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Press Information Bureau
Government of India

Ministry of Science & Technology

Mon, 29 Nov 2021 5:58PM

Indian Bio-Jet fuel technology receives formal military certification

CSIR-IIP Dehradun's home-grown technology to produce bio-jet fuel has been formally approved for use on military aircraft of the Indian Air Force (IAF). The provisional clearance (PC) certificate was handed over by Shri R.Kamalakaran, Group Director (AT&FOL), Centre for Military Airworthiness and Certification (CEMILAC) to Mr Saleem Akhtar Farooqui, Principal Scientist from CSIR-IIP in the presence of Group Captain Asheesh Shrivastava and Wing Commander A Sachan of the IAF and Mr R Shanumgavel of CEMILAC. This certification represents India's growing confidence in aviation biofuel sector and another step towards 'Atmanirbhar Bharat'.

The technology, developed by the Indian Institute of Petroleum (CSIR-IIP), a constituent laboratory of the Council of Scientific and Industrial Research, has undergone evaluation tests and trials over the last three years. The testing of airborne items is a complex and meticulous process involving intricate checks while ensuring the highest levels of flight safety. International aviation standards define the scope of these rigorous assessments. Fuel being the lifeline of aircraft requires thorough analysis before being filled into manned flying machines. The certification received by the lab today is an acknowledgment of the satisfactory results obtained from various ground and inflight tests performed on the indigenous bio-jet fuel by various test agencies supported by the IAF.

Earlier on 26 Jan 19, an AN-32 aircraft, filled with blended bio-jet fuel, had flown over Raj Path at New Delhi during the Republic Day celebrations. Thereafter, the performance and reliability of the Indian technology were also tested when the Russian military aircraft safely landed and took off from Leh airport on 30 Jan 20 at high altitudes under severe winter conditions. The fuel was also used on a civil, commercial demonstration flight operated by SpiceJet on 27 Aug 18 from



AN-32 transport aircraft using bio-jet fuel developed by CSIR-IIP on 26th January 26, 2019, at the Republic Day flypast



AN-32 aircraft powered with a 10% blend of Indian bio-jet fuel developed by CSIR-IIP took-off from Kushok Bakula Rimpochee Airport, Leh. This is the first time that both engines of the aircraft were powered by bio-jet indigenous fuel.



Team related to Biojet project with the Engine test facility at Chandigarh

Dehradun to Delhi. These test flights with green fuel underscored the capabilities and commitment of Indian scientists and airmanship of IAF to serve a national cause.

Today's approval by CEMILAC is a culmination of many years of intensive research and active support of many agencies, including the test facilities of Indian Oil Corporation (IOCL) Panipat Refinery and Hindustan Aeronautics Ltd. (HAL). This clearance will enable Indian armed forces to use bio-jet fuel produced using indigenous technology across all its operational aircraft.

This will also enable early commercialization of the technology and its mass production. Indian bio-jet fuel can be produced from used cooking oil, tree-borne oils, short gestation oilseed crops grown off-season by farmers, and waste extracts from edible oil processing units. It will reduce air pollution by virtue of its ultralow sulphur content compared with conventional jet fuel and contribute to India's Net-Zero greenhouse gas emissions targets. It will also enhance the livelihoods of farmers and tribals engaged in producing, collecting, and extracting non-edible oils.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776193>



पत्र सूचना कार्यालय
भारत सरकार

विज्ञान एवं प्रौद्योगिकी मंत्रालय

Mon, 29 Nov 2021 5:58PM

भारतीय जैव-जेट ईंधन प्रौद्योगिकी को औपचारिक सैन्य प्रमाणन प्राप्त

सीएसआईआर-आईआईपी देहरादून के जैव-जेट ईंधन के उत्पादन की घरेलू तकनीक को भारतीय वायु सेना (आईएएफ) के सैन्य विमानों में उपयोग के लिये औपचारिक रूप से मंजूरी दे दी गयी है। श्री आर. कमलकन्नन, समूह निदेशक (एटी एंड एफओएल), सेना उड़नयोग्यता और प्रमाणीकरण केन्द्र (सीईएमआईएलएसी) के द्वारा भारतीय वायु सेना के ग्रुप कैप्टन आशीष श्रीवास्तव एवं विंग कमांडर ए सचान और सीईएमआईएलएसी के श्री आर शनमुगावेल की उपस्थिति में सीएसआईआर-आईआईपी के प्रधान वैज्ञानिक श्री सलीम अख्तर फारूकी को प्रोविजनल क्लीयरेंस (पीसी) प्रमाणपत्र सौंपा गया। यह प्रमाणन विमानन जैव-ईंधन क्षेत्र में भारत के बढ़ते विश्वास और 'आत्मनिर्भर भारत' की दिशा में एक और कदम का प्रतिनिधित्व करता है।



सीएसआईआर-आईआईपी द्वारा विकसित जैव-जेट ईंधन का उपयोग कर 26 जनवरी, 2019 को गणतंत्र दिवस के फ्लाइंपास्ट में शामिल एएन-32 परिवहन विमान

वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद की एक घटक प्रयोगशाला, भारतीय पेट्रोलियम संस्थान (सीएसआईआर-आईआईपी) द्वारा विकसित प्रौद्योगिकी का पिछले तीन वर्षों में मूल्यांकन, जांच और परीक्षण किया गया है। हवाई जहाजों का परीक्षण एक जटिल और बेहद सावधानीपूर्वक की जाने वाली प्रक्रिया है जिसमें उड़ान सुरक्षा के उच्चतम स्तर को सुनिश्चित करते हुए गहन जांच शामिल है। अंतर्राष्ट्रीय विमानन मानक इन कठोर आकलनों के दायरे को परिभाषित करते हैं। विमान की जीवन रेखा होने के कारण ईंधन को मानवयुक्त उड़ान मशीनों में इस्तेमाल से पहले गहन विश्लेषण की आवश्यकता होती है।

प्रयोगशाला द्वारा आज प्राप्त प्रमाणीकरण भारतीय वायुसेना द्वारा समर्थित विभिन्न परीक्षण एजेंसियों द्वारा स्वदेशी जैव-जेट ईंधन पर किये गये विभिन्न जमीनी और उड़ान परीक्षणों से प्राप्त संतोषजनक परिणामों की स्वीकृति है।

इससे पहले 26 जनवरी 2019 को, मिश्रित जैव-जेट ईंधन के साथ एक एएन-32 विमान गणतंत्र दिवस समारोह के दौरान नई दिल्ली में राज पथ के ऊपर से उड़ा था। इसके बाद, 30 जनवरी 2020 को भारतीय प्रौद्योगिकी के प्रदर्शन और विश्वसनीयता का तब भी परीक्षण हुआ जब बेहद ऊंचे क्षेत्र में सर्दियों की कड़ी परिस्थितियों के बीच रूसी सैन्य विमान लेह हवाई अड्डे पर सुरक्षित उतरा और वहां से सफलता पूर्वक उड़ान भरी। 27 अगस्त 2018 को देहरादून से दिल्ली के लिए स्पाइसजेट द्वारा संचालित एक नागरिक व्यवसायिक प्रदर्शन उड़ान में भी इस ईंधन का उपयोग किया गया था। हरित ईंधन के साथ ये परीक्षण उड़ानें एक राष्ट्रीय उद्देश्य को पूरा करने के लिये भारतीय वैज्ञानिकों की क्षमताओं एवं प्रतिबद्धता और भारतीय वायुसेना की सैन्यभावना को रेखांकित करती हैं।

सीईएमआईएलएसी के द्वारा आज दी गयी स्वीकृति इंडियन ऑयल कॉरपोरेशन (आईओसीएल), पानीपत रिफाइनरी और हिंदुस्तान एयरोनॉटिक्स लिमिटेड (एचएएल) की परीक्षण सुविधाओं सहित कई एजेंसियों के कई वर्षों के गहन शोध और सक्रिय समर्थन की पराकाष्ठा है। यह मंजूरी भारतीय सशस्त्र बलों को अपने सभी इस्तेमाल हो रहे विमानों में स्वदेशी तकनीक का उपयोग करके उत्पादित जैव-जेट ईंधन का उपयोग करने में सक्षम बनाएगी। यह प्रौद्योगिकी के जल्द व्यावसायीकरण और इसके बड़े पैमाने पर उत्पादन को भी सक्षम करेगा। भारतीय जैव-जेट ईंधन का उत्पादन इस्तेमाल

किये गये खाना पकाने के तेल, पेड़ से उत्पन्न तेल, किसानों द्वारा गैर मौसमी और कम समय में तैयार होने वाली तिलहन फसलों और खाद्य तेल प्रसंस्करण इकाइयों से निकले अपशिष्ट से किया जा सकता है। यह पारंपरिक जेट ईंधन की तुलना में अपने बेहद निचले स्तर के सल्फर तत्व के कारण वायु प्रदूषण को कम करेगा और भारत के शुद्ध-शून्य ग्रीनहाउस गैस उत्सर्जन लक्ष्यों में योगदान देगा। यह अखाद्य तेलों के उत्पादन, संग्रह और तेल निकालने में लगे किसानों और आदिवासियों की आजीविका को भी बढ़ाएगा।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776361>



सीएसआईआर-आईआईपी द्वारा विकसित 10% मिश्रण के भारतीय जैव-जेट ईंधन के साथ संचालित एएन-32 विमान ने लेह के कुशोक बकुला रिम्पोचे हवाई अड्डे से उड़ान भरी। यह पहली बार है कि विमान के दोनों इंजनों को स्वदेशी जैव-जेट ईंधन से चलाया गया था।



चंडीगढ़ में इंजन परीक्षण सुविधा के साथ जैव-जेट परियोजना से संबंधित टीम





Development of Kaveri Engine

Cabinet Committee on Security (CCS) sanctioned Kaveri Engine project in 1989. The following milestones were achieved:

- 9 Full prototype engines and 4 core engines built
- 3217 hours of engine testing conducted
- Completed Altitude tests & Flying Test Bed (FTB) trials. This is the first time that an indigenously developed military gas turbine engine was flight tested

Kaveri engine project has achieved higher Technology Readiness Level (TRL) in many critical technology domains and those technologies are being used in the various engine development programmes of the country. Further the engines are used as test vehicles for validating next generation technologies.

Funds details are as follows:

Funds allocated	Expenditure	Commitment
Rs. 2105 crore	Rs. 2035.56 crore	Rs. 2097.65 crore

At present, the LCA Tejas is integrated with an imported engine. However, in future, it is proposed to develop indigenous engines for powering our own aircrafts such as LCA variants and AMCA in association with an International Engine House. The technological capabilities built through the Kaveri engine project will be utilised.

LCA Tejas, Flight Operational Clearance (FOC) configuration demands higher thrust than the intended engine requirement. Hence the Kaveri in the present architecture cannot be integrated. In order to induct with LCA Tejas, a modified engine version is required.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri M. Mohamed Abdulla in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776092>



Increasing Defence Exports

Many reforms/steps have been taken up to boost Defence exports in recent times. These are as follows:

- i. Special Chemicals, Organisms, Materials, Equipment and Technologies (SCOMET) Category 6 titled “Munitions List” that was hitherto “Reserved” has been populated and Military Stores list notified vide Notification No.115 (RE-2013)/2009-2014 dated 13th March 2015 stands rescinded.
- ii. The Director General of Foreign Trade (DGFT) vide Public Notice No. 4/2015-20 dated 24th April, 2017 has delegated its authority and notified Department of Defence Production (DDP) as the Licensing Authority for export items in Category 6 of SCOMET. The export of items specified in Category 6 (Munitions List) except those covered under Notes 2 & 3 of Commodity Identification Note (CIN) of the SCOMET is now governed by the Standard Operating Procedure issued by the Department of Defence Production (DDP), Ministry of Defence.
- iii. Standard Operating Procedure (SOP) for the export of munitions list items has been modified and placed on the website of the DDP.
- iv. A completely end-to-end online portal for receiving and processing export authorisation permission has been developed. The applications submitted on this portal are digitally signed and the authorisation are also issued digitally, at faster pace.
- v. In repeat orders of same product to the same entity, consultation process has been done away with and permission is issued immediately. For the repeat order of same product to different entity, the consultation earlier done with all stakeholders is now limited only with MEA.
- vi. In Intra-Company business (which is especially relevant for outsourcing of work by defence related parent company abroad to its subsidiary in India), the earlier requirement of getting End User Certificate (EUC) from the Government of importing country has been done away with and ‘Buying’ Company is authorized to issue the EUC.
- vii. The requirement of Government signed EUC in cases of providing engineering services (ToT related to Munitions List) to Wassenaar Arrangement (WA) Countries has been dispensed with.
- viii. Legitimate export of systems/platforms for civil end use to WA Member countries is considered subject to submission of EUC or import certificate or equivalent document issued by the Government of importing country.
- ix. The legitimate export of the parts and components of small arms and body armour for civil use are now being permitted after prior consultation with MEA.
- x. For export of items for exhibition purposes, the requirement of consultation with stakeholders has been done away with (except for select countries).
- xi. Powers have been delegated to DRDO and CMDs of DPSUs for exploring export opportunities and participation in global tenders.
- xii. New simplified End User Certificate Format for Parts & Components has been provided in SOP.
- xiii. Validity of Export Authorization for export of parts & components has been increased from 02 years to date of completion of order/component whichever is later.

- xiv. A new provision for re-exporting parts and components for undertaking repair or rework to provide replacement for a component under warranty obligation is inserted in the SOP as a sub-classification of repeat orders.
- xv. MHA vide Notification dated 1.11.2018 has delegated its powers to this Department to issue export license under Arms Rules 2016 in Form X-A, for parts & components of small arms. With this the Department of Defence Production becomes the single point of contact for exporter for export of parts and components of Small Arms & Ammunitions.
- xvi. The Government has notified the Open General Export License (OGEL) - a one time export license, which permits the industry to export specified items to specified destinations, enumerated in the OGEL, without seeking export authorisation during the validity of the OGEL. OGEL has been integrated with end to end online Portal.
- xvii. Scheme for Promotion of Defence Exports has been notified to provide an opportunity to the prospective exporters an option to get their product certified by the Govt. and provides access to the testing infrastructure of Ministry of Defence for initial validation of the product and its subsequent field trials. The certificate can be produced by the prospective exporter for marketing their products suitably in the global market.
- xviii. A separate Cell has been formed in the Department of Defence Production to co-ordinate and follow up on export related action including enquiries received from various countries, sharing the leads with private sector & public sector companies and facilitate exports.
- xix. In order to boost defence exports, regular webinars are being organized with Friendly Foreign Countries (FFCs) under the aegis of DDP, MoD through Indian Mission abroad and Industry Associations with active participation from Indian Defence Industries.
- xx. A Scheme to provide financial support to Defence Attaches for taking up actions for promoting exports of India made defence products both of public and private sector in the countries to which they are attached has been notified.

To enhance functional autonomy, efficiency and unleash new growth potential and innovation in Ordnance Factories, the Government has converted 41 Ordnance Factories into seven Defence Public Sector Units (DPSUs), 100% Government owned corporate entity (ies).

Now with corporatisation and functional autonomy gained by the new DPSUs, they are required to develop their own markets including international market through diversification of their product portfolio and participation in exhibitions and export promotion activities. New DPSUs are required to achieve export targets. The CMDs of DPSUs are also allowed to explore export opportunities and participate in global tender under the delegated powers. They are allowed to open their marketing offices abroad. They have started customisation of their product as per user requirements and getting engaged with foreign OEMs and channel partners in foreign countries to boost their exports.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Dr Vikas Mahatme in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776094>

India to develop jet engines for aircrafts

It will be developed with foreign collaboration

New Delhi: While the indigenous Light Combat Aircraft (LCA) *Tejas* is at present integrated with an imported engine, in future it is proposed to develop indigenous engines for powering aircraft such as LCA variants and Advanced Medium Combat Aircraft (AMCA) in association with an International Engine House, the Government informed the Parliament on Monday.

“LCA *Tejas*, Flight Operational Clearance (FOC) configuration demands higher thrust than the intended engine requirement. Hence the Kaveri in the present architecture cannot be integrated. In order to induct with LCA *Tejas*, a modified engine version is required,” Minister of State for Defence Ajay Bhatt said in a written reply in the Rajya Sabha. The technological capabilities built through the Kaveri engine project will be utilised, he stated on the proposed engine development in future.

The LCA FOC variant and the Mk1A are powered by the GE-F404 engines while the LCA-Mk2 and AMCA in future will initially be powered by a more powerful GE-F414 engines.

Project Kaveri

The Cabinet Committee on Security (CCS) had sanctioned the indigenous Kaveri engine project in 1989. The project which ran for 30 years with an expenditure of ₹2035.56 crore saw the development of nine full prototype engines and four core engines. A total of 3217 hours of engine testing was conducted and the engine has also completed altitude tests and Flying Test Bed (FTB) trials.

Stating that this is the first time that an indigenously developed military gas turbine engine was flight tested, Mr. Bhatt said that Kaveri engine project has achieved higher Technology Readiness Level (TRL) in many critical technology domains and those technologies are being used in the various engine development programmes of the country. “Further the engines are used as test vehicles for validating next generation technologies.”

Indigenous helicopters

To another question on the induction of the indigenous Light Utility Helicopters (LUH) developed by Hindustan Aeronautics Limited (HAL), Mr. Bhatt said that the Initial Operational Clearance to LUH has been granted. Four Limited Series Production (LSP) of the indigenous Light Utility Helicopters (LUH) would be manufactured by 2022-23 and eight LSP LUHs by 2023-24, Mr. Bhatt said.

The numbers would be split equally between the Army and Air Force. The LSP would be followed by manufacture of Series Production helicopters by HAL, he added. The LUH along with the K2-229T light utility helicopter from Russia is meant to replace the ageing *Cheetah* and *Chetak* helicopters in service.

<https://www.thehindu.com/news/national/india-to-develop-jet-engines-for-aircrafts/article37762645.ece>

HAL to manufacture first four light utility helicopters by 2022-23: Centre

Out of the initial quota of four choppers, two each will go to the Indian Army and the Indian Air Force while the two forces will get four LUHs each from the second batch of the limited series production

Edited By Vivek Punj

Hindustan Aeronautics Ltd (HAL) will manufacture four light utility helicopters (LUHs) under limited series production by 2022-23, the central government told Rajya Sabha on Monday.

Responding to a question, Minister of State for Defence Ajay Bhatt also said that the government-owned aerospace behemoth will build another eight LUHs by 2023-24.

Out of the initial quota of four choppers, two each will go to the Indian Army and the Indian Air Force while the two forces will get four LUHs each from the second batch of the limited series production, he said.

"This would be followed by the manufacture of series production (SP) of the helicopters by the HAL," Bhatt said.

Earlier this month, the defence ministry approved the procurement of 12 LUH from the HAL for around ₹1,500 crore.

The LUH is designed and developed as a replacement for ageing fleets of Cheetah and Chetak helicopters currently being flown by Indian armed forces.

The indigenously-developed LUH is a new generation helicopter in the 3-tonne category that boasts features like a glass cockpit with multi-function displays (MFD) and is powered by a single turboshaft engine. To a separate question on the Kaveri fighter jet engine programme, Bhatt said it has achieved a "higher technology readiness level (TRL) in many critical technology domains".

Bhatt added that nine full prototype engines and four core engines were built, while 3,217 hours of engine testing was conducted, where "completed altitude tests and flying test bed (FTB) trials" were carried out.

"This is the first time that an indigenously developed military gas turbine engine was flight tested," he added.

The minister said a total of ₹2,105 crore was allocated for the programme out of the amount spent is ₹2,035 crore. The Cabinet Committee on Security had approved the Kaveri engine project back in 1989. The project was primarily rolled out for India's Light Combat Aircraft (LCA) programme.

"At present, the LCA Tejas is integrated with an imported engine. However, in future, it is proposed to develop indigenous engines for powering our own aircraft such as LCA variants and AMCA (Advanced Medium Combat Aircraft) in association with an international engine house," Bhatt said. He said the technological capabilities built through the Kaveri engine project will be utilised. The minister said the Kaveri engine in the present architecture cannot be integrated into the LCA Tejas.

"LCA Tejas, Flight Operational Clearance (FOC) configuration demands higher thrust than the intended engine requirement. Hence the Kaveri in the present architecture cannot be integrated. In order to induct with LCA Tejas, a modified engine version is required," he said.

<https://www.livemint.com/news/india/hal-to-manufacture-first-four-light-utility-helicopters-by-2022-23-centre-11638200029488.html>



The defence ministry has approved the procurement of 12 LUH from the HAL for around ₹1,500 crore. (ANI)

देवघर एयरपोर्ट: अनोखी पहल से पार्किंग के साथ-साथ मिलेगी बिजली की भी सुविधा, शेड में लगा है सोलर पैनल

Deoghar Airport: इस खास सोलर प्लेट वाले शेड से गाड़ियों का तो पानी और धूप से बचाव होगा ही, साथ ही शेड में सोलर पैनल लगे होने की वजह से यहां टर्मिनल बिल्डिंग को बिजली भी उपलब्ध हो जाएगी। देवघर एयरपोर्ट पर शुरू हुये इस अनोखी पहल की काफी चर्चा हो रही है और लोग इस प्रयोग के लिए एयरपोर्ट अथॉरिटी की सराहना भी कर रहे हैं।

By मनीष दुबे

देवघर: देवघर एयरपोर्ट (Deoghar Airport) लगभग बनकर तैयार हो चुका है जल्द ही यहां से विमान सेवा शुरू कर दी जाएगी। टर्मिनल बिल्डिंग एटीसी बिल्डिंग रनवे भी पूरी तरह बनकर तैयार हो गया है। इसी बीच एयरपोर्ट अथॉरिटी ऑफ इंडिया की तरफ से देवघर एयरपोर्ट पर एक अनोखी और अच्छी पहल की गई है। दरअसल यहां टर्मिनल बिल्डिंग (Terminal Building) के समीप कार पार्किंग में शेड बनाया गया है। लेकिन, यह शेड दूसरे शेडों अलग है। इसकी सबसे खास बात यह है कि कार पार्किंग के तैयार किए गए यह शेड सोलर पैनल से बने हुए हैं। इस खास शेड से गाड़ियों का तो पानी और धूप से बचाव होगा ही, साथ ही शेड में सोलर पैनल (Solar Panel) लगे होने की वजह से यहां टर्मिनल बिल्डिंग को बिजली भी उपलब्ध हो जाएगी। देवघर एयरपोर्ट पर शुरू हुये इस अनोखी पहल की काफी चर्चा हो रही है और लोग इस प्रयोग के लिए एयरपोर्ट अथॉरिटी की सराहना भी कर रहे हैं।



देवघर एयरपोर्ट पर सोलर पैनल शेड लगाकर एक खास पहल की गयी है.

वहीं, इस बारे में देवघर एयरपोर्ट के डायरेक्टर संदीप ढींगरा ने बताया कि यह एक अनोखी पहल की गई है। इस शेड में अल्बेस्टर की जगह सोलर पैनल का उपयोग किया गया है जिससे बिजली उत्पन्न कर टर्मिनल बिल्डिंग को दिया जाएगा।

देवघर एयरपोर्ट पर उतरेगा DRDO का भी जहाज

बता दें, 2018 में 24 मई को प्रधानमंत्री नरेन्द्र मोदी ने देवघर एयरपोर्ट का ऑनलाइन शिलान्यास किया था। फिलहाल 2500 मीटर का रनवे बनकर तैयार है। इस पर एज लाइट लगाई जा चुकी है। एयर ट्रैफिक कंट्रोल का ट्रायल हो चुका है। टर्मिनल का काम भी लगभग पूरा हो चुका है। देवघर एयरपोर्ट पर 180 यात्रियों की क्षमता वाला विमान उतर सकता है। एयरपोर्ट के 2.5 किमी लंबे 45 मीटर चौड़े रनवे पर एयर बस तक उतारने की क्षमता होगी। यहां डीआरडीओ का जहाज भी उतरेगा। डीआरडीओ के जहाज व पायलट के ठहराव के लिए अलग से व्यवस्था की जा रही है।

17 सितंबर को PM मोदी करेंगे देवघर एयरपोर्ट का उद्घाटन

आपको बता दें कि मिली जानकारी के अनुसार 17 सितंबर को PM मोदी देवघर एयरपोर्ट का उद्घाटन करने वाले हैं। इसके बाद देशभर के लोग हवाई मार्ग से यहां आकर बाबा बैद्यनाथ के दर्शन कर पाएंगे। देवघर एयरपोर्ट चालू होने से झारखंड, बिहार और बंगाल के यात्रियों को सुविधा होगी। वहीं, कोलकाता, पटना, बागडोगरा और रांची एयरपोर्ट के बीच में देवघर एयरपोर्ट होगा। देवघर एयरपोर्ट के चालू होने से इस

इलाके में धार्मिक स्थानों के साथ-साथ आर्थिक विकास भी तेजी से होगा और भक्तों को काफी सुविधाएं होगी।

<https://hindi.news18.com/news/jharkhand/dhanbad-challenge-to-dhanbad-police-nanhein-khans-killer-prince-khan-threatening-audio-viral-kill-recovery-agent-bryj-3874157.html>

Telangana Today

Tue, 30 Nov 2021

Hyderabad-based MTAR Technologies to expand presence in clean energy

By YV Phani Raj

Hyderabad: Hyderabad-based MTAR Technologies, a precision engineering solutions company that makes mission critical precision components for multiple sectors, is strengthening its presence in clean energy, and is planning to expand its overall headcount from over 1,500 currently to about 2,500 in the next 1-2 years, in its efforts to become an integrated systems company.

The company today serves customers in the nuclear, space, defence, and clean energy sectors and its portfolio includes 14 products in the nuclear sector, six products in the space and defence sectors, and three products in the clean energy sector and has a mix of developmental and volume-based production.

P Srinivas Reddy, MD, MTAR Technologies, told Telangana Today in an exclusive interview, “We are going to go deep into the sectors we already operate, and want to become an integrated systems company. We will enhance development and manufacturing capabilities as well as expand our customer base. With a focus on R&D and innovation, we have already indigenised several products.”

He added, “While all the sectors offer enormous growth opportunities, we believe that clean energy will be one of our core focus areas in future. Clean energy is moving to the next level. We will be enhancing manufacturing capabilities to meet export market needs in this sector. We are making main assembly hydrogen units for US-based Bloom Energy, and they are being integrated in the US. We are looking at the possibility of integrating them in our units here, going forward.”

The company also sees opportunities in hydel and wind power as it looks to expand capabilities in the energy sector, beyond fuel cells.

Manufacturing base

MTAR has seven strategically based manufacturing units including an export-oriented unit based in Hyderabad, Telangana. The company has a long-standing relationship of over three and four decades with customers such as the Indian Space Research Organisation (ISRO) and the Defence Research and Development Organisation (DRDO). It is also working on several missile programmes in the defence sector.

The company has manufactured critical components and assemblies such as liquid propulsion engines, components, and assemblies for cryogenic engines, specifically turbo pumps, booster pumps, gas generators and injector heads for such engines, and electro-pneumatic modules to serve space launch vehicles for ISRO. “We are working on Gaganyaan currently and are keen to take part in future space programmes as well,” Reddy added.

MTAR also contributed to India’s Moon mission Chandrayaan-2 by manufacturing spacecraft’s crucial parts. For the defence sector, it undertook complex assemblies for the DRDO, including



assembly for Agni missiles, and the assembly of secondary injection thrust vector control (SITVC) valves and hydraulic fin tip control (HFTC) valves.

It has also consistently supplied products such as hot boxes, hydrogen boxes, and electrolysers to Bloom Energy and defence products such as aluminium weldments and machined components to an Israeli defence tech company.

He informed, the company has managed to ensure that the supply disruptions during the pandemic-induced lockdowns did not impact operations and is expecting 20-25 per cent growth in its revenues this fiscal. MTAR is also going for additional global certifications with an eye on building its exports base.

<https://telanganatoday.com/hyderabad-based-mtar-technologies-to-expand-presence-in-clean-energy>

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Mon, 29 Nov 2021 3:05PM

Budgetary Allocation for Defence

Gross Defence Budget (BE) as percentage of GDP for the last two years and current year are as under:

(Rs in Crore)

Year	Defence Budget (BE) [Gross]	GDP*	Defence Budget as percentage of GDP
2019-20	4,72,069.78	2,11,00,607.00	2.24
2020-21	5,14,796.69	2,24,89,420.00	2.29
2021-22	5,20,794.99	2,22,87,379.00	2.34

*Figures are as per Budget at a Glance of the Union Budget.

It may be seen from above that Defence Budget is consistently increasing in absolute terms as well as a percentage of GDP.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri Tiruchi Siva in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776101>



**Press Information Bureau
Government of India**

Ministry of Defence

Mon, 29 Nov 2021 3:05PM

Replacement of Helicopters

Replacement of aircraft fleet of the defence forces including Cheetah and Chetak helicopters is reviewed from time to time keeping in view the operational requirements. This is a continuous process. The Government has planned replacement of these helicopters with Naval Utility Helicopter, indigenous Light Utility Helicopter (LUH) manufactured by HAL under “Buy (Indian-IDDMM)” project and Russian built Ka-226T as “Buy & Make (Indian)”.

Initial Operational Clearance to LUH has been granted. Four Limited Series Production (LSP) LUHs (02 for Indian Army and 02 for Indian Air Force) would be manufactured by 2022-23 and eight (LSP) LUHs (04 for Indian Army and 04 for Indian Air Force) by 2023-24. This would be followed by manufacture of Series Production (SP) Helicopters by HAL.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Smt AmbikaSoniiin Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776099>



**Press Information Bureau
Government of India**

Ministry of Defence

Mon, 29 Nov 2021 3:03PM

Defence manufacturing facility in private sector

Uttar Pradesh Defence Industrial Corridor (UPDIC) comprising six nodes, namely Agra, Aligarh, Chitrakoot, Jhansi, Lucknow and Kanpur, was launched in August 2018 to attract and facilitate investments from industries to develop a defence manufacturing ecosystem. A private sector company, namely PTC Industries Limited, has set up a new plant, namely Aerolloy Technologies Limited, at Lucknow node of the UPDIC for manufacturing of exotic, critical/super critical materials and components to be used in aerospace sector. Raksha Mantri inaugurated the said facility on 13th November 2021.

National Aluminum Company Limited (NALCO), a Central Public Sector Enterprise (CPSE) under Ministry of Mines, and Mishra Dhatu Nigam Limited (MIDHANI), a Defence Public Sector Undertaking (DPSU) under Ministry of Defence, have established a Joint Venture (JV) company, namely Utkarsha Aluminum Dhatu Nigam Limited in August 2019 for manufacturing of Aluminum alloys at Nellore, Andhra Pradesh

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri Parimal Nathwani in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776097>



**Press Information Bureau
Government of India**

Ministry of Defence

Mon, 29 Nov 2021 2:58PM

Maritime Security

The Government has taken a number of measures to strengthen coastal, offshore and maritime security. Broadly, these measures include capacity augmentation of maritime security agencies for surveillance and patrol of the nation's maritime zones; enhanced technical surveillance of coastal and offshore areas; establishment of mechanisms for inter-agency coordination; increased regulation of activities in the maritime zones; as also integration of the fishing and coastal communities.

Indian Naval ships and aircraft are regularly deployed on 'Mission Based Deployments' in Indian Ocean Region to enhance maritime security. It also undertakes surveillance to enhance Maritime Domain Awareness and address contingencies that may arise. These are in consonance with Government of India's vision of Security and Growth for All in the Region (SAGAR) and the Maritime Security Strategy to build its role as the 'Preferred Security Partner' in our extended maritime neighbourhood. Besides this, India proactively engages with regional Navies to enhance friendship/cooperation and promote maritime security in the Indian Ocean Region (IOR). Operational interactions with friendly foreign countries include activities like Joint Exclusive Economic Zone (EEZ) Surveillance, Coordinated Patrols on annual / bi-annual basis along the International Maritime Boundary Line (IMBL), Maritime Exercises, etc.

India also exchanges Maritime Information bilaterally with Friendly Foreign Countries to create Maritime Domain Awareness in IOR. This includes information on military and naval assets of hostile / adversarial countries; assessment of maritime activities of mutual concern and activities related to transnational maritime based threats.

Besides these, India also participates in regional frameworks such as Association of Southeast Asian Nations Regional Forum (ARF), East Asia Summit (EAS) and the ASEAN Defence Ministers Meeting Plus (ADMM Plus) to expand its cooperation and exchanges with the Indo-Pacific region.

This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri Anand Sharma in Rajya Sabha today.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1776090>

Vice Admiral R Hari Kumar to take over as Chief of Naval Staff today

Vice Admiral R Hari Kumar will take charge as the new Chief of Naval Staff on Tuesday. He will succeed Admiral Karambir Singh, who is retiring from service on November 30.

By Manjeet Negi

New Delhi: Vice Admiral R Hari Kumar will take over as the new Chief of Naval Staff on November 30. He will succeed Admiral Karambir Singh, who is the incumbent Indian Navy Chief.

Admiral R Hari Kumar was previously the Flag Officer Commanding-in-Chief (FOC-in-C) Western Naval Command. He was the head of the overseas committee of INS Vikramaditya and the first flag officer to be appointed as commandant of naval war college at Goa.

He has played important role in housing infrastructure for officers and sailors at Mumbai.

Who is Vice Admiral R Hari Kumar?

Born on April 12, 1962, Vice Admiral R Hari Kumar graduated from J-squadron, 61 Course National Defence Academy in December 1981. He was commissioned into the Executive Branch of the Navy on January 1, 1983.

During a career spanning nearly 39 years, he has served in a variety of Command, Staff and Instructional appointments.

Vice Admiral Kumar's Sea Command includes Coast Guard Ship C-01, INS Nishank, Missile Corvette, INS Kora and Guided Missile Destroyer INS Ranvir. He also commanded aircraft carrier INS Viraat. He also served as Fleet Operations Officer of the Western Fleet.

Vice Admiral R Hari Kumar has undergone courses at the Naval War College in the US, Army War College in Madhya Pradesh and Royal College of Defence Studies in the UK.

Vice Admiral R. Hari Kumar has been conferred the Param Vishist Seva Medal, the Ati Vishist Seva Medal, and Vishist Seva Medal.

<https://www.indiatoday.in/india/story/vice-admiral-r-hari-kumar-take-charge-chief-of-naval-staff-1882302-2021-11-30>



Vice Admiral R Hari Kumar will take over as the new Chief of the Naval Staff on November 30.



Press Information Bureau
Government of India

Ministry of Science & Technology

Mon, 29 Nov 2021 2:38PM

New indigenous smart technology system can automatically protect power grids from short-circuits

An Indian researcher has developed a unique innovation of a prototype of a smart system that can protect power grids from short-circuits by either automatically diverting the current into a parallel shunt (external resistance to bypass maximum current) or limiting a current surge by developing high resistance in the current path.

Short-circuit situations also often occur in power distribution networks like power grids, resulting in huge current surges that can damage the power grids as they are not designed to handle the large surge current. These surges (fault current) damage the power grids causing major economic loss and disruption in the electricity supply.

In recent years a new fault current limiter technology has been developed, namely, using superconductors. These are called as superconducting fault current limiters (SCFL). This technology developed is based on the property of superconductors offering zero resistance to currents up to a threshold current value, namely, the critical current. At currents beyond the critical current, the resistance of the superconductor becomes high. Thus, the SCFL's operating principle is that when the fault current exceeds the critical current of the superconductor, its resistance becomes high. This reduces the fault current, and when the fault current reduces below the threshold critical current, the normal zero resistance mode offering operation returns. The SCFL is energy efficient in its operation. Companies in the west are already investing in superconducting fault current limiters (SCFL) technology. However, they are expensive, with an approximate cost of each superconducting fault current limiter being in the range of Euro 1 million ~ Rupees 8,00,00,000 (Eight crores).

Prof. Satyajit Banerjee from the Indian Institute of Technology Kanpur (IIT Kanpur) and his group (Md. Arif Ali) have indigenously developed a unique innovation of a prototype of a Smart Superconducting Fault Current Limiter (SCFLsm), which has a circuit wherein a superconducting element has an array of hall sensors distributed around the superconductor.

This circuit is connected in parallel to a low resistance shunt through a switch. The array of hall sensors allows continuous monitoring of current flowing through different regions of the superconductor used in the SCFLsm. Precise and continuous monitoring of the current through the fault limiting superconducting element can trigger automatic action, like, diverting the current into a parallel shunt and protecting the grid. This smart aspect of the SCFLsm is that it allows for fault limiting action at any user-settable, predetermined threshold value of current flowing through the SCFLsm. This feature is unlike a conventional SCFL where fault limiting action sets in only the critical current value, which is fixed by the material of the superconductor and the processing it underwent during the synthesis of the superconductor.



The figure above shows the fully integrated smart superconducting fault current limiter in operation.

Another advantage is that the SCFLsm allows for the continuous monitoring and mapping of the current distribution across the superconductor used inside it. This enables the direct visualization of any instability setting in the SCFLsm during its operation. If any instability sets in the superconductor while the SCFLsm is operating at high currents, the mapping technology will detect its development. Subsequently, corrective action can be initiated to divert the current from the superconductor and protect the SCFL. Thus the common problem of failures of the superconductors experienced in conventional SCFL's can be mitigated. The operation of this SCFLsm is completely automatic and independent of any manual intervention for resetting the system after a fault.

The technology developed with support from the Advanced Manufacturing Technologies Program of the Department of Science & Technology (DST), Government of India is in the 4th stage of Technology Readiness level, and a national patent has also been filed for the same. The prototype can be incorporated in any of the large power sector companies who are working with their standard superconducting fault current limiters.

Prof. Banerjee further plans to develop more efficient, large current automatic compact switches to divert current between superconductors to shunt. This will help diversion of the faulty as soon as it is detected by the smart sensors built into his SCFLsm prototype.

He also plans to develop predictive (intelligence) capability in his smart SCFL to automatically detect when one is nearing the threshold of formation of instability in the superconducting element or even to detect when the system is approaching the stage of fault occurrence. In this situation, the system will develop smartness and have sensors that will impart it something akin to intelligence to take rudimentary decisions.

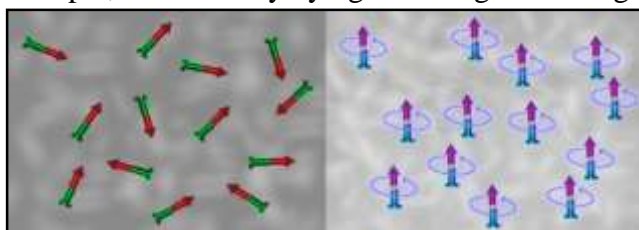
<https://pib.gov.in/PressReleasePage.aspx?PRID=1776078>



Tue, 30 Nov 2021

Programmable interaction between quantum magnets

The forces between particles, atoms, molecules, or even macroscopic objects like magnets are determined by the interactions of nature. For example, two closely lying bar magnets realign themselves under the influence of magnetic forces. A team led by Prof. Dr. Matthias Weidemüller and Dr. Gerhard Zürn at the Center for Quantum Dynamics of Heidelberg University has now succeeded in its aim to change not only the strength but also the nature of the interaction between microscopic quantum magnets, known as spins. Instead of falling into a state of complete disorder, the especially prepared magnets can maintain their original orientation for a long period. With these findings, the Heidelberg physicists have successfully demonstrated a programmable control of spin interactions in isolated quantum systems.



On the left, a disordered ensemble of classical magnets in a stable equilibrium configuration. On average, the system appears not to be magnetised. On the right, Floquet engineering has stalled the magnets' reorientation. The quantum magnets maintain their aligned configuration for a long time in spite of the disorder. Credit: Sebastian Geier

Magnetic systems can exhibit surprising behavior when they are prepared in an unstable configuration. For example, constraining a collection of spatially disordered magnetic dipoles, such as bar magnets, to be aligned in the same direction, will lead to a subsequent reorientation of the magnets. This ultimately results in an equilibrium in which all magnets are randomly oriented.

While the majority of investigations used to be limited to classical magnetic dipoles, it has recently become possible to expand the approaches to quantum magnets using what are called quantum simulators. Synthetic atomic systems mimic the fundamental physics of magnetic phenomena in an extremely well-controlled environment where all relevant parameters can be adjusted almost at will.

In their quantum simulation experiments, the researchers used a gas of atoms that was cooled down to a temperature near absolute zero. Using laser light, the atoms were excited to extremely high electronic states, separating the electron by almost macroscopic distances from the atomic nucleus. These "atomic giants," also known as Rydberg atoms, interact with each other over distances of almost a hair's breadth. "An ensemble of Rydberg atoms exhibits exactly the same characteristics as interacting disordered quantum magnets, making it an ideal platform to simulate and explore quantum magnetism," states Dr. Nithiwadee Thaicharoen, who was a postdoc on Prof. Weidemüller's team at the Institute for Physics and now continues her research as a professor in Thailand.

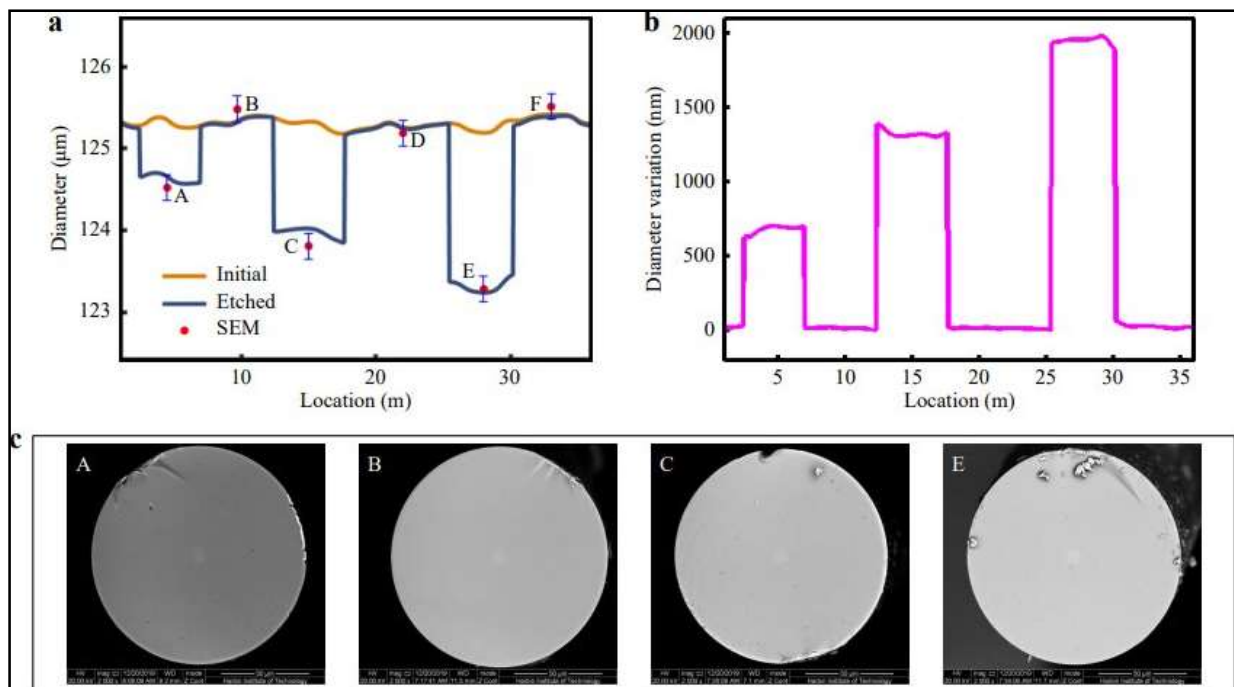
The essential trick of the Heidelberg physicists was to steer the dynamics of the quantum magnets by adopting methods from the field of nuclear magnetic resonance. In their experiments, the researchers apply especially designed periodic microwave pulses to modify the atomic spin. A major challenge was to precisely control the interaction between the atomic spins using this technique, known as Floquet engineering. "The microwave pulses had to be applied to the Rydberg atoms at timescales of a billionth of a second, with these atoms being super-sensitive at the same time to any external perturbation, however tiny, like minute electric fields," says Dr. Clément Hainaut, a postdoc on the team who recently moved to the University of Lille (France). "We nonetheless succeeded in stalling the spin's seemingly inevitable reorientation and maintaining a macroscopic magnetisation through our control protocol," explains doctoral student Sebastian Geier. "Using our Floquet engineering approach, it should now be possible to reverse the timeline such that the spin system inverts its evolution after having gone through a very complex dynamic. It would be like a broken glass magically reassembling itself after it has crashed onto the floor."

The studies are an important step towards a better understanding of basic processes in complex quantum systems. "After the first and second quantum revolution, which led to the understanding of the systems and the precise control of single objects, we are confident that our technique of dynamically adjusting interactions in a programmable fashion opens a path to Quantum Technologies 3.0," concludes Matthias Weidemüller, professor at the Institute for Physics and Director of Heidelberg University's Center for Quantum Dynamics.

More information: Sebastian Geier et al, Floquet Hamiltonian engineering of an isolated many-body spin system, *Science* (2021). DOI: [10.1126/science.abd9547](https://doi.org/10.1126/science.abd9547)
<https://phys.org/news/2021-11-programmable-interaction-quantum-magnets.html>

Nondestructive testing of optical fiber diameters

The increased use of optical fiber has seen a greater focus on the precise control and measurement of its diameter. That is due to the diameter being vital for a wide range of fields, from high-speed optical communication to ultra-high sensitivity sensing. Handling optical fiber before measurement can damage the fiber permanently, particularly when multiple-point measurements are needed.



(a) Demodulated diameter distribution before and after etching and its comparison with the SEM results (A-F). (b) Diameter variations along the FUT. (c) Four representative images of the fiber cross-section at A, B, C, and E, captured by SEM. Credit: by Zijie Hua, Dexin Ba, Dengwang Zhou, Yijia Li, Yue Wang, Xiaoyi Bao and Yongkang Dong

In a new paper published in *Light: Advanced Manufacturing*, a team of scientists led by Professor Yongkang Dong from the National Key Laboratory of Science and Technology on Tunable Laser at Harbin Institute of Technology has developed a unique technology that measures the mechanical properties of optical fibers through forward stimulated Brillouin scattering (FSBS). The paper, entitled "Non-destructive and distributed measurement of optical fiber diameter with nanometer resolution based on coherent forward stimulated Brillouin scattering," sought to protect optical fiber during the measurement of the diameter so that it can be implemented in the appropriate field.

In the past, scanning electron microscopes (SEMs) or optical microscopes are widely employed in many industries for imaging the cross-sections of fibers for measuring fiber diameter. However, optical and electron microscopy is useful only for point measurements. This measurement methodology is destructive as the fiber must be cut at the measurement locations, causing irreversible damage. These conventional microscopy techniques involve a trade-off between the resolution and the microscope's field of view (FOV), limiting resolution to approximately 100 nm for fiber diameters of roughly 125 μm.

FSBS is a nonlinear optomechanical interaction between optical field components and acoustic waves that propagate in a shared medium. In this case, the process occurs in the forward direction with the optical tones either co- or counter-propagating. It was first applied to monitor single-mode fiber diameters in 1992. Under the paradigm, the research team introduced a novel optomechanical protocol called optomechanical time-domain analysis (OMTDA). They can measure the diameter

of every part of an optical fiber up to several kilometers. At the same time, it achieved a significantly greater spatial resolution across the optical fiber axis.

What does this mean? In practical terms, it means a more straightforward and non-destructive method of checking optical fiber diameter, with an accuracy of a few nanometers. While this may seem obtuse, the opportunities for science are immense.

More information: Zijie Hua et al, Non-destructive and distributed measurement of optical fiber diameter with nanometer resolution based on coherent forward stimulated Brillouin scattering, *Light: Advanced Manufacturing* (2021). DOI: [10.37188/lam.2021.025](https://doi.org/10.37188/lam.2021.025)

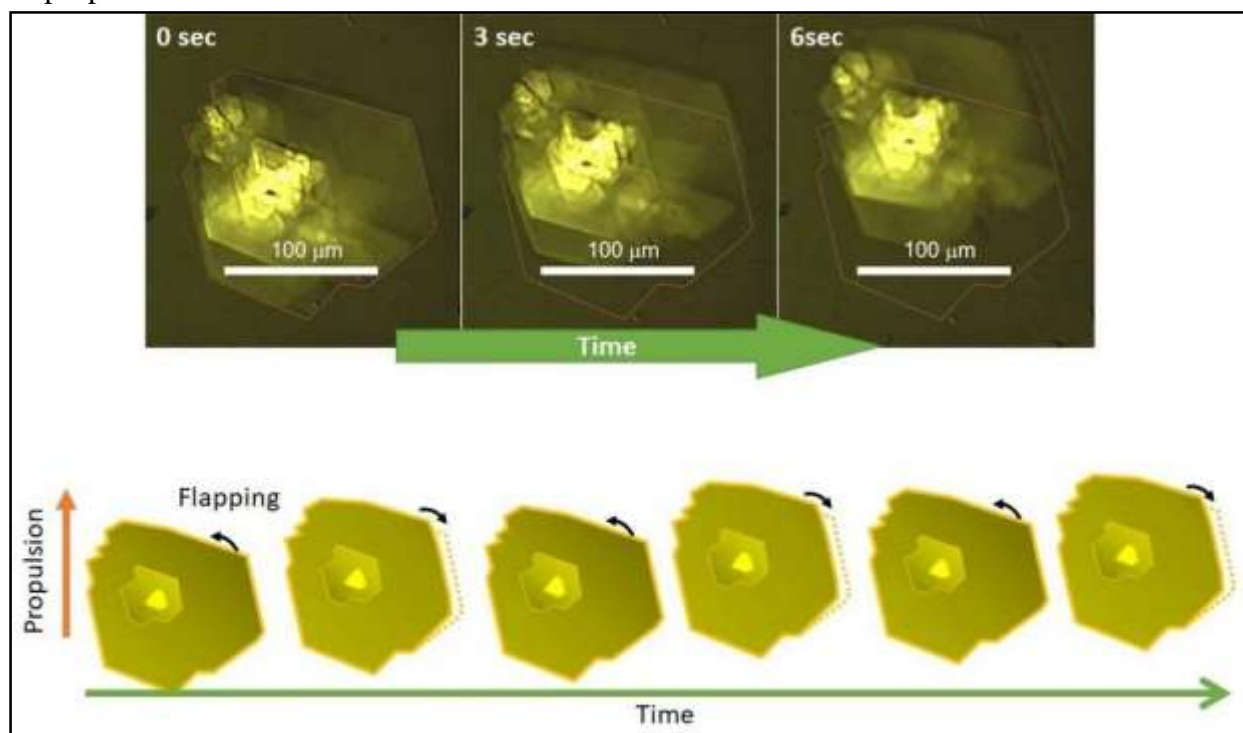
<https://phys.org/news/2021-11-nondestructive-optical-fiber-diameters.html>



Tue, 30 Nov 2021

Mobile molecular robots swim in water

Creating molecular microrobots that mimic the abilities of living organisms is a dream of nanotechnology, as illustrated by the renowned physicist Richard Feynman. There are a number of challenges in achieving this goal. One of the most significant of these is the creation of directed self-propulsion in water.



(Above) A series of light micrographs showing the movement of one of the synthesized microrobots in this study; (Below) A representation of the movement of the fin over time (Kazuma Obara, Yoshiyuki Kageyama, Sadamu Takeda. *Small*. November 27, 2021). Credit: Kazuma Obara, Yoshiyuki Kageyama, Sadamu Takeda. *Small*. November 27, 2021

A team of three scientists from Hokkaido University, led by Assistant Professor Yoshiyuki Kageyama, has succeeded in creating a microcrystal that utilizes self-continuous reciprocating motion for propulsion. Their findings were published in the journal *Small*.

The dream of microrobots is an old one, having been addressed in science fiction for many decades, and popularized by the rise of nanotechnology. One aspect of these robots is self-propulsion, the ability to move themselves self-sustainably. There are two major challenges to achieving this: the first is to make a molecular robot that can reciprocally deform, and the second is converting this deformation into propulsion of the molecular robot.

Kageyama's group built on their previous research that had solved the first challenge—the creation of molecular robots that can reciprocally deform. However, tiny objects cannot convert their reciprocal motion into progressive motion, in general, as explained by Edward Purcell's scallop theorem. In the current study, the scientists went to the next step and succeeded in realizing self-propulsion of the molecular robot in an experimental system where motion was confined to two dimensions; in this system, viscous resistance acts anisotropically, making it negligibly weak.

Mobile molecular robots swim in water

The microrobot was powered by blue light, which drove a series of reactions leading to the fin flipping and the propulsion. Due to the nature of the reactions, the motion was not continuous, but occurred intermittently; in addition, the molecular robots exhibited one of three different styles of propulsion: a "stroke" style, with the fin in front; a "kick" style, with the fin behind; or a "side-stroke" style, with the fin to one side. The nature of mobility was affected by the area of the fin and its angle of elevation; individual crystals propelled themselves in different directions and styles.

The scientists then created a computational minimum model to understand the variables that affected the propulsion in a two-dimensional tank. They were able to determine that fin length, fin ratio and elevation angle were the key variables affecting the direction and the pace of propulsions.

"The result, which demonstrated that tiny flappers can swim assisted by the anisotropy caused by confined spaces, could spur research into molecular robots," says Kageyama. "A similar mechanism may be in the movement of small aquatic organisms in specific conditions such as inside eggs."

More information: Kazuma Obara et al, Self-Propulsion of a Light-Powered Microscopic Crystalline Flapper in Water, *Small* (2021). DOI: [10.1002/sml.202105302](https://doi.org/10.1002/sml.202105302)

Journal information: *Small*

<https://phys.org/news/2021-11-mobile-molecular-robots.html>

Study reveals acute effects of severe COVID-19 on the brain

By James Kingsland

- *A large international study suggests that around 1 in every 100 patients hospitalized with COVID-19 have brain complications.*
- *These include stroke, brain hemorrhage, and other potentially fatal conditions.*
- *Many of the patients had preexisting illnesses, such as high blood pressure, heart disease, and diabetes.*
- *Previous research has shown that some people who recover from COVID-19 have lingering neurological and psychiatric symptoms.*

As the COVID-19 pandemic wears on, experts increasingly recognize that SARS-CoV-2, the virus that causes the disease, affects areas beyond the lungs. It can also infect the kidneys, gut, and blood vessels, for example.

In addition, COVID-19 can cause a range of neurological and psychiatric symptoms.

One telltale symptom is a loss of taste or smell, which indicates that SARS-CoV-2 can infect the peripheral nervous system. But the virus can also affect the central nervous system, producing symptoms such as headaches, dizziness, confusion, and seizures.

Now, a large international study led by researchers at Thomas Jefferson University, in Philadelphia, has found that around 1% of patients hospitalized with COVID-19 develop potentially fatal brain complications.

These include strokes, bleeding, and inflammation called encephalitis.

“Much has been written about the overall pulmonary [lung] problems related to COVID-19, but we do not often talk about the other organs that can be affected,” says Dr. Scott H. Faro, a professor of radiology and neurology at the university, who also led the study.

“Our study shows that central nervous system complications represent a significant cause of morbidity and mortality in this devastating pandemic,” he explains.

The researchers presented their currently unpublished results at the annual meeting of the Radiological Society of North America, in Chicago. The study has yet to be peer reviewed, and only a summary of the results is available.

Preexisting conditions could be risk factors

The retrospective, observational study involved almost 40,000 patients, who were hospitalized with COVID-19 at any of seven university hospitals in the United States or four in Western Europe.

The participants’ average age was 66 years, and there were twice as many men as women.

Many had preexisting conditions, such as heart disease, diabetes, or high blood pressure, which is also called hypertension.



In people with severe COVID-19, central nervous system complications may be more common than initially estimated. Mental Art + Design/Stocksy

Among those who had undergone a brain MRI or CT scan, 442 patients had brain-related complications attributable to COVID-19.

This suggests that around 1.2% of the total patient group had a brain complication as a result of the disease.

The most frequent complications were:

- ischemic stroke: 6.2%.
- hemorrhage, or bleeding: 3.72%.
- encephalitis: 0.47%.

More rare complications included inflammation of the brain and spinal cord, which is called acute disseminating encephalomyelitis, and encephalopathy syndrome, which causes symptoms similar to those of a stroke.

“It is important to know an accurate incidence of all the major central nervous system complications,” Dr. Faro says, noting, “There should probably be a low threshold to order brain imaging for patients with COVID-19.”

Overall, brain complications appeared to be about three times as common among patients in Europe, compared with those in the U.S. The study could not explain the factors behind this disparity. However, doctors detected strokes more often in COVID-19 patients in the U.S. than in Europe.

“The one feature that is likely a contributing factor is: There was an increase in comorbidities (cardiac, diabetes, and chronic [kidney] failure) in the U.S. population [compared with] Europe,” Dr. Faro told *Medical News Today*.

Is direct infection the cause?

Currently, the direct role that the viral infection of the central nervous system plays in the neurological complications is unclear.

Overactivation of the immune system, inflammation, dehydration, and low oxygen levels, an issue called hypoxia, are also likely to be important factors.

“The [central nervous system] complications of COVID-19 are multifactorial and [involve] both the direct spread of the virus from the lungs and nasal mucosa, as well as indirect autoimmune factors and physiological changes (hypoxia, inflammation, dehydration),” Dr. Faro told *MNT*.

“More research is needed to better [understand] this,” he added.

The acute effects of COVID-19 on the central nervous system may result in lingering neurological and cognitive symptoms.

A study Trusted Source published in October found that some people who recover from the infection experience cognitive impairments, such as problems with concentration and memory, often called brain fog, for several months.

There may also be long-term effects on mental health. A study published in May found that in the 6 months after recovering from COVID-19, 13% Trusted Source of participants received a first diagnosis of a neurological or psychiatric condition.

The most common diagnoses were anxiety disorders, mood disorders, substance misuse disorders, and insomnia.

Neurological diagnoses were less common, and included strokes, dementia, and brain hemorrhages. It is unknown whether COVID-19 was directly responsible for these neurological and psychiatric conditions. The senior author of this study, Paul Harrison, a professor of psychiatry at the University of Oxford, told *MNT* that he and colleagues are conducting a follow-up study to see whether the effects continue beyond the 6-month period.

“We are looking at longer-term outcomes now and hope to have [our] study completed early next year,” he said.

<https://www.medicalnewstoday.com/articles/study-reveals-acute-effects-of-severe-covid-19-on-the-brain#Is-direct-infection-the-cause?>

