

Aug
2021

समाचार पत्रों से चयित अंश Newspapers Clippings

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

खंड : 46 अंक : 159 12 अगस्त 2021

Vol.: 46 Issue : 159 12 August 2021



रक्षा विज्ञान पुस्तकालय
Defence Science Library
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Thu, 12 Aug 2021

DRDO tastes success with new turbofan engine after Odisha test launch

The DRDO has developed the new engine to replace the foreign engine earlier used in the missile system

By Hemant Kumar Rout

Bhubaneswar: In a much-needed technology push, India test-launched Indigenous Technology Cruise Missile (ITCM) with a new Made-in-India turbofan engine from a defence facility off Odisha coast on Wednesday. Defence sources said the ITCM, an advanced version of subsonic cruise missile Nirbhay, was test fired with small turbofan engine Manik from the Integrated Test Range (ITR) at about 10 am. This was the first developmental trial of the missile with the new indigenous engine after an unsuccessful attempt on October 12 last year as the mission had to be aborted due to a technical snag in the system.



Nirbhay cruise missile being test fired. (Photo | Express)

“Equipped with the new engine, the missile was tested for a short range. The turbofan engine performed well. The focus was on gauging the performance of the engine, which has been validated by clearing decks for further advancement. The next test will be to cover the full range of the missile,” a senior defence official told TNIE. The first successful test of the Manik engine assumes significance as once mastered, the technology will pave the way for development of different versions of the engine and long-range much faster cruise missiles.

The DRDO has developed the new engine to replace the foreign engine earlier used in the missile system. The small turbofan engine of 400 kgf thrust class has been designed and developed by Bengaluru-based Gas Turbine Research Establishment to propel cruise missiles.

“Manik has state-of-the-art digital control, advanced fuel control and pyro systems. The twin spool engine without an afterburner and with high speed alternator, un-cooled high pressure turbine blades and shrouded low pressure turbine blades, makes it different from others,” said a defence scientist.

Developed by DRDO, Nirbhay is India’s first indigenously built cruise missile. After initial hiccups, the weapon system has completed six developmental trials between 2012 and 2019. It will soon be deployed in the armed forces after a couple of user trials. The cruise missile will supplement the Indo-Russian joint venture supersonic cruise missile BrahMos.

<https://www.newindianexpress.com/states/odisha/2021/aug/12/drdo-tastes-success-with-new-turbofan-engine-after-odisha-test-launch-2343690.html>

Nirbhay cruise missile test-fired; indigenous engine a success, say officials

An official said that next test firing will be done in mission mode before user trial for air force and navy. This was the first successful test-firing with the indigenous booster engine after the previous one had to be aborted in October last year after eight minutes flying time

By Shishir Gupta

New Delhi: After the October 2020 failed test, the Defence Research and Development Organisation (DRDO) on Wednesday fired the 1,000-km range Nirbhay cruise missile from Chandipur testing facility in Odisha. The sub-sonic cruise missile was fired at 9:55am and was tested for 100 km in flight and 15 minutes in time.

The firing was a partial success. According to DRDO sources, the indigenous engine was successfully tested but the delivery platform came down due to inexplicable reasons. "Maybe a snag in the controller, but the engine worked well. Next test firing will be done in mission mode before user trial for air force and navy," said an official.



Nirbhay is a subsonic missile, flying at a speed of 0.7 Mach.

This was the first successful test-firing with the indigenous booster engine after the previous one had to be aborted after eight minutes flying time.

Nirbhay is a subsonic missile, flying at a speed of 0.7 to 0.9 Mach, with sea-skimming and terrain-hugging capability that helps the missile stay under enemy radar to avoid detection. It is a two-stage missile with first stage using solid fuel and the second using liquid fuel. It carries a convention warhead of 300 kilograms weight and can hit targets upto 1500 km range. The missile is capable of flying between 50 metres to four km from ground and pick up the target before engaging and destroying it.

The missile also has a loitering capability that allows the delivery platform to manoeuvre mid-flight and at the end to hit the target by doing inflight course corrections. It can be fired from sea, land and through mobile launchers.

The missile is now going to be handed over to the army, which will conduct three more tests before inducting it. After induction, Nirbhay is expected to be deployed along the Line of Actual Control (LAC) amid the stand-off with China at multiple points in East Ladakh.

<https://www.hindustantimes.com/india-news/nirbhay-cruise-missile-test-fired-drdo-says-indigenous-engine-a-success-101628656458294.html>

Thu, 12 Aug 2021

India successfully test-fired DRDO's indigenous technology cruise missile off Odisha Coast

India test-fired DRDO's Indigenous Technology Cruise Missile off Odisha coast on August 11, a step ahead in making war weapons & becoming self-sufficient

By Nikita Bishay

India on Wednesday, August 11, successfully tested the DRDO's Indigenous Technology Cruise Missile (ITCM) off the coast of Odisha. According to sources, more tests are to be conducted in near future to understand and develop the technology. Also, the range of the missile with an indigenous cruise engine can be increased later.

India's Indigenous Technology Cruise Missile

After a successful test of its cruise missile made entirely of indigenous technology, India has now moved a step ahead in the direction of making war weapons. The missile launch was a significant step towards becoming self-sufficient. Designed and developed by the Defence Research and Development Organisation (DRDO), the missile with a Made-in-India Manik turbofan engine test flew for around 150 km. The engine has performed as expected by DRDO.



Credits: ANI

Talking about the structure of the missile, it has a length of six meters, a wingspan of 2.7 m, a diameter of 0.52 m and a launch weight of about 1.5 tonnes.

"The new cruise missile will supplement the Indo-Russian joint venture supersonic cruise missile BrahMos," sources said.

DRDO's other missiles

Earlier in July, India had test-fired its indigenous developed New Generation Akash Missile (Akash-NG). It is a Surface to Air Missile defence system launched in Balasore, Odisha. It is said to strike targets at a distance of 60 km and can fly up to Mach 2.5. The testing was done during inclement weather conditions, which further proved the weather durability of the weapon system. The performance of the missile system was validated through data captured by Radar, Telemetry and Electro-Optical Tracking systems deployed by ITR, Chandipur.

At the same time, DRDO also flight-tested the Man-Portable Anti Tank Guided Missile.

Before that in June, a new missile of the Agni series known as Agni-Prime was test-fired from the Odisha coast. Being a canisterised missile, it has a range capability between 1000 and 2000 kilometres.

In February 2021, India had also successfully test-fired indigenously developed and tank-guided missile systems called Helina and Dhruvastra.

The development of these missiles will prove to be a force multiplier for the Air Defence capability of the Indian Air Force.

<https://www.republicworld.com/technology-news/science/india-successfully-test-fired-drdos-indigenous-technology-cruise-missile-off-odisha-coast.html>

DRDO ने सफलतापूर्वक किया स्वदेशी क्रूज मिसाइल का परीक्षण

By Ankur Singh

नई दिल्ली: डीआरडीओ ने आज सफलतापूर्वक स्वदेशी तकनीक वाली क्रूज मिसाइल का सफल परीक्षण किया है। इस स्वदेशी तकनीक क्रूज मिसाइल को ओडिशा क बालासोर स टेस्ट किया गया है। सूत्रों के अनुसार मिसाइल तकरीबन 150 किलोमीटर की दूरी तक गई। इस टेस्ट में अपेक्षा के अनुसार नतीजे सामने आए हैं। इसकी खास बात यह है यह पूरी तरह से स्वदेशी है और इसमें स्वदेशी इंजन लगा है। आने वाले समय में इसके और टेस्ट किए जाएंगे।

डीआरडीओ की इस मिसाइल का सफल होना पाकिस्तान और चीन दोनों के लिए खतरे की घंटी साबित हो सकता है। दरअसल इससे पहले भारत ने आकाश मिसाइल का भी सफल परीक्षण किया था। जिस तरह से भारत तेजी से स्वदेशी तकनीक के इस्तेमाल के जरिए मिसाइल तैयार कर रहा है उससे भारत की रक्षा रणनीति काफी मजबूत हो रही है और सीमा पर देश की सुरक्षा भी पुख्ता होगी।

चीन और पाकिस्तान के खतरे को देखते हुए भारत लगातार एक तरफ जहां विदेशी तकनीक को अपने डिफेंस में शामिल कर रहा है तो दूसरी तरफ स्वदेशी तकनीक का भी लगातार विस्तार कर रहा है। पिछले महीने भारत ने अग्नि मिसाइल का सफल परीक्षण किया था। चीन पूर्वी लद्दाख में तो पाकिस्तान जम्मू कश्मीर बॉर्डर पर लगातार उकसावे वाली हरकते करता रहता है, लिहाजा भारत अपनी तैयारियों में किसी भी तरह की कमी नहीं रहने देना चाहता है। भारत के पास दुनिया की सबसे तेज सुपर सोनिक क्रूज मिसाइल भी है जिसका नाम ब्रम्होस है, इसे भारत ने रूस के साथ मिलकर तैयार किया है। इसकी रेंज में कुछ दिन पहले बढ़ोतरी की गई है। अब यह 4300 किलोमीटर प्रति घंटे की रफ्तार से उड़ान भर सकता है। इसका मार इतनी अचूक है कि दुश्मन का इससे बचा पाना काफी मुश्किल है।



<https://hindi.oneindia.com/news/india/drdo-successfully-tested-indigenous-technology-cruise-missile-633066.html?story=2>

India will become world's largest arms exporter: DRDO Chief Reddy

Pune: India is self-sufficient in the manufacture of fighter aircraft, missiles, satellites, radar systems and other defence equipment. India is stressing on increasing export of defence equipment to friendly nations. India will be on the top list of global arms exporters in the next few years, said the Defence Secretary (Research and Development) and DRDO Chairman G. Sateesh Reddy on celebrating the 6th foundation day of MIT Art, Design and Technology University, Pune.

Further Dr Reddy said that this is the era of growth in space technology. India has launched more than 40 satellites through PSLV satellite launchers. Heavy satellites are launched into space by the



GSLV Satellite Launcher. Work is underway at various levels in India to send a man into space, 'Chandrayan, Marsyan'. A variety of new technologies are being launched by the Department of Defence.

Today we are the 6th largest producer of fighter aircraft and battle tanks in the world and the 4th largest producer of supersonic Brahmastra missiles in the world. The world's largest range gun is being manufactured in Pune. The development of new technologies is being encouraged through DRDO start-up companies. It wants to establish its identity as a country that will export defence technology. Universities and educational institutions will play an important role in this. DRDO has started several Centres of Excellence in the country. DRDO has signed MoUs with more than 3,000 educational institutions.

MIT ADT University should take the initiative to start a course on Defence Technology. Currently, 8,000 students across the country are doing internships in DRDO's labs. They are being given the opportunity to study defence technology. An incubator will provide Rs 1 crore to students and Rs 10 crore to industry to encourage innovation. The research will be promoted in Bioengineering Labs, Foot Technology Labs, and Marine Engineering Labs.

Meanwhile, Apple training centre, MIT School of Indian Civil Services and a translation and fact-checking laboratory were inaugurated. At the inauguration session Ajit Shankarrao Bhosale, Prof. Rahul Karad, Prof. Dr. Mangesh Karad expressed their views.

The 6th foundation day of MIT Art, Design and Technology University was celebrated virtually on Wednesday 11th August 2021.

Air Marshal Ajit Shankarrao Bhosale, Member of Union Public Service Commission (UPSC), New Delhi, Prof. Dr. Vishwanath Karad, Founder of MIT Group of Institutions, Prof. Rahul Karad, Managing Trustee and Executive President, MIT Group of the institution, Prof. Dr Mangesh Karad, Executive President and Vice-Chancellor of MIT ADT University. Prof. Dr. Sunita Mangesh Karad, Prof Jyoti Karad Dhakne, Dr Anant Chakradev, Dr Mahesh Chopde and the dean, director, teaching and non-teaching staff were present.

<https://www.punekarnews.in/india-will-become-worlds-largest-arms-exporter-drdo-chief-reddy/>

Thu, 12 Aug 2021

DRDO Chief speaks at MIT varsity's 6th foundation day

Pune, Aug 11 (UNI) India is self-sufficient in the manufacture of fighter aircraft, missiles, satellites, radar systems and other defence equipment, stated Defence Secretary (Research and Development) and DRDO president G. Sateesh Reddy on Wednesday.

He was speaking at a virtual programme held to celebrate the 6th foundation day of MIT Art, Design and Technology University, Pune.

He said that India is stressing on increasing export of defence equipment to friendly nations and added that India will be on the top list of global arms exporters in the next few years.

He told that this is the era of growth in space technology. India has launched more than 40 satellites through PSLV satellite launcher. Heavy satellites are launched into space by the GSLV Satellite Launcher. Work is underway at various levels in India to send man into space, 'Chandrayan, Marsyan'. A variety of new technologies are being launched by the Department of Defence.

Today we are the 6th largest producer of fighter aircraft and battle tanks in the world and the 4th largest producer of supersonic Brahmastra missiles in the world. The world's largest range gun is being manufactured in Pune. The development of new technologies is being encouraged through DRDO start-up companies. It wants to establish its identity as a country that will export defence technology. Universities and educational institutions will play an important role in this. DRDO has started several Centres of Excellence in the country. DRDO has signed MoUs with more than 3,000 educational institutions, he underscored.

He further said that the MIT ADT University should take the initiative to start a course on Defence Technology. Currently, 8,000 students across the country are doing internships in DRDO's labs. They are being given the opportunity to study defences technology. An incubator will provide Rs 1 crore to students and Rs 10 crore to industry to encourage innovation. Research will be promoted in Bioengineering Labs, Foot Technology Labs, and Marine Engineering Labs.

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Air Marshal Shri. Ajit Shankarrao Bhosale, Member of Union Public Service Commission (UPSC), New Delhi, Prof. Dr. Vishwanath Karad, Founder of MIT Group of Institutions, Prof. Rahul Karad, Managing Trustee and Executive President, MIT Group of institution, Prof. Dr. Mangesh Karad, Executive President and Vice Chancellor of MIT ADT University. Prof. Dr. Sunita Mangesh Karad, Prof Jyoti Karad Dhakne, Dr. Anant Chakradev, Dr. Mahesh Chopde and dean, director, teaching and non-teaching staff were present.

<http://www.uniindia.com/drdo-chief-speaks-at-mit-varsity-s-6th-foundation-day/west/news/2474182.html>

भारत हर साल कितने करोड़ के हथियार बेचता है?

सरकार ने संसद में दी जानकारी

सरकार की तरफ से बताया गया है कि 75 देशों को भारत की तरफ से रक्षा उत्पाद निर्यात किए जा रहे हैं। हालांकि इन देशों का नाम सुरक्षा की दृष्टि से सार्वजनिक करने से सरकार ने इनकार कर दिया

Edited By: अंकित त्यागी

भारत अब कई क्षेत्रों में आत्मनिर्भर बनने की कोशिशों में लगा है। कई ऐसे उत्पाद जिन्हें आयात किया जाता था, अब उन्हें देश में ही तैयार किया जाने लगा है। देश का रक्षा क्षेत्र भी अब धीरे-धीरे निर्यात के क्षेत्र में आगे बढ़ने लगा है। मॉनसून सत्र के दौरान सरकार की तरफ से जो आंकड़ें मुहैया कराए गए हैं, उनमें पिछले 7 सालों में देश से हुए रक्षा निर्यात के बारे में जानकारी दी गई है।



सरकार से पूछा गया था सवाल

एक सवाल के जवाब में सरकार की तरफ से बताया गया है कि पिछले 7 साल में देश से कौन-कौन से रक्षा उत्पादों को निर्यात किया गया है। सरकार की तरफ से उन देशों के बारे में भी बताया गया है जिन्हें रक्षा उत्पाद निर्यात किए गए हैं। सरकार की तरफ से बताया गया है कि रक्षा उत्पादन विभाग (DDP) की तरफ से खास केमिकल्स, मैटेरियल और टेक्नोलॉजीज की श्रेणी 6 में शामिल युद्ध सामग्रियों को निर्यात किया गया है।

आकाश मिसाइल देश का सबसे अहम रक्षा निर्यात है जिस पर सबकी नजरें टिकी हैं.

कौन-कौन से उत्पाद हुए निर्यात

जो उत्पाद भारत ने निर्यात किए हैं उनमें हथियार, सिम्युलेट्स, आंसू गैस लॉन्चर, टॉरपीडो लोडिंग सिस्टम, अलार्म मॉनिटरिंग एंड कंट्रोल, नाइट विजन मोनोक्यूलर और बाइनोक्यूलर, हल्के वजन वाले टॉरपीडो, बख्तरबंद व्हीकल्स, सिक्योरिटी व्हीकल, हथियार तलाशने वाले रडार्स, एचएफ रेडियो, तटीय रडार प्रणाली जैसे सिस्टम शामिल हैं जिनका निर्यात किया गया है। सरकार की तरफ से बताया गया है कि 75 देशों को भारत की तरफ से रक्षा उत्पाद निर्यात किए जा रहे हैं। हालांकि इन देशों का नाम सुरक्षा की दृष्टि से सार्वजनिक करने से सरकार ने इनकार कर दिया।

7 साल में हुआ कितना निर्यात

सरकार ने साल 2014 से 2020-2021 तक कई करोड़ों रुपयों का निर्यात किया है। जो जानकारी रक्षा मंत्रालय की तरफ से दी गई है, उसके मुताबिक

2014-2015 में 1940.64 करोड़ रुपए का निर्यात

2015-2016 में 2059.18 करोड़ रुपए का निर्यात

2016-2017 में 1521.91 करोड़ रुपए का

2017-2018 में 4682.36 करोड़ रुपए का

2018-2019 में 10745.77 करोड़ रुपए का

2019-2020 में 9115.55 करोड़ रुपए का

2020-2021 में 84348434.84 करोड़ रुपए का रक्षा निर्यात भारत से हुआ

आकाश मिसाइल होगी निर्यात

आकाश जमीन से हवा में हमला करने वाला एक मिसाइल सिस्टम है। इस वर्ष की शुरुआत में कैबिनेट सुरक्षा समिति (सीसीएस) ने इस मिसाइल के निर्यात की मंजूरी दी थी। इस मंजूरी के बाद आकाश मिसाइल को कुछ मित्र देशों जिसमें कुछ आसियान के देश जैसे वियतनाम और फिलीपींस भी शामिल हैं, उन्हें निर्यात किया जाएगा। मित्र देशों ने सेनाओं में शामिल होने के बाद देश में बनी आकाश मिसाइल को खरीदने की इच्छा जताई है। जो आकाश मिसाइल निर्यात की जाएगी, वह उस सिस्टम से पूरी तरह से अलग है जिसे सेनाएं फिलहाल प्रयोग कर रही हैं। आकाश मिसाइल सिस्टम पहला ऐसा हथियार है जो भारत में बना है और जिसे निर्यात किया जाएगा। भारत फास्ट पेट्रोल बोट्स, हेलीकॉप्टर्स और दूसरे हथियारों के साथ ही अंतरराष्ट्रीय ग्राहकों के लिए रडार्स भी तैयार कर रहा है।

ब्रह्मोस को किया जाएगा निर्यात

इसे डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (डीआरडीओ) की तरफ से डिजाइन किया गया है। कई देशों की तरफ से ब्रह्मोस मिसाइल को खरीदने की भी इच्छा जताई गई है जिसे रूस के साथ मिलकर तैयार किया गया है। लेकिन आकाश मिसाइल पहली पसंद बन गई है। आकाश मिसाइल सिस्टम 'मेक इन इंडिया' पहल की सफलता का बड़ा उदाहरण है। माना जा रहा है कि वियतनाम आकाश मिसाइल सिस्टम का पहला ग्राहक बन सकता है। इसके अलावा यूएई की तरफ से भी इसे खरीदने की इच्छा जताई गई है। वैज्ञानिकों की मानें तो आकाश मिसाइल की विभिन्नताएं इसे पसंदीदा हथियार बनाती हैं।

<https://www.tv9hindi.com/utility-news/govt-gives-data-related-with-defence-export-from-india-in-last-7-years-776238.html>

Exclusive: स्वतंत्रता दिवस पर इस बार बिल्कुल अलग होगी लाल

किले की सुरक्षा व्यवस्था, पीएम मोदी के लिए है खास इंतजाम

पीएम आवास से लालकिला के बीच इस बार कुल पांच सेफ हाउस बनाया गया है। अत्यंत गोपनीय तरीके से बनाया गया सेफ हाउस ऊंची इमारतों में बनाया गया है। सूत्रों के मुताबिक सेफ हाउस में बेहतर इलाज से लेकर हर तरह की सुविधाएं होंगी।

By Mangal Yadav, राकेश कुमार सिंह

नई दिल्ली: स्वतंत्रता दिवस पर लाल किले की सुरक्षा इस साल सबसे अधिक कड़ी रहेगी। अब से पहले सात लोक कल्याण मार्ग स्थित प्रधानमंत्री आवास से लेकर लालकिला तक 11.2 किलोमीटर के बीच कोई सेफ हाउस नहीं बनाया जाता था। केवल लालकिला के अंदर एक सेफ हाउस होता था। लेकिन इस साल पहली बार ड्रोन हमले के संभावित खतरे को देखते हुए प्रधानमंत्री आवास से लाल किला के बीच हर दो किलोमीटर पर एक-एक सेफ हाउस बनाया गया है।



पीएम आवास से लालकिला के बीच इस बार कुल पांच सेफ हाउस बनाया गया है। अत्यंत गोपनीय तरीके से बनाया गया सेफ हाउस ऊंची इमारतों में बनाया गया है। इसका मसकद यह है कि प्रधानमंत्री द्वारा लालकिला के लिए आवास से निकलने पर सुरक्षा कर्मियों को जैसे ही कहीं हमले की जानकारी मिलेगी तो उन्हें तुरंत नजदीक के सेफ हाउस में सुरक्षित ले जाया जा सके।

सूत्रों के मुताबिक उक्त सेफ हाउस में बेहतर इलाज से लेकर हर तरह की सुविधाएं होंगी। इसमें उपलब्ध सुविधाओं को परखने के लिए अक्सर रक्षा मंत्रालय व दिल्ली पुलिस समेत तमाम सुरक्षा एजेंसियां माकड़िल कर रही हैं। सेफ हाउस में चाक चौबंद बंदोबस्त किए जा रहे हैं।

इस साल 26 जनवरी को सैकड़ों की संख्या में ट्रैक्टरों को लेकर उपद्रवी दिल्ली में प्रवेश कर गए थे और उन्होंने जमकर उत्पात मचाया था। लालकिला के अंदर आकर उन्होंने जमकर तोड़फोड़ की थी। उक्त घटना से सबक लेकर स्वतंत्रता दिवस समारोह में भी उपद्रवी कोई खलल न डाले, इसके लिए सुरक्षा के बेहद कड़े बंदोबस्त किए गए हैं। लालकिला जाने वाले सभी रास्तों पर पत्थरों लदे लोहे के कंटेनर खड़े कर दिए गए हैं। सभी कंटेनरों पर स्वतंत्रता दिवस समारोह वाले दिन कमांडो व पैरा मिलिट्री के शूटरों की तैनाती की जाएगी। सड़कों पर इस तरह से कंटेनर खड़े किए गए हैं जिससे ट्रैक्टरों से किसी सूरत में उसे नहीं हटाया जा सकेगा।

लालकिला पर इस बार पहली बार रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) द्वारा दो एंटी ड्रोन रडार लगाया गया है। अगर कोई संदिग्ध ड्रोन लालकिला के तीन-चार किलोमीटर के दायरे में दिखाई देगा तो डीआरडीओ के जवान उसे वहीं जाम कर जमीन पर गिरा सकेंगे।

पुलिस अधिकारी का कहना है कि इस बार सीसीटीवी कैमरे भी हर बार की तुलना में काफी अधिक लगाए गए हैं। प्रधानमंत्री जिन मार्गों से लालकिला आएंगे और वापस लोक कल्याण मार्ग जाएंगे। उक्त रूटों के अलावा लालकिला के चारों तरफ जगह-जगह सीसीटीवी कैमरे लगाए गए हैं। सीसीटीवी कैमरों पर निगरानी के लिए दस कंट्रोल रूम बनाए गए हैं।

<https://www.jagran.com/delhi/new-delhi-city-ncr-police-made-one-safe-house-every-two-kilometers-from-pm-residence-to-red-fort-for-pm-modi-security-jagran-special-21918613.html>

Why L&T is offering the Indian army a homegrown artillery gun

By Sandeep Unnithan

New Delhi: The Indian army's urgent requirement for towed artillery guns has taken an interesting turn. Larsen & Toubro Defence has offered to supply 400 towed artillery gun systems, which the army earlier wanted to import from an Israeli firm. The L&T guns, jointly developed with French gun maker Nexter, will be made locally with an indigenous content of over 70 per cent. L&T is understood to have made the unsolicited offer to the Indian army recently. The firm has said it can deliver the first gun in less than a year. The offer comes even as the army's bid to buy the Israeli guns has hit a dead end. Last month, the defence ministry overruled the army and Department of Military Affairs' (DMA) case to buy 400 artillery guns from Israeli firm Elbit Systems. The procurement was revived after border tensions with China in 2020. As the army's own recent experience showed during the 1999 Kargil conflict, medium artillery fire support is crucial for offensive and defensive operations in the mountains.



The L&T- Nexter consortium's 'Trajan' 152mm, howitzer during Indian Army firing trials at Pokhran

The army had revived the case for the 2017 import contract as indigenous production of the Dhanush (a version of the FH-77B Bofors howitzer acquired in 1987) has stalled. The state-owned OFB (Ordnance Factory Board) has an order of 114 guns but is yet to deliver the first regiment of 20 Dhanush guns (one artillery regiment is 18 guns with two kept in reserve).

The Israeli gun was the cheapest offer in 2017 when price bids were opened after a six-year trial evaluation process to buy 1,480 guns (400 to be bought off the shelf and 1,180 to be built through ToT (transfer of technology) within the country).

In July, the defence ministry cited irregularities in this deal and asked the army to restart the competition, a process which could take up to five years to complete. The L&T offer trial approved guns could thus offer a new route out of the present logjam.

The defence ministry wants the L&T guns to be produced under the industry-funded Make-II programme of its Defence Acquisition Procedure. The L&T-Nexter consortium finished 'L2' or the second lowest bidder in the army's 2011 'Buy and Make Global' contract. Under this, a foreign gun-maker could deliver the gun systems through its Indian partner. French gun-maker Nexter did not have a towed gun system of its own when it bid for the 2011 contract. Their 'Caesar' 155x52 mm howitzer had variants mounted on a truck or tank chassis. Between 2011 and 2013, L&T designed the gun's semi-auto loader, auxiliary power unit, trails, ploughs, fire control system and ballistic computer system. Hence, over 70 per cent of two Caesar prototypes, which successfully passed army trials between 2013 and 2017, was indigenous. The new guns will be assembled at L&T's facility in Hazira, Gujarat.

In August last year, the defence ministry put towed artillery guns on a list of defence equipment it will not import after December 2021. The reasons are not far to seek. After decades of import dependence, howitzer manufacturing has taken an indigenous turn. Apart from the state-owned GCF, howitzer production lines exist in private sector Bharat Forge and Tata Advanced Systems in Bengaluru (both firms are making Advanced Towed Artillery Gun System or ATAGS prototypes).

The L&T offer could add a fourth gun assembly line. In February 2021, L&T supplied the 100th K9 Vajra self-propelled howitzer to the Indian army. It was part of a Rs 5,000 crore contract in 2017 in which the Indian firm partnered with South Korean defence major Hanwha Defense. These guns and the 145 M777 ultra-light howitzers being acquired from BAE Systems in 2015 are the army's first new artillery purchases after it bought 410 Bofors guns in 1986. The army has a requirement of close to 3,000 artillery guns in various forms—towed, tracked, wheeled and mounted on high-mobility vehicles and ultra-light (air-droppable) howitzers.

The L&T proposal comes even as a second indigenous gun system has shown promise, clearing the way for future locally-sourced acquisitions. The DRDO-designed and Tata Advanced Systems-produced gun fired 60 rounds in 60 minutes, demonstrating a sustained rate of fire in summer trials in Pokharan this month. This is the first for an Indian 155/52 mm gun because most guns of the caliber fire 45 rounds in an hour. The gun also cleared cross-country movement in the self-propelled mode through sandy terrain and other mobility trials. Tata and Bharat Forge have fielded prototypes in these army trials. Their successful completion will clear the acquisition of 150 ATAGS for Rs 3,365 crore, which will be divided among the two developers. These however are only initial GSQR trials and the field evaluation and user trials are still some way off. Going by the army's laborious procedures, it could be at least five years before an order for the ATAGS is placed.

<https://www.indiatoday.in/india-today-insight/story/why-l-t-is-offering-the-indian-army-a-homegrown-artillery-gun-1839576-2021-08-11>



Thu, 12 Aug 2021

Two dedicated paediatric COVID-19 care centres coming up in Mysuru

Healthcare infrastructure is being ramped up amidst fears of a third wave and its possible impact on children

By Shankar Bennur

Masuru: Amidst the fears of a possible impact of the third wave of COVID-19 among children, the paediatric healthcare infrastructure in the city is being hurriedly ramped up with two exclusive children COVID-19 hospitals being readied.

Besides Cheluvamba Hospital, a hospital for women and children attached to the Mysuru Medical College and Research Institute (MMCRI), the super speciality hospital on the PKTB campus on KRS Road is being scaled up for tackling any surge in cases.

Two 450 LPM and 500 LPM capacity medical oxygen generators are being installed at the two hospitals under CSR initiatives.

MMCRI Dean and Director C.P. Nanjaraj told *The Hindu* that the work on ramping up the paediatric facilities is expected to be over soon. A COVID-19 wing with 20 paediatric ventilators, 15 high dependency unit (HDU) beds and 100 oxygenated beds are getting ready for the treatment of paediatric cases, including MIS-C (Multi Inflammatory Syndrome), whose cases had gone up in the second wave. The Super Speciality Hospital under MMCRI, which was converted into a COVID-19 hospital in the last wave when cases surged to deal with the shortage of beds, is also being turned into a COVID-19 Children's Hospital. It is equipped with 30 paediatric ventilators, 20 HDUs and 100 oxygenated beds.

The ICU beds at the super speciality hospital were managed under PPP model with a private hospital joining hands with the district administration in dealing with the pandemic situation in the second wave. "If there is a need for more beds and facilities, we could again reopen the trauma care centre and the stone building in K.R. Hospital for handling the cases. The old Jayadeva Block in K.R. Hospital that treated seriously ill COVID-19 patients is equipped with 220 beds, including 60 ventilator beds, 20 HDUs," Dr. Nanjaraj said.

The MMCRI has also submitted a list of healthcare essentials to the State government for the requirement of the hospitals to combat the third wave. "Many corporate companies are coming forward to help the MMCRI's hospitals combat the pandemic. They too had sought the list of requirements which had been sent to them. We have sought paediatric ventilators under the CSR initiative for critical care."

With a threat of children developing post-COVID-19 complications like MIS-C (Multi Inflammatory Syndrome), drugs need to be stocked up and the same is being done. Intravenous immune globulin needs to be inoculated into the patients post-infection.

In addition, the DRDO is installing a 1,000 LPM capacity oxygen generator whose work is also nearing completion. MMCRI, which manages multiple COVID-19 hospitals in Mysuru, was identified by the Union Healthy Ministry for the oxygen plant. MMCRI has 1,005 bed strength. Mysuru is among six cities identified by the Centre in the State for installing Pressure Swing Absorption (PSA) medical oxygen generation plants. The DRDO is executing the project based on the recommendations of the sites by the Union Ministry.

<https://www.thehindu.com/news/national/karnataka/two-dedicated-paediatric-covid-19-care-centres-coming-up-in-mysuru/article35857913.ece>

DRDO on Twitter



Balasore, Odisha: India today successfully tested the DRDO-developed Indigenous Technology Cruise Missile off the coast of Odisha. The missile flew for around 150 km with an indigenous cruise engine. More tests would be conducted in near future: Sources

11:38 AM · Aug 11, 2021





Press Information Bureau
Government of India

Ministry of Defence

Wed, 11 Aug 2021 4:25PM

Indian Army team to attempt simultaneous scaling of five virgin peaks in Tehram Shehr Glacier

An expedition to simultaneously scale five virgin peaks located in the Teram Shehr Glacier, near Siachen Glacier was flagged off by Major General Akash Kaushik, Chief of Staff, Fire and Fury Corps from Siachen Base Camp on 09 Aug 2021. The Indian Army mountaineers from the Ladakh Scouts Regiment will attempt scaling APSARASAS I, APSARASAS II, APSARASAS III, PT-6940 and PT-7140 simultaneously. The ceremony at Base Camp was attended by troops deployed in Siachen Base Camp and local Indian Army Veterans.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1744817>



पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 11 Aug 2021 4:25PM

भारतीय सेना की टीम तेहराम शहर ग्लेशियर की पांच अछूती चोटियों की एक साथ चढ़ने का प्रयास करेगी

9 अगस्त 2021 को सियाचिन बेस कैंप से मेजर जनरल आकाश कौशिक, चीफ ऑफ स्टाफ, फायर एंड फ्यूरी कॉर्प्स द्वारा सियाचिन ग्लेशियर के पास तेहराम शहर ग्लेशियर में स्थित पांच अछूती चोटियों पर एकसाथ चढ़ने के लिए एक अभियान को हरी झंडी दिखाई गई। लद्दाख स्काउट्स रेजिमेंट अप्सरासस I, अप्सरासस II, अप्सरासस III, पीटी-6940 और पीटी-7140 एक साथ चढ़ने का प्रयास करेगी। बेस कैंप में आयोजित समारोह में सियाचिन बेस कैंप में तैनात सैनिकों के साथ-साथ भारतीय सेना में सेवारत अनुभवी स्थानीय लोगों ने भाग लिया।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1744950>

Lockheed proposes to set up MRO facility for F-21s in India

By Elizabeth Roche

- *The offer is part of the company's bid to win the order for 114 fighter aircraft for the air force*
- *Lockheed has already tied up with Tata group to locally manufacture the aircraft*

New Delhi: US aerospace company Lockheed Martin Corp. is open to setting up a maintenance, repair, and overhaul (MRO) facility in India for F-21 to further sweeten its bid for the 114 fighter aircraft for the Indian Air Force (IAF), its representatives said on Wednesday.

Michael Kelley, vice president, India, Lockheed Martin aeronautics strategy and business development, and Brett Medlin, the F-21 India campaign lead, are in the country to hold talks with government and IAF officials on the multibillion-dollar deal. This comes against the backdrop of India planning to procure 114 medium multi-role combat aircraft (MMRCA) for the air force.



Lockheed Martin F-21. India is planning to procure 114 medium multi-role combat aircraft (MMRCA) for the IAF.

Lockheed is competing with Boeing's F-18, Swedish SAAB's Gripen, Dassault Aviation's Rafale, EADS' Eurofighter Typhoon, and MiG-35 of Russia's United Aircraft Corp.

Lockheed has already tied up with Tata group to locally manufacture the aircraft. It had previously promised to shift its production line to India if it secures the MMRCA deal and not sell the F-21 to any other country. "Once you build an airplane and put it together in the country you also know by extension how to take it apart," Kelley said.

"So you have the fundamental competencies of an MRO once you put the final assembly and checkout capability. If you add to that the ecosystem of the different avionics and subsystems, there will be Indian companies in the supply chain feeding the checkout facilities. So yes, there will definitely be the possibility for MRO. It has got to be competitive because obviously IAF would want to do the MRO here, but bringing other aircraft to do MRO, Indian industry has got to be competitive in bringing that work here," Kelley said.

Once an MRO facility is built in India the aircraft need not be taken to the US or other countries where Lockheed has an established MRO unit, according to analysts. "It is, however, unclear if this means that engine overhaul will be done at the Indian facility, considering that Lockheed does not manufacture engines. Another point is that if the F-21 is only offered to India, as Lockheed has said, I am not sure of the economics of the MRO proposal. For instance, how aircraft of other countries can be serviced at the Indian unit," said a person aware of the matter, seeking anonymity.

Kelley said he was hopeful that India could come up with a decision on procuring the MMRCAs by the first quarter of 2022. When asked how the F-21 would fit in with the requirements of the IAF, which has already procured 36 Rafales from France and has allocated ₹48,000 crore for state-run Hindustan Aeronautics Ltd to manufacture 83 Tejas, a light combat aircraft, Medlin said, from an operational perspective, the F-21 complemented both the Tejas and the Rafale.

"If you assess what is the fighter squadron requirement of Indian Air Force, they are operating well below that. If you look at the pace of deliveries of the Tejas versus their requirement, the force structure gap that the IAF has, what the F-21 will provide is help fill that gap of capacity as well as capability for the IAF," Medlin said.

The IAF has a squadron strength of 30 against the sanctioned strength of 42, mostly on account of the phase-out of its aging Russian MiG fighter jets.

<https://www.livemint.com/industry/manufacturing/lockheed-martin-says-open-to-setting-up-mro-facility-for-f-21-in-india-11628693799311.html>



Thu, 12 Aug 2021

Kenya to Guam, India outlines sphere of interest in the Indo-Pacific with string of naval exercise

By Atul Aneja

New Delhi: Keen on demonstrating its sphere of interest mainly in the Indian Ocean, but also with a spur in the Pacific, the Indian navy has carefully deployed its warships for exercises with like-minded countries in the Indo-Pacific region.

The Indian navy's state-of-the-art stealth frigate, Talwar has just finished participation in Cutlass Express 2021 of the East African coastline of the Indian Ocean. The warship exercised in massive multinational manoeuvres steered by the Africa Command of the United States. The participants included 12 East African countries, the UK, European Union Naval Force Somalia (EUNAVFOR), Critical Maritime Routes Indian Ocean (CRIMARIO), EUCAP Somalia, and Interpol, apart from the International Maritime Organisation (IMO) and the United Nations Office on Drugs and Crime (UNODC),

The exercise was a combined effort to enhance familiarity with Indian Ocean waters in a critical zone extending from the Horn of Africa to the Gulf of Aden -- a prime route for commercial shipping heading to Europe, Africa and Asia. International concerns have heightened as this area has been badly hit by piracy and international terrorism, triggering the need for international collaboration.

This year, the exercise was held in close proximity to Djibouti, Kenya, Madagascar, and the Seychelles -- areas of prime interest to India.

The manoeuvres take place as a follow up to the visit to Kenya in June by External Affairs Minister, S. Jaishankar. India, during that visit had discussed the security situation in the Indo-Pacific region, including Horn of Africa, especially the rise of international terrorism in the littoral states.

"Kenya is in fact India's maritime neighbour and is an important stakeholder in the geopolitics of the Western Indian Ocean. Moreover, just like India, it is a non-permanent member of the United Nations Security Council for the 2021-2022 term. Therefore, EAM's visit to Kenya is an opportunity for India to engage on a range of bilateral, regional as well as multilateral issues," said Sankalp Gurjar, a research fellow at the Indian Council of World Affairs (ICWA) in an article published in India Narrative ahead of Jaishankar's visit.

Having identified Kenya as a partner in the Indian Ocean, New Delhi reinforced its special relationship with Nairobi by deploying the Talwar in a separate exercise with Kenya following the Cutlass Express manoeuvres.

The Indian warship exercised with Kenya Navy Ship Shujaa off the port of Mombasa.

"Post conclusion of exercise Cutlass Express 2021 INS Talwar undertook a Maritime Partnership Ex with Kenya Navy Ship Shujaa," an Indian navy spokesperson in Mumbai tweeted.

India's Ministry of Defence said that the Talwar's visit is further going to strengthen "India's commitment to the countries along the East Coast of Africa and the Western IOR".

While the Talwar was engaged in manoeuvres in the Western Indian Ocean, two other naval ships were steaming into Brunei, marking India's stakes across the strait of Malacca in part of the West Pacific as well.

During their stay in Brunei, the Indian ships participated in an exercise with ships of the Royal Brunei Navy.

"Indian Naval Ships Shivalik and Kadmatt arrived at Muara, Brunei as part of their deployment to South East Asia on 09 Aug 21," India's defence ministry said in a statement.

Both the ships belong to the Indian Navy's Eastern Fleet. Based in Visakhapatnam under the Eastern Naval Command, the fleet has acquired high importance in tune with India's ASEAN-centric Act East policy.

From Brunei, the ships will head to Guam, for the much larger Malabar-21 exercises with the US, Japan and Australia.

The Malabar-21 off Guam, which is the headquarters to the Indo-Pacific command of the US, has a message for China, which is flexing its muscles in the South China Sea, riding on disputes with several countries belonging to the 10-nation ASEAN. But Indian officials insist that India's visible presence from the East African coastline to Guam is an elaboration of the inclusive doctrine summed up by the acronym SAGAR -- Security and Growth for All in the Region (SAGAR).

<https://www.daijiworld.com/news/newsDisplay?newsID=862085>

Two-stream network proposed for thermal and visible images fusion

By Zhang Nanna

Student Liu Luolin from the Xi'an Institute of Optics and Precision Mechanics (XIOPM) of the Chinese Academy of Sciences (CAS) has proposed a two-stream end-to-end model named TSFNet for thermal and visible image fusion. The results were published in *Neurocomputing*.

The TSFNet, using two branches for feature learning, is quite different from previous two-stream methods, and it can fully capture the information from the both sources.

Thermal images are insensitive to brightness and can distinguish objects and background by differentiating thermal radiation. Visible images can understand human vision more intuitively and have a higher resolution. Therefore, it can be inferred that the fusion of the two may yield a new image with clear objects and high resolution for all-weather and all-day/night monitoring.

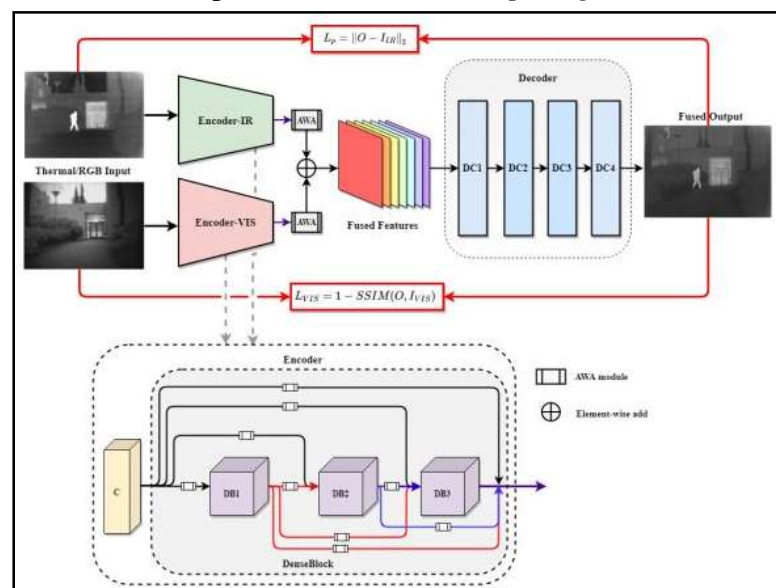


Illustration of the proposed network structure. Credit: XIOPM

In this study, in order to enable the model to retain the detailed information of the source image autonomously during the fusion, LIU and his team members adopted an adaptive weight allocation strategy to guide feature selection. The whole framework was disassembled into three modules, feature extraction, fusion, and reconstruction.

According to the experiments results, TSFNet outperforms state-of-the-art methods under different evaluation metrics. In the future, it will provide a guides for designing new network of image fusion.

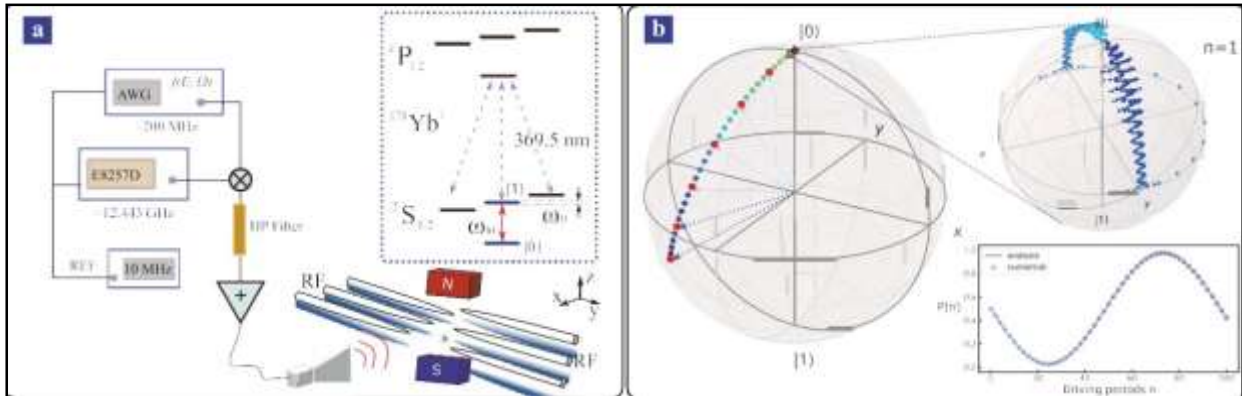
More information: Luolin Liu et al, Two-stream network for infrared and visible images fusion, *Neurocomputing* (2021). DOI: [10.1016/j.neucom.2021.05.034](https://doi.org/10.1016/j.neucom.2021.05.034)

<https://phys.org/news/2021-08-two-stream-network-thermal-visible-images.html>

Locations of Riemann zeros accurately measured

By Zhang Nannan

The Riemann hypothesis raised in 1859 is one of the six unsolved Millennium problems, and its proof greatly facilitate the understanding of the distribution laws of prime numbers. For a long time, there has been a growing academic focus on the non-trivial zeros of the Riemann zeta function. This enables physicists to reproduce prime numbers and inspires them to discover the essence of Riemann hypothesis with a feasible quantum approach.



Experimental procedure to measure Floquet dynamics in a trapped-ion system. Credit: HE Ran et al.

To achieve the high-precision measurement of the locations of the Riemann zeros, Prof. GUO Guangcan's research team from the University of Science and Technology of China (USTC) of the Chinese Academy of Sciences adopted a trapped ion system.

The team, together with Spanish theoretical physicists Prof. Charles Creffield and Prof. German Sierra, measured experimentally the first 80 Riemann zeros by using a trapped-ion qubit in a Paul trap, which is periodically driven with microwave fields. The results were published in NPJ Quantum Information on July 14.

Among all possible solutions, the Hilbert–Pólya conjecture combines the Riemann zeta function with quantum theory. The conjecture assumes the existence of a quantum system in which the eigenvalues of the Hamiltonian quantities are consistent with the Riemann zeros. Researchers are attracted by this conjecture and discover many potential static Hamiltonians. But these static Hamiltonians are difficult to measure experimentally.

In this work, the researchers chose not to prove the Riemann hypothesis, but to provide a physical embodiment of mathematical objects by using advanced quantum technology. In the trapped ion system, the ion was subjected to a time-periodic driving field, and its behavior was consequently described by Floquet theory. When an effect termed "coherent destruction of tunneling" appeared, they could observe the freezing of the qubit's dynamics as the driving parameters were varied.

Thanks to high-fidelity quantum operations and a long coherence time, the researchers achieved 30 driving periods and measured the first 80 Riemann zeros, an improvement of nearly two orders of magnitude over previous works.

This work provides an important experimental basis for researchers to study the Hilbert–Pólya conjecture and to gain a deeper understanding of the connection between the Riemann hypothesis and quantum systems.

More information: Ran He et al, Riemann zeros from Floquet engineering a trapped-ion qubit, *npj Quantum Information* (2021). DOI: [10.1038/s41534-021-00446-7](https://doi.org/10.1038/s41534-021-00446-7)
<https://phys.org/news/2021-08-riemann-zeros-accurately.html>

Tracking pileups on battery charging route to drive performance

Because of their high storage capacity, metal oxides are a promising class of potential conversion-type electrode materials for next-generation lithium-ion batteries. Conversion-type electrode materials undergo conversion reactions; when they react with lithium ions, they get converted into entirely new products. Today's commercial batteries are based on a completely different mechanism called intercalation.

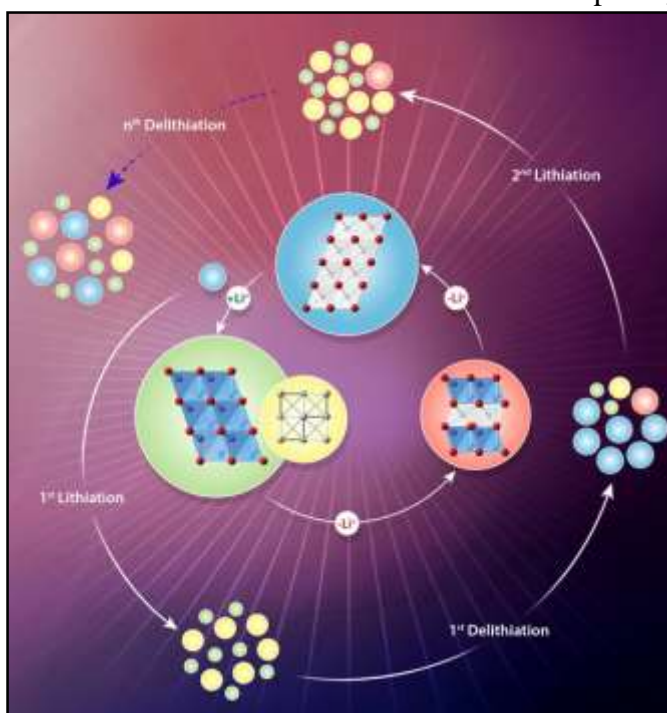
"In intercalation, lithium is reversibly inserted into and extracted from electrode materials without damaging their crystal structure," explained Sooyeon Hwang, a staff scientist in the Electron Microscopy Group of the Center for Functional Nanomaterials (CFN) at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory. "While these materials are highly stable, only a limited number of lithium ions can participate. As a result, their capacity is relatively lower than conversion-type materials."

"Many more lithium ions can participate in conversion reactions with metal-oxide electrode materials, enabling a higher battery capacity," added Ji Hoon Lee, an expert in electrochemistry and X-ray absorption spectroscopy who formerly conducted research in the Chemistry Division at Brookhaven Lab during his time as a postdoc at Columbia University and is now an assistant professor at Kyungpook National University in Korea. "However, the crystal structure of these materials completely changes from its original state, causing instabilities like a fade in capacity over multiple charge-discharge cycles."

Hwang and colleagues from the CFN and collaborating institutions have been studying conversion-type electrode materials for several years. Previously, they studied iron-oxide electrodes at high current and found that "kinetic barriers" during long-term cycling caused capacity fade. At high current, the battery charges and discharges relatively fast, as is the case for real batteries.

"If this cycling occurs too fast, a lithium gradient can arise across the electrode material," explained Hwang. "For example, one location may have more lithium inserted or extracted than another location."

Now, the team—co-led by Hwang and Lee and including scientists from the CFN, Chemistry Division, and National Synchrotron Light Source II (NSLS-II) at Brookhaven Lab—removed these kinetic barriers by operating the batteries at more mild conditions of low current and constant voltage after charge and discharge. Though a gap exists between these experimental conditions and



An Illustration of the structural changes occurring at a metal-oxide electrode during battery cycling. The inner circle shows structural changes during lithium extraction and lithium insertion. The outer circle shows how the material degrades by incomplete lithium-extraction reactions over several charge-discharge cycles. This image was featured on the cover of *Chemistry of Materials* 33, 10 (2021). Credit: Brookhaven National Laboratory

real-world conditions, an understanding of how electrode materials behave on a fundamental level can inform new designs for better-performing batteries.

In this case, they tested one of two nontoxic and widely available metal oxides—nickel oxide or iron oxide—in lithium-ion half-cell batteries.

"Our goal in this initial study was to perform simple electrochemical tests to understand the fundamental mechanism of lithium insertion and extraction," said Hwang. "Future studies will require full-cell batteries involving both electrodes.

The electrochemical tests revealed significant differences in battery voltage profiles and capacity over 10 cycles. To characterize changes in the cycled electrode materials, the team performed experiments at three NSLS-II beamlines—Quick X-ray Absorption and Scattering (QAS), Pair Distribution Function (PDF), and X-ray Powder Diffraction (XPD)—and at the CFN. The QAS beamline provided chemical information, including oxidation states, on each metal at different states of charge and discharge. The PDF and XPD beamlines are well-suited for determining crystal structure, with PDF being particularly sensitive to how atomic bonds are locally configured.

From these X-ray synchrotron studies, the team observed that the reduction and oxidation (redox) reactions of nickel in nickel oxide and iron in iron oxide were not very reversible. However, they didn't know the reason for the incomplete reconversion reactions and capacity fade. Using transmission electron microscopes (TEMs) in the CFN Electron Microscopy Facility, they obtained high-resolution images. These images showed intermediate phases of lithium metal oxides appearing after charging. By contrast, during discharge, the metal oxides directly convert into lithium oxide and pure metal.

"The presence of the intermediate phase means lithium is not fully extracted during charging," explained Hwang. "This phase sticks around and accumulates over time. So, the amount of available lithium ions for subsequent cycles decreases, causing the capacity to keep dropping cycle after cycle. Previously, we showed that kinetic barriers were responsible for capacity fade, but here we demonstrate that intrinsic restrictions can also cause a drop in capacity."

Given these results, the team believes charging and discharging occur through different ("asymmetric") reaction pathways. Energy is required to extract lithium ions during charging, so this reaction follows a pathway based on energy transfer, or thermodynamics. On the other hand, the insertion of lithium ions during discharging happens spontaneously, and this fast lithium diffusion follows an alternative pathway driven by kinetics.

Next, the team plans to characterize other conversion-type electrode materials such as metal sulfides and perform studies during battery cycling; such in-situ characterization is one of the areas CFN specializes in.

"Brookhaven is very conducive to forming collaborations and friendships with early-career researchers," said Hwang. "The discussions with them were very helpful in this work, which represents the first time I led a project independently."

More information: Shuang Li et al, Asymmetric Reaction Pathways of Conversion-Type Electrodes for Lithium-Ion Batteries, *Chemistry of Materials* (2021). DOI: [10.1021/acs.chemmater.0c04466](https://doi.org/10.1021/acs.chemmater.0c04466)

Jing Li et al, Phase evolution of conversion-type electrode for lithium ion batteries, *Nature Communications* (2019). DOI: [10.1038/s41467-019-09931-2](https://doi.org/10.1038/s41467-019-09931-2)

Journal information: [Chemistry of Materials](https://doi.org/10.1021/acs.chemmater.0c04466), [Nature Communications](https://doi.org/10.1038/s41467-019-09931-2)
<https://phys.org/news/2021-08-tracking-pileups-battery-route.html>

Understanding lung damage in patients with Covid-19

Summary:

A severe course of COVID-19 disease is not caused by the direct destruction of the lung due to the multiplication of the virus. New research shows that inflammatory processes and the endothelium of the lung are involved.

A severe course of COVID-19 disease is not caused by the direct destruction of the lung due to the multiplication of the virus. As researchers from Berlin report in the journal *Nature Communications*, inflammatory processes and the endothelium of the lung are involved.

Researchers from around the globe have spent the past 18 months trying to understand COVID-19, the disease caused by the SARS-CoV-2 coronavirus. Capable of causing acute lung failure, the disease is known to wreak havoc on both the lungs and other organs and organ systems. Unfortunately, drug-based treatment options remain limited. One of the difficulties has been the fact that COVID-19 is caused by an errant and sometimes exaggerated immune response. In order to identify therapeutic targets, researchers need to gain a detailed understanding of the underlying mechanisms, both in terms of how they work and where in the body they occur. Patient-centered approaches are rather limited in their scope. This particularly applies to the study of disease mechanisms during the early phase of infection. Biomaterials, which are needed for this type of research, can usually be harvested only after a patient has been admitted to hospital. Furthermore, it is virtually impossible to obtain lung tissue samples from patients with mild or moderate disease and pneumonia, as the harvesting procedure would place these patients at too great a risk. What is left, then, is the analysis of tissues harvested from COVID-19 patients after their death.

Under the leadership of Prof. Dr. Martin Witzenth, Deputy Head of Charité's Department of Infectious Diseases and Respiratory Medicine, the researchers used available patient samples to obtain valuable information on both disease mechanisms and disease progression. The researchers searched for a suitable model which might enable them to also study compartments of the lungs not easily accessible in patients but necessary in order to study the early phase of the disease. Hamster models have proven extremely useful, both as part of international research efforts into COVID-19 and research pertaining to SARS-CoV-1. "We wanted to know whether we could use these models to develop new treatment options and tried to replicate findings from patient samples. We were remarkably successful in this regard," says Prof. Witzenth, the study's co-last author. "We were primarily interested in the lung's endothelial cells, which line the pulmonary blood vessels and form a barrier there. In severe COVID-19 cases, this barrier becomes dysfunctional, a development which eventually results in lung failure."

Syrian hamster is most important animal model for COVID

Working alongside researchers from the MDC's Berlin Institute for Medical Systems Biology (BIMSB), virologists and veterinary surgeons from Freie Universität Berlin, as well as data experts from the Berlin Institute of Health (BIH), the researchers were able to describe the detailed characteristics of SARS-CoV-2 infection in an animal model. They subsequently corroborated their findings using data sets pertaining to patient samples. The purpose of this analysis is to make what is currently the most important, non-transgenic animal model for the study of COVID-19 available for research aimed at developing future treatments. Hamsters contract the same virus variants as humans. They also develop similar disease symptoms, and severe disease will result in damage to

the lungs. Symptoms and progression of COVID-19, however, vary between different species of hamster. While symptoms usually remain moderate in Syrian hamsters, Roborovski hamsters will develop severe disease.

The reasons for this and the processes which take place in the cells of the lungs were demonstrated as part of experiments conducted at the BIMS. These included single-cell analyses during which individual cells obtained from a particular sample were loaded onto a chip, where they were first barcoded and then encapsulated into minute droplets of aqueous fluid. Once prepared, single cells can undergo RNA sequencing, a process used to establish the sequence of genetic building blocks which a cell has just read. Thanks to barcoding, this RNA was later identifiable as originating from a particular cell, enabling the researchers to determine cellular function at the single-cell level with a high degree of accuracy. "We were able to observe how certain cells involved in lung immunity -- namely monocytes and monocyte-derived macrophages -- ingest the virus and subsequently show a very pronounced response. They send out biological messengers which then elicit a very strong inflammatory response. In our model, this is quickly brought under control by T cells, another type of immune cell which is dispatched for this very purpose. In severe COVID-19, however, this does not happen," explains the study's co-first author Dr. Geraldine Nouailles, a researcher at Charité's Department of Infectious Diseases and Respiratory Medicine. She adds: "A fast and efficient T cell response is crucial to successful recovery from COVID-19."

While COVID-19 prompts the immune system to go into overdrive, SARS-CoV-2 initially displays a low rate of replication in the lungs and respiratory tract. "The destruction of lung tissue seen in severe COVID-19 is not a direct result of viral propagation inside cells, but of the strong inflammatory response," explains fellow co-first author Dr. Emanuel Wyler, a researcher at the MDC. He adds: "This also appears to apply to the cells of the vasculature, in particular the lung's endothelial cells. They show a very strong response to the virus but are neither infected by it nor destroyed in the process." If the disease is severe, blood vessels can become obstructed and vessel walls unstable, resulting in acute lung failure. It does not appear likely, however, that this blood vessel damage also plays a part in moderate COVID-19. "That COVID-19 activates the endothelium -- a type of protective barrier lining blood vessels which, amongst other things, also controls a range of processes in the lung's micro blood vessels -- did not come as a surprise. What did come as a surprise, however, was that these cells are also the active driver of inflammation," says Prof. Witzenth. "Given their key role in disease progression, these cells could be targeted using one of two therapeutic strategies. One is to use substances which are capable of sealing the endothelial barrier. The other is to use substances which calm the endothelium. One of these is already the target of research conducted in our Collaborative Research Center SFB-TR84, where we were able to show that it is effective in pneumonia and ventilated patients." Other anti-inflammatory drugs currently being tested as treatments for COVID-19 target the immune response itself. They are also effective against monocytes and macrophages and temper their activity.

Now that their model has been validated, the researchers hope to use it to help develop safe and effective treatments for patients with COVID-19. The aim is to reduce the number of patients who develop severe lung injury. The multidisciplinary team of researchers are currently analyzing the responses of different cell types observed in Roborovski dwarf hamsters. The researchers want to establish why the infection produces severe disease in these animals, and why it is not self-limiting as is the case in Syrian hamsters. "We hope this will guide us to a possible explanation for why some people develop severe COVID-19 but others do not," says Dr. Nouailles. As a first step, the researchers will need to decipher the dwarf hamster's genome. The fact that hamsters have traditionally been regarded as somewhat exotic by the animal research community explains the existence of numerous knowledge gaps. "Information from our current study has enabled us to close some of these gaps. This represents major progress, including in terms of a more conscious and targeted approach to the use of animals in medical research," explains co-last author Dr. Jakob Trimpert, a virologist and veterinary surgeon from Freie Universität Berlin. In addition to developing the COVID-19 hamster models, Dr. Trimpert and his team also worked with Freie

Universität Berlin's Department of Veterinary Pathology. Performing the necessary histopathological analyses (microscopic examination of infected lung tissue) under the leadership of Prof. Dr. Achim Gruber, the team's work represents a crucial contribution to the study's published findings.

About this study

Funding for this study was provided by: the German Research Foundation (DFG) -- via the SFB-TR84 Collaborative Research Center; the Federal Ministry of Education and Research (BMBF) -- via the CAPSyS-COVID, PROVID, and NAPKON (National Pandemic Cohort Network of the Network University Medicine/ Nationales Forschungsnetzwerk der Universitätsmedizin zu Covid-19, NUM) projects; and the Berlin Institute of Health (BIH) at Charité -- via the CM-COVID project.

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