 1,12,137 crore, plateauing at Rs 1,03,535 crore in 2020-21. Large percentage of this gap, approximately 75% impacts modernisation, averaging Rs 75,000 to 80,000 crore. This resulted in another scathing report by SCoD in 2020. It also meant that in January 19, payment of Rs 20,000 crore to HAL had to be withheld to meet external contractual liabilities.

Last defence budget (2020-21) reflected 1.82% increase over previous one with an outlay of Rs 3.37 lakh crore. In this, capital budget, catalyst for modernisation included meagre increase of 3%, amounting to Rs 3,400 crore, over the revised estimates (RE) of 2019-20. The Air Force engaged in major modernisation drive and was allocated Rs 43,281.91 crore, which was lower than RE of Rs 44,869.14 crore. Chinese aggression on LAC has resulted in emergency purchases of \$2 billion since June 20, 2020 and exemption of Covid curbs on DMA, except DA pay outs.

The biggest challenge in Covid-induced economic downturn is to find resources for modernisation. There has been buzz that in 2019, the government had finalised substantial defence modernisation plan with an outlay of \$130 billion over seven years. Despite expectations, it is unlikely to be included in budgetary outlay and may be announced, as an intent to be funded later. At best, an increase of Rs 10,000 to 15,000 crore towards capital acquisitions is anticipated.

While there is push for ‘atamnirbharata’ but it is appropriate to put on record the fact that CAG and other bodies have flagged disproportionately high costs of indigenous platforms. It may be worthwhile to look at targeted and smart self-reliance, coupled with strategic collaborative partnerships, to become the lead integrators.

<https://timesofindia.indiatimes.com/city/chandigarh/defence-budget-and-quest-for-atamnirbhar-modernisation/articleshow/80607004.cms>

Aero India to witness big boost to Atmanirbhar Bharat, largest defence order to be signed

Rajnath Singh will formally sign India's largest defence orders for Indian industry, a Rs 48,000 crore contract for 83 LCA Tejas Mark 1 aircraft on February 3

The stage is all set for the biggest air show of the country -- the 13th edition of Aero India. The Defence Ministry's biannual air show will see heightened government pitch for indigenous aircraft designs. Defence Minister Rajnath Singh will formally sign India's largest defence orders for Indian industry, a Rs 48,000 crore contract for 83 LCA Tejas Mark 1 aircraft on February 3.

The contract--73 combat jets in the Mark 1A configuration and 10 Mark 1 trainers--will be signed on the inaugural day of the three-day Aero India 2021 air show beginning in Bengaluru on February 3. This contract, the single-largest order for an indigenously produced defence platform after the indigenous nuclear submarine project, was cleared by the Cabinet Committee on Security (CCS) on January 13.



HAL is also poised to get a Rs 3,000 crore order for 15 Light Combat Helicopters, two of which have already been produced. This order also might be inked at Aero India. The HAL-built Light Utility Helicopter (LUH), currently in development trials, will get its Initial Operational Clearance (IOC) at the air show.

Raksha Mantri to inaugurate LCA's third assembly line

On February 2, the Defence Minister will inaugurate the LCA's third assembly line in Bengaluru. The new greenfield assembly line in Doddanekundi, co-located near the existing two production lines at the Bengaluru complex, was completed last year. The third line will be dedicated to producing 18 LCA Tejas Mark 1 trainers. HAL will convert the line into the future hub for export versions of the aircraft.

HAL is to start delivering the LCAs beginning February 2024. The aircraft maker will complete deliveries of all 83 jets to the IAF by 2028-29. To meet the delivery schedules of 16 aircraft per year, the aircraft-maker is sourcing Tejas wing sections from its Su-30 MKI assembly line in Nashik. The Nashik line has been building Su-30MKIs for the IAF since 2004 though production has been tapering down to build the last squadron of the Russian-designed aircraft.

The IAF currently operates two squadrons of the LCA's Mark 1 variant. The first squadron was raised in Sulur, Coimbatore, in 2016 and now has 16 jets. The second, No. 18 squadron, was operationalised with a single Final Operational Clearance (FOC) aircraft in May last year. Four more HAL-produced FOC aircraft will be on display at the air show next week. The 123 LCAs in the Mark 1 and 1A versions will replace the six squadrons of MiG-21 Bisons as they fly out of service towards the end of this decade. Meanwhile, another indigenously designed and built machine is lining up to replace the armed forces' fleet of the 1960s' vintage Chetak and Cheetah LUHs.

The military version of the LUH is to get its IOC at Aero India. The machine was designed and built by HAL in a short span of five years. It demonstrated its ability to operate in high altitudes in September this year. During 10-day trials, the machine flew from Leh and did a 'hot and high' hover performance at the Daulat Beg Oldie advanced landing ground which, at over 16,000 feet, is the world's highest. The helicopter also demonstrated its payload capability at the Siachen glacier and received an IOC for the civilian variant last February.

<https://www.republicworld.com/india-news/general-news/aero-india-to-witness-big-boost-to-atmanirbhar-bharat-largest-defence-order-to-be-signed.html>

DRDO to showcase its prowess during Aero India-2021

Synopsis

The major attraction of DRDOs participation in the event is the flying display of Airborne Early Warning & Control (AEW&C) system, Light Combat Aircraft (LCA) Tejas and LCA Navy.

Bengaluru: The Defence Research and Development Organisation (DRDO) will exhibit its latest defence technologies and demonstrate many systems during the Aero India-2021 at the Yelahanka Air Force Station in Bengaluru from February 3 to 5. Themed around Atmanirbhar Bharat, more than 300 products, technologies, innovations in the indoor, outdoor, static and flying display during the show will be displayed, the DRDO said in a statement.

According to the organisation, more than 30 laboratories of DRDO connected to aeronautical development will exhibit their products and technological achievements in this mega event.

The major attraction of DRDOs participation in the event is the flying display of Airborne Early Warning & Control (AEW&C) system, Light Combat Aircraft (LCA) Tejas and LCA Navy.



AF's Light Combat Aircraft (LCA) Tejas

While the air display will show the aerodynamic capabilities of the aircraft, LCA navy will also be on Tarmac for static display.

"The DRDO is developing technologies for all major defence domains and has been participating in this exhibition in a big way in all its editions," said the DRDO.

It also said it has been working towards Atmanirbhar Bharat and has taken up many policy initiatives to work closely with all stakeholders of the ecosystem.

The models and exhibits are shown in various technology categories and thrust is on digital display of data to highlight the product details.

The highlights of indoor systems include Combat Free Fall System, models of Advanced Medium Combat Aircraft (AMCA), ABHYAS - High-speed Expendable Aerial Target, Twin Engine Deck Based Fighter (TEDBF), FCS System for Light Combat Aircraft and Aerostat Systems.

The displays will also include Nirbhay missile and P- 16 Heavy Drop System.

In the area of materials, titanium sponge being developed for INS Vikrant, the aircraft carrier will be shown along with other important products for aeronautics applications.

The DRDO said Defence Minister Rajnath Singh on February 3 will release DRDO export compendium, New Procedure for Design, Development and Production of Military Aircraft and Airborne Stores (DDPMAS) document for airworthiness certification, Aeronautical Research and Development Board (AR&DB) Golden Jubilee Stamp and documents on Journey of the board towards Golden Jubilee of AR&DB.

Among the missiles, full scale models of various surface to air missiles like Astra, Long Range Surface to Air Missile (LRSAM), Quick Reaction Surface-to-Air Missile (QRSAM), Air to Air Missile Astra, New Generation Anti- Radiation Missile (NGARM) and Smart Anti Airfield Weapon (SAAW) are being shown.

Besides the missiles, technology sub-systems like RF Seeker, IIR Seeker, PINAKA Guidance Kit, Model of rail track rocket sled (RTRS) facility and exploder for naval warheads etc will also be on display.

Indian Maritime Simulation System (IMSAS), Air Warfare Simulation System and the Air Defence Simulation System are also planned to be demonstrated as working systems.

<https://economictimes.indiatimes.com/news/defence/drdo-to-showcase-its-prowess-during-aero-india-2021/articleshow/80585364.cms>



Sat, 30 Jan 2021

DRDO to host 13th edition of Aero India international air show from Feb 3 to 5

The 13th edition of the Aero India international air show, organised by the Defence Research and Development Organisation (DRDO) is set to take place from February 3 to 5 at Air Force Station Yelahanka, Bengaluru

The 13th edition of the Aero India international air show, organised by the Defence Research and Development Organisation (DRDO) is set to take place from February 3 to 5 at Air Force Station Yelahanka, Bengaluru. On the first day, Defence Minister Rajnath Singh will release the DRDO export compendium, a new Procedure for Design, Development and Production of Military Aircraft and Airborne Stores (DDPMAS) document and other documents.

As per a statement, the DRDO will exhibit its latest defence technologies and demonstrate many systems. One of the DRDO's major attractions will include flying displays of Airborne Early Warning and Control (AEW&C) system, Light Combat Aircraft (LCA) Tejas and LCA Navy. Organised every two years, Aero India is a platform for aerospace enthusiasts, prospective defence industries, aspirant start-ups and other stakeholders to participate and witness the advances in global defence and aerospace fields and interact with delegations and industries from across the globe.

"The Organisation with its vast defence design and development capability has been working towards Atmanirbhar Bharat and has taken up many policy initiatives to work closely with all stakeholders of the ecosystem. More than thirty laboratories of DRDO connected to aeronautical development are exhibiting their products and technological achievements in this mega event," the statement said. Over 300 products, technologies and innovations will be showcased in indoor, outdoor, static and flying displays at the biennial event.

Keeping in view the ongoing COVID-19 pandemic, multimedia-based presentations and product and technology brochures are being provided digitally for download based on QR code. The DRDO has also planned an enriching experience of indigenous defence technologies and systems in a bid to integrate stakeholders of defence systems development in the country. As many as 30 first time models will be on display. (ANI)

(This story has not been edited by Devdiscourse staff and is auto-generated from a syndicated feed.)

<https://www.devdiscourse.com/article/headlines/1428004-vaccine-nationalism-will-prolong-pandemic-who-chief>

Aero India 2021: HAL to have Atmanirbhar Formation Flight; DRDO will showcase over 300 technologies

Bengaluru: Defence PSU Hindustan Aeronautics Limited on Friday said a unique flying display of its indigenous platforms — both fixed and rotary wing — titled Atmanirbhar Formation Flight will be part of the flying display at Aero India 2021, while Defence Research and Development Organisation said it would showcase more than 300 products and technologies.

“HAL will showcase its prowess in defence and aerospace centred on the theme ‘Conceive. Indigenise. Collaborate’, at the world’s first hybrid exhibition. The Atmanirbhar Formation Flight consisting of LCA trainer, HTT-40, IJT, Advanced Hawk Mk 132 and Dornier-228, will fly in a special formation showcasing the spectrum of trainers and signifying self-sufficiency in the trainer segment,” the defence PSU said.

Other than these aircraft, Su30-MKi, advanced light helicopter (ALH) Dhruv, light combat helicopter (LCH) and light utility helicopter (LUH) will also take part in the flying display. Static displays will include Dornier-228, HTT-40 and LUH and ALH Mk III.

“HAL’s major attraction will be the Combat Air Teaming System (CATS) simulator. It will have Tejas–Max cockpit as the mother-ship platform with the embedded air teaming intelligence concepts to demonstrate the fully integrated as well as autonomous wingman platforms and swarming of drones to engage in the mission. Immersive mission visualization will be projected over a wider screen apart from the command and display at Tejas-Max cockpit,” HAL added.

DRDO, stating that it will exhibit its latest defence technologies and demonstrate many systems, said it is developing technologies for all major defence domains and has been participating in this exhibition in a big way in all its editions.

The organisation with its vast defence design and development capability has been working towards Atmanirbhar Bharat and has taken up many policy initiatives to work closely with all stakeholders in the ecosystem. More than 30 laboratories of DRDO connected to aeronautical development are exhibiting their products and technological achievements at this mega event. “More than 300 products, technologies and innovations are being presented at the show in indoor, outdoor, static and flying displays. Defence minister Rajnath Singh will release DRDO export compendium, among other things,” DRDO said.

The major attraction of DRDO’s participation is the flying display of Airborne Early Warning & Control (AEW&C) system, LCA Tejas and LCA Navy. “While the air display will show the aerodynamic capabilities of the aircraft, LCA-Navy will also be on the tarmac for static display. The highlights of indoor systems include Combat Free Fall System, models of the advanced medium combat aircraft (AMCA), ABHYAS - High-speed Expendable Aerial Target, Twin Engine Deck Based Fighter (TEDBF), FCS System for LCA and Aerostat Systems,” DRDO officials explained.

Aside from this, the organisation will display Nirbhay missile, P-16 Heavy Drop System, AWACS’ India aircraft model, Pilotless Target Aircraft Engine (PTAE), etc. It will also showcase missiles, electronics and communication and other technologies and products, including ASTRA (missile).

<https://timesofindia.indiatimes.com/city/bengaluru/hal-to-have-atmanirbhar-formation-flight-drdo-will-showcase-over-300-technologies/articleshow/80591767.cms>





Sat, 30 Jan 2021

Aero India 2021: Runway to Billion Opportunities

By Ravi Shankar

The upcoming Aero India show is billed as the “Runway to a Billion Opportunities”. The theme of the event resonates with Prime Minister Narendra Modi’s vision for *Atmanirbhar Bharat*. The Aero India 2021, a biennial air show that provides a platform for aerospace companies to showcase their products and services is scheduled to be held from February 3 to 5 February at the Yelahanka Air Force Station in Bengaluru. Due to the COVID-19 pandemic, the three day event is unique as it will be the world’s first hybrid show, which means delegates would be present either physically or virtually.

According to the Ministry of Defence (MoD), exhibitors, companies and other businesses can also participate remotely. Exhibitors can interact with virtual visitors through video/chat/SMS or email. “There will be facilities to track details of virtual visitors who visited your stall, schedule online B2B meetings with them and also participate in conferences,” an official said. There will be a QR code to exchange business cards, report cleanliness issues or give feedback. “Exhibitors and visitors will be able to experience everything that a person present at the venue does. They’ll even have access to show dailies and other digital repositories,” the official said.



Photo: BharatShakti/Rohit Pandita

There are 171 virtual exhibitors and over 50 foreign nations that will be represented at the show with the event being a complete sell-out. The pandemic has forced organisers to restrict visitors at the venue: Only 15,000 will be allowed in the exhibition area while those at the air display viewing area will be limited to 3,000.

Watch Aero India Virtually for Free

The MoD has done away with the Rs 1,000 fee the public needed to pay to virtually watch the 13th edition of Aero India. The general public can watch the show for free. “Once people register on the portal, they will have access to various virtual exhibitions, inauguration and other aspects of the show online,” said the official.

IOR Defence Ministers Conclave

During the Aero India event, India will host the Defence Ministers of the Indian Ocean Region (IOR) conclave on 4 February, focusing on security concerns and collaborative efforts. Its theme will be ‘Enhanced peace, security and cooperation in the Indian Ocean’. India has sent invites to 28 countries of the IOR with the option of attending physically or virtually. The conclave will be followed by two seminars by the Indian Navy and Bharatshakti.in with the Indian Coast Guard and Invest India being co-opted in the later, on cooperation in the IOR.

The conclave assumes significance in the backdrop of China’s increasing military presence in the Indian Ocean. The IOR is of strategic importance to India, which sees the region as a natural extension of its sphere of influence. India has gone from calling itself the next “security provider” to “net security provider” in the region. As part of SAGAR (Security and Growth for All in the Region), India undertook COVID-related outreach programmes to provide food and medical aid, vaccines as a gift to IOR nations.

India also hopes to sell some indigenously developed defence equipment to the countries of the IOR. Indian companies will be displaying defence platforms for export like LCA fighter jets, a range of helicopters, air defence systems like Akash.

DRDO to Showcase Over 300 Products

Defence Research and Development Organisation (DRDO) is set to exhibit its latest defence technologies and demonstrate many systems during the event. Over 30 laboratories of DRDO connected to aeronautical development will exhibit their products and technological achievements in this mega event.

“More than 300 products, technologies and innovations are being presented in indoor, outdoor, static and flying displays. The models and exhibits are shown in various technology categories and thrust is on the digital display of data to highlight the product details,” the press release said.

The major attraction of DRDO’s participation in the event is the flying display of Airborne Early Warning & Control (AEW&C) system, Light Combat Aircraft (LCA) Tejas and LCA Navy. The highlights of indoor systems include Combat Free Fall System, models of Advanced Medium Combat Aircraft (AMCA), ABHYAS – High-speed Expendable Aerial Target, Twin Engine Deck Based Fighter (TEDBF), FCS System for LCA and Aerostat Systems. The displays will also include Nirbhay missile and full-scale models of various Surface to Air missiles like Astra, LRSAM, QRSAM, Air to Air Missile Astra, Anti-Radiation Missile NGARM and Smart Anti Airfield Weapon SAAW are being shown.

HAL to Demonstrate Aatmanirbhar Spirit

The state-run aviation major, Hindustan Aeronautics Limited (HAL) will showcase its prowess in defence and aerospace, centred on the theme ‘Conceive. Indigenise. Collaborate’ at the event. HAL’s major attraction will be the Combat Air Teaming System simulator. The simulator will have TEJAS–MAX cockpit as the mother-ship platform with the embedded air teaming intelligence concepts to demonstrate the fully integrated platforms and swarming of drones to engage in the mission.

Five of HAL’s indigenous aircraft are set to fly in formation in a unique display titled ‘Aatmanirbhar Formation Flight’ during air show. The formation will comprise Light Combat Aircraft trainer (LIFT Trainer), HTT-40, Intermediate Jet Trainer, Advanced Hawk Mk-132 and Civil Do-228, which will fly in a special formation, showcasing the spectrum of trainers and signifying self-sufficiency in the trainer segment. Sukhoi 30 MKI, Advanced Light Helicopter Dhruv, Light Combat Helicopter, Light Utility Helicopter will also take part in the flying display separately.

HTT-40, Advanced Hawk Mk 132 and Civil Do-228 will also be available for customer demonstration flights at the three-day event. The static display will include Do-228, Hindustan Turbo Trainer-40 and LUH and ALH Mk III. The outdoor display adjacent to HAL stall will feature rotary wing products, namely LCH, ALH Mk IV Rudra and ALH Civil variant. With the central theme of the India Pavilion being rotary-wing capabilities in India, HAL’s rotary platform Light Utility Helicopter (LUH) will be the centrepiece of the display.

According to organisers, 41 aircraft would participate in the flight display on an inaugural day while there would be 63 aircraft on static display. The key attractions would be the display by Surya Kiran aircraft and Sarang helicopters.

As per MoD, the indigenous technological and logistic prowess will be to the fore and the event will embolden domestic aerospace and defence industries, start-ups, MSMEs to forge partnerships with foreign OEMs.

<https://bharatshakti.in/aero-india-2021-runway-to-billion-opportunities/>

Tejas should be the lynchpin of India's defence export strategy

HAL is the leading aircraft manufacturer in the country and will continue to be so in the foreseeable future

By Air Marshal M Matheswaran (Retd)

The recent clearance by the CCS for the IAF's procurement of 83 Tejas Mk 1A aircraft is a shot in the arm for HAL, the manufacturer. It adds to the earlier order of 40 Mk 1 aircraft, whose final deliveries are likely to be completed by early 2022. This would ensure continuity in production for HAL, a vital aspect that is necessary for the industry to sustain and grow. It is the culmination of a long-awaited order process and a huge boost for the Indian defence industry. With an increasing focus on Atmanirbhar Bharat (self-reliant India), the national leadership needs to ensure that this is just the beginning of a well-crafted strategy. Aerospace capability is vital for India to become self-sufficient in critical technologies.

HAL is the leading aircraft manufacturer in the country and will continue to be so in the foreseeable future. Given its huge infrastructure investments made over decades, and the fact that it is the leading DPSU, it would be a few decades before any private player achieves comparable stature. The government's past policy of restricting defence production to the public sector became the undoing of



Tejas. Credit: PTI.

all attempts at self-reliance and indigenisation in the past. The fact that HAL was doing everything -- a poor strategy -- led to delays in delivery, problems in supply chain control and product support, quality and reliability issues, and poor export orientation. Learning from the past, HAL announced that it intends to focus on its role as systems integrator, retain control over design, development, quality and delivery, while much of the manufacturing would be outsourced to private industries. Outsourcing should be substantive -- to the extent of 70-80%. Such a strategy is vital for India's aerospace ecosystem to develop and mature.

If the Tejas is to succeed as a fine example of self-reliance, lessons from the experience of the HF-24 Marut and ALH projects should not be forgotten. The HF-24 Marut, India's first indigenous fighter aircraft developed under Jawaharlal Nehru's leadership, was a fine achievement, but was phased out prematurely, in less than two decades, due to poor strategy. Successful aircraft and engine developments all over the world are characterised by continuity and block development strategy. This was not followed for the HF-24. When the Tejas programme began more than 20 years later, there was no continuity in terms of people, experience and knowledge management from the previous effort. Now that the Tejas is in series production, it is vital to follow the block development approach, building incremental improvements into the aircraft with each block of manufacturing. A series development strategy of going from Mk 1 to Mk 1A to Mk 2, and further to TEDBF (twin-engine naval fighter) is the right way to consolidate and stabilise the overall ecosystem, skill levels, and more importantly increasing indigenisation.

The Advanced Light Helicopter (ALH) is an unqualified success of indigenous helicopter development. The lesson is primarily in the area of exports. While the ALH is a success story of how a development strategy of different variants based on a basic core platform gives rich dividends, HAL's attempts at exports lacked a coherent strategy and supply chain control. The export results of ALH has clearly been a failure. Large orders from the Army, Air Force, along with few orders from the Coast Guard and the paramilitary forces ensured a sufficiently large

domestic order to sustain production. This experience and continuity led to the development of the Light Combat Helicopter (LCH) and the Light Utility Helicopter (LUH). However, successful exports would have given a major boost to Indian industry and would have enabled an increased role for the private industry.

If the lessons of the Marut and ALH are absorbed well, HAL as the OEM of Tejas must embark on an aggressive export strategy. India's weakness has been its indifference to the idea of defence exports as a major component of the national economy and industrial development. Contrast this with France's national strategy, articulated by its leaders immediately after 1945, wherein the defence industry and armament exports formed a critical component of rebuilding the economy. The logic was clear – defence industry and armament exports had a vital role in nation-building in terms of science and technology, education and skills, research, and economic development. The French defence industry, which was dependent on American assistance and licence production till the 1950s, achieved self-reliance by the 1960s, when they became a major exporter of arms to over 100 countries.

The Tejas should form the lynchpin of our export strategy. If strategised correctly in terms of cost, timely delivery and product support, the aircraft can become an excellent export prospect, though the global fighter market is ruthlessly competitive and is exceptionally difficult for new entrants. This requires an integrated effort that combines foreign policy, military diplomacy, and aggressive defence marketing and cooperation. Since the Mk1/1A incorporates critical equipment that are of foreign origin (for example, the GE engine) it makes eminent sense to create risk-sharing partnerships with these companies to ensure successful exports. Effectively, this 4/4.5-generation aircraft should be pitched as the best value for money to a large number of countries in Asia, Africa, Europe and Latin America. While the Mk 1 and 1A become the most affordable high-performance aircraft and best value for money, the trainer by itself has immense potential. The Tejas trainer is an ideal aircraft for the LIFT (Lead-In Fighter Trainer) role for all air forces.

Export of the Tejas Light Combat Aircraft is vital for the Indian aircraft industry and the establishment of a vibrant aerospace manufacturing ecosystem. A successful export strategy could result in a production run of 300-400 additional fighters. This would energise the industry, develop a huge pool of highly skilled manpower, and boost the quality of Indian aircraft manufacturing. In turn, it would accelerate the development of next-generation aircraft such as the AMCA, UAVs/UCAVs, and maybe even the development of a bomber. In sum, export strategy for the Tejas must start at the earliest, now that the IAF's order for 83 Mk 1As is a reality.

(The writer was Deputy Chief of Integrated Defence Staff at HQ, IDS, and was responsible for policy plans and force structure development (PP &FD) of the three Services. He is president of The Peninsula Foundation (TPF), a policy think tank based in Chennai)

<https://www.deccanherald.com/specials/sunday-spotlight/tejas-should-be-the-lynchpin-of-india-s-defence-export-strategy-945481.html>

DRDO to exhibit its latest defence technologies and systems during Aero India 2021

Organised biennially, Aero India is a platform for aerospace enthusiasts, prospective defence industries, aspirant start-ups and all other stakeholders to participate and witness the advances in global defence and aerospace fields and interact with many national and international delegations and industries

During the 13th edition of Aero India international air show, scheduled to be held from February 3 to 5, 2021 at Air Force Station Yelahanka, Bengaluru; Defence Research and Development Organisation (DRDO) will exhibit its latest defence technologies and demonstrate many systems.

Organised biennially, Aero India is a platform for aerospace enthusiasts, prospective defence industries, aspirant start-ups and all other stakeholders to participate and witness the advances in global defence and aerospace fields and interact with many national and international delegations and industries.

The DRDO is developing technologies for all major defence domains and has been participating in this exhibition in a big way in all its editions. The Organisation with its vast defence design and development capability has been working towards Atmanirbhar Bharat and has taken up many policy initiatives to work closely with all stakeholders of the ecosystem. More than thirty laboratories of DRDO connected to aeronautical development are exhibiting their products and technological achievements in this mega event.

More than 300 products, technologies and innovations are being presented in indoor, outdoor, static and flying displays. The models and exhibits are shown in various technology categories and thrust is on the digital display of data to highlight the product details. Keeping in view of all COVID-19 guidelines, multimedia-based presentations and product and technology brochures are being provided digitally for download based on QR code.

During a ceremony on February 03, 2021, Defence Minister Rajnath Singh will release DRDO export compendium, New Procedure for Design, Development and Production of Military Aircraft and Airborne Stores (DDPMAS) document for airworthiness certification, Aeronautical Research & Development Board (AR&DB) Golden Jubilee Stamp & documents on Journey of the board towards Golden Jubilee of AR&DB.

The major attraction of DRDO's participation in the event is the flying display of Airborne Early Warning & Control (AEW&C) system, Light Combat Aircraft (LCA) Tejas and LCA Navy. While the air display will show the aerodynamic capabilities of the aircraft, the LCA navy will also be on Tarmac for static display. The highlights of indoor systems include Combat Free Fall System, models of Advanced Medium Combat Aircraft (AMCA), ABHYAS – High-speed Expendable Aerial Target, Twin Engine Deck Based Fighter (TEDBF), FCS System for LCA and Aerostat Systems.

The displays will also include Nirbhay missile, P-16 Heavy Drop System, AWACS India Aircraft Model, Kaveri Dry Engine Prototype, Gas turbine blade and Pilotless Target Aircraft Engine (PTAE), etc. In the area of materials, titanium sponge being developed for INS Vikrant, the aircraft carrier will be shown along with other important products for aeronautics applications.



Defence Research and Development Organisation (DRDO) will exhibit its latest defence technologies and demonstrate many systems. (Image: Facebook/@DPIDRDO)

Among the engineering products, the exhibits include Aircraft Mounted Accessory Gear Box (AMAGB), AWAGB Bearing, MRSAM Launcher and Two-stroke single/double/four-cylinder engines for UAVs etc. The armament related products being showcased are 250kg pre-fragmented bomb, 450Kg HSLD Bomb, INS GPS Guidance Kit for 450Kg HSLD Bomb, Missile warhead models of Astra, Helina, Canopy Severance System (CSS) for Tejas Aircraft, IR flare for PTA.

Among the missiles, full-scale models of various Surface to Air missiles like, Astra, LRSAM, QRSAM, Air to Air Missile Astra, Anti-Radiation Missile NGARM and Smart Anti Airfield Weapon SAAW are being shown. Besides the missiles, technology sub-systems like RF Seeker, IIR Seeker, PINAKA Guidance Kit, Model of rail track rocket sled (RTRS) facility and exploder for naval warheads etc will also be on display.

In the area of electronics and communications, various mission and radar computers, laser warning sensors, AEW&CS data links, various SDR models, lightweight portable laser target designator, radars and antennae will be displayed. Integrated life support system, emergency survival rations, NBC Suit Mk-5, personal decontamination kit and other life sciences products will be shown.

Indian Maritime Simulation System (IMSAS), Air Warfare Simulation System and the Air Defence Simulation System are also planned to be demonstrated as working systems. Outdoor exhibits of DRDO include ADFCR (radar vehicle), ADTCR (sensor and power systems), Anti Drone System, QRSAM, Rustom-1, Mobile Launcher Vehicle, MARS, Akash, and Rudram (NGARM) missile among others.

For India Pavilion, keeping in view the theme of Rotary Wing Platforms, over seventeen products applicable to helicopters are exhibited. The products include Low-Frequency Dunking Sonar (LFDS) on Advanced Light Helicopter (ALH), torpedoes that can be launched from helicopters, Airborne Software Defined Radio, Radar for Naval Utility, Light-weight Electro-Optical Payload (LEOP), Dual Colour Missile Approach Warning System (DCMAWS), and Digital RWR. The other systems applicable for rotary-wing platforms include IFF Mk XII, Combat Search & Rescue (CSAR), Heli-Net, SANT Missile and NASM-SR Dummy Model.

A seminar on 'Energising the R&D Capabilities of Industry for 'Atmanirbhar Bharat' is being organised by DRDO on 4th February 2021. DRDO perspectives on industry participation, proactively in defence R&D and manufacturing will be discussed in the seminar. Speakers from India and overseas will deliver talks on various aspects of industry expectations from Government setups and DRDO. On the valedictory day, DRDO will transfer more than ten technologies to various industry partners. This year Aero India 2021 would be a hybrid show and DRDO exhibits can also be seen virtually while interacting with the exhibitors.

With an endeavour to integrate various stakeholders of defence systems development in the country, the DRDO has planned an enriching experience of indigenous defence technologies and systems. As many as 30 first time models/full-scale systems are on display. Various interactions are expected with the scientists to explain and demonstrate the systems and exhibits.

The exhibition of DRDO at Aero India 2021 is an excellent opportunity for Indian aerospace community to foster the cause of indigenous development of military systems and technologies with the spirit of self-reliance and national pride.

<https://www.thestatesman.com/india/drdo-exhibit-latest-defence-technologies-systems-aero-india-2021-1502949488.html>

HAL aircraft, U.S. bomber at Aero India

The show will begin on February 3 at Air Force Station, Yelahanka

Bengaluru: This edition of Aero India, beginning February 3 at Air Force Station, Yelahanka, will not only see integrated flying of Surya Kiran and Sarang aerobatics team, but also also feature flying and static display of indigenous aircraft from the HAL stable.

Among other highlights is a 'fly-by' by B-1B bomber of the U.S. Air Force, and flying display of Airborne Early Warning & Control (AEW&C) system, Light Combat Aircraft (LCA) Tejas and LCA Navy of the DRDO.

The B-1B, a supersonic heavy bomber that carries largest conventional payload of guided and unguided weapons, belongs to the 28th Bomb wing based out of Ellsworth Air Base in South Dakota. A release from the U.S. Embassy said the U.S. team will be led by Don Heflin, U.S. Charge d'Affaires, and leading U.S. defence companies will take part.



This edition of the show will also feature flying and static displays of indigenous aircraft from the HAL stable.

HAL's show

Titled 'Aatmanirbhar Formation Flight', HAL will showcase LCA trainer (LIFT Trainer), HTT-40, IJT, Advanced Hawk Mk 132 and Civil Do-228 in special formation showcasing the spectrum of trainers and signifying self-sufficiency in the trainer segment. A release said that HTT-40, Advanced Hawk Mk132 and Civil DO-228 will also be available for customer demonstration flight.

It said that Sukhoi 30 MKI, Advanced Light Helicopter (ALH) Dhruv, Light Combat Helicopter (LCH), Light Utility Helicopter (LUH) will also take part in the flying display. Static display will include Do 228, Hindustan Turbo Trainer (HTT)-40 and LUH and ALH Mk III, the release added. The outdoor display will feature Rotary wing products such as LCH, ALH Mk IV Rudra and ALH Civil variant.

An interesting display will be the Combat Air Teaming System (CATS) simulator that will have TEJAS-MAX cockpit as the mothership platform with embedded air teaming intelligence concepts to demonstrate to engage in the mission, the release added. With the central theme of India Pavillion being Rotary wing capabilities in India, the release said scaled models of IMRH, ALH, LUH, LCH will be displayed.

DRDO products

The DRDO, which has more than 30 laboratories connected to aeronautical development, will exhibit over 300 products and technologies. According to DRDO, its displays will also include Nirbhay missile and P-16 Heavy Drop Systems. Besides the missiles, technology sub-systems like RF Seeker, IIR Seeker, PINAKA Guidance Kit, Model of rail track rocket sled (RTRS) facility and exploder for naval warheads will also be on display.

<https://www.thehindu.com/news/national/karnataka/hal-aircraft-us-bomber-at-aero-india/article33700319.ece>

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Sun, 31 Jan 2021 11:33AM

Indian Coast Guard will celebrate 45th Raising Day

Indian Coast Guard is celebrating its 45th Raising Day on 01 Feb 2021. From a modest beginning with just 07 surface platforms in 1978, ICG has grown into a formidable force with 156 ships and 62 aircraft in its inventory and is likely to achieve targeted force levels of 200 surface platforms and 80 aircraft by 2025.

As the fourth largest Coast Guard in the world, Indian Coast Guard has played a significant role in securing the Indian Coasts and enforcing regulations within the Maritime Zones of India. True to its motto “Vayam Rakshamah” meaning “We Protect”, the service has to its credit saving over 10,000 lives and apprehending around 14,000 miscreants since inception in 1977. On an average, Coast Guard saves one precious life every second day at sea.

Despite the restrictions imposed by the ‘COVID-19’ pandemic, Indian Coast Guard has maintained 24x7 vigil in the Exclusive Economic Zone, by deploying about 50 ships and 12 aircraft daily. The deterrence at sea and coordinated air surveillance by the service enabled seizure of contraband worth about ₹ 1,500 Crore and apprehension of more than 10 foreign fishing boats with 80 miscreants illegally operating in the Indian EEZ alone in year 2020. The ‘Preventive and Measured Response’ stance of operations introduced just over a year ago, ensured that more than 6,000 fishing boats with about 40,000 fishermen were escorted to safe harbours during the passage of 11 cyclones last year, thus averting loss of lives and property at sea.

In consonance with the Hon’ble PM’s vision of ‘SAGAR’ - Security And Growth of All in the Region, Indian Coast Guard created maritime history in dousing a raging fire onboard the 333 M long Very Large Crude Carrier Motor Tanker New Diamond with about 3 Lakh Metric Tonnes of crude oil off Sri Lanka, thereby averting a major ecological disaster. Further, ICG also provided Pollution Response assistance to Mauritius during the grounding of Merchant Vessel Wakashio and provided 30 T of Pollution Response equipment in addition to training. ICG is also collaborating with littoral countries to combat transnational maritime crimes and enhance maritime safety in its area of responsibility and in the Indian Ocean Region.

To harmonise the Maritime & Civil Aviation Search & Rescue mechanism, ICG conducted National Maritime Search & Rescue Board meeting and followed it up with SAR Exercise-2020 (SAREX-2020) to validate the existing mechanism for undertaking Mass Rescue Operations. In order to synergise Coastal Security and intelligence, a maiden seminar was conducted to enhance the effectiveness of Intelligence sharing between stakeholders. The service is also working in close coordination with Central and State agencies to put in place a robust Coastal Security mechanism.

The President of India, Vice President, Prime Minister and Defence Minister congratulated the Indian Coast Guard on completion of 44 glorious years of yeoman service to the nation and appreciated the remarkable role played by the service in pursuit of the nation’s interests in the Maritime Zones.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1693670>



पत्र सूचना कार्यालय
भारत सरकार
रक्षा मंत्रालय

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भारतीय तटरक्षक बल अपना 45वां स्थापना दिवस मनाएगा

भारतीय तटरक्षक बल 1 फरवरी 2021 को अपना 45वां स्थापना दिवस मना रहा है। 1978 में केवल 7 जमीनी प्लेटफार्मों के साथ एक साधारण शुरुआत से आज आईसीजी अपनी सूची में 156 जहाजों और 62 विमानों के साथ एक अजेय सेना बन चुका है और 2025 तक 200 जमीनी प्लेटफार्मों और 80 विमानों के लक्षित बल प्राप्त करने की संभावना है।

दुनिया में चौथे सबसे बड़े तटरक्षक बल के रूप में, भारतीय तटरक्षक बल ने भारतीय तट को सुरक्षित करने और भारत के समुद्री क्षेत्रों में नियमों को लागू करने में महत्वपूर्ण भूमिका निभाई है। अपने आदर्श वाक्य "वयम रक्षाम" का अर्थ "हम रक्षा करते हैं"। भारतीय तटरक्षक बल ने 1977 में स्थापना के बाद से 10,000 से अधिक लोगों की जान बचाने और लगभग 14,000 बदमाशों को पकड़ने का काम किया है।

कोविड-19 महामारी द्वारा लगाए गए प्रतिबंधों के बावजूद, भारतीय तटरक्षक बल ने लगभग 50 जहाजों और 12 विमानों को दैनिक रूप से तैनात करके, महत्वपूर्ण आर्थिक क्षेत्रों में 24x7 सतर्कता बनाए रखी है। समुद्र में हवाई निगरानी सेवा की मदद से वर्ष 2020 में भारतीय ईईजेड जोन में अवैध रूप से काम कर रहे 80 उपद्रवियों के साथ लगभग 1,500 करोड़ मूल्य की 10 से अधिक विदेशी मछली पकड़ने की नौकाओं को जप्त किया। भारतीय तटरक्षक बल द्वारा एक साल पहले निवारक और सोची-समझी प्रक्रिया के तहत पिछले साल 11 चक्रवातों के दौरान लगभग 40,000 मछुआरों के साथ 6,000 से अधिक मछली पकड़ने वाली नौकाओं को सुरक्षित बंदरगाह पर ले जाया गया। इससे बड़े पैमाने पर समुद्री जान-माल का नुकसान से बचाया गया।

माननीय प्रधानमंत्री की 'सागर' दृष्टि के अनुरूप- सुरक्षा और क्षेत्र में सभी की प्रगति, भारतीय तटरक्षक बल ने श्रीलंका के 333 मीटर लंबे बहुत बड़े क्रूड कार्टर मोटर टैंकर न्यू डायमंड जिसमें तीन लाख मैट्रिक टन कच्चा तेल था जिसमें आग लग गयी थी को बचाने का काम किया जिससे एक बड़ी पारिस्थितिक आपदा टल गई। इसके अलावा, आईसीजी ने मर्चेंट वेसेल वेकेशियो की ग्राउंडिंग के दौरान मॉरीशस को प्रदूषण प्रतिक्रिया सहायता प्रदान की और प्रशिक्षण के अलावा 30 टी प्रदूषण उपकरण प्रदान किए। इसके साथ आईसीजी समुद्री देशों के साथ अंतर्राष्ट्रीय समुद्री अपराधों का मुकाबला करने और अपनी अधिकार वाले क्षेत्र में और हिंद महासागर क्षेत्र में समुद्री सुरक्षा को बढ़ाने के लिए सहयोग कर रहा है।

आईसीजी ने समुद्री और नागरिक उड्डयन खोज और बचाव तंत्र का सामंजस्य स्थापित करने के लिए राष्ट्रीय समुद्री खोज और बचाव बोर्ड की बैठक आयोजित की और बड़े पैमाने पर बचाव कार्यों को करने के लिए मौजूदा तंत्र को मान्य करने के लिए एसएआर एक्सरसाइज-2020 (एसएआरईएक्स-2020) के साथ इसका पालन किया। तटीय सुरक्षा और खुफिया समन्वय के लिए, हितधारकों के बीच इंटेलेजेंस साझाकरण की प्रभावशीलता को बढ़ाने के लिए एक पहली संगोष्ठी आयोजित की गई थी। यह सेवा केंद्रीय और राज्य एजेंसियों के साथ घनिष्ठ समन्वय में भी काम कर रही है ताकि एक मजबूत तटीय सुरक्षा तंत्र बनाया जा सके।

राष्ट्रपति, उपराष्ट्रपति, प्रधानमंत्री और रक्षा मंत्री ने राष्ट्र के लिए 44 शानदार वर्ष पूरे करने पर भारतीय तटरक्षक बल को बधाई दी और समुद्री क्षेत्रों में देश के हितों की खोज में सेवा द्वारा निभाई गई उल्लेखनीय भूमिका की सराहना की।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1693756>



Press Information Bureau
Government of India

Ministry of Defence

Fri, 29 Jan 2021 2:18PM

IN FAC T-81 decommissioned

Indian Naval Fast Attack Craft (IN FAC) T-81 of the Super Dvora MK II class, was decommissioned on 28 Jan 21 at Naval Dockyard, Mumbai after having served the nation successfully for more than 20 years. Rear Admiral V Srinivas, Flag Officer Commanding Maharashtra Naval Area was the Chief Guest on the occasion.

The 25 meters long vessel with 60 tonnes displacement was built at Goa Shipyard Ltd. In collaboration with M/s Ramta of Israel. She was commissioned into the Navy on 05 Jun 1999 by the then Governor of Goa, Lt Gen JFR Jacob (Retd).

The ship, specially designed for shallow waters, could achieve speeds up to 45 knots and had the capability of day/night surveillance and reconnaissance, Search & Rescue, beach insertion, extraction of Marine Commandoes and high speed interception of intruder craft.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1693178>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Fri, 29 Jan 2021 2:18PM

भारतीय नौसेना के एफएसी

पोत टी-81 को सेवामुक्त किया गया

सुपर डीवोरा एमके-2श्रेणी के भारतीय नौसेना के फास्ट अटैक क्राफ्ट (आईएन एफएसी) टी -81को 20 वर्षों से अधिक समय तक सफलतापूर्वक राष्ट्र की सेवा करने के बाद 28 जनवरी,2021 को मुंबई के नेवल डॉकयार्ड में सेवामुक्त कर दिया गया। इस अवसर पर महाराष्ट्र नौसेना क्षेत्र के फ्लैग ऑफिसर कमांडिंग रियर एडमिरल वी. श्रीनिवास मुख्य अतिथि थे।

इजरायल के मैसर्स रामता के सहयोग से 60 टन विस्थापन क्षमता तथा 25 मीटर लंबा यह पोत गोवा शिपयार्ड लिमिटेड में बनाया गया था। उन्हें गोवा के तत्कालीन गवर्नर लेफ्टिनेंट जनरल जे.एफ.आर जैकब (सेवानिवृत्त) द्वारा 05 जून, 1999 को नौसेना में शामिल किया गया था।

इस पोट को विशेष रूप से उथले पानी के लिए डिज़ाइन किया गया था। यह 45 नॉट तक की गति प्राप्त करने के साथ-साथ दिन/रात की निगरानी करने एवं टोह लेने, खोज तथा बचाव करने, समुद्र तट तक पहुंचने, समुद्री कमांडो को सुरक्षित निकालने तथा घुसपैठियों के जहाजों का शीघ्र पता लगाने में सक्षम था।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1693283>

FINANCIAL EXPRESS
Read to Lead

Sun, 31 Jan 2021

Defence Budget needs to focus on commonality of equipment, interoperability among the three services

Union Budget 2021 India: “The ad-hoc procurements initiated to meet the immediate requirements of the Defence forces are expected to be well addressed as regular Capital procurements,” opines an expert

By Huma Siddiqui

Indian Union Budget 2021-22: The 2021 Defence Budget outlay is expected to reflect the geopolitical world scenario emerging post pandemic and the very Budget constrained on the Nation itself. Procurement of newer assets for land, sea and air operations under Capital outlay are likely to be similar in nature as was seen earlier but more organized and efficiently sourced. “The ad-hoc procurements initiated to meet the immediate requirements of the Defence forces are expected to be well addressed as regular Capital procurements,” opines an expert.

Pending Deals

Due to budgetary constraints several big deals are delayed for all the three services.

Indian Army: Artillery guns, assault rifles, snipers and specialized vehicles and armed drones, helicopters. FICV (Future Infantry Combat Vehicle), TCS (Tactical Communication System) and BMS (Battle Management System) which are expected to come through the ‘Make’ route are required on urgent basis, especially since Indian troops are deployed along the Line of Actual Control (LAC).



The technology within the Nation has not yet evolved to be able to support ‘Atmanirbhar Bharat’ or self-reliant India in Defence.

IAF: New transport and fighter aircraft, helicopters, and drones

Indian Navy: Helicopters, UAVs, Aircraft Carrier, Submarines, Guns, and new warships. Discussions are going on with the US arm of BAE Systems for the \$600 million 127 mm medium caliber guns. India intends to buy 11 such guns.

India-China Border Standoff

“With the Chinese perceived threat alive today, the Defence Budget is expected to see a major tilt towards safeguarding Sino-India land and sea borders. The border skirmishes has highlighted the need for a focus shift to tactically aggressive deterrence, especially for Naval and Indian Air Force (IAF) deployments,” says Milind Kulshreshtha, C4I expert & Strategic Analyst,

“But these activities shall incur additional expenses in the Revenue budget section. For example, enhancements of Combat Air Patrol by air assets can put a heavy strain on the operational Budget available with IAF. With two volatile borders, IAF and Navy are expected to extensively deploy

their ISR assets for enhanced air and sea patrols to thwart any Chinese ship or trawler intrusion near Indian waters,” he states.

Theatre Command Focus

Ideally, the budget needs to be focusing on commonality of equipment and interoperability among the three services as the basis of planning. Unfortunately, such mature processes are yet to be seen in the Indian Defence Budget philosophy.

Sharing his views with Financial Express Online, the C4I expert & Strategic Analyst says, “The much required Theatre Commands need urgency of implementation and the technology shortcomings to enable jointness are glaring. A well planned Defence Budget to bring jointness of operations shall be the much needed top-down approach to drive this initiative. It may be a misnomer to state that Theatre Command creation is expected to be a zero additional budget activity and more of an administrative re-alignment.”

“In fact, a well-planned Theatre Command plan can assist in hardware interchangeability within the three services and a resource optimization. Defence Budget is one single point where such intricate plans can be put to action. A marked difference if not seen now in the budget to acknowledge Theatre Level Command implementation essentially may indicate only paper work on the concept,” Mr Kulshreshtha observes.

Atmanirbhar in Defence & Negative List

The technology within the Nation has not yet evolved to be able to support ‘Atmanirbhar Bharat’ or self-reliant India in Defence.

According to Milind Kulshreshtha, “The creation of a Negative List for Defence imports needs actual alternatives being available on the ground as each equipment piece counts for Defence forces. Resorting to ad-hoc procurements from overseas to fulfill the existing gaps results into demotivating the local private suppliers and this vicious loop needs to be addressed in the Project funding stage. Indigenous Defence MSMEs have reported an intermittent equipment induction approach towards their products and only a few companies which are already well funded usually find the going smooth.”

Overall, India needs to be extremely cautious of avoiding an arms-race kind of mind-set with China since economical might of the adversary is far superior. This means that at any given stage, India can only afford to maintain a highly efficient war-fighting asset but with a technological edge. This force is required to be highly adaptable to meet the challenges of any hostile environment emerging in the near future.

“However, if the Defence Budget is just about sufficient to meet the present essential requirements, the modern technology to maintain India as a strong regional power may remain beyond the reach of the Armed forces,” the C4I expert concludes.

<https://www.financialexpress.com/budget/defence-budget-needs-to-focus-on-commonality-of-equipment-interoperability-among-the-three-services/2182524/>

Indian Army expects 6% plus increase in its capital expenditure allocation in the coming Union budget

This year, there isn't enough revenue allocation, including for Dearness Allowance for the entire year, highly-placed sources said

By Srinjoy Chowdhury

With India facing Covid related economic difficulties, the Army, deployed in East Ladakh, is expecting a modest 6 per cent plus increase in its capital expenditure allocation in the coming Union budget.

Highly placed government sources said that the increase will be modest, and at a time when a number of purchases of new weaponry are in the pipeline. They include purchases of:

- 5 regiments of air-defence gun-missile systems from South Korea or perhaps, Russia, costing about Rs 15,000 crore
- 400 howitzers by Elbit, an Israeli firm, following which another 1180 can be manufactured in India after the transfer of technology. This is a relatively inexpensive weapon system and the 400 gun deal is valued at less than Rs 5000 crore.



Representational Image | Photo Credit: PTI

This is being considered crucial as the gun being developed by the DRDO will take another 3-4 years to be ready and it is currently being seen as a little too heavy.

Similarly, the 130mm guns that have been 'up-gunned' to 155mm cannot be used beyond a point in the mountains due to technical reasons.

- The purchase of Kamov choppers is also stuck. The agreement has a reference to about 70 per cent indigenous content, but the Russian manufacturers are having difficulties going beyond 60 per cent.
- The manufacture of the Russian AK-203 is also stuck because of issues relating to 'royalty'. India is not keen to pay a royalty to the designers per weapon manufactured in India. Several lakh AK-203s are likely to be made not just for the army but after that, the para-military forces.
- The plan to purchase carbines from the UAE has also been put on hold. This was at the last minute after the negotiations were completed.

While the capital budget deals with the purchase of weaponry and also, construction and other work, revenue involves salaries, purchases of fuel and spares and other expenses. The Army's capital budget was about Rs 32,000 crore in 2020-21, with about Rs 23,000 crore for purchase of new weapons and revenue, about Rs 145,000 crore.

There were savings in the revenue budget, Covid being a reason. The training was cut down. Some courses and movements of troops were postponed. Also, in the work area, there was a slowdown because of labour shortages after the migration last year. To move revenue allocations to the capital budget can be done but it requires the Finance Ministry's clearance.

c "DA hasn't been factored in," a senior official said, hoping it will be made good later.

Atmanirbhar Bharat is also an issue. While indigenisation is very important, everything can't be made at home. And the Army has been assured at the highest levels that everything necessary doesn't have to be indigenous.

Facing such a situation, the Army Chief General M.M. Naravane, speaking at a public function, spoke about the need for a revolution in bureaucratic affairs, the laborious procurement process and the rules, which ought to be more friendly to the users, meaning the armed forces, and the manufacturers. Yes, the army was committed to indigenous purchases, but some weapons had to be imported. "We can't have an operational void when the enemy is at the gates," he had said.

<https://www.timesnownews.com/india/article/indian-army-expects-6-per-cent-plus-increase-in-its-capital-expenditure-allocation-in-the-coming-union-budget/713505>



Sat, 30 Jan 2021

As LAC becomes the new LoC, India's challenge deepens

The severe constraints imposed by the pandemic will be unveiled soon, when the budget is presented. Delhi's challenge will be to provide adequate funds for deployment of troops along the LAC for an extended period. Long-term planning must go beyond urgent procurement of some inventory items and focus on enhancing India's neglected trans-border military capabilities in an astute manner

By C Uday Bhaskar

The New Year has got off to a bumpy start as far as the already tense and uneasy India-China relationship is concerned. Even as troops from both sides are in proximate and prickly contact in the Ladakh region since the middle of 2020, January 2021 has been punctuated by a series of developments that pose a complex set of challenges to the two Asian giants.

The ninth round of talks between the military commanders from both sides, held on January 24, has remained inconclusive. But the silver lining is that even if there was no breakthrough, there has been no breakdown as regards the dialogue process.

This is even more relevant given that there were reports of skirmishes in the Sikkim region on January 20. Earlier in the month, media reports referred to the Chinese having constructed a new village a few kilometres across the Line of Actual Control (LAC) over the last year, thereby altering the demographic patterns in transgression of protocols agreed to in 2005.

To aggravate the territoriality issue further, China asserted, on January 21, that its construction of a village near LAC in the eastern sector was "beyond reproach" because Beijing had "never recognised" Arunachal Pradesh. In summary, the contested territoriality issue is now no longer confined to Ladakh in the western sector, but has moved eastwards with areas in Sikkim and Arunachal Pradesh being brought into simmer mode.



Soldiers of the Indian Army operating T-90 Bhishma tank near the Line of Actual Control, Chumar-Demchok area of Eastern Ladakh, January 6, 2021 (ANI)

Reviewing the troubled bilateral relationship in a holistic manner, one could argue that India's approach since Galwan seeks to convey a message of political resolve — that the Narendra Modi government will not be the first to blink — with a visible signal that restraint is still at play. The fact that the Indian military could wrest a minor but significant tactical advantage in the Ladakh region after being initially "surprised" has given Delhi that additional leverage, which has enhanced its resolve to stay firm and seek a return to the pre-Galwan status quo position.

Two signals from Delhi merit scrutiny. The Republic Day gallantry awards included a Mahavir Chakra (the second-highest award) to Colonel Santosh Babu, the commanding officer of the Bihar

regiment who, along with 20 other soldiers, was killed by People's Liberation Army (PLA) troops in the Galwan scuffle. The citation for Babu notes that "his column faced stiff resistance from the adversary who attacked using lethal and sharp weapons along with heavy stone pelting from adjoining heights" and avoids any reference to China or PLA by name. In other places, the choice of word is "enemy". One can conjecture that this is a case of Delhi signalling an olive branch in an elliptical manner.

Lest the Modi government be accused of appeasement in not naming the adversary/enemy, external affairs minister (EAM) S Jaishankar's remarks, on January 28, at a thinktank event, are instructive. Reviewing the entire trajectory of the India-China ties from Delhi's perspective, EAM reiterated what he has said in the past — namely that Galwan has profoundly disturbed the relationship and that in relation to LAC "any attempt to unilaterally change the status quo is completely unacceptable". He added, "Significantly, to date, we have yet to receive a credible explanation for the change in China's stance or reasons for massing of troops in the border areas."

China, which chose to tie a "knot" in a relationship that was relatively stable since 1993, has to decide on how it wants to frame the relationship with India — but for now, the tactical scenario is bleak. With LAC now becoming troubled in both west and east, from Ladakh to Arunachal Pradesh (the tri-junction with Bhutan having already been aggravated), the focus for the Indian military in monitoring PLA and deterring where required will be the higher priority. In short, LAC will acquire the sheen of the Line of Control (LoC) with Pakistan. And this will dilute the reserve strength and assets that India has maintained till now, when the annual operational tasking prioritised the western neighbour.

The severe constraints imposed by the pandemic will be unveiled soon, when the Union Budget is presented. Delhi's challenge will be to provide adequate funds for the deployment of troops along LAC for an extended period. Long-term planning must go beyond urgent procurement of some inventory items and focus on enhancing India's neglected trans-border military capabilities in an astute manner. Apart from air and naval power, India needs to invest in the new domain of new technologies that extend from cyberwarfare to artificial intelligence and spectrum domination in a selective manner. This plea has been made often but in vain.

Jaishankar's speech is an important diplomatic punctuation in placing markers and identifying the preferred template for the bilateral relationship as being predicated on "the three mutuals — mutual respect, mutual sensitivity and mutual interests". The resonance with the Nehruvian era (*Panchsheel*) is palpable. And the abiding lesson is that diplomacy and political resolve, however refined, acquire appropriate efficacy only when backed by credible composite national capability, both economic and military. The Covid-19-scarred budget will play a role in framing India's long-term China policy.

(Commodore (retired) C Uday Bhaskar is the director of Society for Policy Studies. The views expressed are personal)

<https://www.hindustantimes.com/opinion/as-lac-becomes-the-new-loc-india-s-challenge-deepens-101611931699672.html>

Fighting to win

The armed forces face the gigantic security challenge of modernising the military machine with the enemy at the gates

By Sandeep Unnithan

It takes a war to make our people work together. Peace breaks them up into narrow sectional pieces. We must learn to rise above sectional interests and work for what is best for the country."

These words by Air Chief Marshal P.C. Lal from his memoirs are as relevant today as they were when they were written 36 years ago. Air Chief Marshal Lal was the chief of air staff during the 1971 Indo-Pakistan war, the last conflict all three armed forces fought together. Last year, the government instituted the most comprehensive and sweeping reform of the armed forces since Independence. The most significant shake-up of the Indian armed forces took place after the 1962 border war with China. A country dependent on food imports to feed its people had to ramp up military spending and make the difficult choice of building factories and shipyards to produce warships, tanks and fighter jets.



This time around, fortunately, it did not take a war to wake the government up. The appointment of the first chief of defence staff (CDS) in December 2019 precedes the creation of what could be a

historic reshaping of the armed forces, changing them from 17 single-service commands to just five joint commands. It comes at a time when India, the world's sixth nuclear weapons power, has enormous security challenges. Since Independence, India has built itself the world's second largest army, the fourth largest air force and seventh largest navy. A gigantic military industrial complex with ordnance factories, defence shipyards and aircraft assembly lines.

Geo-strategic adversaries

India's security scenario since Independence can be described as in four broad phases. The first began with Independence and the Kashmir war in 1947-48 and lasted until 1962. The defeat of the Indian army in the war with China prompted a hike in defence spending and military modernisation. This reinvigorated military machine then blunted Pakistan's aggression in 1965 and, finally, comprehensively defeated it in the east in a lightning war in 1971, leading to the creation of Bangladesh.

The third phase began when Pakistan embarked on a quest for nuclear weapons, acquiring them with Chinese assistance in the early 1980s. This led to India restarting its dormant nuclear weapons programme. Equipped with new skill sets from the US-funded covert war which bled the Soviet Union in Afghanistan in the 1980s, the Pakistan army turned its attention to its eastern borders with India. It put in place what can be described as a 'sword and shield' strategy-the sword of terrorists and so-called 'non-state actors' with which it inflicted a war of a thousand cuts first in Punjab and later in Jammu and Kashmir. Nuclear weapons and overt threats of using them constituted the shield, which seemingly blunted a conventional Indian response.

Last year, a modernised People's Liberation Army (PLA) suddenly mobilised two divisions along the Line of Actual Control (LAC) in eastern Ladakh and backed multiple incursions by its troops. The heightened threat of a two-front war brought about by a resurgent China under its president Xi Jinping, the most powerful military leader since Mao Zedong, and ally Pakistan, mark the fourth and most significant phase for the Indian armed forces. As Ashley J. Tellis, senior fellow at the Carnegie Endowment for International Peace, argues, India is now dealing with a problem it has never had to face in the past-a superpower at its doorstep.

Dysfunctional military-industrial complex

India's security challenges are complex and unlike those faced by any other global democracy. These are no doubt resourceintensive- a fully-loaded Rafale fighter jet, for instance, costs over Rs 1,000 crore. The Indian Air Force (IAF), at one point, wanted 126 of them. It can be argued that China's ultimate gameplan on the border and its strategic nexus with Pakistan is another sophisticated war of a thousand cuts.

"It is to ensure that our defence spending is bled by difficult, protracted deployments and we are unable to modernise," says Brigadier Kuldeep Singh (retired), former member of the National Security Council.

Yet, India's two-and-a-half-front challenges (the half is deployment in counterinsurgency) are not those that can be solved merely by throwing more money. It is already one of the world's top five defence spenders-over Rs 4.7 lakh crore last year. Defence expenditure accounts for over 15 per cent of government spending, the second highest after debt servicing. Significantly, this figure does not cover annual government expenditure on nuclear weapons and building their delivery platforms, such as the four nuclear-powered ballistic missile submarines- a project estimated to cost close to Rs 1 lakh crore. Its gigantic military-industrial complex is dysfunctional and is not

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THE AGENDA

<ul style="list-style-type: none"> ➤ Ensure success of the Aatmanirbhar Bharat initiative by boosting indigenous defence production and making India a hub of defence manufacturing ➤ Complete integration of armed forces from 17 single-service commands into five integrated theatres ➤ Realise the goal of a turnover of \$25 billion (Rs 1.8 lakh crore) in defence manufacturing in the next five years. This includes mil- 	<ul style="list-style-type: none"> itary hardware exports worth \$5 billion (Rs 36,460 crore) ➤ Commitment of orders of Rs 50,000 crore to Indian industry each year and hiked FDI in defence under the automatic route from 49% to 74% ➤ Integrated capability development plan to prioritise acquisition of military hardware. Institute a defence capital acquisition plan to speed up and harmonise these acquisitions
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producing state-of-the-art weaponry that the armed forces need. This has prompted imports which, over the years, have turned India into the world's second largest importer of defence hardware, accounting for 9.5 per cent of the world's sales of weapons between 2014 and 2019.

Imports bring capability accretion to the armed forces, but in the long term ensure dependence for spares and upgrades, which can kick in at the worst of times, such as a national security crisis. India's problems are of prioritising spending and getting its armed forces to plan to fight together rather than coordinate their operations in integrated theatres. It needs to reform its military-industrial complex, build greater self-sufficiency and turn into an exporter of military hardware.

India thus faces the three challenges of modernising its ageing military hardware, indigenising its military hardware to ensure self-sufficiency and harmonising its combat power to ensure it can defend its borders against security threats. The bright side is that for the first time since Independence, there has been a realisation of these tasks and deadlines have been set for delivering on them. Staying the course to achieve them, of course, would be the greatest challenge.

<https://www.indiatoday.in/magazine/nation/story/20210208-fighting-to-win-1764184-2021-01-30>

The Tribune

Sat, 30 Jan 2021

China may trigger fresh crisis along LAC

Even as soldiers battle the winter conditions, the greater challenge for the Indian Army lies in anticipating events and preparing for contingencies in the coming summer months. The PLA military strategy appears to be focused on two objectives — strengthening control over the disputed areas along the LAC and overcoming their war-fighting weaknesses in Tibet

By Lt Gen DS Hooda (Retd)

The standoff at the Line of Actual Control (LAC) in Ladakh is set to continue through the winter. There is minimal possibility of any significant military moves during the winter months, and it has been reported that the People's Liberation Army (PLA) has already moved 10,000 soldiers from depth areas back to their permanent garrisons in Xinjiang and Tibet military regions. The Indian Army, even if it wishes to, will find it more difficult to pull out soldiers. With the roads to Ladakh closed, both the moving out of troops and their re-induction in an emergency, is extremely difficult.

Even as soldiers battle the winter conditions, the greater challenge for the Indian Army lies in anticipating events and preparing for contingencies in the coming summer months. The overall political intent of the Chinese leadership in precipitating the crisis along the border is still open to differing interpretations, but eight months into the standoff, there is greater clarity to their military aims. The PLA military strategy appears to be focused on two objectives — strengthening control over the disputed areas along the LAC and overcoming their war-fighting weaknesses in Tibet.



DETERRENCE NEEDED: India must secure the disputed areas before the snow melts and PLA movements become easier across the LAC. PTI

It is becoming increasingly evident that the primary element of the PLA's military strategy is to change the nature of disputed areas to give permanence to their claims. In Ladakh, this is being attempted by physically occupying the disputed areas on the north bank of Pangong Tso or physically preventing the Indian patrols from going up to their claim lines at Depsang. Despite nine

rounds of military-level talks, there has been no movement forward on disengagement from these two areas.

The construction of a village in the disputed Longju sector of Arunachal Pradesh is another ploy to firm up China's claims. While this area has been under Chinese control since 1959, the fact that India also has a claim to this area is well known to both sides. It had been an accepted norm that both countries should avoid any provocative move in the disputed areas. In 2014 and 2016, the PLA had objected to the construction of small irrigation projects at Demchok, claiming this was a disputed area. However, all protocols and norms have now lost their sanctity.

In 2005, both countries signed an agreement on the 'Political Parameters and Guiding Principles for the Settlement of the India-China Boundary Question'. Article VII of the agreement states, "In reaching a boundary settlement, the two sides shall safeguard due interests of their settled populations in the border areas." By building villages and settling civilians in disputed areas, India could be presented with a *fait accompli* during the border negotiations.

The second element of the PLA's strategy is to overcome its war-fighting weaknesses in Tibet, and many of the steps undertaken by the PLA in this regard precede the Ladakh standoff. The most obvious disadvantage is faced by the PLA Air Force due to the rudimentary support facilities at the airfields and the problems in operating from high-altitude facilities, which limit the fuel and weapon payloads that can be carried by an aircraft. Some of these weaknesses are now being attempted to be overcome through the development of new military facilities. A September 2020 Stratfor report by Sim Tack pointed out that after the Doklam incident of 2017, China "started constructing at least 13 entirely new military positions near its borders with India."

The new constructions include three air bases, five permanent air defence positions, and five heliports. Four air defence positions are coming up within the existing airbases, along with other facilities such as additional runways and blast pens. The report states that the recent Chinese infrastructure developments are aimed at "strengthening its ability to project air power along the entire Indian border."

Another area where the PLA has a deficiency is its training standards and the ability to fight a high-altitude war. Here again, some attempts to improve standards are visible. In the last few years, the Chinese Army has attempted to introduce realism in training by setting up "blue forces" in the combined-arms training centres that act as an enemy to PLA units.

Coming specifically to Tibet, the PLA Army and Air Force training exercises have steadily increased over the years. These details have been comprehensively covered in an Observer Research Foundation paper, "PLA joint exercises in Tibet: Implications for India." What is noteworthy is that in 2018, 2019 and 2020, major PLA exercises were held in January and February, the coldest months of the year. However, for now, the Indian Army still retains its superiority in high-altitude warfare.

The 2020 Ladakh incursion by the PLA was an operation that was preceded by many months of preparation and military infrastructure development in Ladakh. It also shows that China is now moving aggressively to establish its claims over the disputed areas and has discarded all the agreements that had kept the peace along the LAC.

What does this mean for the coming summer months? It would be strategically prudent for the Indian Army to prepare for a contingency in which the PLA attempts to move into more disputed areas along the LAC, particularly in Arunachal Pradesh. To counter this, we must aggressively secure these areas now before the snows melt and the PLA movements become easier across the Himalayan watershed defining the LAC.

An argument is often made that the existing stalemate resulting from our firm stance is a victory for us because we are not acquiescing to Chinese demands. There is certainly some merit in this argument because a stalemate is generally considered a setback for the superior power. However, remaining entirely on the defensive could also mean that we have passed on the initiative to the Chinese and will continue to react to their actions. With talks not making any headway, the summer months could see military jockeying in the disputed areas. Strong and visible military

preparation in these areas would serve as deterrence to any PLA action and strengthen our hand in future negotiations.

<https://www.tribuneindia.com/news/comment/china-may-trigger-fresh-crisis-along-lac-205186>

Outlook

Fri, 29 Jan 2021

Webley & Scott to launch "Made in India" revolvers

Hardoi (UP): The home-grown revolver of Webley and Scott, the renowned British firearms company, is being manufactured in Hardoi town of Uttar Pradesh under Prime Minister Narendra Modi's "Make in India" initiative.

The firearm is likely to be launched by Chief Minister Yogi Adityanath next month, following which it will reach the market, Sial Manufacturers director Surendra Pal Singh said on Thursday.

Singh, however, stressed that time had not yet been allotted by the chief minister's office for it and efforts were being made to schedule its launching next month.

The British firm had entered into an understanding with Lucknow-based Sial Manufacturers to manufacture firearms.

According to Singh, the unit in Sandila, around 55 km west of Lucknow, is the first of Webley and Scott in the country.

The preparations are on for the launching of the firearm and one revolver each has been placed in the gun house of the Sial group in Lucknow and Kanpur in view of people's curiosity to see it, Singh said, stressing that the displayed ones were not for sale.

The Ordnance Factory Kanpur has checked the revolver and preparations are on for setting up a firing range in the Sandila unit for the next testing, Singh said.

Webley and Scott is an arms manufacturer founded in Birmingham, England. Webley produced handguns and long guns from 1834-1979 when the company ceased to manufacture firearms and instead turned its attention to producing air pistols and air rifles.

In 2010, Webley and Scott restarted the production of shotguns for commercial sale.

Webley is famous for the revolvers and automatic pistols it supplied to the British Empire's military, particularly the British Army, from 1887 through both World War I and World War II.

Singh said an understanding has been reached with 15 gun houses in different states of the country till now for selling the revolver. The company will not sell directly but through gun houses, he said.

"Revolvers, pistols, airguns will be made in this unit. Keeping in mind the vast market potential, the decision to set up this unit had been taken," Singh had earlier said, adding that the project had been completed with the help of the Centre and the state government.

"We had applied for the licence in 2017 and got it in March 2019 under which we can make revolvers, pistols and ammunition," he had said.

Singh added that they would also make goods for the defence and paramilitary forces later.

While Sial has a stake of 51 per cent, the British firm has 49 per cent and this unit has been completed in a year's time. Since there is demand for revolvers, the unit will be manufacturing it initially. Its cost would be Rs 1.55 lakh. Other products will be brought in the market later, he had said. PTI CORR SAB SMI HMB

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/webley--scott-to-launch-made-in-india-revolvers/2018861>

China launches second advanced Naval frigate for Pakistan

Synopsis

The Pakistan Navy has contracted the construction of four Type 054A/P frigates from China since 2017, and the first ship was launched in August last year.

Beijing: China on Friday launched the second naval missile frigate equipped with an improved radar system and long-range missiles for its all-weather ally Pakistan to help it bolster maritime defence and deterrence capabilities, according to a media report.

The Pakistan Navy has contracted the construction of four Type 054A/P frigates from China since 2017, and the first ship was launched in August last year.

The Type 054A multi-purpose, guided-missile frigate is the mainstay of the Chinese People's Liberation Army (PLA) Navy, with 30 vessels in commission.

The second Type 054A/P frigate for Pakistan was launched on Friday in Shanghai which will significantly enhance Pakistan's maritime defence and deterrence capabilities, the state-run Global Times reported.

Zhang Junshe, a senior research fellow at the PLA Naval Military Studies Research Institute, told the daily earlier that the Type 054A, on which the Type 054A/P is based, is China's most advanced frigate.

Compared with previous Chinese frigates, the new version has better air defence capability, as it is equipped with an improved radar system and a larger number of missiles with a longer range, Zhang said, noting that the Type 054A frigate also has world-class stealth capability.

These ships will be some of the most technologically advanced platforms of the Pakistan Navy Surface Fleet, equipped with the modern surface, subsurface and anti-air weapons, sensors and combat management systems, Admiral M Amjad Khan Niazi, Chief of the Naval Staff of the Pakistan Navy, told the newspaper.

"These ships will boost (the) potency of our fleet and significantly contribute to maintaining peace and security in the region," he said.

China, which shares all-weather ties with Pakistan, has emerged as the biggest weapons supplier for Pakistan's military.

Besides advanced naval ships, China also partners with the Pakistan Air Force to build JF-17 Thunder fighter aircraft.

<https://economictimes.indiatimes.com/news/defence/china-launches-second-advanced-naval-frigate-for-pakistan/articleshow/80586955.cms>



UV lamps to sanitize Lucknow Metro coaches

Lucknow: The Lucknow Metro has introduced UV lamps to sanitise even minuscule nooks and corners of coaches to ensure an ultra-hygienic public transport system.

Managing director of Uttar Pradesh Metro Rail Corporation (UPMRC) Kumar Keshav said that the Lucknow Metro is second in the world to be using the technology after the New York subway system.

The UV system, developed by a Jaipur-based private company, has been tested for over two weeks and approved last October by Defence Research Development Organisation (DRDO).

“Last June, after going through a twitter feed on New York subway experimentation to sanitise their coaches with UV light, we contacted a Jaipur-based UV apparatus manufacturer. Based on our requirements, the firm developed a UV lamp to sanitise an entire coach. Prior to this, in May 2020 we had introduced UV sanitisation box for Metro tokens,” said Kumar.



The UV sanitization works on ultraviolet germicidal irradiation (UVGI) disinfection method. It uses short-wavelength ultraviolet (Ultraviolet C or UV-C) light of 254 nm UV-C to kill or make micro-organisms inactive by destroying nucleic acids and disrupting their DNA. Depending upon the kind of box/room/area to be sanitised, the wattage is adjusted and suitable wavelength is identified.

Kumar said, “The apparatus certified by DRDO, sanitizes the entire coach in seven minutes but as added care, we are sanitising each coach for 15 minutes. The apparatus is operated through a remote, so that the operator doesn’t come in direct contact of UV rays which are harmful for skin and health.”

He added, “Similar apparatus is being used by medical industry to sanitise operation theatres and medical equipment. The best part of this initiative is that it is very economical, that is, approximately a cost reduction to 1/40th (2.5%) of the cost of sanitization through manual mode for 16 trains.”

Currently, UPMRC spends Rs 5,000 per day to sanitise its 20 trains, but a UV lamp costs Rs 8,000 per unit and they are long-lasting. The corporation is likely to purchase over a dozen lamps.

<https://timesofindia.indiatimes.com/city/lucknow/uv-lamps-to-sanitize-lucknow-metro-coaches/articleshow/80593209.cms>

New study investigates photonics for artificial intelligence and neuromorphic computing

Scientists have given a fascinating new insight into the next steps to develop fast, energy-efficient, future computing systems that use light instead of electrons to process and store information—incorporating hardware inspired directly by the functioning of the human brain.

A team of scientists, including Professor C. David Wright from the University of Exeter, has explored the future potential for computer systems by using photonics in place of conventional electronics.

The article is published today (January 29th 2021) in the prestigious journal *Nature Photonics*.

The study focuses on potential solutions to one of the world's most pressing computing problems—how to develop computing technologies to process this data in a fast and energy efficient way.

Contemporary computers are based on the von Neumann architecture in which the fast Central Processing Unit (CPU) is physically separated from the much slower program and data memory.

This means computing speed is limited and power is wasted by the need to continuously transfer data to and from the memory and processor over bandwidth-limited and energy-inefficient electrical interconnects—known as the von Neumann bottleneck.

As a result, it has been estimated that more than 50 % of the power of modern computing systems is wasted simply in this moving around of data.

Professor C David Wright, from the University of Exeter's Department of Engineering, and one of the co-authors of the study explains "Clearly, a new approach is needed—one that can fuse together the core information processing tasks of computing and memory, one that can incorporate directly in hardware the ability to learn, adapt and evolve, and one that does away with energy-sapping and speed-limiting electrical interconnects."

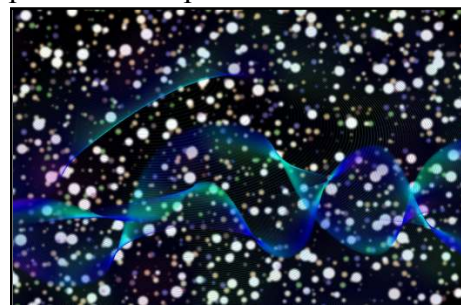
Photonic neuromorphic computing is one such approach. Here, signals are communicated and processed using light rather than electrons, giving access to much higher bandwidths (processor speeds) and vastly reducing energy losses.

Moreover, the researchers try to make the computing hardware itself isomorphic with biological processing system (brains), by developing devices to directly mimic the basic functions of brain neurons and synapses, then connecting these together in networks that can offer fast, parallelised, adaptive processing for artificial intelligence and machine learning applications.

The state-of-the-art of such photonic 'brain-like' computing, and its likely future development, is the focus of an article entitled "Photonics for artificial intelligence and neuromorphic computing" published in the prestigious journal *Nature Photonics* by a leading international team of researchers from the USA, Germany and UK.

More information: B J Shastri et al. Photonics for artificial intelligence and neuromorphic computing. *Nature Photonics* (2021) [DOI: 10.1038/s41566-020-00754-y](https://doi.org/10.1038/s41566-020-00754-y)

Journal information: *Nature Photonics*
<https://phys.org/news/2021-01-photonics-artificial-intelligence-neuromorphic.html>



Credit: CC0 Public Domain

Direct coherent multi-ink printing of fabric supercapacitors

By Thamarasee Jeewandara

Fiber-shaped supercapacitors are a desirable high-performance energy storage technology for wearable electronics. The traditional method for device fabrication is based on a multistep approach to construct energy devices, which can present challenges during fabrication, scalability and durability. To overcome these restrictions, Jingxin Zhao and a team of scientists in physics, electrochemical energy, nanoscience, materials, and chemical engineering in China, the U.S., and Singapore, developed an all-in-one coaxial fiber-shaped asymmetric supercapacitor (FASC) device. The team used direct coherent multi-ink writing, three-dimensional (3-D) printing technology by designing the internal structure of the coaxial needles and regulating the rheological property and feed rates of the multi-ink. The device delivered a superior areal energy and power density with outstanding mechanical stability. The team integrated the fiber-shaped asymmetric supercapacitor (FASC) with mechanical units and pressure sensors to realize high performance and self-powered mechanical devices to monitor systems. The work is now published on *Science Advances*.

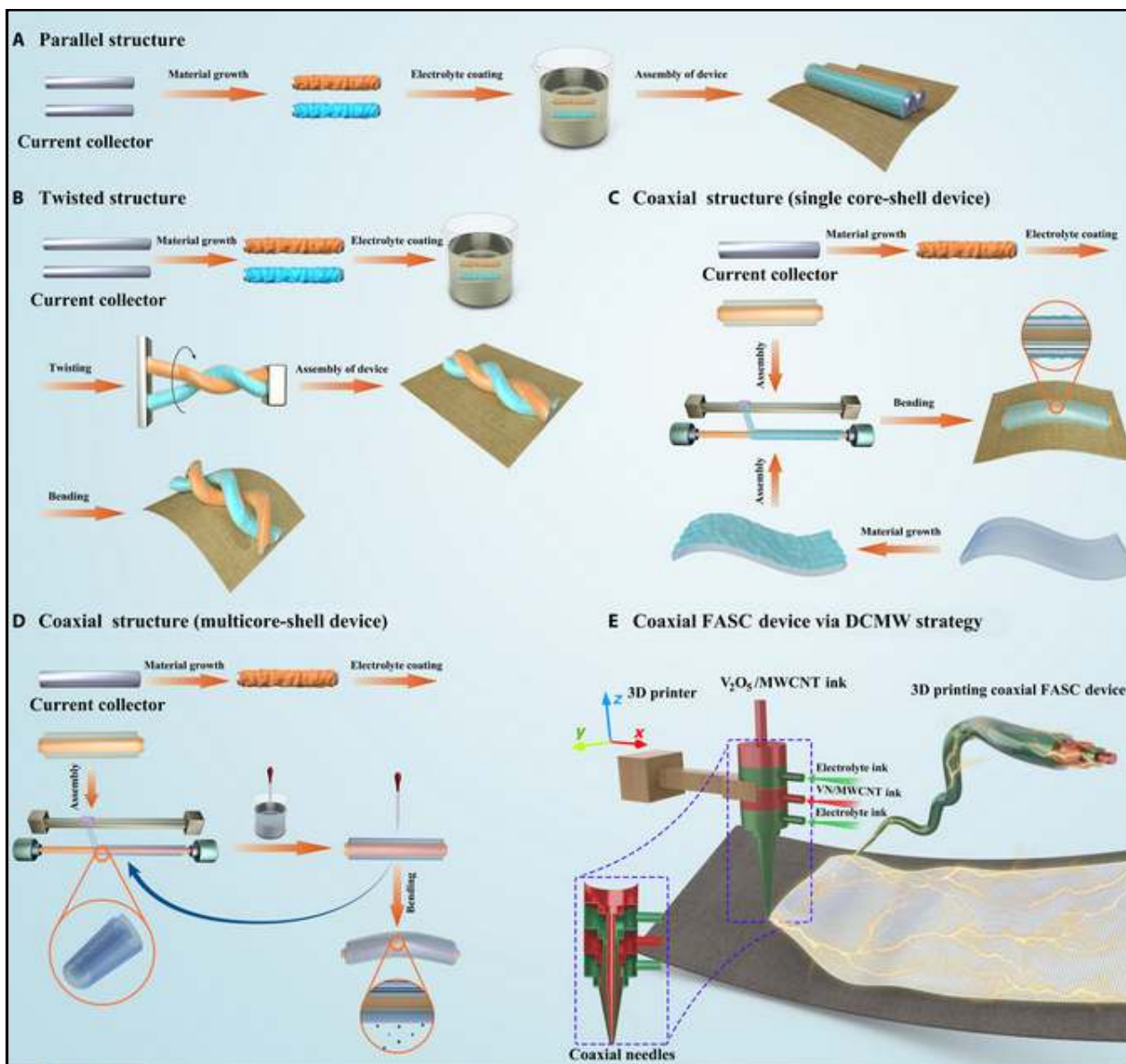
Texture-based wearable electronics

Advances in textile-based wearable electronics can be achieved with advanced fibrous energy storage devices with excellent knittability, flexibility and high mechanical stability. Fiber-shaped asymmetric supercapacitors (FASCs) are widely in use to develop wearable electronics as a promising fiber-shaped energy storage device due to their high power density, long cycling stability, excellent reversibility and improved energy density. In this work, Zhou et al. integrated high-throughput 3-D printing direct ink-writing technology to construct the all-in-one coaxial FASC device with compact internal structures. For this, they rationally designed the device using 3-D printed direct, coherent multi-ink writing (DCMW). The team also designed the internal structure of the multicore-shell needles by charge matching different electrodes, where the rheological properties of the multi-inks matched each other from the innermost layer to the outermost layer during 3-D printing.

The device contained a compact four-layer structure that shortened the ion diffusion path to improve the electrochemical performance and mechanical durability of the device under bending. The team produced a proof-of-concept FASC device with vanadium oxide nanowires/multiwalled carbon nanotubes (MWCNTs) and vanadium nitride (VN) nanowires with multiwalled carbon nanotubes, as positive and negative electrodes, respectively. The performance of the construct surpassed the existing 3-D printing supercapacitor devices to offer a universal strategy to form on-demand fibrous energy storage devices within wearable electronics.

The Fabrication process

The researchers next synthesized the positive and negative electrodes to build the high-energy density FASC device. Thereafter, they uncovered the microstructure and morphology of the samples using field-emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM). They then used X-ray photoelectron spectroscopy (XPS) to survey the surface elements of the prepared samples. The team used as-printed coherent multi-inks and polyvinyl alcohol (PVA) with good rheological behavior as the 3-D printable inks to achieve the coaxial FASC device. They tuned the composition and rheology behavior of the inks for successful extrusion to maintain a self-supporting pattern. The team explained the ink behaviors with the Herschel-Bulckley model, where the values of viscosity were suitable for printing.



Diagrammatic illustration of the fabrication process of various FASC devices. Schematic diagram of the comparison of the preparation process of the conventional FASC device with (A) parallel, (B) twisted, (C and D) coaxial architectures, and (E) our development of three-dimensional (3D) printing coaxial FASC device via a direct coherent multi-ink writing (DCMW) technology. Credit: Science Advances, doi: 10.1126/sciadv.abd6978

Materials characterization and electrochemical flexible performance of the device

The team characterized the cross-sections of scanning electron microscopy (SEM) images of the different variants of positive and negative electrodes developed in the lab. They confirmed the phase composition and chemical states of the material ink by using X-ray powder diffraction, X-ray photoelectron spectroscopy and Raman spectra. The team observed the cross-sectional SEM image of the 3-D printing coaxial FASC device and also printed a variety of complicated patterns by 3-D printing DCMW technology to demonstrate the competence of the setup to form 3-D printed coaxial FASC devices with high accuracy and scalability. The stress-strain performance results showed excellent flexibility and mechanical strength of the printed fiber-electrodes and devices. The team observed the mesopore structures of the positive and negative electrode fibers on the basis of the pore size distribution, which benefitted the transport and diffusion of electrolyte ions during the fast charge/discharge process.

Integrating the 3-D printing coaxial FASC device within a wearable device.

In order to realize the high energy density 3-D printing coaxial FASC device for a wearable device, Zhou et al. selected the accurate electrochemical performances of the positive and negative electrodes via charge matching. The as-printed coaxial FASC device embraced outstanding

electrochemical performance and showed a high working voltage of 1.6 V. The team assessed the electrochemical performance of the fabricated 3-D printing coaxial device using galvanostatic charge/discharge (GCD) and electrochemical impedance spectroscopy (EIS). The results revealed the desired capacitive behavior for the as-prepared FASC device. The specific capacitance of the whole device surpassed most of the conventional fiber-shaped supercapacitors. To demonstrate the feasibility of powering the electronic devices, Zhou et al developed a fully charged 3-D printing coaxial FASC device in the shape of a dragon to illuminate a 1.5 V red light-emitting diode (LED).

Constructing a self-powered and self-moving system for energy storage and conversion

The scientists then integrated the FASC devices with a solar cell and electric motor to realize a self-powered system to convert solar energy into electric energy and mechanical energy. The as-fabricated 3-D printing coaxial FASC device provided power to the pressure sensor in the setup based on bioinspired multiscale structured polydimethylsiloxane (PDMS) and polypyrrolle stamps due to the existence of the multiscale architecture. The team did not observe performance degradation after 600 loading/unloading cycles to demonstrate the excellent cycle stability of the device. The all-in-one coaxial solid-state FASC device with high energy density therefore proved a prospective candidate across the new fields of artificial intelligence, robotics and sensing.

In this way, Jingxin Zhao and colleagues developed a 3-D printing direct coherent multi-ink writing technology to fabricate an all-in-one coaxial solid-state FASC device with an ultrahigh areal energy or power density, with multi-inks. The compact structure of the printed coaxial FASC device embraced splendid flexibility and mechanical stability performance that was superior to traditional architecture asymmetric supercapacitors. The 3-D printing coaxial FASC devices served as on-demand energy storage units to drive pinwheels, pumping prototypes, electric cars, and pressure sensors with improved performance. The results offer a highly versatile solution to design high-performance, on-demand, fiber-based energy storage devices for advanced wearable applications.

More information: Zhao J. et al. Direct coherent multi-ink printing of fabric supercapacitors, *Science Advances*, DOI: [10.1126/sciadv.abd6978](https://doi.org/10.1126/sciadv.abd6978)

Shi P. et al. Design of amorphous manganese oxide@multiwalled carbon nanotube fiber for robust solid-state supercapacitor, *ACS Nano*, doi.org/10.1021/acsnano.6b06357

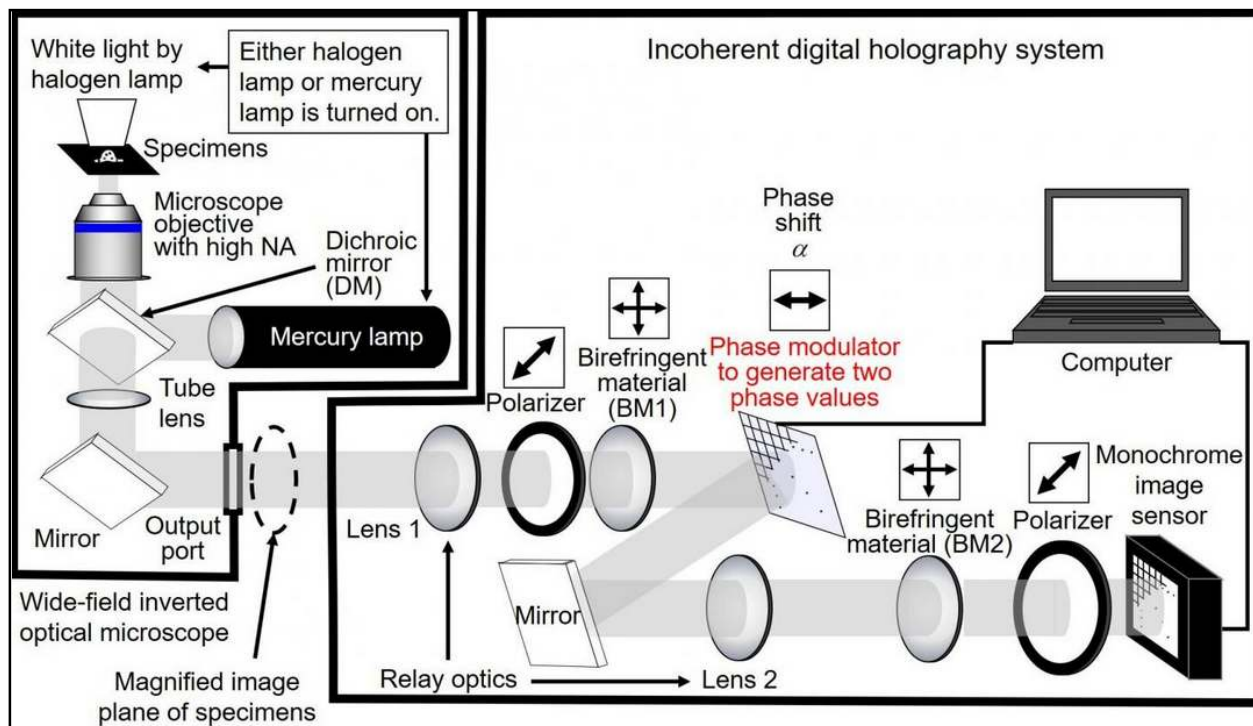
Lee A. et al. 3-D bioprinting of collagen to rebuild components of the human heart. *Science*, DOI: [10.1126/science.aav9051](https://doi.org/10.1126/science.aav9051)

Journal information: [Science Advances](https://www.science.org)

<https://phys.org/news/2021-01-coherent-multi-ink-fabric-supercapacitors.html>

High-speed holographic fluorescence microscopy system with submicron resolution

The National Institute of Information and Communications Technology (NICT), Tohoku University, Toin University of Yokohama, and Japan Science and Technology Agency (JST) have succeeded in developing a scanless high-speed holographic fluorescence microscopy system with submicron resolution for a 3-D space. The system is based on digital holography.



Overview of the developed high-speed holographic fluorescence microscopy system for scanless 3D measurement with submicron resolution. Credit: National Institute of Information and Communications Technology (NICT), Tohoku University, Toin University of Yokohama, Japan Science and Technology Agency (JST)

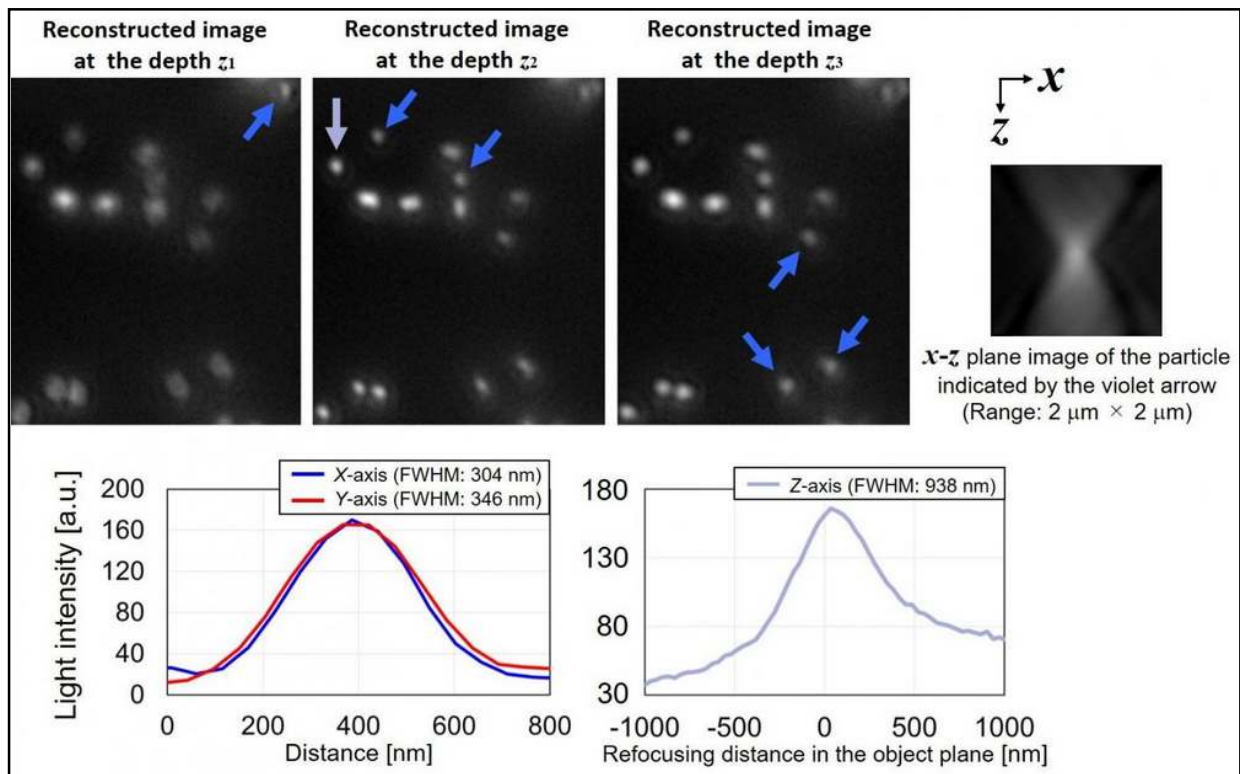
The developed microscopy system has an algorithm to acquire 3-D information of fluorescent objects toward scanless 3-D measurement in less than 1 millisecond. Scanless 3-D sensing with submicron resolution and color-multiplexed holographic fluorescence imaging have been demonstrated using the algorithm. The microscopy system will be further developed to achieve holographic 3-D motion-picture sensing of specimens with incoherent light.

This achievement was published in *Optics Letters* as an open-access paper on January 29, 2021.

The scanless high-speed holographic fluorescence microscopy system shown in Figure 1 was constructed based on digital holography and is applicable to the sensing of incoherent light such as fluorescence light and natural light. The developed algorithm enables the adoption of a phase modulator to generate two phase values, which is expected to increase the measurement speed. Submicron resolution for a 3-D space was successfully demonstrated using fluorescent objects with a diameter of 0.2 micron.

The experimental results shown in Figure 2 indicate that the developed microscopy system achieves 3-D sensing of nanoparticles and has submicron resolution quantitatively for a 3-D space. Scanless 3-D measurement in less than 1 millisecond is achievable by using the algorithm with either a ferroelectric liquid crystal on silicon (FLCOS) or an electro-optic (EO) device. Color-multiplexed holographic fluorescence imaging with the algorithm and only four exposures has also been demonstrated by combining the proposed algorithm and computational coherent superposition

(CCS). The number of exposures is reduced by the algorithm, and the number of photons per hologram is increased even for ultimately weak light.



Upper left: experimental results of 3D sensing for fluorescent particles with a diameter of 0.2 micron. Upper right: x-z image of the reconstructed particle marked by the violet arrow. Bottom left: plots of the particle marked by the violet arrow along the x- and y-axes. Bottom right: plots of the particle marked by the violet arrow along the z-axis. Credit: National Institute of Information and Communications Technology (NICT), Tohoku University, Toin University of Yokohama, Japan Science and Technology Agency (JST)

More information: Tatsuki Tahara et al, Two-step phase-shifting interferometry for self-interference digital holography, *Optics Letters* (2021). DOI: [10.1364/OL.414083](https://doi.org/10.1364/OL.414083)

Journal information: *Optics Letters*

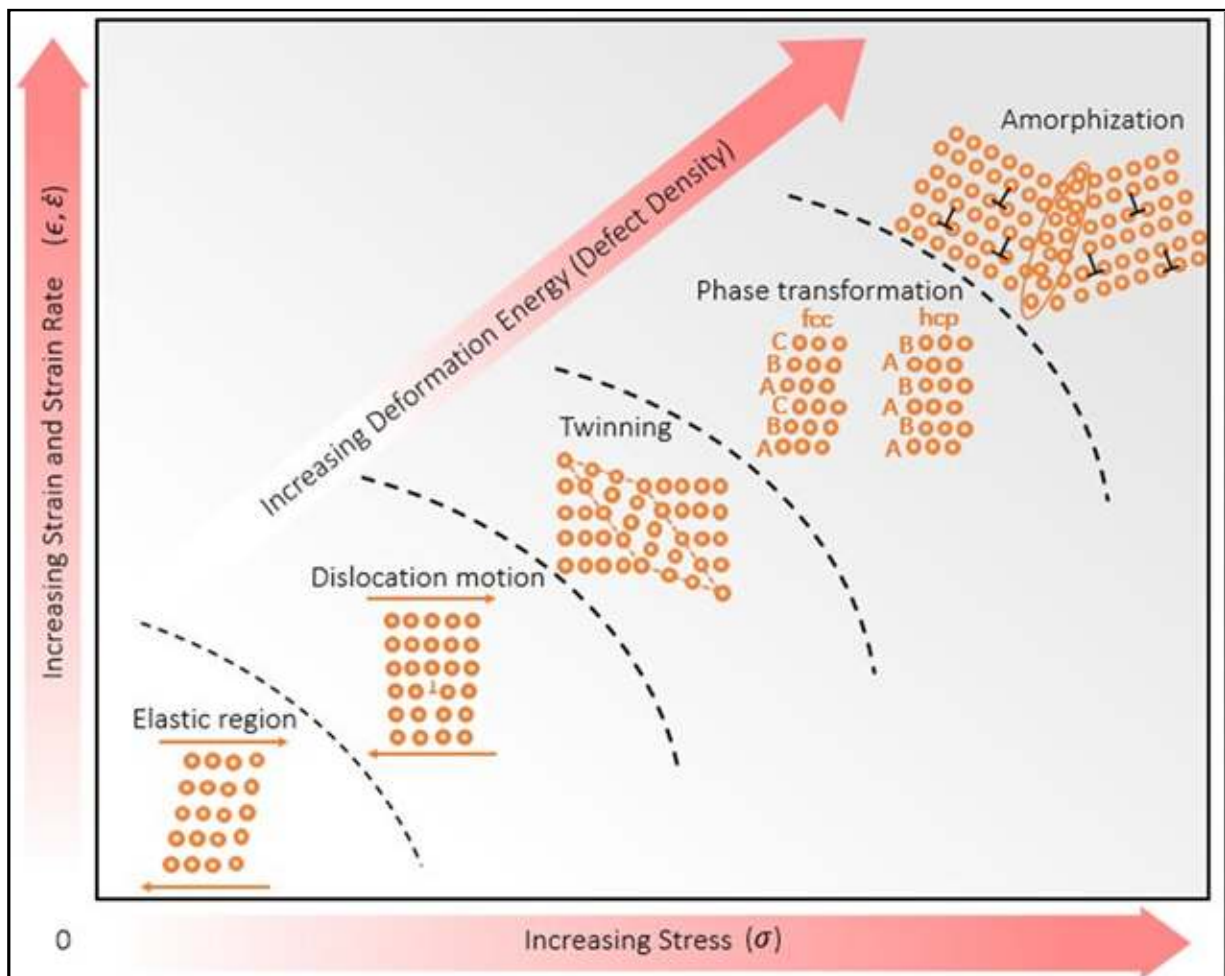
<https://phys.org/news/2021-01-high-speed-holographic-fluorescence-microscopy-submicron.html>

Islands without structure inside metal alloys could lead to tougher materials

An international team of researchers produced islands of amorphous, non-crystalline material inside a class of new metal alloys known as high-entropy alloys.

This discovery opens the door to applications in everything from landing gears, to pipelines, to automobiles. The new materials could make these lighter, safer, and more energy efficient.

The team, which includes researchers from the University of California San Diego and Berkeley, as well as Carnegie Mellon University and University of Oxford, details their findings in the Jan. 29 issue of *Science Advances*.



Proposed hierarchical deformation mechanism paradigm for the equi-atomic CrCoNi-based HEAs subjected to increasing degrees of deformation. Elastic deformation, dislocation-mediated plasticity, twinning-induced plasticity, TRIP, and finally solid-state amorphization. Triggering the next mechanism requires the generation of additional defects, i.e., dislocations and/or point defects (vacancies). These multiple mechanisms can interact, leading to a synergy of strengthening processes and a resulting highly complex microstructure. Credit: University of California San Diego

"These present a bright potential for increased strength and toughness since metallic glasses (amorphous metals) have a strength that is vastly superior to that of crystalline metals and alloys," said Marc Meyers, a professor in the Department of Mechanical and Aerospace Engineering at UC San Diego, and the paper's corresponding author.

Using transmission electron microscopy, which can identify the arrangement of atoms, the researchers concluded that this amorphization is triggered by extreme deformation at high

velocities. It is a new deformation mechanism that can increase the strength and toughness of these high entropy alloys even further.

The research is based on seminal work by Brian Cantor at the University of Oxford, and Jien-Wei Yeh at National Tsing Hua University in Taiwan. In 2004, both researchers led teams that reported the discovery of high-entropy alloys. This triggered a global search for new materials in the same class, driven by numerous potential applications in the transportation, energy, and defense industries.

"Significant new developments and discoveries in metal alloys are quite rare," Meyers said.

More information: "Amorphization in extreme deformation of the CrMnFeCoNi high-entropy alloy" *Science Advances* (2021). advances.sciencemag.org/lookup...1126/sciadv.abb3108

Journal information: *Science Advances*

<https://phys.org/news/2021-01-islands-metal-alloys-tougher-materials.html>

COVID-19 Research News

ThePrint

Sat, 30 Jan 2021

Schizophrenia second biggest risk factor after age for Covid mortality, finds US study

In comparison to Covid patients without psychiatric disorders, those diagnosed with schizophrenia spectrum disorder had 2.7 times higher risk of mortality, the study found

By Kairvy Grewal

New Delhi: Schizophrenia could be the second biggest risk factor contributing to Covid-19 mortality, according to a study by US researchers.

Published in *Jama Psychiatry* on 27 January, the study also found that people suffering from schizophrenia could face a higher risk of severe Covid-19.

In comparison to Covid-19 patients without psychiatric disorders, the study — conducted by researchers at New York University Langone Medical Center — found that those diagnosed with schizophrenia spectrum disorder had 2.7 times higher risk of mortality.

It aimed to evaluate the association of schizophrenia spectrum disorder, mood disorder, and anxiety disorder with mortality in Covid-19 patients.

Schizophrenia is a chronic brain disorder, which causes distortions in thinking and perception. Some symptoms of the illness include delusions, hallucinations, disorganised speech, lack of motivation. People with schizophrenia are two to three times more likely to die early than the general population.

The study defined mortality as death or discharge to hospice within 45 days from a positive test result of coronavirus.

Researchers evaluated health records from 260 clinics and four hospitals in New York. Out of 26,540 patients who were tested, 7,348 adults tested positive for Covid-19 between 3 March and 31 May 2020.



Schizophrenia is a chronic brain disorder, which causes distortions in thinking and perception | Illustration: Ramandeep Kaur | ThePrint

Out of the 7,348 adults who tested positive, 75 patients had a history of schizophrenia, 564 had a history of mood disorder and 360 had a history of anxiety disorder.

From all the patients who tested positive for Covid-19, 864 patients died or were discharged to hospice within 45 days. The study didn't find an association between anxiety or mood disorders from Covid-19.

However, it was found that people with schizophrenia were 2.7 times more likely to die from Covid-19 than people without the mental illness.

“The most notable finding from this study is the high risk of mortality associated with schizophrenia spectrum diagnoses, ranking second behind age in strength of an association among all demographic and medical risk factors examined in the sample,” the study said.

It stressed the need for “targeted interventions” for patients with severe mental illnesses to prevent “worsening health disparities”.

What links Schizophrenia to Covid-19?

The study noted that a higher risk with schizophrenia to Covid-19 mortality was expected based on previous studies on mortality. However, the “magnitude” of the increase in mortality was “unexpected”.

Considering that schizophrenia is a chronic mental illness, experts believed it may not have a “direct biological correlation” to Covid-19 mortality.

The study also predicted that delay in treatment or reduced access to care could have contributed to this outcome.

Speaking to ThePrint, Dr B.N. Gangadhar, director and vice-chancellor of the National Institute of Mental Health and Neuro Sciences (NIMHANS), Bengaluru, said, “Any comorbidity with Covid increases the mortality, schizophrenia itself is a comorbidity.”

Dr Gangadhar further said research has revealed that schizophrenia “accelerates ageing” and that he was “hardly surprised” that schizophrenia showed a high risk of mortality.

‘People with schizophrenia end up getting neglected’

Dr Soumitra Pathare, psychiatrist and director of the Centre for Mental Health Law and Policy at the Indian Law Society's Law College, Pune, said the mortality may not have a direct correlation with schizophrenia.

“People with schizophrenia as it is have a higher mortality as compared to their peers and that is frequently linked to various conditions. They end up getting neglected much more, so they don't get their physical health checked. There is evidence of discrimination in physical healthcare provisions,” he explained.

He also said there is evidence of poor quality of care meted out to people with schizophrenia and often their concerns are neglected.

Medicines used for treating schizophrenic patients are associated with metabolic syndrome.

“This may not have a direct relationship to Covid-19, but the indirect relationship being that they anyway get poor quality of care, they are on higher risk factors, diabetes is more likely to present in people with schizophrenia,” he explained.

Further, high risk factors, which are undiagnosed like cardiac conditions, metabolic conditions, are prevalent because they get poor quality of care.

This might have to do with why their mortality from Covid-19 is higher as opposed to a direct physical relationship between schizophrenia and Covid-19, said Pathare.

<https://theprint.in/health/schizophrenia-second-biggest-risk-factor-after-age-for-covid-mortality-finds-us-study/594984/>

