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Ministry of Defence

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DRDO signs MOU with MAHA-Metro for implementation of advanced biodigester Mk-II technology in metro rail network

Defence Research and Development Organisation (DRDO), Government of India's premier research agency and Maharashtra Metro Rail Corporation (MAHA –METRO), a joint venture company of the GoI and Government of Maharashtra are working together to conserve water and protect the environment by installing DRDO's eco-friendly biodigester units (a non-sewered sanitation technology) in its facilities. A Memorandum of Understanding (MOU) was inked on January 5, 2021 between MAHA-METRO and DRDO through which DRDO will render technical support for the implementation of its advanced biodigester Mk-II technology for the treatment of human waste (night soil) in the metro rail network.

Dr AK Singh, Distinguished Scientist & Director General- Life Sciences, DRDO Headquarters, New Delhi, and Dr Brijesh Dixit, Managing Director, Maharashtra Metro Rail Corporation Limited (MMRCL) exchanged the MoU on behalf of their organisations. The MoU was signed by Dr DK Dubey, Director DRDE, Gwalior and Sh. Atul Gadgil, Director, Maha-Metro Rail Corporation Limited, Pune.

DRDO's biodigester is an indigenous, green and cost-effective technology, with a rare distinction of having one of the largest numbers of DRDO-licensees (ToT holders).

Indian Railways has already installed about 2.40 lakh biodigesters in its fleet of passenger coaches. Now for MAHA-METRO, the technology has been revamped and further improved in a bid to save the water and space.

A customized version of this MK-II Biodigester, suitable for treating human waste generated from houseboats in Dal Lake was successfully demonstrated by the DRDO to J&K Administration. Lakes and Waterways Development Authority (LWDA) of the J&K Administration has initiated the process to procure 100 units of Mk-II Biodigesters for civil habitats around the Dal Lake so as to minimize water pollution. The implementation of Biodigester MK-II in Srinagar is being monitored by a committee of experts constituted by the High Court of J&K under the Chairmanship of Dr E Sreedharan, former MD of



DMRC. When fully implemented, this green technology will significantly reduce the Dal lake pollution.

This technology is upgraded through improvements in the bio-degradation efficiency, design modification and addition of secondary treatment module. The new reactor is designed to provide more path length with increased biological reaction time, thereby enhancing the bio-degradation efficiency of the system. This technology was primarily developed for the armed forces in high altitude Himalayan regions, including Leh-Ladakh and Siachen glacier.

Dr G Satheesh Reddy, Secretary DDR&D & Chairman DRDO conveyed his wishes to both the teams for a successful implementation and said that technologies require upgradation with the availability of data and feedback.

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రక్షణ మంత్రిత్వ శాఖ

Tue, 05 Jan 2021 5:43PM

మెట్రో రైల్ నెట్వర్క్లో ఆధునిక బయోడైజెస్టర్ ఎంకె-11 సాంకేతికత

ను అమలు చేసేందుకు మహా_మెట్రోతో ఎం ఒయుపై సంతకాలు

చేసిన డిఆర్డిఓ

భారత ప్రభుత్వ ప్రధాన పరిశోధన సంస్థ డిఫెన్స్ రీసెర్చ్ అండ్ డెవలప్‌మెంట్ ఆర్గనైజేషన్ (డిఆర్డిఓ), మహారాష్ట్ర ప్రభుత్వం, భారత ప్రభుత్వ సంయుక్త వ్యాపార సంస్థ అయిన మహారాష్ట్ర మెట్రో రైల్ కార్పొరేషన్ (మహా -మెట్రో) తమ తమ కేంద్రాలలో నీటి పరిరక్షణ, పర్యావరణ సంరక్షణకు డిఆర్డిఓ పర్యావరణ అనుకూల బయోడైజెస్టర్ యూనిట్లను (మురికినీటి నాలాలు అవసరం లేని పారిశుద్ధ్యం సాంకేతికత) నెలకొల్పేందుకు కలిసి పని చేస్తున్నాయి. ఈ మేరకు మహా -మెట్రో, డిఆర్ డిఓ సంస్థల మధ్యన జనవరి 5, 2021న అవగాహన పత్రం పై సంతకం చేశాయి. దీని ప్రకారం డిఆర్డిఓ మెట్రో రైల్ నెట్వర్క్లో మానవ వ్యర్థాలను శుద్ధి చేసే తన ఆధునిక బయోడైజెస్టర్ ఎంకె- 11 సాంకేతికతను అమలు చేసేందుకు డిఆర్డిఓ సాంకేతిక తోడ్పాటును అందిస్తుంది.

ప్రముఖ శాస్త్రవేత్త, డిఆర్డిఓ కేంద్ర కార్యాలయం, న్యూఢిల్లీ -లైఫ్ సైన్సెస్ డైరెక్టర్ జనరల్ డాక్టర్ ఎ.కె. సింగ్, మహారాష్ట్ర మెట్రో రైల్ కార్పొరేషన్ లిమిటెడ్ (ఎంఎంఆర్‌సిఎల్) మేనేజింగ్ డైరెక్టర్ డాక్టర్ బ్రిజ్‌షే దీక్షిత్ తమ సంస్థల తరపున అవగాహనా పత్రాలను ఇచ్చిపుచ్చుకున్నారు. ఈ అవగాహనా పత్రంపై డిఆర్డిఓ, గ్వాలియర్ డైరెక్టర్ డాక్టర్ డి.కె. దూబే, మహా-మెట్రో రైల్ కార్పొరేషన్ లిమిటెడ్, పూణె డైరెక్టర్ ఎస్.హెచ్. గాడ్గిల్ సంతకాలు చేశారు. డిఆర్డిఓ రూపొందించిన బయోడైజెస్టర్, దేశీయంగా, పర్యావరణ అనుకూల, తక్కువ ఖర్చుతో కూడిన సాంకేతికతనే కాక అత్యధిక సంఖ్యలో డిఆర్డిఓ లైసెన్సీలు గల ప్రత్యేకత దానికి ఉంది.

తన ప్యాసింజర్ కోచ్‌లలో భారతీయ రైల్వేలు ఇప్పటికే 2.4-లక్షల బయోడైజెస్టర్లను ఏర్పాటు చేసింది. ప్రస్తుతం మహా-మెట్రో కోసం, ఆ సాంకేతికతను నీటిని, స్థలాన్ని ఆదా చేసేందుకు మెరుగుపరచారు.

కస్టమైజ్ చేసిన ఎంకె-11 బయోడైజెస్టర్ దాల్ సరస్సులోని హాజ్ బోట్లలో ఉత్పత్తి అయిన మానవ వ్యర్థాలను శుద్ధం చేయడంలో ఎంత విజయవంతంగా పని చేయగలదో డిఆర్డిఓ సంస్థ జమ్ము-కాశ్మీర్ పరిపాలనా విభాగానికి ప్రత్యక్షంగా రుజువు చేశారు. జెడికెకు చెందిన సరస్సులు, జలమార్గ అభివృద్ధి అధారిటీ నీటి కాలుష్యాన్ని తగ్గించేందుకు దాల్ సరస్సు చుట్టూగల పౌర ఆవాసాలలో ఏర్పాటు చేసేందుకు 100 యూనిట్ల ఎంకె-11 బయోడైజెస్టర్లను సేకరించే ప్రక్రియను ప్రారంభించింది. శ్రీనగర్లో బయోడైజెస్టర్ ఎంకె-11 అమలును జెడికె హాకోర్లు డిఎంఆర్సి మాజీ ఎండి డాక్టర్ ఇ. శ్రీధర్స్ నేతృత్వంలో నియమించిన నిపుణుల కమిటీ పర్యవేక్షిస్తోంది. ఒకవేళ ఇది పూర్తిగా అమలు చేస్తే , పర్యావరణ అనుకూల సాంకేతికత దాల్ లోక్లోని కాలుష్యాన్ని చెప్పుకోదగినంతగా తగ్గిస్తుంది.

బయో-డిగ్రేడేషన్ సామర్థ్యం, నమూనాలో మార్పులు, ద్వితీయ శుద్ధి మాడ్యూల్ను అదనంగా చేర్చడం వంటి మెరుగుల తో ఈ సాంకేతికతను అభివృద్ధి పరిచారు. జీవ ప్రతిచర్య కాలాన్ని పెంచడం ద్వారా, వ్యవస్థ బయో డిగ్రేడేషన్ సామర్థ్యాన్ని పెంచేందుకు మరింత మార్గాన్ని అందించే విధంగా కొత్త రియాక్టర్ను రూపొందించారు. ఈ సాంకేతికతను లోహ్-లడాక్, సియూచిన్ గ్లెషియర్ సహా హిమాలయ ప్రాంతాలలో ఎత్తైన ప్రదేశాలలో మోహరించిన సైనిక దళాల కోసం ప్రధానంగా అభివృద్ధి చేశారు.

డిడిఆర్&డి, డిఆర్డిఓ చైర్మన్ అయిన డాక్టర్ జి సతీష్ రెడ్డి విజయవంతమైన అమలుకు ఇరు బృందాలకు శుభాకాంక్షలు చెప్తూ, డాటా లభ్యత, పీడిబ్యాక్లతో సాంకేతికతలను మెరుగుపరచడం అవసరం అవుతుందన్నారు.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1686393>

नईदुनिया

Wed, 06 Jan 2021

महाराष्ट्र की मेट्रो रेल में लगेगा डीआरडीई का बायोडाइजेस्टर फार्मूला

Gwalior DRDE News: ग्वालियर, नईदुनिया प्रतिनिधि। महाराष्ट्र की मेट्रो ट्रेनों में भी अब रक्षा अनुसंधान एवं विकास स्थापना (डीआरडीई) का बायोडाइजेस्टर फार्मूला लगेगा। इसके लिए रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) और महाराष्ट्र रेल कार्पोरेशन के बीच मंगलवार को पुणे में समझौता ज्ञापन पर हस्ताक्षर हुए। डीआरडीओ की ग्वालियर स्थित प्रयोगशाला डीआरडीई द्वारा विकसित इको-फ्रेंडली बायोडाइजेस्टर प्रौद्योगिकी मार्क-2 का इस्तेमाल अब महाराष्ट्र मेट्रो रेल कॉर्पोरेशन की इकाइयों में होगा। डीआरडीओ अब महाराष्ट्र मेट्रो रेल नेटवर्क में मानव मल के निस्तारण के लिए बायोडाइजेस्टर प्रौद्योगिकी मार्क-2 की स्थापना के लिए तकनीकी सहायता प्रदान करेगा।

ज्ञात रहे कि मूल रूप से इस प्रौद्योगिकी का विकास हिमालय के सियाचिन और लेह-लद्दाख जैसे उच्च पर्वतीय बर्फीले इलाकों के लिए किया गया था, जहां मानव मल का निस्तारण एक बड़ी समस्या रही है। इस एमओयू के तहत डीआरडीओ द्वारा विकसित बायोडाइजेस्टर महाराष्ट्र मेट्रो के समस्त स्टेशनों में लगाए जाएंगे। डीआरडीओ के विशिष्ट वैज्ञानिक एवं महानिदेशक जैवविज्ञान डा एके सिंह एवं महाराष्ट्र मेट्रो रेल निगम लिमिटेड के प्रबंध निदेशक डा ब्रजेश दीक्षित ने अपने संगठनों की ओर से एमओयू का आदान प्रदान किया। इस दौरान डा एके सिंह ने कहा कि भारत को और अधिक स्वच्छ बनाने और पर्यावरण के संरक्षण के हमारे मिशन को इससे बल मिलेगा। महाराष्ट्र और देश के अन्य हिस्सों में पानी की कमी को दृष्टिगत करते हुए यह प्रौद्योगिकी शौचालयों में न्यूनतम पानी के इस्तेमाल को सुनिश्चित करेगी। इसका इस्तेमाल

डलझील, श्रीनगर में तैरते हाउसबोटों में भी किया गया है। झील एवं जलमार्ग विकास प्राधिकरण (एलडब्ल्यूडीए) ने इन मार्क-2 बायोडाइजेस्टर की कार्यप्रणाली से संतुष्ट होकर डलझील के आसपास के इलाकों में इस्तेमाल के लिए 100 मार्क-2 बायोडाइजेस्टर के क्रय की प्रक्रिया आरंभ कर दी है ताकि डलझील में जलप्रदूषण को कम किया जा सके। डीआरडीई ग्वालियर के वरिष्ठ वैज्ञानिक एवं बायोडाइजेस्टर मार्क-2 प्रौद्योगिकी के तकनीकी विशेषज्ञ डा.एके गोयल ने बताया कि सतत अनुसंधान के द्वारा मार्क-2 बायोडाइजेस्टर की प्रौद्योगिकी को उन्नत किया गया है। इस दौरान डीआरडीई के वरिष्ठ वैज्ञानिक डा एके गुप्ता एवं डा अनुराग पांडेय विशेष रूप से मौजूद थे।

<https://www.naidunia.com/madhya-pradesh/gwalior-gwalior-drde-news-drde-biodigester-formula-will-be-included-in-maharashtra-metro-rail-6640886>



Wed, 06 Jan 2021

Maharashtra Metro and DRDO sign MoU for using biodigester Mk-II technology for treatment of human waste on metro rail network

By Mrunal Jadhav

Pune: Defence Research and Development Organisation (DRDO), Government of India's premier research agency and Maharashtra Metro Rail Corporation (MAHA-METRO), a joint venture company of the GoI and Government of Maharashtra are working together to conserve water and protect the environment by installing DRDO's eco-friendly biodigester units (a non-sewered sanitation technology) in its facilities.

A Memorandum of Understanding (MOU) was inked today between MAHA-METRO and DRDO through which DRDO will render technical support for the implementation of its advanced biodigester Mk-II technology for the treatment of human waste (night soil) in the metro rail network.

Dr AK Singh, Distinguished Scientist & Director General- Life Sciences, DRDO Headquarters, New Delhi, and Dr Brijesh Dixit, Managing Director, Maharashtra Metro Rail Corporation Limited (MMRCL) exchanged the MoU on behalf of their organisations. The MoU was signed by Dr DK Dubey, Director DRDE, Gwalior and Sh. Atul Gadgil, Director, Maha-Metro Rail Corporation Limited, Pune.

DRDO's biodigester is an indigenous, green and cost-effective technology, with a rare distinction of having one of the largest numbers of DRDO-licensees (ToT holders).

Indian Railways has already installed about 2.40 lakh biodigesters in its fleet of passenger coaches. Now for MAHA-METRO, the technology has been revamped and further improved in a bid to save the water and space.

A customized version of this MK-II Biodigester, suitable for treating human waste generated from houseboats in Dal Lake was successfully demonstrated by the DRDO to J&K Administration. Lakes and Waterways Development Authority (LWDA) of the J&K Administration has initiated



the process to procure 100 units of Mk-II Biodigesters for civil habitats around the Dal Lake to minimize water pollution. The implementation of Biodigester MK-II in Srinagar is being monitored by a committee of experts constituted by the High Court of J&K under the Chairmanship of Dr E Sreedharan, former MD of DMRC. When fully implemented, this green technology will significantly reduce the Dal lake pollution.

This technology is upgraded through improvements in the bio-degradation efficiency, design modification and addition of secondary treatment module. The new reactor is designed to provide more path length with increased biological reaction time, thereby enhancing the biodegradation efficiency of the system. This technology was primarily developed for the armed forces in high altitude Himalayan regions, including Leh-Ladakh and Siachen glacier.

Dr G Satheesh Reddy, Secretary DDR&D & Chairman DRDO conveyed his wishes to both the teams for successful implementation and said that technologies require upgradation with the availability of data and feedback.

<https://www.punekarnews.in/maharashtra-metro-and-drdo-sign-mou-for-using-biodigester-mk-ii-technology-for-treatment-of-human-waste-on-metro-rail-network/>



Wed, 06 Jan 2021

Pune Metro, DRDO sign MoU for using biodigester technology to treat sewage at metro station

Brijesh Dixit, Managing Director of Maha-Metro, said that the decision was taken after its success for the Nagpur Metro rail and it would go a long way in the objective of Pune metro to adopt ecofriendly measures

Pune: With its successful usage in the Indian Railways and Nagpur Metro, the Maharashtra Metro Rail Corporation Ltd (Maha-Metro) on Tuesday signed an agreement with the Defence Research and Development Establishment (DRDE) of the DRDO for adopting the Biodigester Technology for treating human waste and recycling water consumed in Pune metro rail.

“The Biodigester technology is an eco-friendly, cost-effective, decentralised, on-site human waste treatment technology that uses anaerobic microbial consortium. We will be able to conserve a significant amount of water in a state where water scarcity is increasing everyday,” said Brijesh Dixit, Managing Director of Maha-Metro.

He said that the decision was taken after its success for the Nagpur Metro rail and it would go a long way in the objective of Pune metro to adopt ecofriendly measures.

A K Singh, Director General-Life Sciences of DRDO, said human waste is an ever-growing problem in developing countries and improper disposal leads to contamination of drinking and ground water resources, which causes diseases. “The Biodigester technology developed by DRDE is an efficient and economic onsite alternative to the conventional sanitation techniques. It has proved effective in wide geo-climatic conditions by tweaking the design. It has been adopted by the Indian Railways leading to zero toilet discharge on tracks,” he said.

The present model helps in recycling of water which can be used for cleaning floors, washrooms and washing vehicles. “We are further improving the technology to have recycled water that would



Pune metro is estimated to have five lakh footfall every day and the Biodigester technology would be used at all the metro stations. (File photo)

enable washing clothes and the ultimate goal would be to get potable quality water," Singh said, adding the DRDE would be providing technical advice to Maha-Metro for its set up and maintenance.

Dixit said the Pune metro is estimated to have five lakh footfall every day and the Biodigester technology would be used at all the metro stations.

<https://indianexpress.com/article/cities/pune/pune-metro-drdo-sign-mou-for-using-biodigester-technology-to-treat-sewage-at-metro-station-7133957/>

Outlook

Wed, 06 Jan 2021

India, Israel successfully test Medium-Range Surface-to-Air Missile defence system

By Harinder Mishra

Jerusalem: India and Israel have successfully tested a Medium-Range Surface-to-Air Missile (MRSAM) defence system jointly developed by the two countries in a boost to their combat capabilities aimed at providing ultimate protection from enemy aircraft.

The test was conducted last week at an Indian facility and validated all components of the weapons system, a press release by Israel Aerospace Industries (IAI) on Tuesday said.

The MRSAM is an advanced path-breaking air and missile defence system that provides ultimate protection against a variety of aerial platforms. Defence experts say that it can shoot down enemy aircraft at a range of 50-70 kms.

Jointly developed by IAI and the Defence Research and Development Organisation (DRDO), in partnership with other defence companies in Israel and India, the MRSAM is being used by all the three wings of the Indian army and also Israel Defence Forces (IDF).

The system includes an advanced phased-array radar, command and control, mobile launchers and interceptors with advanced RF seeker.

"MRSAM Air & Missile Defense System is a cutting edge, innovative system that once again has proven its advanced capabilities against a variety of threats. Every trial in an air defence system is a complex operational event and the COVID-19 limitations significantly increase the complexity," Boaz Levy, IAI's President and CEO, said.

"This trial is yet another testimonial to the strong partnership between IAI and India and the two nations. IAI is proud to lead this impressive cooperation with DRDO and the Indian forces and is dedicated to its continued success," Levy said.

Israeli specialists and Indian scientists and officers participated in and witnessed the test, the leading Israeli defence industry said.

The flight test demonstrated different extreme reference scenarios, validating various system capabilities, it stressed.

"As part of the test, the MRSAM interceptor was launched from a land-based mobile launcher and successfully hit its threats. The scenario began by targeting the threat detected by the Systems digital MMR Radar and launched the MRSAM interceptor toward its operational trajectory. The interceptor acquired the target, and successfully intercepted it," the press statement noted.

"All the weapon system's elements met the test goals successfully," it said.

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

<https://www.outlookindia.com/newscroll/india-israel-successfully-test-mediumrange-surfacetoair-missile-defence-system/2005190>

India and Israel successfully test MRSAM air defence system

India and Israel tested successfully a MRSAM defence system which will be a boost to their combat capabilities aimed at providing ultimate protection from enemy aircraft

Edited By Namrata Agarwal

Highlights

- 1. India, Israel successfully tested a MRSAM defence system in an Indian facility last week.**
- 2. It will be a major boost to their combat capabilities aimed at providing ultimate protection from enemy aircraft.**

Jerusalem: In a major boost to their combat capabilities, India and Israel have conducted a successful test of a Medium-Range Surface-to-Air Missile (MRSAM) defence system which was jointly developed by the two countries. It is aimed at providing ultimate protection from enemy aircraft.

Taking to Twitter, the Israel Aerospace Industries (IAI) wrote: "IAI and DRDO successfully test launch the MRSAM air defense system last week at a test range in India. The MRSAM is an advanced path breaking air and missile defense system that provides ultimate protection against a variety of aerial platforms."

A press release by Israel Aerospace Industries (IAI) on Tuesday said, last week the test was conducted at an Indian facility and validated all components of the weapons system.

The missile has been jointly developed by IAI and the Defence Research and Development Organisation (DRDO), the MRSAM is being used by all the three wings of the Indian army and also Israel Defence Forces (IDF). This has been done in a partnership with other defence companies in Israel and India.

The MRSAM is an advanced path-breaking air and missile defence system that provides ultimate protection against a variety of aerial platforms. Defence experts say that it can shoot down enemy aircraft at a range of 50-70 kms. The system includes an advanced phased-array radar, command and control, mobile launchers and interceptors with advanced RF seeker.

"MRSAM Air & Missile Defense System is a cutting edge, innovative system that once again has proven its advanced capabilities against a variety of threats. Every trial in an air defence system is a complex operational event and the COVID-19 limitations significantly increase the complexity," Boaz Levy, IAI's President and CEO, said.

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<https://zeenews.india.com/india/india-and-israel-successfully-test-mrsam-air-defence-system-2334385.html>



File photo

Medium-Range Surface-to-Air Missile (MRSAM)

The Medium-Range Surface-to-Air Missile (MRSAM) is being developed by India's Defence Research and Development Organisation (DRDO) in collaboration with Israel Aerospace Industries (IAI)

The Medium-Range Surface-to-Air Missile (MRSAM) was developed by India's Defence Research and Development Organization (DRDO) in collaboration with Israel Aerospace Industries (IAI). It was handed over to the Indian Air Force (IAF) in August 2019.

The missile is designed to provide the armed forces with air defence capability against a variety of aerial threats at medium ranges.

MRSAM development and testing

A contract for the MRSAM programme was signed in February 2009. The IAF will buy 450 MRSAMs and 18 firing units at a value of more than \$2bn.

The IAF ordered one MRSAM regiment including 16 firing units and associated fire control systems and surveillance systems.

IAI and DRDO conducted three flight tests of the MRSAM weapon system at the Integrated Test Range off Odisha Coast, India, in July 2016, to validate all missile components. The missile successfully intercepted a moving aerial target in all the three tests.

MRSAM/LRSAM were exhibited by IAI at the Aero India 2017 held in February 2017. IAI received approximately \$2bn contract for providing advanced MRSAMs for the Indian Army in April 2017. It will also supply additional LRSAMs for the Indian Navy.

In January 2019, IAI entered a \$93m agreement with the Indian Navy and Cochin Shipyard for providing Naval MRSAM. It will mainly offer maintenance and other services for various MRSAM sub-systems.

The Indian Navy successfully test-fired LRSAM from its warship INS Chennai off the coast of Odisha in January 2019.

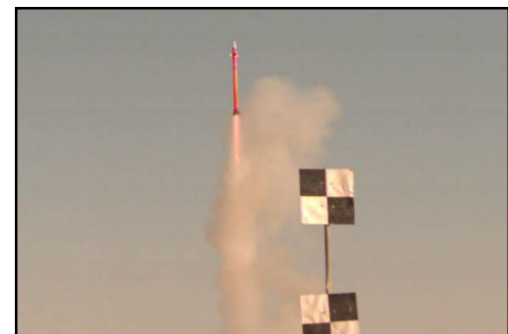
MRSAM design and features

Each MRSAM weapon system comprises one command and control system, one tracking radar, missiles, and mobile launcher systems.

The mobile launcher is used to transport, emplace and launch up to eight canisterised missiles in two stacks. It can fire the missiles in single or ripple firing modes from the vertical firing position.

The combat management system simplifies the process of engaging a variety of threats. It identifies and tracks the threat using a tracking radar. The system calculates the distance between the target and the launcher and then determines if the identified target is a friend or a foe. The target information is then transmitted to the mobile launcher.

The weapon is 4.5m-long, weighs approximately 276kg, and is equipped with canards and fins for control and manoeuvrability.



Guidance and warhead of medium-range surface-to-air missile

MRSAM missile is equipped with an advanced active radar radio frequency (RF) seeker, advanced rotating phased array radar, and a bidirectional data link. The RF seeker, located in the front section of the missile, is used to detect moving targets in all weather conditions.

The phased array radar provides a high-quality air situation picture, while the bidirectional data link is used for relaying midcourse guidance and target information to the missile.

The missile's explosive warhead, featuring a self-destruct fuse, provides high-probability of kill against enemy targets with minimal collateral damage.

Performance of MRSAM weapon

MRSAM surface-to-air missile is powered by a dual-pulse solid propulsion system developed by DRDO.

The propulsion system, coupled with a thrust vector control system, allows the missile to move at a maximum speed of Mach 2. The weapon has the ability to engage multiple targets simultaneously at ranges of 70km.

Variants of DRDO's medium-range surface-to-air missile

MRSAM is a land-based configuration of the long-range surface-to-air missile (LRSAM) or Barak-8 naval air defence system, which is designed to operate from naval vessels.

The Indian Ministry of Defence is procuring an undisclosed number of MRSAM air defence systems to replace the Indian Army's ageing air defence systems.

Contractors involved

Under a contract with DRDO, Tata Advanced Systems designed and manufactured combat management systems for the MRSAM programme at its research and development (R&D) facility in New Delhi, India.

Bharat Dynamics (BDL) is the lead integrator for the MRSAM missile systems. BDL established a new production facility in Hyderabad with an investment of \$100m to manufacture both MRSAM and LRSAM missiles. The facility has the capacity to produce 100 missiles a year.

Kalyani Rafael Advanced Systems (KRAS), a joint venture of Kalyani Group and Rafael Advanced Defense System, was contracted to produce and supply missile kits for final integration by BDL.

Other contractors involved in the development of the MRSAM include Bharath Electronics (BEL), L&T, Elta, and other private companies.

Project Type: Surface-to-air missile

Manufacturers: DRDO and IAI

Service Entry: 2017

Length: 4.5m

<https://www.airforce-technology.com/projects/medium-range-surface-to-air-missile-mrsam/>

20 years since LCA Tejas's first flight: What's next for India's indigenous fighter programme?

New facility to produce Tejas will be ready from FY22: HAL CMD

By Pradip R Sagar

At 10:00 on January 4, 2001, Wing Commander Rajiv Kothiyal took the maiden flight of India's fighter jet Light Combat Aircraft (LCA). In 2003, Prime Minister Atal Bihari Vajpayee christened the fighter "Tejas". Now with two squadrons, the Tejas has become an important asset in the Indian Air Force's inventory along with frontline jets like the Sukhoi-30 MKIs, Mirage-2000s, MiG-29s and the newly inducted Rafales. And, the IAF plans to have more of them with an additional 83 of the Mark-1 version in addition to its naval version.

It took 18 years to test the prototype of the aircraft. In 1983, DRDO had obtained permission to initiate a programme to design and develop a Light Combat Aircraft. The move was taken in anticipation of the life expiry of the MiG-21 fleet and the government allocated Rs 5.75 billion (equivalent to Rs 63 billion or \$880 million in 2019) for the LCA programme.

In 1985, the then IAF Chief Air Chief Marshal Idris Hassan Latif supported the LCA programme and submitted Air Staff Requirements (ASR) for the fighter jet.

DRDO Chief Dr G Satheesh Reddy, in an interview to the WEEK, had said that there are few nations in the world that have successfully made a fighter aircraft of their own. "We are one of them. It has taken about three decades of struggle," he added.

The Tejas is a single-engine, delta wing, multirole lightweight fighter- designed by the Aeronautical Development Agency (ADA) and Hindustan Aeronautics Limited (HAL).

The fourth-generation aircraft is designed to carry a veritable plethora of air-to-air, air-to-surface, precision-guided and standoff weaponry. It can travel at supersonic speeds at all altitudes and can carry a payload of 3,500 kg, with a service ceiling of 15km. It is best suited for air combat and offensive air support.

Armaments of both Russian and European origin can be integrated with the platform.

Speaking on the occasion of 20 years since the LCA's first flight, HAL CMD R. Madhavan told THE WEEK that the project is progressing very well, with an augmented production capacity of 10-12 LCAs per year with exclusive production facilities in Bangalore.

"We have also developed partners for the supply of major structural assemblies. A new facility spread across 35 acres and with a built-up area of over 34,000 square metres is being made ready for production of structural assemblies of the advanced variant of Tejas—LCA Mk1A. This facility will be in full-fledged operation from FY 2021-22 onwards," Madhavan said, adding that HAL will be able to produce 16 aircraft per year from 2022-23 onwards to match the order for 83 LCAs.

LCA Mk1A is an advanced version of the LCA Mk1 with four major capabilities over the current variant of LCA. These improvements are planned in operational roles, enhancing the combat ability and maintainability improvements through the incorporation of an AESA Radar, EW suite and BVR missile capabilities, an official said.



HAL Tejas in flight | Sanjay Ahlawat



The naval version of the Tejas

LCA Mk1A will have the inbuilt capability to fire BVR missiles such as the Derby missile, with the current Tejas already proving such capability. The indigenously developed BVR missile (ASTRA Mk1) has been identified to be integrated on Mk1A, which will be a weapon of choice for the IAF. This versatile weapon will give an edge to LCA Tejas over its contemporaries in BVR warfare.

Tejas Mk-II is a medium-weight fighter aircraft, which will replace the Mirage fighters. The preliminary design phase has been completed and detailed design work is in progress. It will have a higher-thrust engine compared with the LCA Mk-I.

Speaking on the Tejas Mk-II, an official said that it will be a medium-weight fighter (MWF) and that its design is ready. The current Tejas has a maximum takeoff weight of 13.5 tonnes while the MWF is in the next class and is targeted to have a maximum takeoff weight of around 17.5 tonnes. The Indian Air Force will be ordering these aircraft in large numbers to meet its requirements. The first flight of the Mk-II will happen in 2022 and will take another 5-6 years to get into production. By that time, the Mirage-2000 fighters will complete their lifespan and the LCA Mk-II should get into production.

And to fill the gap in the IAF's combat fleet, Tejas is expected to play an important role in the medium category.

On September 13, 2019, the naval version of Tejas LCA achieved a successful "arrested landing" at the shore-based Test Facility of INS Hansa in Goa, achieved a milestone.

Indian Navy had hailed this day as a "golden letter day" in its history—even after it first rejected the naval version of LCA. Eventually in January last year, LCA Navy made a maiden take off from INS Vikramaditya.

<https://www.theweek.in/news/india/2021/01/05/20-years-since-lca-tejass-first-flight-whats-next-for-indias-indigenous-fighter-programme.html>



Wed, 06 Jan 2021

Indian army to procure 118 local-made Arjun Mk-1A main battle tanks

According to news published by the newspaper website "The Hindu" on December 26, 2020, India has launched the process for the procurement of 118 local-made Arjun Mk-1A main battle tanks.

“The file is currently with the Deputy Chief of Army Staff and will be shortly sent to Integrated Defence Staff (IDS) to put up the case. The case is planned to be fielded before the Defence Procurement Board (DPB) and the Defence Acquisition Council (DAC) in January 2021,” the Indian military source said.

The Arjun is a third-generation main battle tank developed by India's Defence Research and Development Organisation (DRDO), for the Indian Army. The development of the tank began in 1972 by the Combat Vehicles Research and Development Establishment (CVRDE), a laboratory of DRDO. The first batch of 16 production version Arjun tanks was received in 2004 and they were



The latest generation of Indian-made Arjun main battle tank. (Picture source Army Recognition)

provided as a squadron to the 43 Armoured Regiment. The regiment was later made up to 45 tanks on 25 May 2009 making it the first Arjun regiment of the Indian Army.

The Arjun has a crew of four and is armed with one 120 mm rifled gun able to fire APFSDS (kinetic energy penetrator) rounds, HE, HEAT, High Explosive Squash Head (HESH) rounds at a rate of 6–8 rounds per minute. the gun of the Arjun is also capable to fire Israeli developed semi-active laser-guided LAHAT missile. The Arjun can carry 39 rounds in special blast-proof canisters. The second armament of the tank includes on 12.7 mm anti-aircraft machine gun mounted on the commander hatch turret and one 7.62 mm coaxial machine gun.

The turret and glacis are protected with "Kanchan" ("gold") modular composite armor, which derived its name from Kanchan Bagh, Hyderabad, where the Defence Metallurgical Research Laboratory (DMRL) is located. Kanchan is made by sandwiching composite panels between Rolled Homogenous Armour (RHA) able to defeat APFSDS (Armour-piercing fin-stabilized discarding sabot) and HEAT (High-explosive anti-tank) rounds.

The Arjun Mk-1A is an upgraded version of the Arjun Mark 1 offering more firepower, protection, and mobility. The hull and turret of Arjun Mk.1A have been modified to give a lower silhouette making detection more difficult, while it also supports the newly developed Thermo-Baric (TB) and Penetration-cum-Blast (PCB) ammunition.

The Arjun Mk-1A is fitted with an improved Gunner's Main Sight (GMS) integrated with Automatic Target Tracking (ATT) which are all connected to a computerized fire control system enhancing the first round kill capability that guarantees accurate engagement even under adverse conditions, panoramic sight (CPS Mark II) integrated uncooled thermal imager and night vision camera with binocular sights, laser rangefinder for an advanced hunter-killer capability, To improve mobility due to an additional increase in weight, an Advanced Running Gear System (ARGS) has been developed where the hydropneumatic suspension system is completely redesigned to enhance agility.

https://www.armyrecognition.com/defense_news_january_2021_global_security_army_industry/indian_army_to_procure_118_local-made_arjun_mk-1a_main_battle_tanks.html

DRDO on Twitter





MIB India #StayHome #StaySafe @MIB_India · 14h
 .@DRDO_India signs MOU with MAHA-METRO for implementation of
 Advanced Biodigester Mk-II Technology in Metro Rail Network.



A. Bharat Bhushan Babu @SpokespersonMoD · 14h
 DRDO Signs MOU with MAHA-METRO for implementation of Advanced
 Biodigester Mk-II Technology in Metro Rail Network [pib.gov.in](http://pib.gov.in/PressReleasePa...)
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Defence News

Defence Strategic: National/International



Wed, 06 Jan 2021

India to sign \$2.5-billion contract for 56 transport planes for IAF

Airbus Defence and Space and Tata Advanced Systems Limited (TASL) will jointly execute the project to equip the air force with 56 C-295 transport aircraft under the Make-in-India initiative in the aerospace sector

By Rahul singh

New Delhi: India will sign a \$2.5-billion contract this year for the supply of 56 medium transport aircraft to the Indian Air Force to replace its fleet of aging Avro-748 planes, officials familiar with the development said on Tuesday.

Airbus Defence and Space and Tata Advanced Systems Limited (TASL) will jointly execute the project to equip the air force with 56 C-295 transport aircraft under the Make-in-India initiative in the aerospace sector.

Under the contract, Airbus will supply the first 16 aircraft in flyaway condition while the remaining 40 will be assembled in India by TASL, the officials said.

The procurement of 56 C-295 from Airbus with participation of an Indian production agency for the manufacture of 40 aircraft (out of total 56) in India is at financial approval stage and the contract is likely to be signed in the near future, the defence ministry said in its year-end review.



The C-295 is said to be a highly versatile tactical airlifter. (airbus.com/defence/)

“The case is first of its kind which envisages participation of private companies and would prove to be a boost for our defence industry,” the ministry said.

While the C-295s are meant to replace the Avro-748 transport planes, the new aircraft will also be suitable for demanding roles that the AN-32 currently undertakes, as previously reported by Hindustan Times.

The Avro-748 entered service in the early 1960s and has been long due for replacement, said Air Vice Marshal Manmohan Bahadur (retd), additional director general, Centre for Air Power Studies.

“The replacement C-295 project has been in the works for the past eight years and has spawned a new term --- the Avro model --- in the acquisition field due the unique path adopted. Actually, there is an acquisition fatigue that has crept in, a state that needs to be broken by actually inducting the aircraft that is sorely required by the IAF. The C-295 would also be the natural replacement for AN-32s which too would be getting phased out soon,” Bahadur said.

The first 16 planes will be supplied in two years, and the deliveries of the 40 locally-assembled ones will be spread over an additional eight years. The aircraft can operate from short, unprepared airstrips and carry out a variety of missions in all-weather conditions.

The contract for buying 83 LCA Mk 1A aircraft for the IAF from Hindustan Aeronautics Limited (HAL) is also likely to be signed soon after approval by the Cabinet Committee on Security, the ministry said its review. Last March, the defence ministry gave a green light to the purchase of 83 advanced Tejas jets from HAL. The deal is expected to be worth Rs 38,000 crore.

The deal for the 83 Mk-1A jets will take the total number of Tejas variants ordered to 123.

The 40 LCAs already ordered by the IAF are in the initial operational clearance (IOC) and the more advanced final operational clearance (FOC) configurations. The LCA Mk-1A will come with additional improvements over the FOC aircraft, making it the most advanced Tejas variant so far.

The Mk-1A variant is expected to come with digital radar warning receivers, external self-protection jammer pods, active electronically scanned array radar, advanced beyond-visual-range missiles and significantly improved maintainability.

India is also likely to sign a deal with Israel for additional Harop (P-IV) loitering weapon systems in the first quarter of 2021, the year-end review said. The Harop is designed to locate and attack high-value targets with precision. The weapon (also known as a suicide drone) tracks the target, dives on to it and detonates the warhead on impact, according to its maker Israel Aerospace Industries.

<https://www.hindustantimes.com/india-news/india-to-sign-2-5-billion-contract-for-56-transport-planes-for-iaf/story-2wPztr38s2bNoQPhzTj2SJ.html>

BEML bags order for the supply of high mobility vehicles to Indian Army

- *BEML said, 'Vehicles would enable armoured fighting vehicles, troops, ammunitions and stores to be moved to far-flung, difficult terrains in operational areas'*
- *BEML is involved in sectors like defence, rail, power, mining and infrastructure*

BEML Limited, one of the Defence equipment manufacturer and a 'Schedule A' Company under the Ministry of Defence (MoD) received orders from MoD for supply of High Mobility vehicles, at an approximate value of ₹758 crore.

The company in a regulatory filing said, "These High Mobility vehicles would play a key role in the logistics management of the Indian Army leveraging on its exceptional cross country capabilities."

These vehicles would enable armoured fighting vehicles, troops, ammunitions and stores to be moved to far-flung, difficult terrains in operational areas.

The equipment will be manufactured at BEML's Palakkad Plant in Kerala and would supply the vehicles to Indian Army in a span of one year.

BEML is involved in sectors like defence, rail, power, mining and infrastructure.

The government on Sunday invited preliminary bids for strategic sale of 26% stake along with transfer of management control in defence PSU BEML.

"Govt has issued the PIM/EOI for disinvestment of 26 per cent equity share capital of BEML Ltd along with transfer of management control. Disinvestment will be through a two stage competitive bidding process," DIPAM Secretary Tuhin Kanta Pandey tweeted.

Bidders can submit their Expression of Interest (EOI) for buying the stake in BEML by March 1, as per the Preliminary Information Memorandum (PIM) issued by the Department of Investment and Public Asset Management (DIPAM).

At the current market price, a 26 per cent sale could fetch about ₹1,000 crore to the exchequer. Shares of BEML closed at ₹974.25, on Friday. BEML is involved in sectors like defence, rail, power, mining and infrastructure. The company's total revenue from operations was ₹3,028.82 crore in fiscal 2019-20. SBI Capital Markets has been appointed as the advisor by the Government of India (GOI) for advising and managing the proposed strategic disinvestment of BEML.

BEML has an order book of ₹9,795 crore as on March 31, 2020. The government has 'in-principle' decided to disinvest 26 per cent stake of BEML through strategic sale with transfer of management control. The government holds 54.03 per cent stake in the company.

The stock lost 1.41% to close at ₹992 at the BSE

<https://www.livemint.com/companies/news/beml-bags-order-for-the-supply-of-high-mobility-vehicles-to-indian-army-11609850994992.html>



FILE PHOTO: An Indian Army convoy moves along a highway leading to Ladakh. (Photo: Reuters)

'Army well-entrenched to counter misadventure by Chinese forces'

It maintained all protocols and agreements, Defence Ministry says in its annual report

New Delhi: Unilateral and provocative actions by the Chinese to change the status quo by force, in more than one area on the Line of Actual Control (LAC), were responded to by the Army “in a firm and non-escalatory way,” ensuring the sanctity of our claims in Eastern Ladakh, the Defence Ministry has said. The Army, it stated, was “well-entrenched” to counter any “misadventure” by the Chinese forces.

“Indian Army has maintained all protocols and agreements between the two countries while the People’s Liberation Army (PLA) escalated the situation by utilisation of unorthodox weapons and amassing large number of troops,” the Ministry said in its annual report. “India categorically conveyed to China that any attempt to unilaterally alter the status quo at the border is unacceptable and that India is determined to protect its sovereignty and territorial integrity,” it stated.



Army vehicles moving towards Line of Actual Control (LAC) amid border tension with China, in Leh. File Photo. | Photo Credit: PTI

Winter preparations

The report said Advance Winter Stocking (AWS) and winter preparations for the enhanced strength had been completed and troops were “well entrenched to counter any misadventure” by the Chinese forces. “While the Indian Army is prepared for any eventuality, talks are also progressing to resolve the issue in an amicable manner,” it stated.

On the Army’s response, the report said that the Army, with assistance from Indian Air Force (IAF), mobilised troops, including “accretionary forces”, in a very short duration including heavy equipment like guns and tanks, as also ammunition, rations and clothing.

Galwan clash

On the violent clash in Galwan which saw the first combat fatalities in over five decades, the Ministry said 20 soldiers lost their lives while preventing PLA troops from ingressing into Indian territory. “The Chinese also suffered significant casualties,” it said.

Later, on August 28 and 29 last year, Indian troops, in a “precautionary deployment, pre-empted Chinese expansionist designs and occupied heights” along the southern bank of Pangong Tso, the report said adding, “Braving inclement weather, own troops continue to be deployed on these heights.”

Eight rounds of Corps Commander level talks, in addition to diplomatic talks, have so far failed to reach any breakthrough in disengagement and de-escalation along the LAC. However, the 9th round of senior military commander talks has been delayed. The Army has deployed around 50,000 troops in addition to tanks and other equipment along the disputed boundary in Eastern Ladakh to match the Chinese deployments since the beginning of the standoff in early May.

<https://www.thehindu.com/news/national/army-well-entrenched-to-counter-misadventure-by-chinese-forces/article33504272.ece>

Indian Navy's second nuclear-powered missile submarine 'INS Arighat' to be commissioned soon

INS Arighat, the Indian Navy's second nuclear-powered ballistic missile submarine, will be commissioned soon. According to sources, Arighat has 'performed well' during sea trials.

It was expected to be commissioned in the late 2020s. However, the same was delayed due to the COVID-19 pandemic and would receive operational clearance soon.

The submarine is the second in its class, the first one being the INS Arihant, currently in service with the Navy. These submarines are a part of India's nuclear triad, classified as Strategic Strike Nuclear Submarines.

Arighat, similar to the INS Arihant, can carry four nuclear-capable K-4 SLBMs (submarine-launched ballistic missile) with a range of over 3,500 kilometers or twelve conventional warhead K-15 SLBMs with a range of about 750 kilometers. The K-15 can also carry a strategic nuclear warhead.

The submarines also carry torpedoes and mines. The Arighat was quietly launched in November 2017 by then-Defense Minister Nirmala Sitharaman. A total of 4 vessels are planned in the class, the first two being INS Arihant and INS Arighat with a total displacement of 6,000 tonnes. The remaining two are yet to be named and would be bigger having a displacement of 7,000 tonnes with enhanced capability of carrying 12-15 long-range ballistic missiles.

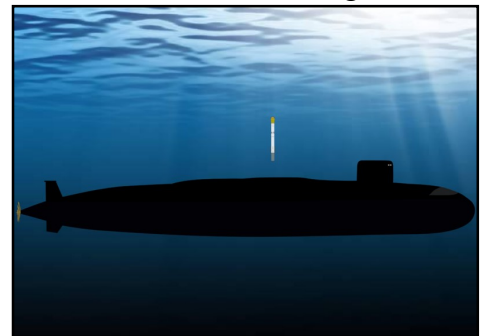
According to India Today, the two new units, the S4 and S4 'star', displacing over 1,000 tonnes more than the Arihant class will move into the SBC drydock vacated by the two Arihant-class submarines.

These submarines, fitted with eight ballistic missiles or twice the Arihant's missile load, will be launched by 2022. An official has said the Arighat launch has more to do with creating more workspace within the cramped SBC (Ship Building Centre, Visakhapatnam) for assembling the S4 and S4 'star'.

It was announced on November 5, 2018, that INS Arihant had completed its first deterrent patrol. The 20-day long patrol ended on November 4, 2018, and PM Narendra Modi felicitated the crew of Arihant after the mission.

According to independent experts, India's another nuclear-powered submarine (although not carrying ballistic missiles), the INS Chakra, was sent along with INS Kalvari (diesel-electric submarine) to search for the Pakistani submarine PNS Saad, which was believed to be deployed in the sea after the 2019 Balakot airstrike amid heightened tensions between both countries.

<https://eurasianimes.com/indian-navys-second-nuclear-powered-missile-submarine-ins-arighat-to-be-commissioned-soon/>



A graphic image of INS Arihant.

Chinese Fighter Jets simulate Indian Rafales, Su-30 MKIs in mock drills with Pakistan

By Aakriti Sharma

China's J-10C and J-11B fighter jets were used to simulate India's Rafale and Su-30 MKI fighter jets during the recently-concluded Shaheen IX exercise with Pakistan, Chinese experts claim.

A Chinese media report said J-10C and J-11B fighters, early warning aircraft KJ-500, and electronic warfare aircraft Y-8 participated in the 20-day joint exercises, which had begun on December 7. From Pakistan side, the JF-17 and Mirage III fighter jets took part in the drills.

Both sides had also deployed special operation units. For the first time, the Chinese Naval Aviation had sent its warplanes to a joint exercise with a foreign country.

A Chinese military aviation expert Fu Qianshao told state-owned *Global Times* that the J-10C and J-11B are very suitable to simulate India's fighter jets in mock battles. Fu said many aspects of the J-10C mid-sized fighter jet, including the size, aerodynamic characteristics, aviation, and weapon systems, and overall combat capability, are comparable to the French-made Rafale.

Fu noted that the participation of J-11B heavy fighter jets was also strategic as they have a similar appearance to India's Su-30 combat aircraft.

Usually, the J-10C is compared to the classic American F-16 fighter Falcon as both have capabilities such as beyond-visual-range engagement, precision air-to-ground strike, digital glass cockpit instruments, in-flight refueling, and electronic warfare.

However, following the induction of Rafale fighters, some experts have projected an edge for India over Pakistan. Amid the ongoing border stand-off with China, New Delhi had requested France to ensure the timely delivery of the fighter jets.

Chinese J-10C Versus India's Rafale

Heavier than the Chinese J-10C, Rafale has a greater thrust-to-weight ratio when it comes to the same weight of fuel and weapons on the two fighter jets. Furthermore, the short-range missile of Rafale (MICA-IR) has an imaging infrared (IIR) seeker while the PL-8 missile of J-10c has only an infrared (IR) seeker.

At the same time, in beyond visual range missiles, the J-10C uses the PL-15, which is a dual-stage BVRAAM with a 200+ km range. Rafale's Meteor has greater maneuverability but it has a range of "well in excess of 100km", according to its manufacturers, and is also smaller in length than the PL-15.

India has deployed Rafale fighters in Ladakh amid the stand-off with China. Drawn from Rafale's experience in combat operations in Mali, Afghanistan, Libya, Iraq, and Syria, one can safely assume that the French-made aircraft has an edge because the J-10C, just like any other Chinese fighter, has never been to a battle.

Notably, China has deployed a variant of J10 along the Line of Actual Control in the Himalayas.

China 'Learns' from Pakistan's Experiences

As both Pakistan and China have a common rival, India, their air forces focused on large-scale aerial battles and close-quarters aerial support during the Shaheen IX exercise.

The *GT* report claims that both sides received a boost in combat capabilities with more than 200 sorties. Fu said Chinese pilots could learn from the aggressive maneuvers and rich experiences of Pakistani pilots, who had engaged in a dogfight with India in February 2019.

After flying an air superiority sortie in a “hi-tech” Chinese fighter aircraft during the Shaheen IX exercises, Pakistan Air Chief Marshal Mujahid Anwar Khan said Chinese Military Aviation Technology is on par with contemporary requirements and has full capacity to meet the challenges of modern warfare.

Ding Yuanfang, a Chinese Air Force deputy brigade commander, told media: “Unlike previous Shaheen series exercises, this time we comprehensively deployed aviation forces and paratroopers and added real combat-oriented training courses like maritime training for the first time”.

<https://eurasianimes.com/chinese-fighter-jets-simulate-indias-rafales-su-30-mkis-in-mock-drills-with-pakistan/>



Wed, 06 Jan 2021

India-China Rift: राफेल आने के बाद दहशत में चीन, पाकिस्तान के साथ मिलकर कर रहा है यह 4 बड़े बदलाव- सूत्र

खुफिया रिपोर्ट के मुताबिक, भारत में राफेल (Rafale) फाइटर एयरक्राफ्ट आने के बाद से चीन घबराया हुआ है। इसी के चलते चीन (China) अपनी एयर फोर्स में बड़े बदलाव कर रहा है।

संदीप कुमार बोल

नई दिल्ली: भारतीय वायुसेना (Indian air force) की ताकत से चीनी एयर फोर्स दहशत में है। सूत्रों की मानें तो ऐसा भारत में फाइटर एयरक्राफ्ट राफेल (Rafale) आने के बाद हुआ है। राफेल की मार से बचने के लिए चीन अब नए तरीके के हैंगर (जहाज खड़े करने की जगह) बना रहा है। हवाई पट्टियों (Air Strip) को अपडेट कर रहा है। इस काम के लिए चीन पाकिस्तान की मदद भी ले रहा है। खुफिया रिपोर्ट के मुताबिक, बालाकोट (Balakot) में हुई एयर स्ट्राइक (Air Strike) से भी सबक लेते हुए चीन (China) कई बड़े बदलाव कर रहा है।

इंडियन एयर फोर्स ने बालाकोट में आतंकियों के कैम्प को ग्राउंड पैनिट्रेटिंग बम से निशाना बनाया था। एक खुफिया रिपोर्ट के मुताबिक, चीन इस बात को अच्छी तरह से जानता है। यही वजह है कि चीन अब चारों तरफ से बंद हैंगर बना रहा है। जहां वो अपने फाइटर एयरक्राफ्ट को इंडियन एयर फोर्स के फाइटर से सेफ रख सके। इसके लिए हैंगर की दीवारें 3 मीटर तक मोटी बनाई जा रही हैं।



भारत को साल 2021 में गणतंत्र दिवस तक तीन और राफेल विमान मिल सकते हैं. (AP)

वहीं दूसरी ओर हैंगर का गेट सिंगल पीस हाई स्ट्रॉंग स्टील प्लेट से तैयार किया जा रहा है, जिससे हमले के दौरान अगर 300 से 500 किलो के बॉम्ब, क्रूज मिसाइल और ग्राउंड पैनिट्रेटिंग बम से हमला हो तो उसके फाइटर सेफ रहें।

पाकिस्तान के साथ मिलकर स्कार्दू एयरबेस को अपडेट कर रहा है

इंडियन एयर फोर्स की बढ़ती ताकत से चीन इस कदर घबराया हुआ है कि उसने तरीके से अपने एयर फोर्स स्टेशन को अपडेट करना शुरू कर दिया है। इस काम में पाकिस्तान भी उसका साथ दे रहा है।

खुफिया जानकारी रिपोर्ट के मुताबिक चीन पाकिस्तान की मदद से गिलगित बाल्टिस्तान में स्कार्दू एयरबेस को अपडेट कर रहा है।

वहां न सिर्फ नया रनवे तैयार किया जा रहा है, बल्कि एयर फील्ड पर ऐसी लाइट लगा रहा है जिससे दिन-रात चौबीसों घंटे खराब से खराब मौसम में भी एयर ऑपरेशन किया जा सके। इस लाइटिंग सिस्टम के लगने के बाद चीन रात और खराब मौसम में भी अपने फाइटरो को आसानी से लैंडिंग करा सकेगा।

<https://hindi.news18.com/news/nation/chinese-air-force-updating-his-air-force-station-with-of-pakistan-after-entry-of-rafale-fighter-aircraft-in-indian-air-force-dlnh-3403171.html>

Science & Technology News



Wed, 06 Jan 2021

Researchers regenerate deactivated catalyst in methanol-to-olefins process

The MTO process, which was first commercialized in 2010, is a catalytic process converting methanol—which is typically made from coal, natural gas, biomass, and CO₂—over a SAPO-34 zeolite catalyst. It's becoming one of the main streams for producing light olefins, including ethylene and propylene, from non-oil resources.

One of the major challenges in MTO is the rapid deactivation of the zeolite catalyst due to the coke deposition.

In industrial practices, a fluidized bed reactor-regenerator configuration is normally used in order to maintain the continuous operation, in which air or oxygen is usually input to burn off the deposited coke to restore the catalyst activity in the regenerator. This involves the transformation of coke species to CO₂, with a substantial fraction of the carbon resource being converted to low-value greenhouse gas.

A research group led by Prof. Ye Mao and Prof. Liu Zhongmin from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences regenerated deactivated catalyst in the industrially important methanol-to-olefins (MTO) process by directly transforming the coke deposited on the zeolite catalyst to active intermediates rather than burning it off to carbon oxide.

This work was published in *Nature Communications* on Jan. 4.

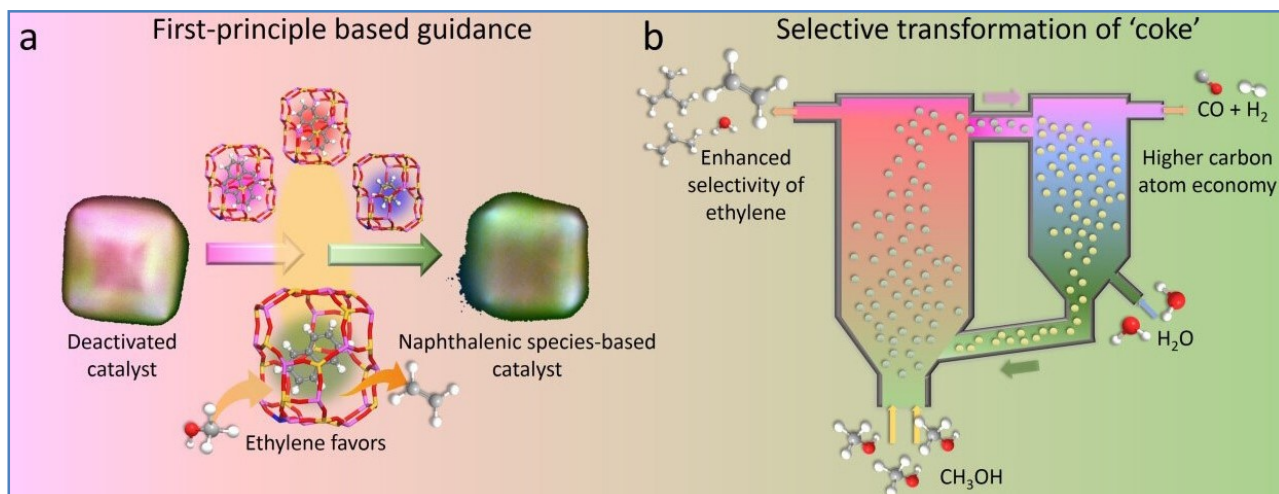
It was previously shown that MTO follows the hydrocarbon pool mechanism, i.e. the light olefins are favorably formed with the participation of active intermediate species, otherwise known as hydrocarbon pool species (HCPs), during the reaction. The HCPs will evolve into coke species that deactivate the catalyst.

By using density functional theory (DFT) calculations and multiple spectroscopy techniques, the team showed that naphthalenic cations, amongst HCPs were highly stable within SAPO-34 zeolites at high temperature, and steam cracking could directionally transform the coke species in SAPO-34 zeolites to naphthalenic species at high temperature.

This technology not only recovers the catalyst activity but also promotes the formation of light olefins owing to the synergic effect imposed by naphthalenic species.

Furthermore, the researchers verified this technology in the fluidized bed reactor-regenerator pilot plant in DICP with industrial-alike continuous operations, achieving an unexpectedly high

light olefins selectivity of 85% in the MTO reaction and 88% valuable CO and H₂ with negligible CO₂ in regeneration.



a. First-principle-based simulations provide the criteria of stability and functionality of organic intermediates confined in nano-cavity. b. Selective transformation of coke into specific naphthalenic species-rich catalyst, and improvement of MTO performance and atom economy implemented in the circulating fluidized bed reactor-regenerator configuration. Credit: GAO Mingbin

This technology opens a new venue to control the selectivity of products via regeneration in industrial catalytic processes.

More information: Jibin Zhou et al, Directed transforming of coke to active intermediates in methanol-to-olefins catalyst to boost light olefins selectivity, *Nature Communications* (2021). DOI: [10.1038/s41467-020-20193-1](https://doi.org/10.1038/s41467-020-20193-1)

Journal information: [Nature Communications](https://phys.org/news/2021-01-regenerate-deactivated-catalyst-methanol-to-olefins.html)
<https://phys.org/news/2021-01-regenerate-deactivated-catalyst-methanol-to-olefins.html>



Wed, 06 Jan 2021

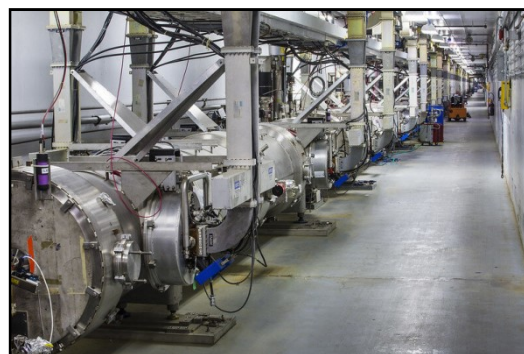
Machine learning improves particle accelerator diagnostics

Operators of the primary particle accelerator at the U.S. Department of Energy's Thomas Jefferson National Accelerator Facility are getting a new tool to help them quickly address issues that can prevent it from running smoothly. A new machine learning system has passed its first two-week test, correctly identifying glitchy accelerator components and the type of glitches they're experiencing in near-real-time.

An analysis of the results of the first field test of the custom-built machine learning system was recently published in *Physical Review Accelerators and Beams*.

The Continuous Electron Beam Accelerator Facility, a DOE User Facility, features a unique particle accelerator that nuclear physicists use to explore the heart of matter. CEBAF is powered by superconducting radiofrequency cavities, which are structures that enable CEBAF to impart energy to beams of electrons for experiments.

"The heart of the machine is these SRF cavities, and quite often, these will trip. When they trip, we'd like to



The Continuous Electron Beam Accelerator Facility, a DOE User Facility, features a unique particle accelerator that nuclear physicists use to explore the heart of matter. Credit: DOE's Jefferson Lab

know how to respond to those trips. The trick is understanding more about the trip: which cavity has tripped and what kind of fault it was," said Chris Tennant, a Jefferson Lab staff scientist in the Center for Advanced Studies of Accelerators.

Expert accelerator scientists review information on these faults and can use that to determine where the fault started and what type of fault it is, thus informing CEBAF operators on the best way to recover from the fault and mitigate future ones. However, that expert review takes time that operators don't have when experiments are underway.

In late 2019, Tennant and a team of CEBAF accelerator experts set out to build a machine learning system to perform that review in real-time.

They worked with several different groups to design and build from scratch a custom data acquisition system to pull information on cavity performance from a digital low-level RF system that is installed on the newest sections of particle accelerator in CEBAF, which includes about one-fifth of the SRF cavities in CEBAF. The low-level RF system constantly measures the field in SRF cavities and tweaks the signal for each one to ensure that they operate optimally.

When a cavity faults, the machine learning data acquisition system pulls 17 different signals for each cavity from the digital low-level RF system for analysis.

"We're leveraging information-rich data and turning it into actionable information," he said.

These same information-rich data are used by accelerator experts to help identify faulting cavities and causes. These past analyses were used to train the machine learning system prior to deployment.

The new system was installed and tested during CEBAF operations over an initial two-week period in early March 2020.

"For that two weeks, we had a few hundred faults that we were able to analyze, and we found that our machine learning models were accurate to 85% for which cavity faulted first and 78% in identifying the type of fault, so this is about as well as a single subject matter expert," Tennant explained.

This near-real-time feedback means that CEBAF operators can take immediate steps to mitigate problems that arise in the machine during experimental runs, and hopefully preventing smaller problems from turning into bigger ones that can reduce experiments' runtime.

"The idea is eventually, the subject matter experts won't need to spend all their time looking at the data themselves to identify faults," he said.

The next step for Tennant and his team is to analyze data from a second and longer test period that took place in late summer. If the system performed as well as the first test indicates, the team hopes to begin designs for extending the system to include older SRF cavities in CEBAF.

This project was originally proposed and funded through Jefferson Lab's Laboratory Directed Research & Development program for fiscal year 2020, and it was later selected by DOE for a \$1.35 million grant to leverage machine learning to revolutionize experimentation and operations at user facilities in the coming years.

"This was a proof-of-principle project. It was somewhat riskier, because several years ago, when this project was proposed, none of us on the team knew anything about machine learning. We just sort of jumped in," Tennant said. "So, sometimes supporting those higher-risk/higher-reward projects really pays off."

More information: Chris Tennant et al, Superconducting radio-frequency cavity fault classification using machine learning at Jefferson Laboratory, *Physical Review Accelerators and Beams* (2020). DOI: [10.1103/PhysRevAccelBeams.23.114601](https://doi.org/10.1103/PhysRevAccelBeams.23.114601)
<https://phys.org/news/2021-01-machine-particle-diagnostics.html>

Reading out qubits like toppling dominoes: A new scalable approach towards the quantum computer

Creating a powerful, large-scale quantum computer depends on a clever design such that many qubits (the building block of a quantum computer) can be controlled and read out. Researchers at QuTech, a collaboration between TU Delft and TNO, have invented a new readout method that is an important step forward on the road towards such a large-scale quantum computer. They have published their findings in *Nature Communications* today.

Like toppling dominoes

"Our new readout method is based on a phenomenon that all of us know from our childhood: toppling dominoes," said

Sjaak van Diepen, Ph.D. researcher in Lieven Vandersypen's group and lead author of the article. "A first transition triggers a second transition, a second transition triggers a third transition, and so on—much like dominoes toppling over in a chain reaction." Considering the implications of this domino-effect led the team to invent a new readout method. It will be able to overcome a major challenge involved in scaling up towards large-scale quantum computers: that of qubit connectivity (the ability to connect many qubits together).



The image shows the signal measured from a charge sensor, where the scientists have mapped the signal values to colours. Different colours correspond to different

Spin-qubits in quantum dot arrays

The approach of Vandersypen's group to building a quantum computer is based on so-called spin qubits in quantum dot arrays. Quantum dots are very tiny islands that can each confine one or multiple electrons and are tunnel coupled to their neighbors. The spin of the electron acts as a qubit. Spin qubits in quantum dots are read out via a very sensitive detector that measures the charge in its environment. Van Diepen: "Charge sensors work well, but only locally: they need to be in close proximity to the charge they measure. Scaling up the current approach towards a large number of interconnected qubits will therefore limit qubit connectivity, because we would need to place sensors close to all qubits."

Transferring quantum information over a distance

The new readout scheme invented by the scientists makes sure that even a spin qubit far away from the charge sensor will still be read out with high accuracy. Tzu-Kan Hsiao, postdoc and second author of the paper: "Our readout method is based on the fact that charges interact with one another. Therefore, a first charge transition can trigger other charge transitions—forming a cascade of transitions." Before such a cascade of transitions can occur, the researchers first have to make sure that the electrons become sensitive to those transitions—just as dominoes must be put upright before they can topple over. Van Diepen: "We trigger a first charge transition through a method called spin-to-charge conversion, where one particular spin state will lead to a charge transition. This sets off the cascade of transitions, allowing us to read out the spin of a charge far away from the sensor."

The scientists hope that other research groups and industry working on the development of a quantum computer will benefit from implementing the readout method and build upon their findings. In this way, the challenges on the road towards a large-scale quantum computer can be overcome one by one—just like toppling dominoes.

More information: Cornelis J. van Diepen et al. Electron cascade for distant spin readout, *Nature Communications* (2021). DOI: [10.1038/s41467-020-20388-6](https://doi.org/10.1038/s41467-020-20388-6)

Journal information: *Nature Communications*

<https://phys.org/news/2021-01-qubits-toppling-dominoes-scalable-approach.html>

Breaking through the resolution barrier with quantum-limited precision

Researchers at Paderborn University have developed a new method of distance measurement for systems such as GPS, which achieves more precise results than ever before. Using quantum physics, the team led by Leibniz Prize winner Professor Christine Silberhorn has successfully overcome the so-called resolution limit, which causes the 'noise' we may see in photos, for example. Their findings have just been published in the academic journal *Physical Review X Quantum* (*PRX Quantum*).

Physicist Dr. Benjamin Brecht explains the problem of the resolution limit: "In laser distance measurements a detector registers two light pulses of different intensities with a time difference. The more precise the time measurement is, the more accurately the distance can be determined. Providing the time separation between the pulses is greater than the length of the pulses, this works well." Problems arise, however, as Brecht explains, if the pulses overlap: "Then you can no longer measure the time difference using conventional methods. This is known as the 'resolution limit' and is a well-known effect in photos. Very small structures or textures can no longer be resolved. That's the same problem—just with position rather than time."



Credit: Universität Paderborn

A further challenge, according to Brecht, is to determine the different intensities of two light pulses, simultaneously with their time difference and the arrival time. But this is exactly what the researchers have managed to do—"with quantum-limited precision," adds Brecht. Working with partners from the Czech Republic and Spain, the Paderborn physicists were even able to measure these values when the pulses overlapped by 90 per cent. Brecht says: "This is far beyond the resolution limit. The precision of the measurement is 10,000 times better. Using methods from quantum information theory, we can find new forms of measurement which overcome the limitations of established methods."

These findings could allow significant improvements in the future to the precision of applications such as LIDAR, a method of optical distance and speed measurement, and GPS. It will take some time, however, before this is ready for the market, points out Brecht.

More information: Vahid Ansari et al. Achieving the Ultimate Quantum Timing Resolution, *PRX Quantum* (2021). DOI: [10.1103/PRXQuantum.2.010301](https://doi.org/10.1103/PRXQuantum.2.010301)
<https://phys.org/news/2021-01-resolution-barrier-quantum-limited-precision.html>

India's covid-19 vaccination program to start by 13 January: Government

By Neetu Chandra Sharma

- *The union health ministry last week conducted a nationwide mock drill of the vaccination program at 285 session sites to test the end-to-end planned operations and the mechanism set up to ensure smooth vaccination for the highly infectious disease*

India's covid-19 vaccination programme, what Prime Minister Narendra Modi said is going to be the largest in the world, will be rolled out by January 13, centre said on Tuesday.

Indicating the government's plan for a speedy start of the program, Rajesh Bhushan, Secretary, Ministry of Health & Family Welfare on Tuesday said that the covid-19 vaccine will be rolled out within 10 days of receiving the emergency use authorization. He was speaking at the press conference on status of covid-19 pandemic in the country and government preparations to deal with the ongoing health crisis.

"We are prepared to roll out Covid-19 vaccines within 10 days of granting emergency use authorization date, based on dry run feedback. But the government will only decide the exact date of the roll out of the vaccination program," said Bhushan.

The union health ministry last week conducted a nationwide mock drill of the vaccination program at 285 session sites to test the end-to-end planned operations and the mechanism set up to ensure smooth vaccination for the highly infectious disease. The government has said that it will use the digital platform, Co-WIN for providing real time information of vaccine stocks, their storage temperature and individualized tracking of beneficiaries of the covid-19 vaccine.

Bhushan elaborated about the existing logistics management involved and to be adopted in the vaccination chain. The vaccine is transported under refrigerated condition and digitally tracked during transit i.e. manufacturer to primary vaccine store to State vaccine store to District Vaccine store to Primary Health Centre. "Manufacturers first transport the vaccines to the four Primary Vaccine Stores, at Karnal, Mumbai, Kolkata and Chennai; from there it is transported in bulk to the 37 State Vaccine Stores for further dissemination. There are temperature trackers inside all Primary Vaccine Stores, State Vaccine Stores and District Vaccine Stores and information is uploaded on a real-time basis about temperature inside the facility on to a central server," Bhushan added.

Once the vaccine reaches the Sub centre Session Site, there is a requirement for beneficiary registration, on the basis of which District Magistrate can allocate the session based on the requirements, Bhushan said. "There is no need for beneficiary registration of healthcare and frontline workers as their data will be taken from a bulk database that has been populated onto the CO-WIN Vaccine Delivery Management System," the health secretary said.

"At Session Allocation, details of vaccination to the beneficiary, information about the next dose will be captured and communicated digitally. "CO - WIN will also give permission to create a



Member (Health), NITI Aayog Dr. Vinod K. Paul along with the Secretary, Ministry of Health & Family Welfare, Rajesh Bhushan addressing a press conference on the actions taken, preparedness and updates on COVID-19, in New Delhi on Tuesday. (ANI Photo)

Unique Health ID. After both doses a QR code certificate will also be generated which can be stored on Government's DigiLocker app", he added.

He also said that in case of any Adverse Effect Following Immunisation, there is a provision for real time reporting. Other features include SMS in 12 languages, 24X7 helpline, Chat Bot assistance etc. As of now more than 90,000 users have been trained in more than 700 districts. "No major issues were observed in operational aspects of the program. Minor issues noted in Co-WIN for further enhancement which have been addressed. All States expressed confidence in the operational guidelines and IT platform for large scale programme implementation. We have also done multiple dry run for the software," said Bhushan.

The government on January 3 announced that the Subject Expert Committee of Central Drugs Standard Control Organisation (CDSCO) has granted permission for restricted emergency use of Pune based Serum Institute of India's vaccine (Covishield), subject to multiple regulatory conditionalities and permission of restricted use in emergency situation in public interest as an abundant precaution, in clinical trial mode, especially in the context of infection by mutant strain, to Bharat Biotech International Ltd., Hyderabad for its vaccine Covaxin.

Amidst the controversy over lack of efficacy data on Covaxin, Dr Balram Bhargava, director general at the Indian Council of Medical Research (ICMR) clarified that the emergency use authorisation of the two vaccines by the drug regulator and said that safety, efficacy and immunogenicity data are required for approval or a vaccine in a non-emergency situation. "The existing pandemic situation with high mortality available science, and a lack of definite and treatments are considered by SEC for accelerated approval. It is in our legal provision in a pandemic situation, restricted use is considered based on safety and immunogenicity data while phase three is still ongoing immunogenicity data generated through phase two clinical trial serves as a surrogate for efficacy," said Bhargava.

"The clinical trial rule, 2019, the Clinical Trial Registry (CTR) provides for considering phase two results to guide approval. This subject expert committee guides the drug controller general of India in the process of decision making for restricted use under emergency situation," he said. While Pune-based Serum Institute of India (SII) is manufacturing Covishield which is developed by Oxford University and pharma giant AstraZeneca, Covaxin-- is developed by Bharat Biotech in association with the country's apex biomedical research body ICMR.

Bhargava said that covidshield is safe and immunogenic and its data shows that it is non inferior to UK product. For Covaxin, the ICMR chief said that the Phase 1 and 2 clinical trial showed very low adverse events, T cell memory response and in the Phase 3 clinical trial with 25,800 participants there were no safety concerns. "There will be a restricted use in clinical trial mode with consent of the vaccine taker with follow ups," said Bhargava.

Covid-19 vaccination is expected to reduce the disease burden in India which is currently at the second spot in the world after the USA in terms of the covid-19 cases. The total tally of covid-19 cases on Tuesday climbed to 1,03, 58,056 and the toll has increased to 1,51,057. India reported 16,375 new cases of covid-19 in last 24 hours. Also, the total number of cases infected with the new strain of the novel Coronavirus first reported in the UK now stands at 71.

Of all the covid-19 cases, 10 States/UTs have contributed 80.05% of the new cases, the union health ministry said. Maharashtra reported 4,875 cases in the last 24 hours. Kerala recorded 3,021 new cases while Chhattisgarh reported 1,147 daily cases yesterday. Also, 70.15% of the total 201 case fatalities that have been reported in the past 24 hours are from Ten States/UTs. At least 14.42% of new fatalities reported are from Maharashtra which reported 29 deaths. West Bengal and Punjab also saw a fatality count of 25 and 24 contributing another 12.44% and 11.94% of the fatalities, the health ministry said.

<https://www.livemint.com/science/news/indias-covid-19-vaccination-program-to-start-by-13-january-government-11609861001399.html>

