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THE TIMES OF INDIA

Thu, 02 Sept 2021

Uttar Pradesh to give land for BrahMos missile manufacturing for Re 1

Lucknow: UP government will provide land for setting up a plant in Lucknow for manufacturing of next generation BrahMos missiles on a token lease of Re 1.

Union minister Rajnath Singh with CM Yogi on Tuesday

This was informed by Rajnath Singh on Tuesday at the function organised in Chowk for the inauguration and foundation laying of 180 infrastructure projects worth Rs 1,710 crore.

"BrahMos missiles will be manufactured by the Defence Research and Development Organisation (DRDO) in Lucknow. It is part of the memorandum of understanding signed between DRDO and UP Expressways Industrial Development Authority (UPEIDA) during Defence Expo held last year in February. When DRDO proposed setting up a manufacturing plant in Lucknow, it took just an hour for chief minister Yogi Adityanath to decide that be it 100 or 200 acre, whatever land is required will be given at a lease of Rs 1 token money," said Singh amid a thunderous applause from the gathering.

On August 24, BrahMos Aerospace CEO and MD, Sudhir Kumar Misra, in a letter to UPEIDA CEO Awanish Awasthi had sought 200-acre land for the BrahMos missile manufacturing project which is the part of Defence Corridor being developed in UP. The delegation from Aerospace had also met CM Yogi Adityanath. The estimated cost of the project is about Rs 300 crore. The CM has also estimated that over 5,000 people will get direct and 10,000 indirect employment from the venture.

https://timesofindia.indiatimes.com/city/lucknow/uttar-pradesh-to-give-land-for-brahmos-missile-manufacturing-for-rs-1/articleshow/85824001.cms

The Indian EXPRESS

Thu, 02 Sept 2021

HAL's basic trainer aircraft ready for certification clearance, says official

Sources said the aircraft would cost around Rs 50 crore and HAL has invested over Rs 600 crore to develop it

By Aksheev Thakur

Bengaluru: After demonstrating ten spins on August 4, and completing night sorties over the last couple of days, the HTT-40 (Hindustan Turbo Trainer-40) trainer aircraft, that has been built by Hindustan Aeronautics Limited, is ready for certification clearances.

During Aero India 2021, HAL received a Request for Proposal from IAF for 70 such aircraft. (Representational Photo)

Senior officials at HAL said night sorties of the aircraft were carried out on August 31 and September 1. "We are done with spin and entire certification testing. Now, we will be going ahead with the process of certification clearances," the official added.

Intended to replace the HPT-32 (Hindustan Piston Trainer), the HTT-40 is a basic training aircraft developed for the first stage of the training of rookie pilots in the Indian Air Force. In stage two, they graduate to flying the Kiran Mark II trainer jet while the third stage involves training on the Hawk advanced trainer aircraft.

Sources said the aircraft would cost around Rs 50 crore and HAL has invested over Rs 600 crore to develop it.

Initially, delays in the development of the aircraft had resulted in the IAF placing orders for procurement of 75 foreign-made Pilatus PC-7 Mk II turboprop trainers to meet its requirements in 2012. The Ministry of Defence (MoD) in 2015 chose to buy 38 Pilatus aircraft from the Swiss maker with the remaining 68 to be sourced from HAL.

However, in 2019, the MoD suspended business dealings with the Swiss manufacturer owing to a probe by the Central Bureau of Investigation into alleged irregularities in the procurement order for the aircraft.

In 2015, HAL had completed designing the HTT-40 and the following year, the first prototype flew in presence of the then defence minister Manohar Parrikar.

During Aero India 2021, HAL received a Request for Proposal (RFP) from the IAF for 70 aircraft with additional clauses for 38 more.

The certification clearances for the HTT-40 will be given against the Program Compliance and Quality Review (PCQR) protocols following which, the production will take place at HAL's manufacturing units at Bengaluru and Nashik.

HAL's basic trainer will have more than 60 per cent indigenous content and is supported by agencies such as the Centre for Military Airworthiness and Certification (CEMILAC), and the Aircraft and Systems Testing Establishment (ASTE) among others

In 2019, HAL stated that the HTT 40 has completed all major test points and meets the Preliminary Staff Qualitative Requirements (PSQR) issued by the air headquarters for the Basic Trainer Aircraft (BTA) program. It had also completed stalls, engine relights, inverted flying, acrobatic flying and systems testing.

On November 14, 2019, Air Chief Marshal RKS Bhadauria undertook his maiden flight in the HTT 40. During the sortie, he assessed flying characteristics of the aircraft including stall and spin capabilities.

The Defence Ministry in 2020 cleared the purchase of 106 HTT-40 aircraft from HAL.

"The negotiations are going on and hopefully by the end of the year, the ball will set rolling. We got the RfP from the IAF during the Aero Show and after that, the proposal was submitted. The next process is negotiation and audit. Hopefully, by the end of the financial year, we will sign the contract," a senior HAL official said.

The turbo trainer aircraft, with tandem seating, will be used for basic flying training, including aerobatics, instrument flying, navigation, close formation and night flying.

Having a top speed of 450 km/hr, the aircraft will have the technical parameters of modern aircraft systems like Full Authority Digital Engine Control with zero-zero ejection seats and multifunction displays. One of the features of the aircraft is that it has a high rate of climb and can take off from short distances. The aircraft can fly a maximum distance of 1,000 kilometres.

https://indianexpress.com/article/cities/bangalore/hals-basic-trainer-aircraft-ready-for-certification-clearance-says-official-7483925/

The EurAsian Times

Thu, 02 Sept 2021

From Rafale, Gripen & F-18 Jets, GE Aviation emerges as 'Top Choice' for aircraft engine after Indian Fighter Jet deal

Aviation experts believe India's failure to develop indigenous fighter jet engines will greatly benefit the US engine maker – GE Aviation

By Younis Dar

India's Light Combat Aircraft (LCA) program gained a significant boost with the state-owned HAL on 18 August signing the contract worth Rs 5375 crores (USD 716 million) with GE Aviation for the supply of 99 F404 engines.

File Image: HAL Tejas

GE Aviation also won a $1.65 billion US Navy contract for the repair, upgrade or replacement of 17 F414 engine components in support of the F/A-18 Hornet aircraft, the Department of Defense announced.

"General Electric Aviation [of] Lynn, Massachusetts is awarded a not-to-exceed $1.65 billion…contract for the repair, upgrade or replacement, inventory management, and required supply response times of 17 F414 engine components in support of the F/A-18 aircraft," the Defense Department said in a press release on Wednesday.

The contract will include a five-year base period and will be performed in Lynn, Massachusetts and Jacksonville, Florida, the release said. Work on the project is expected to be completed by August 2026, the release added.

The F404-GE-IN20 engines will power the 83 Tejas Mark 1A fighters ordered by the Indian Air Force from Hindustan Aeronautics Limited (HAL) under the largest ever domestic defense deal by the defense ministry.

Both Tejas Mark 1 and 1A use the F404-IN20, considered the highest thrust variant of the F404 family which incorporates GE's latest hot section materials and technologies, as well as a FADEC (Full Authority Digital Engine Control) for reliable power and outstanding operational characteristics.

FADEC enables ignition and control of all aspects of the jet engine performance digitally and such engines feature in all modern aircraft.

HAL chairman and managing director R Madhavan described it as the "largest-ever deal and purchase order placed by HAL for the LCA." He also said the HAL was working closely with GE for its support to pursue "the export potential of LCA and also to supply spares to the global supply chain of GE 404 engines."

"The F404 family of engines has proven itself in operations all over the world and we have committed to deliver all 99 engines and support services by 2029", Chris Cyr, Vice President of GE Aviation said at the signing of the deal.

Meanwhile, Madhavan had earlier said that a deadline of March 2022 had been set for the first flight of the Tejas MK-1A fighter. HAL has reportedly completed the preliminary and critical design review for several systems, which include the mission computer, digital map generator, and digital flight control systems.

The company is also working on integrating the critical systems such as AESA and the EW suite on the FOC version of LCA to test its eventual integration into the MK-1A final version.

GE-404 Family of Engines

For the last 40 years, GE's F404 engine variants have powered over 15 different production and prototype aircraft. Some of the prominent fighters include the F-117 Nighthawk, F/A-18 Hornet, KAI's T-50 Golden Eagle, HAL's Tejas Mk1, and Saab's JAS 39 Gripen.

The engine continues to power fighter aircraft around the world with no signs of retiring even after over four decades of strong performance.

The F404 continues to evolve and attract new customers. Boeing/Saab T-7A Red Hawk is powered by the F404's newest variant, the F404-GE-103, and the aircraft has been chosen to train a new generation of US Air Force pilots guaranteeing a safe future for the versatile engine.

The F404 family of engines also powers multiple Korean aircraft, with the latest indigenous South Korean KF-X fighter jet choosing an advanced version F414-GE-400K engine.

Korea Aerospace Industries is developing KF-X for the country's air force, which is considering retiring its fleet of McDonnell Douglas F-4 Phantom II and Northrop F-5E/F Tiger II fighters.

In fact, the French Rafale fighter aircraft started their journey using the F404 engine in the 1980s when the French M88 engines were still being tested. The first Rafale flew in 1986 using a couple of F404 engines.

The F404 family powers a wide range of fighter aircraft assigned to all sorts of missions from executing low-subsonic attacks to high-altitude interception. The first version of the F404 was developed to power the Boeing F/A-18, and non-afterburning derivatives powered the F-117A Stealth Fighter and the Singapore A4-SU Super Skyhawk, the company website claims.

According to GE, the F404 represents a revolution in ushering in economical fighter aircraft operations, with the engines requiring minimum maintenance helping bring down the operating cost of the aircraft.

As compared to the engines powering the F-16 and F-15s, the F404 had a lesser thrust, although that was somehow compensated by its lightweight and low operating cost.

GE is confident of the fact that F404 will continue to dominate the future with many countries failing to produce their own reliable engines. The company has multiple offers from nations developing their own aircraft, guaranteeing its presence in the military aviation market for a long time.

There will be orders from the makers of India's Tejas, South Korean-built T-50, and US T-7A, which will keep the company busy for another decade.

India is also ordering a heavier, more GE F-414 engine, which is expected to power the Tejas LCA Mark 2 fighter. The engine is likely to be later produced in India as larger units will be required.

With India opting to go with its indigenous fighter to form the backbone of its air force, GE will be one of the main beneficiaries of the decision with India's own Kaveri engine failing to take off.

GE had to compete with EuroJet Turbo GmbH, a Munich-headquartered defense company, which also pitched its EJ200 engine for the Tejas fighter. The latter was, however, defeated by the US engine maker due to a variety of reasons explained in an earlier article.

Described as the most versatile engine in its class, the F404 is here to stay and banking on its dependability and reliability, the engine will dominate the skies for the foreseeable future.

https://eurasiantimes.com/from-rafale-gripen-f-18-jets-ge-aviation-emerges-as-top-choice-for-aircraft-engine-after-indian-fighter-jet-deal/

Thu, 02 Sept 2021

Interview| India's drone market can grow to Rs 50,000 crore in 5 years, says Drone Federation of India Chief Smit Shah

India replaced drone rules that were considered restrictive with a more liberalised set of norms last month, noting the potential of the country becoming a global drone hub by 2030

By Yaruqhullah Khan

India's liberalised Drone Rules, notified on August 26, are seen as a major step in promoting the use of drones across various segments. However, quick implementation of the new rules and promoting their use is critical to developing the market in India, Smit Shah, director of the Drone Federation of India, told Moneycontrol in an interview.

Shah estimates the Indian drone market has the potential to grow to Rs 50,000 crore ($6.8 billion) or more in five years. The new norms are also in line with policies followed globally, he said. Edited excerpts:

Will the government's new Drone Rules push up commercial usage of drones in India? Where is it currently? Which sectors will adopt the commercial use of drones the earliest?

So, currently, drones are being used for aerial cinematography, land surveys, agriculture, construction progress monitoring, and roads, highways and railways.

The idea with the new rules is actually not which sectors will open up but the entire industry opening up because the set of rules that existed before this current policy did not allow for the commercial use of drones.

All drone operations before the new policy were non-compliant, which is why this policy is very important and now we will have drone businesses and drone operations legally conducted…

There's not one sector where drones will not be used – right from land record projects to various other domains like mining, telecom, disaster management, oil and gas.

How do the new Drone Rules compare with international regulations? What more is needed to push the commercial use of drones?

The government has actually come up with a policy that is at par with international standards… when compared with the policies in place in the US, European countries or Australia.

It's safe to say that from a legislation perspective, we are at par with international countries. Now, the biggest challenge will be to operationalise this and kickstart activities.

Under the new drone policy, the government has put in some requirements on the Digital Sky platform for the use of drones. So those things need to be operationalised – everything else looks good.

Anything in the new rules you are not pleased with?

As an industry representative, I would say there's a lot more work that needs to be done…. in implementation of these rules and promotion of drones and creating market opportunities.

But from a regulation, legislation perspective, there is not something we're particularly unhappy with. I think the drone industry in India would prefer some stability of policy… until businesses are established and able to generate some revenue.

What is the level of localisation of drone manufacturing and how long will it be before we see drones being made in India?

Drones as a finished product are being designed and assembled in India. Some of the specific components actually come from the US, European countries as well as China.

The challenge will not be about the design or assembly of drones, but it will be about component manufacturing, where India is lagging right now. A number of components used to make drones like batteries, motors and propellers are being imported due to lack of manufacturing facilities in India.

India as a country has been a bit slow in terms of the manufacturing ecosystem. With the new policy now announced, there is an opportunity to manufacture drones and even subcomponents with very particular needs.

How long before we see localisation at the ground level?

That has already started. There are companies that are trying to build motors, assemble battery packs and engineer propellers in India. There's no definite number to say when we will reach 100 percent localisation.

The government had come out with a policy back in March, which was deemed unfriendly. Can you give us some sense of the lobbying that went into making the rules friendlier?

The rules that were released in March 2021 were from a perspective of licensing and control. The idea of regulating the industry through extreme licensing cannot work because you're putting in the burden of compliance.

The rules published in March 2021 had the following problems:

1. Excessive licensing and permissions were required. There were more than 10 permissions and licences required for research and development, 12 of them required for manufacturing, and many more for importing and operating drones. It was very hard for companies to start a simple drone business.
2. There were some unimplementable equipment and technical requirements, which were mandated from day one. And the rules launched in March 2021 had severe fines, cognizable offences, which essentially demoralise the entire industry and do not incentivise anyone to take a risk.

After those rules were announced, the industry, academia and other stakeholders made written representations and gave feedback to the government and they took that into consideration while making the new rules.

What's the level of drone usage in farming in India, given that in the west drones are used to artificially create rain on arid land?

It's very nascent. Drones in agriculture can be used on two fronts – agriculture survey and monitoring and the other is agriculture spraying. In both segments, the use of drones in India is very small at the moment, but it's expected that agriculture could be one of the biggest use-cases for drones in India.

Globally, the cost of operating drones for companies is comparable with or slightly higher than the cost of labour. In India, since the cost of labour is so low, will companies adopt drones for deliveries and air taxis?

Air taxis, yes, because typically, from a cost perspective, train travel and flying are still quite different. People who prefer flights looking for speed or to save time, overlooking the cheapest mode of travel. So, I would say from the air taxi perspective, the cost should not be an issue.

But for drone delivery, yes, there are some concerns over economic feasibility. The sectors best suited for drone deliveries would be where the impact is higher, which is delivery of lifesaving drugs and even vaccines in rural areas where the healthcare supply chain is not effective and cold-chain storage is not possible.

Those would be the most effective use-cases and once the technology matures and the cost of operations comes down, we will move from a rural healthcare focus to urban delivery applications as well.

How many people in India are trained to fly drones that are not in the line of sight? How do you expect this number to grow in the next two years?

No one yet because the government is still conducting experiments on beyond visual line of sight. The industry is coming together to create industry-driven standards on how to train people to operate drones beyond visual line of sight. This technology is new so it is required that the industry creates standards and safety procedures, which we are currently working on.

How does the Indian industry plan to address drones used as weapons?

The best way to answer this question is through an example. Economic benefits from the automobile industry outweigh the rare instances of a car being used as a bombing instrument. The same is true of the drone industry. Since the technology is quite new, it may seem like a threat and as we start analysing the threat and we conduct more research into the subject, easy-to-deploy technology will emerge to identify and counter the threats from drones.

The only solution to rogue drones would be to deploy countermeasures or counter-drone equipment. There is no other way to stop someone from assembling a drone, strapping in explosives and flying it in an area because you can't control how people use technology, you can only build up defences.

How effective is the counter-drone technology available in India?

There are a few companies that make counter-drone technologies in India. The Defence Research and Development Organisation has created a counter-drone unit. There are some companies that have created indigenous counter-drone technologies.

We have a very sound capability of handling all existing threats... The only requirement is to actually give orders, deploy the systems and deploy them incrementally because the key difference between any other threat and this study is that this threat is new and it will continuously evolve.

What is the size of India's drone market? How do you expect it to grow?

Rough estimates suggest that in five years, it will be Rs 50,000 crore. But this is a very rough estimate. Depending on how the policy enables the use of drones and how quickly companies use this technology, the market may grow even more. The current size of the market is difficult to estimate because this is the first time that the policy has been legalised.

https://www.moneycontrol.com/news/business/interview-indias-drone-market-can-grow-to-rs-50000-crore-in-5-years-says-drone-federation-of-india-chief-smit-shah-7417951.html

COVID 19: DRDO's Contribution

VERDICT

Wed, 01 Sept 2021

DRDO provides Automated Oxygen Delivery System Technology to hospitals battling Covid-19

By Sumanthkuluru

Concept: India's Defence Research and Development Organisation (DRDO) has begun offering hospitals combating the current COVID-19 situation with SpO_2 (Blood Oxygen Saturation) Supplemental Oxygen Delivery System, an automatic system which is developed for Light Combat Aircraft (LCA) Tejas by Defence Bioengineering and Electromedical Laboratory (DEBEL), a division of DRDO. This product comes in the form of a Medical Oxygen Plant (MOP), which is a spin-off technology from the Tejas' Onboard Oxygen (OBOX) generation system.

Credit: Tatiana Shepeleva/Shutterstock

Nature of Disruption: The system observes SpO_2 levels of patients using the pulse oximeter worn on their wrists through wireless configuration. It controls the proportional solenoid valve to regulate the oxygen levels. Using nasal nares, the oxygen is delivered from a lightweight portable oxygen cylinder. The system helps hospitals avoid situations of hypoxia, where tissues in a patient's body do not receive an adequate amount of oxygen to meet the energy requirements of the body. The same situation happens to a COVID-19-positive patient because of the virus infection. The automated system is ideal for use in the household to monitor and change the flow of oxygen for COVID-19-positive patients with the controlled flow at 2/5/7/10 lpm flow. When the oximeter detects lower SpO_2 levels, it gives an alarm, and the system automatically increases oxygen flow based on SpO_2 setting. This optimal usage conserves oxygen resources and increases the patient's ability to fight the disease.

Outlook: DRDO's easy-to-use automated oxygen delivery system can prove to be a blessing in such a grim situation where medical resources are overburdened. The system is easily accessible to healthcare providers and can reduce the workload of medical staff to monitor the oxygen levels of the patient. With an automatic flow control system in place, the usage of oxygen supply can be optimized thus saving more lives in the process. The system would help hospitals alleviate the exigency in managing a huge number of COVID-19 patients nationwide.

https://www.verdict.co.uk/drdo-provides-automated-oxygen-delivery-system-technology-to-hospitals-battling-covid-19/

अमर उजाला

Thu, 02 Sept 2021

हवा से एक मिनट में 1000 लीटर ऑक्सीजन बनाने वाला प्लांट तैयार

पानीपत: कोरोना की संभावित तीसरी लहर से पहले ही सिविल अस्पताल पानीपत को प्रधानमंत्री नागरिक सहायता और आपातकालीन स्थिति निधि से ऑक्सीजन प्लांट की सौगात मिल गई है। यह प्लांट हवा से प्रति मिनट 1000 लीटर ऑक्सीजन तैयार करेगा। इससे 150 बेड को 24 घंटे ऑक्सीजन आपूर्ति की जा सकेगी। इस प्लांट को रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) डिजाइन किया है। अब यह तैयार हो चुका है। इसी सप्ताह में इसका प्रशिक्षण किया जाएगा। इसको लेकर पीएमओ (प्रिंसिपल मेडिकल आफिसर) जल्द डॉक्टरों के साथ मीटिंग करेंगे। प्रशिक्षण से पहले अस्पताल में पर्याप्त ऑक्सीजन की व्यवस्था की जाएगी। ये जाना जाएगा कि कितने मरीज ऑक्सीजन बेड पर हैं। कितने मरीजों की हालत गंभीर है। इसके बाद प्लांट का ट्रायल किया जाएगा।

पानीपत। सिविल अस्पताल पानीपत में एनएचआई द्वारा तैयार किया गया ऑक्सीजन प्लांट। - फोटो : Panipat

लार्सन एंड टर्बो (एलएंडटी) कंपनी ने कारपोरेट सोशल रिस्पांसिबिलिटी (सीसीआर) के तहत यह प्लांट पीएम केयर्स फंड में डोनेट किया है। इसी कंपनी के इंजीनियरों ने जनरेटर, कंप्रेसर, ड्रायर और दो टैंक सहित पूर्ण प्लांट को स्थापित करने के लिए काम शुरू कर दिया है। भारतीय राष्ट्रीय राजमार्ग प्राधिकरण (एनएचएआइ) ने शेड और फाउंडेशन तैयार किया है। अस्पताल प्रशासन ने पीडब्ल्यूडी इलेक्ट्रिक विंग के माध्यम से 250 वाट का डीजल जनरेटर भी क्रय किया है।

ऐसे बनती है हवा से ऑक्सीजन

वातावरण से हवा को कंप्रेस किया जाता है। फिल्टर की मदद से इसे शुद्ध कर ठंडा किया जाता है। इस पूरी प्रक्रिया में हवा में मौजूद ऑक्सीजन लिक्विड में तब्दील हो जाती है। इसे स्टोर किया जाता है, यही मेडिकल ऑक्सीजन है। कुछ प्लांट लिक्विड में तो कुछ गैस के रूप में ऑक्सीजन तैयार करते हैं।

हवा में 21 फीसद ऑक्सीजन

ऑक्सीजन हवा और पानी दोनों में मौजूद होती है। हवा में 21 फीसद ऑक्सीजन, 78 फीसद नाइट्रोजन और एक फीसद अन्य गैसें जैसे हाइड्रोजन, नियोन, जीनोन, हीलियम और कार्बन डाइआक्साइड होती हैं।

एक वयस्क को 550 लीटर ऑक्सीजन चाहिए

डॉ. सुदीप सांगवान ने बताया कि एक व्यक्ति को 24 घंटे में करीब 550 लीटर शुद्ध ऑक्सीजन चाहिए। श्रम करने पर अधिक ऑक्सीजन चाहिए। स्वस्थ व्यक्ति एक मिनट में 12 से 20 बार सांस लेता है। उसके ब्लड में ऑक्सीजन का सैचुरेशन लेवल 95 से 100 फीसदी के बीच होना चाहिए। ऑक्सीजन लेवल 90 से नीचे होने पर उसे कृत्रिम ऑक्सीजन दी जाती है।

डॉक्टरों की बैठक के बाद होगा ट्रायल

प्लांट तैयार हो चुका है। अब इसका ट्रायल होगा। इसके लिए डॉक्टरों के साथ बैठक की जाएगी। अस्पताल में ऑक्सीजन की पर्याप्त सप्लाई मंगवाई जाएगी। मरीजों की स्थिति जांची जाएगी। तब ट्रायल करेंगे। - डॉ. संजीव ग्रोवर, पीएमओ सिविल अस्पताल

https://www.amarujala.com/haryana/panipat/plant-ready-to-make-1000-liters-of-oxygen-in-one-minute-from-air-panipat-news-knl818441154

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Wed, 01 Sept 2021 10:28AM

President's Colour to be awarded to Naval aviation on 06 Sep 2021

Shri Ram NathKovind, the Hon'ble President of India, will award the President's Colour to Indian Naval Aviation at the ceremonial parade to be held at INS Hansa, Goa on 06 Sep 21. During the occasion, a Special Day Cover will be released by the Postal Department. The ceremony is expected to be attended by the Governor of Goa, RakshaMantri, Chief Minister of Goa, Chief of the Naval Staff several other civil and military dignitaries. The President's Colour is the highest honour bestowed on a military unit in recognition of its exceptional service to the nation. The Indian Navy was the first amongst the Indian Armed Forces to be awarded the President's Colour on 27 May 1951 by Dr Rajendra Prasad, the then President of India. Subsequent recipients of the President's Colour in the Navy include Southern Naval Command, Eastern Naval Command, Western Naval Command, Eastern Fleet, Western Fleet, Submarine Arm, INS Shivaji and the Indian Naval Academy.

Indian Naval Aviation came into being with acquisition of the first Sealand aircraft on 13 Jan 1951 and commissioning of INS Garuda, the first Naval Air Station, on 11 May 1953. Arrival of the armed Firefly aircraft in 1958 added an offensive punch, and the naval aviation steadily expanded its inventory to become an integral part of a formidable Navy. The year 1959 saw the commissioning of Indian Naval Air Squadron (INAS) 550 with 10 Sealand, 10 Firefly and three HT-2 aircraft. Over the years, a variety of rotary wing platforms have been added as well, ranging from the Alouette, the S-55, Seaking 42A and 42B; the Kamov 25, 28 and 31; the UH3H; the Advanced Light Helicopter and the latest in the line, the MH60R. Maritime reconnaissance (MR) also grew steadily with induction of the Super-Constellation from the Indian Air Force in 1976, the IL-38 in 1977 and the TU 142 M in 1989. Induction of Dornier 228 in 1991 and the state-of-the-art Boeing P 8I aircraft in 2013 marked the entry of modern high-performance MR aircraft.

The world witnessed the Carrier arm of Indian Naval Aviation coming of age with the induction of INS Vikrant, the first Aircraft Carrier, in 1957 and integral Sea Hawk and Alize Squadrons subsequently. INS Vikrant with its aircraft played a crucial role in the liberation of Goa in 1961 and again in the 1971 Indo-Pak war, where its presence on the Eastern seaboard proved decisive. Induction of INS Viraat along with legendary Sea Harriers in the mid-1980s strengthened Carrier operations of the Navy, which transformed into a reckonable force with the arrival of MiG 29Ks on the mighty INS Vikramaditya in the last decade. The Indian Navy's Carrier capability received significant fillip with sea trials of the indigenously built aircraft carrier, the new avtaar of INS Vikrant, commencing this month.

Today, Indian Naval Aviation boasts of nine air stations and three naval air enclaves along the Indian coastline and the in Andaman and Nicobar Islands. Over the past seven decades, it has transformed into a modern, technologically advanced and highly potent force with more than 250 aircraft comprising Carrier-borne fighters, maritime reconnaissance aircraft, helicopters and remotely piloted aircraft (RPA). The Fleet Air Arm can support naval operations in all three dimensions and will remain the first responder for maritime surveillance and HADR in the Indian Ocean Region. Naval aviation has distinguished itself during operations such as Op Cactus, Op Jupiter, Op Shield, Op Vijay and Op Parakram to name a few. It has also spearheaded HADR operations on behalf of the Indian Navy, providing relief to numerous IOR nations in addition to our countrymen, Op Castor in 2004, Op Sukoon in 2006, Op Sahayam in 2017, Op Madad in 2018, Op Sahayta in 2019 and the recently conducted rescue operations off Mumbai during Cyclone Tauktae in May 21 being examples.

Naval Aviation has been at the forefront in inducting women into the fighting arm of the Navy, and making them work shoulder to shoulder with their male counterparts. Naval Aviators have been decorated with one Mahavir Chakra, six Vir Chakras, one Kirti Chakra, seven Shaurya Chakras, one YudhSeva Medal and a large number of Nao Sena Medals (Gallantry) over the years. Award of President's Colour is testimony to the high professional standards and stellar operations performance of Naval Aviation, which has distinguished itself in service to the nation.

https://pib.gov.in/PressReleasePage.aspx?PRID=1750997

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 01 Sept 2021 10:28AM

राष्ट्रपति छह सितंबर, 2021 को नौसेना विमानन को ध्वज प्रदान करेंगे

राष्ट्रपति श्री रामनाथ कोविन्द छह सितंबर, 2021 को गोवा में आईएनएस हंस पर आयोजित एक रस्मी परेड में नौसेना विमानन को 'राष्ट्रपति का ध्वज' प्रदान करेंगे। इस अवसर पर डाक विभाग 'स्पेशल डे कवर' भी जारी करेगा। समारोह में गोवा के राज्यपाल, रक्षामंत्री, गोवा के मुख्यमंत्री, नौसेना प्रमुख तथा अन्य सैन्य और नागरिक विशिष्टजन के उपस्थित रहने की आशा है। राष्ट्र की अद्वितीय सेवा के लिये किसी भी सैन्य इकाई को प्रदान किया जाने वाला 'राष्ट्रपति का ध्वज' सर्वोच्च सम्मान होता है। भारतीय सशस्त्र बलों में भारतीय नौसेना को सबसे पहले यह सम्मान मिला था, जब भारत के तत्कालीन राष्ट्रपति डॉ. राजेन्द्र प्रसाद ने 27 मई, 1951 को उसे ध्वज प्रदान किया था। उसके बाद 'राष्ट्रपति का ध्वज' नौसेना के दक्षिणी कमान, पूर्वी कमान, पश्चिमी कमान, पूर्वी बेड़े, पश्चिमी बेड़े, पनडुब्बी इकाई, आईएनएस शिवाजी और भारतीय नौसेना अकादमी को भी प्राप्त हुआ।

भारतीय नौसेना विमानन उस समय अस्तित्व में आया, जब 13 जनवरी, 1951 को पहला सी-लैंड हवाई जहाज खरीदा गया तथा 11 मई, 1953 को पहला नौसेना हवाई स्टेशन आईएनएस गरुड़ का लोकार्पण किया गया था। वर्ष 1958 में सशस्त्र फायर-फ्लाई हवाई जहाज के आगमन से नौसेना की ताकत बढ़ी। उसके बाद नौसेना विमानन ने लगातार अपना विस्तार किया और साजो-सामान प्राप्त किया। इस तरह वह

अजेय नौसेना का अभिन्न अंग बन गया। वर्ष 1959 में भारतीय नौसेना हवाई बेड़े (आईएनएएस) 550 का लोकार्पण हुआ। इस स्क्वॉड्रन में 10 सी-लैंड, 10 फायर-फ्लाई और तीन एचटी-2 हवाई जहाज शामिल थे। समय बीतने के साथ नौसेना विमानन में विभिन्न प्रकार के रोटरी विंग वाले हवाई जहाजों के प्लेटफार्मों को भी जोड़ा गया। इन विमानों में एलोएट, एस-55, सी-किंग 42ए और 42बी, कामोव 25, 28 और 31, यूएच3एच, उन्नत हल्के हेलीकॉप्टर और अब तक के सबसे आधुनिक एमएच60आर जैसे विमान तथा हेलीकॉप्टर हैं। समुद्री निगरानी और टोह (एमआर) लेने की गतिविधियां भी तेजी से बढ़ रही हैं। इसके लिये 1976 में भारतीय वायु सेना के सुपर-कॉन्सटेलेशन, 1977 में आईएल-38 और 1989 में टीयू 142 एम को शामिल किया गया। वर्ष 1991 में डोर्नियर और 2013 में उत्कृष्ट बोइंग पी 81 हवाई जहाज को शामिल करने के क्रम में उन्नत एमआर हवाई जहाजों का पदार्पण हुआ।

दुनिया ने देखा कि पहले विमान वाहक पोत आईएनएस विक्रांत के आने से भारतीय नौसेना विमानन परिपक्व हो गया है। आईएनएस विक्रांत 1957 में शामिल किया गया था। इसके बाद सी-हॉक और एलाइज स्क्वॉड्रन को भी शामिल किया गया। आईएनएस विक्रांत ने 1961 में गोवा की मुक्ति और 1971 में भारत-पाक युद्ध में अपने युद्धक विमानों की ताकत दिखाई थी। पूर्वी समुद्री इलाके में उसकी उपस्थिति ने निर्णायक भूमिका निभाई थी। आईएनएस विराट और नामी-गिरामी सी हैरियर को 1980 के दशक के मध्य में शामिल किया गया था। इससे नौसेना का दम-खम और बढ़ा। भारतीय नौसेना विमान वाहक क्षमता ने उस समय और जोर पकड़ लिया, जब स्वेदशी विमान वाहक पोत और आईएनएस विक्रांत के नये अवतार का इसी माह समुद्री परीक्षण शुरू हुआ।

आज, भारतीय नौसेना विमानन के पास नौ हवाई स्टेशन और तीन नौसेना वायु ठिकाने हैं। ये सभी भारत की तटरेखा और अंडमान एवं निकोबार द्वीपसमूह में स्थित हैं। पिछले सात दशकों के दौरान, नौसेना विमानन आधुनिक, प्रौद्योगिकी आधार पर उन्नत और अत्यंत सक्षम बल के रूप में विकसित हो चुका है। इस समय उसके पास 250 से अधिक युद्धक विमान हैं, जिनमें विमान वाहक पोतों पर तैनात हवाई जहाज, समुद्र में टोह लेने वाले हवाई जहाज, हेलीकॉप्टर और दूर से यंत्र द्वारा चलाये जाने वाले हवाई जहाज शामिल हैं।

नौसेना का हवाई बेड़ा सभी तीन आयामों में नौसैन्य कार्रवाई में मदद करने में समक्ष है। वह हिन्द महासागर क्षेत्र (आईओआर) में समुद्री टोही गतिविधियों तथा मानवीय सहायता और राहत वाली एचएडीआर कार्रवाईयों में अग्रिम पंक्ति में कायम रहेगा। नौसेना विमानन ने ऑप्रेशन कैक्टस, ऑप जुपिटर, ऑप शील्ड, ऑप विजय और ऑप पराक्रम के दौरान अपना दम-खम दिखाया था। इसके अलावा और भी कई ऑप्रेशन हैं, जिनमें वह शामिल रहा है। नौसेना विमानन ने भारतीय नौसेना की तरफ से एचएडीआर ऑप्रेशनों का नेतृत्व किया था, जिनके तहत हमारे देशवासियों के अलावा कई आईओआर देशों को राहत पहुंचाई थी। इसके अलावा उसने 2004 में ऑप कैस्टर, 2006 में ऑप सुकून, 2017 में ऑप सहायम, 2018 में ऑप मदद, 2019 में ऑप सहायता और हाल में मई, 2021 में मुम्बई तट से दूर समुद्र में तौक्ते तूफान में बचाव कार्रवाई की थी। उसकी सक्रियता के ये कुछ उदाहरण हैं।

नौसेना के फौजी दस्तों में महिलाओं को शामिल करने के सिलसिले में नौसेना विमानन अग्रणी है। महिलायें यहां पुरुषों के साथ कंधे से कंधा मिलाकर काम करती हैं। नौसेना विमानन कर्मियों को एक महावीर चक्र, छह वीर चक्र, एक कीर्ति चक्र, सात शौर्य चक्र, एक युद्ध सेवा पदक और बड़ी संख्या में नौसेना पदक (वीरता) प्राप्त हो चुके हैं। 'राष्ट्रपति का ध्वज' नौसेना विमानन के उच्च पेशेवराना मानकों और नौसेना विमानन क्षेत्र में उसके शानदार प्रदर्शन का परिचायक है। इस क्षेत्र में अपनी सेवा से उसने देश में विशिष्टता हासिल की है।

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Press Information Bureau
Government of India

Ministry of Defence

Wed, 01 Sept 2021 4:58PM

Curtain raiser Indian Army to participate in multi-lateral exercise ZAPAD 2021 in Russia

A 200 personnel contingent of Indian Army will participate in Exercise ZAPAD 2021, a Multi Nation exercise being held at Nizhniy, Russia from 03 to 16 September 2021.

ZAPAD 2021 is one of the theatre level exercises of Russian Armed Forces and will focus primarily on operations against terrorists. Over a dozen countries from Eurasian and South Asian Region will participate in this signature event.

The NAGA Battalion group participating in the exercise will feature an all Arms combined task force. The exercise aims to enhance military and strategic ties amongst the participating nations while they plan & execute this exercise.

The Indian Contingent has been put through a strenuous training schedule which encompasses all facets of conventional operations including mechanised, airborne & heliborne, counter terrorism, combat conditioning and firing.

https://pib.gov.in/PressReleasePage.aspx?PRID=1751101

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 01 Sept 2021 4:58PM

भारतीय सेना रूस में बहु-पक्षीय अभ्यास जैपेड 2021 में भाग लेगी

भारतीय सेना का 200 सैनिकों का एक दल दिनांक 03 से 16 सितंबर 2021 तक रूस के निझनी में आयोजित होने वाला एक बहुराष्ट्रीय अभ्यास जैपेड 2021 में भाग लेगा।

जैपेड 2021 रूसी सशस्त्र बलों के थिएटर स्तर के अभ्यासों में से एक है और यह मुख्य रूप से आतंकवादियों के खिलाफ ऑपरेशन पर केंद्रित होगा। इस युद्धाभ्यास में यूरेशियन और दक्षिण एशियाई क्षेत्र के एक दर्जन से अधिक देश भाग लेंगे।

अभ्यास में भाग लेने वाली नागा बटालियन में एक ऑल आर्म्स कंबाइंड टास्क फोर्स होगी। अभ्यास का उद्देश्य भाग लेने वाले देशों के बीच सैन्य और रणनीतिक संबंधों को बढ़ाना है, भाग लेने वाले देश इस अभ्यास की योजना और निष्पादन करते हैं।

भारतीय दल को एक कठिन प्रशिक्षण कार्यक्रम के बाद रखा गया है जिसमें मशीनीकृत, हवाई और हेलीबोर्न, आतंकवाद रोधी, कॉम्बैट कंडीशनिंग एवं फायरिंग समेत पारंपरिक अभियानों के सभी पहलुओं को शामिल किया गया है।

https://pib.gov.in/PressReleasePage.aspx?PRID=1751178

Press Information Bureau
Government of India

Ministry of Defence

Wed, 01 Sept 2021 7:50PM

Opening ceremony Indo – Kazakhstan joint military exercise KAZIND-21

The India – Kazakhstan joint military exercise "KAZIND-21" commenced today at Training Node Aisha Bibi, Kazakhstan. This is the 5th Edition of Annual bilateral joint exercise of both Armies and will continue till 10th September 2021. The fourth edition of the exercise was held at Pithoragarh, India in Sep 2019.

The contingent comprises 120 troops from Kazakhstan and 90 soldiers from the Indian Army. Both the contingents will share their expertise and skills in the field of counter terror operations. The exercise will culminate in a 48 hours joint validation exercise scheduled on 08 & 09 September 2021. The validation exercise will be a test bed for the soldiers of both Armies as they would be undergoing challenges of actual operations in such scenarios.

This exercise will provide impetus to the ever growing military and diplomatic ties between the two nations. The joint exercise also reflects the strong resolve of both nations to counter terrorism and will to stand shoulder to shoulder to combat the same.

https://pib.gov.in/PressReleasePage.aspx?PRID=1751202

BUSINESS INSIDER INDIA

Thu, 02 Sept 2021

India is updating its air force for a modern war, and China isn't its only concern

By Benjamin Brimelow

- ***The Indian air force is in the midst of a massive modernization and expansion effort.***
- ***India has focused on archrival Pakistan for decades, but it is now contending with a much larger foe: China.***

Earlier this month, at the end of India's annual Independence Day parade in New Delhi, the Indian Air Force showed off its aircraft inventory in multiple flyovers of the Rajpath, a ceremonial boulevard in the capital.

The flyovers included transport aircraft, helicopter gunships, fighters, and fighter-bombers. It was the latest show of force for a military branch that, like its naval counterpart, is in the midst of a massive modernization and expansion effort.

A newly inducted Indian Air Force Rafael fighter jet on October 6, 2020. Mohd Zakir/Hindustan Times via Getty Images

Focused for decades on the threat from archrival Pakistan, India is now preparing its air force to fight another much larger foe: China.

With roughly 2,000 combat aircraft from its air force and navy, China has the largest aviation force in Asia and the third largest in the world. Worse for India, China's increasingly close relationship with Pakistan is

resulting in closer military cooperation, including joint development of fighter jets.

Faced with the potential for an air war against two enemies, the IAF is increasing its size and capabilities.

A significant inventory

With well over 1,000 aircraft itself, the IAF is by no means small. Since India's independence, it has mostly fielded Russian aircraft made entirely in Russia or licensed for local production.

Even today, the biggest fleets in the IAF inventory are those of the MiG-21, MiG-29, and the Su-30MKI - a version of Russia's Su-30 made specifically for and by India. (India signed a contract for the Su-30MKI in the 1990s and has built more than 200 of them domestically since the mid-2000s.)

The service also has some European models, such as SEPECAT Jaguars and Mirage 2000s, which are the IAF's primary strike platforms. But those aircraft, which were acquired in the 1980s, are showing signs of age, and the IAF plans to retire them by 2030.

India's MiG-21s, first introduced in the 1960s, are also expected to be retired by 2030 - even the modernized MiG-21 Bison models. The jet has a poor safety record; as of 2013, more than 480 of India's MiG-21s had been involved in accidents that had caused over 200 deaths.

Threats on two fronts

The Su-30MKI purchase was more than just a general upgrade. It came after the Pakistan Air Force in 1982 accepted the first of 28 US-made F-16s, which seriously increased the PAF's capabilities a decade after it last fought the IAF.

The US paused F-16 deliveries in 1990 because of Pakistan's nuclear program, but they resumed in 2005, and the PAF now has some 75 F-16s. Their use is conditional and closely monitored by the US, but Pakistan would likely have no qualms about using them in an all-out war.

In 2019, a series of skirmishes between India and Pakistan included airstrikes on each other's territory and resulted in one MiG-21 Bison being shot down by PAF fighters, possibly by an F-16. It was the first time since 1971 that air attacks had been conducted across the Line of Control.

During the Cold War, China sold Pakistan its J-6 and J-7 fighters, which were Chinese copies of Russia's MiG-19 and MiG-21. The PAF has also benefitted from Pakistan's closer ties with China in recent years.

Their air forces regularly conduct joint exercises, and they have even jointly developed a fourth-generation multirole combat aircraft, the JF-17, of which Pakistan has over 100.

China and Pakistan are now planning upgrades to Pakistan's JF-17 fleet, and China has announced the sale of 50 Wing Loong II combat drones to Pakistan. Pakistan may also acquire Chinese strike aircraft.

China's own air force also poses a threat to the IAF. Particularly worrying for India are the J-10 and J-11 fighters and the J-20 stealth fighter.

The aerial threat from China was abundantly clear after last year's deadly standoff along its disputed border with India.

India has a longer history of air operations in the area, but China is rapidly building and expanding air bases and defenses along its western borders.

A major modernization

Appreciating the threats, the IAF has committed to modernization.

In 2016, India signed a contract with French firm Dassault Aviation four 36 Rafale multirole fighters. Twenty-six of them have been delivered so far, and some have already been deployed to counter possible Chinese aggression.

The IAF has also purchased 15 CH-47 Chinook helicopters and 22 AH-64 Apache gunships, both of which have also been deployed to the border region.

India has developed its own lightweight fighter jet, the HAL Tejas, and has about 20 in service. The original order for 40 fighters was supplemented by an additional order of 83 improved Tejas Mark 1A variants, with a second production line built to speed up production.

To meet its needs in the near-term, India is buying another 21 MiG-29s and 12 Su-30MKIs. It is also upgrading its MiG-29 fleet and modifying its Su-30MKIs to be able to fire Brahmos cruise missiles.

The IAF is also seeking 114 medium multirole combat aircraft.

The US-made F/A-18E/F and F-15, the French-built Rafale, the European-made Eurofighter Typhoon, and Russia's MiG-35 and Su-35 - all twin-engine jets - are in the running, as are the single-engine Swedish-built JAS 39 Gripen and US-built F-21, a version of the F-16 designed specifically for India.

India also has a number of high-profile domestic projects in development. It plans to fly a prototype from its own fifth-generation stealth fighter program by 2025 and recently unveiled an unmanned fighter jet program.

India has relied on foreign suppliers for much of its military hardware - especially Russia, with which it has a longstanding but increasingly fraught relationship - but many of the new acquisition efforts will require some degree of local production as part of Prime Minister Narendra Modi's "Make in India" program aimed at boosting domestic manufacturing.

Amid ongoing tensions with China and renewed uncertainty about the future in Afghanistan, India's efforts to expand and modernize its air force show how serious it is about countering the threat from its two most contentious neighbors.

https://www.businessinsider.in/international/news/india-is-updating-its-air-force-for-a-modern-war-and-china-isnt-its-only-concern/articleshow/85853446.cms

Forbes

Thu, 02 Sept 2021

As India liberalizes its drone rules, Billionaires aim for the skies

By Ramakrishnan Narayanan

Barely five months after announcing the Unmanned Aircraft Systems Rules, which had been met with a tepid response, the Indian government has had a quick rethink. Last week it announced the Liberalized Drone Rules, 2021, which promise to make life infinitely less complicated for drone operators.

Indian naval officers speak with representatives of Adani Defence and Aerospace standing next to a Hermes 900 Unmanned Aerial Vehicle (UAV) during his visit to their stall in the exhibition area on the third day of the five-day Aero India 2019 Airshow at the Yelahanka Air Force Station in Bangalore on February 22, 2019. MANJUNATH KIRAN/AFP via Getty Images

The new rules, says a government press release, are built on the premise of trust, self-certification and non-intrusive monitoring, while balancing safety and security considerations. The country's newly appointed civil aviation minister Jyotiraditya Scindia is confident that India has the potential to be a global drone hub by 2030.

The Drone Rules have abolished several approvals, cut down the paperwork from 25 forms to five, and reduced the types of fees from a complex 72 to a mere four. The quantum of fees will now be nominal and has been delinked from the size of the drone. For

example, the fee for a remote pilot license has been reduced from 3,000 rupees (about $40), to a mere 100 rupees (about $1.35) for all categories of drones.

The government plans to develop a user-friendly digital sky platform with an interactive airspace map displaying green, yellow and red zones. No permissions will be required for operating drones in green zones. There will no longer be any restriction on foreign ownership in Indian drone companies, while the import of drones will be regulated by the Directorate General of Foreign Trade. The coverage of drones under Drone Rules will be increased from 300kg to 500kg, including drone taxis.

Smit Shah, Director, Drone Federation of India, an industry body, says the government has taken a most pragmatic and industry-friendly approach by repealing the March rules and replacing them with a new set of guidelines. “These new rules put India on a par with other countries as far as regulation goes. It is now up to the industry to make use of the opportunity.”

Some Indian billionaires seem to be prepared to grab this. Billionaire Mukesh Ambani’s Reliance Industries has a majority stake in drone manufacturer Asteria Aerospace, which has developed drones weighing between 15 kilos to less than 2 kilos. India’s second-richest person Gautam Adani’s group company Adani Defence Aerospace, has tied up with Israeli company Elbit Systems to make unmanned aerial vehicles in a factory in south India. Tata Advanced Systems, part of the diversified conglomerate Tata Group, is focusing on designing and developing mini and micro UAVs, while Mahindra Defence, a unit of billionaire Anand Mahindra’s Mahindra & Mahindra group, has tied up with Aeronautics of Israel for naval shipborne UAVs.

Shah estimates the market potential to be over 500 billion rupees ($6.85 billion) in the next five years; already there are over 100 drone companies and more than 200 service providers in the country. These include startups such as Detect Technologies, which uses unmanned aerial vehicles to monitor oil industry structures, and Aarav Unmanned Systems, which has successfully raised venture capital funding,

India’s civil aviation regulator, Director General of Civil Aviation, had imposed a blanket ban on the use of drones in the country in 2014 after someone tried to deliver pizzas using a drone. The government unveiled the first drone policy in 2018, which was restrictive and sought to impose absolute control over the sector. Since then, the government and industry have worked together to evolve guidelines.

Recently, the Civil Aviation Ministry permitted drone trials by a few companies, including Mahindra & Mahindra, the government-owned steel company SAIL, Bayer Crop Science and even the state government of Karnataka for various purposes. Restaurant aggregators and food delivery firms such as Zomato and Swiggy have been involved in drone trials for food deliveries. Others have been conducting trials for delivering medicines and other essentials in remote parts of the country, while several states have expressed interest in using drones to deliver Covid-19 vaccines to India’s hinterland. According to Shah, with the new rules, the sky is the limit.

https://www.forbes.com/sites/nramakrishnan/2021/08/31/as-india-liberalizes-its-drone-rules-billionaires-aim-for-the-skies/?sh=79a600577d1b

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Thu, 02 Sept 2021

Physicists find 'magnon' origins in 2D magnet

By Jade Boyd

Rice physicists have confirmed the topological origins of magnons, magnetic features they discovered three years ago in a 2D material that could prove useful for encoding information in the spins of electrons.

Rice University graduate student Lebing Chen used a high-temperature furnace to make chromium triiodide crystals that yielded the 2D materials for experiments at Oak Ridge National Laboratory's Spallation Neutron Source. Credit: Jeff Fitlow/Rice University

The discovery, described in a study published online this week in the American Physical Society journal *Physical Review X*, provides a new understanding of topology-driven spin excitations in materials known as 2D van der Waals magnets. The materials are of growing interest for spintronics, a movement in the solid-state electronics community toward technologies that use electron spins to encode information for computation, storage and communications.

Spin is an intrinsic feature of quantum objects and the spins of electrons play a key role in bringing about magnetism.

Rice physicist Pengcheng Dai, co-corresponding author of the *Physical Review X* study, said inelastic neutron-scattering experiments on the 2D material chromium triiodine confirmed the origin of the topological nature of spin excitations, called magnons, which his group and others discovered in the material in 2018.

The group's latest experiments at Oak Ridge National Laboratory's (ORNL) Spallation Neutron Source showed "spin-orbit coupling induces asymmetric interactions between spins" of electrons in chromium triiodine, Dai said. "As a result, the electron spins feel the magnetic field of moving nuclei differently, and this affects their topological excitations."

In van der Waals materials, atomically thin 2D layers are stacked like pages in a book. The atoms within layers are tightly bonded, but the bonds between layers are weak. The materials are useful for exploring unusual electronic and magnetic behaviors. For example, a single 2D sheet of chromium triiodine has the same sort of magnetic order that makes magnetic decals stick to a metal refrigerator. Stacks of three or more 2D layers also have that magnetic order, which physics call ferromagnetic. But two stacked sheets of chromium triiodine have an opposite order called antiferromagnetic.

That strange behavior led Dai and colleagues to study the material. Rice graduate student Lebing Chen, the lead author of this week's *Physical Review X* study and of the 2018 study in the same journal, developed methods for making and aligning sheets of chromium triiodide for experiments at ORNL. By bombarding these samples with neutrons and measuring the resulting spin excitations with neutron time-of-flight spectrometry, Chen, Dai and colleagues can discern unknown features and behaviors of the material.

In their previous study, the researchers showed chromium triiodine makes its own magnetic field thanks to magnons that move so fast they feel as if they are moving without resistance. Dai said the latest study explains why a stack of two 2-D layers of chromium triiodide has antiferromagnetic order.

"We found evidence of a stacking-dependent magnetic order in the material," Dai said. Discovering the origins and key features of the state is important because it could exist in other 2D van der Waals magnets.

Additional co-authors include Bin Gao of Rice, Jae-Ho Chung of Korea University, Matthew Stone, Alexander Kolesnikov, Barry Winn, Ovidiu Garlea and Douglas Abernathy of ORNL, and Mathias Augustin and Elton Santos of the University of Edinburgh.

More information: Lebing Chen et al, Magnetic Field Effect on Topological Spin Excitations in CrI3, *Physical Review X* (2021). DOI: 10.1103/PhysRevX.11.031047

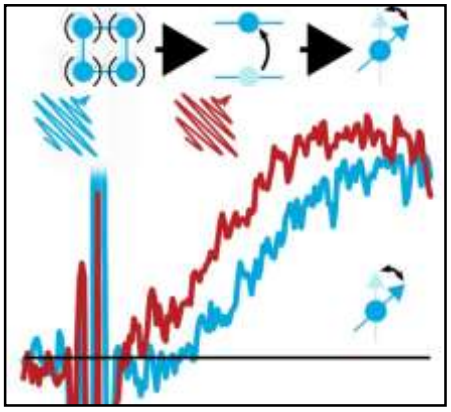
Journal information: *Physical Review X*

https://phys.org/news/2021-09-physicists-magnon-2d-magnet.html

Thu, 02 Sept 2021

Ultrafast electronic control of magnetic anisotropy by mid-infrared light

One of the most important tasks in modern information technologies is controlling spin directions in magnets. State-of-the-art hard disk drives and large-volume magnetic storage used in data centers require magnetization in solids to switch their directions in nanoseconds, corresponding to GHz frequency, or even faster speeds. An ever-increasing demand for writing speed has pushed researchers towards extensive research in optical techniques using femtosecond laser pulses.



(Top panel) Schematic image of the magnetic anisotropy control by resonant pumping of phonon (blue) and 4f electrons (red). (Bottom panel) Spin dynamics measured after MIR pumping tuned at 4f electronic transition (red) exhibits immediate onset of reorientation, while ultrafast heating of phonon system (blue) results in a delayed onset reflecting finite thermalization time. Credit: The University of Tokyo, University of Konstanz, Osaka University

When very short, intense laser pulses in the near-infrared wavelength range are absorbed in magnets, a complex energy exchange occurs between the electronic, lattice, and spin systems, resulting in the modification of magnetic anisotropy. Understanding how such internal energy transfers between subsystems following ultrafast photoexcitation result in the change of magnetic anisotropy is crucial for the implementation of efficient and ultrafast magnetic recording, reaching beyond picoseconds or even femtoseconds in the future.

In this work, researchers from University of Konstanz, The University of Tokyo, and Osaka University have shown that the photoexcitation of electronic and lattice degrees of freedom at femtosecond time scales results in distinctly different temporal evolutions of the magnetic anisotropy in the prototypical weak ferromagnet $Sm_{0.7}Er_{0.3}FeO_3$.

This rare-earth orthoferrite exhibits a so-called spin reorientation transition (SRT) in which a change of the spin direction occurs at a critical temperature. By irradiating the sample with an intense, femtosecond mid-infrared laser pulse resonantly tuned to a phonon frequency and probing the ultrafast spin dynamics due to spin reorientation, the SRT was found to occur with a delayed onset. Here, the relatively slow thermalization of the crystal lattice limits the spin dynamics. In contrast, when exciting the 4f electronic transition of the rare-earth Sm^{3+} ions, it was found that the SRT dynamics started immediately.

This result indicates that the magnetic anisotropy is altered by means of a purely electronic change without emitting excessive heat into the lattice system. The data indicate that the speed of this ultrafast anisotropy modification reaches a time scale of tens of femtoseconds—much faster than the spin dynamics itself. Thus, the 4f electronic pumping may allow for ultrafast "triggering" of the magnetization switching in future spintronics devices that operate below picosecond time scales.

"The influence of the ultrafast lattice heating following infrared photoexcitation has been widely investigated so far. However, this is the first time that the roles of the lattice and electronic transitions on the ultrafast magnetic anisotropy have been clearly distinguished at femtosecond time scales," authors say.

Since transition-metal compounds that contain rare-earth elements are among the most widely used magnets in the modern world, the scheme demonstrated here is expected to pave the way for a new non-thermal route to ultrafast control of spin dynamics in an important class of materials.

More information: "Ultrafast control of magnetic anisotropy by resonant excitation of 4f electrons and phonons in $Sm_{0.7}Er_{0.3}FeO_3$," *Physical Review Letters*: doi.org/10.1103/PhysRevLett.127.107401

Journal information: *Physical Review Letters*

https://phys.org/news/2021-09-ultrafast-electronic-magnetic-anisotropy-mid-infrared.html

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Thu, 02 Sept 2021

Fast tool developed for quantum computing and communication

Isaac Nape, an emerging South African talent in the study of quantum optics, is part of a crack team of Wits physicists who led an international study that revealed the hidden structures of quantum entangled states. The study was published in the renowned scientific journal, *Nature Communications*, on Friday, 27 August 2021.

Credit: Wits University

Nape is pursuing his Ph.D. at Wits University and focuses on harnessing structured patterns of light for high dimensional information encoding and decoding for use in quantum communication.

Earlier this year he scooped up two awards at the South African Institute of Physics (SAIP) conference to add to his growing collection of accolades in the field of optics and photonics. He won the award for "Best Ph.D. oral presentation in applied physics," and jointly won the award for "Best Ph.D. oral presentation in photonics."

In May, he was also awarded the prestigious 2021 Optics and Photonics Education Scholarship from the SPIE, the international society for optics and photonics, for his potential contributions to the field of optics, photonics or related field.

Faster and more secure computing

Now Nape and his colleagues at Wits, together with collaborators from Scotland and Taiwan offer a new and fast tool for quantum computing and communication. "Quantum states that are entangled in many dimensions are key to our emerging quantum technologies, where more dimensions mean a higher quantum bandwidth (faster) and better resilience to noise (security), crucial for both fast and secure communication and speed up in error-free quantum computing.

"What we have done here is to invent a new approach to probing these 'high-dimensional' quantum states, reducing the measurement time from decades to minutes," Nape explains.

Nape worked with Distinguished Professor Andrew Forbes, lead investigator on this study and Director of the Structured Light Laboratory in the School of Physics at Wits, as well as postdoctoral fellow Dr. Valeria Rodriguez-Fajardo, visiting Taiwanese researcher Dr. Hasiao-Chih Huang, and Dr. Jonathan Leach and Dr. Feng Zhu from Heriot-Watt University in Scotland.

Are you quantum or not?

In their paper titled "Measuring dimensionality and purity of high-dimensional entangled states," the team outlined a new approach to quantum measurement, testing it on a 100 dimensional quantum entangled state.

With traditional approaches, the time of measurement increases unfavorably with dimension, so that to unravel a 100-dimensional state by a full quantum state tomography would take decades. Instead, the team showed that the salient information of the quantum system—the number of dimensions entangled and their level of purity—could be deduced in just minutes. The new approach requires only simple projections that could easily be done in most laboratories with conventional tools. Using light as an example, the team using an all-digital approach to perform the measurements. The problem, explains Nape, is that while high-dimensional states are easily made, particularly with entangled particles of light (photons), they are not easy to measure—the existing toolbox for measuring and controlling them is almost empty.

You can think of a high-dimensional quantum state like faces of a dice. A conventional dice has six faces, numbered one through six, for a six-dimensional alphabet that can be used for computing or for transferring information in communication. To make 'high-dimensional dice' means creating dice with many more faces: 100 dimensions equals 100 faces—a rather complicated polygon.

"In our everyday world, it would be easy to count the faces to know what sort of resource we had available to us, but not so in the quantum world. In the quantum world, you can never see the whole die, so counting the faces is very difficult. The way we get around this is to do a tomography, as they do in the medical world, building up a picture from many, many slices of the object," explains Nape.

But the information in quantum objects can be enormous, so the time for this process is prohibitive. A faster approach is a Bell measurement, a famous test to tell if what you have in front of you is entangled, like asking it "are you quantum or not?" But while this confirms quantum correlations of the dice, it doesn't say much about the number of faces it has.

Chance discovery

"Our work circumvented the problem by a chance discovery, that there is a set of measurements that is not a tomography and not a Bell measurement, but that holds important information of both," says Nape. "In technical parlance, we blended these two measurement approaches to do multiple projections that look like a tomography but measuring the visibilities of the outcome, as if they were Bell measurements. This revealed the hidden information that could be extracted from the strength of the quantum correlations across many dimensions."

First and fast

The combination of speed from the Bell-like approach and information from the tomography-like approach meant that key quantum parameters such as dimensionality and the purity of the quantum state could be determined quickly and quantitatively, the first approach to do so.

"We are not suggesting that our approach replace other techniques," says Forbes. "Rather, we see it as a fast probe to reveal what you are dealing with, and then use this information to make an informed decision on what to do next. A case of horses-for-courses."

For example, the team see their approach as changing the game in real-world quantum communication links, where a fast measurement of how noisy that quantum state has become and what this has done to the useful dimensions is crucial.

More information: Isaac Nape et al, Measuring dimensionality and purity of high-dimensional entangled states, *Nature Communications* (2021). DOI: 10.1038/s41467-021-25447-0

Journal information: *Nature Communications*

https://phys.org/news/2021-09-fast-tool-quantum.html

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Thu, 02 Sept 2021

Improved fabrication technique paves way for improved quantum devices

Physicists and engineers have found a way to identify and address imperfections in materials for one of the most promising technologies in commercial quantum computing.

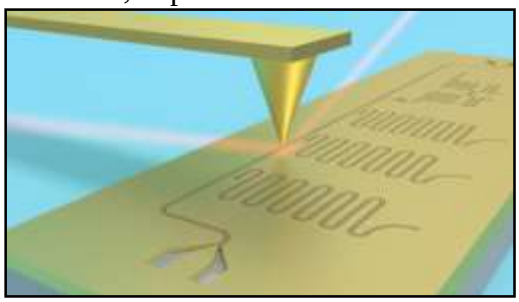
The University of Queensland team was able to develop treatments and optimize fabrication protocols in common techniques for building superconducting circuits on silicon chips.

Dr. Peter Jacobson, who co-led the research, said the team had identified that imperfections introduced during fabrication reduced the effectiveness of the circuits.

"Superconducting quantum circuits are attracting interest from industry giants such as Google and IBM, but widespread application is hindered by 'decoherence', a phenomenon which causes information to be lost," he said.

"Decoherence is primarily due to interactions between the superconducting circuit and the silicon chip—a physics problem—and to material imperfections introduced during fabrication—an engineering problem."

"So we needed input from physicists and engineers to find a solution."



Schematic of a superconducting circuit being imaged using terahertz scanning near-field microscopy. Credit: The University of Queensland

The team used a method called terahertz scanning near-field optical microscopy (THz SNOM)—an atomic force microscope combined with a THz light source and detector.

This provided a combination of high spatial resolution—seeing down to the size of viruses—and local spectroscopic measurements.

Professor Aleksandar Rakić said the technique enabled probing at the nanoscale rather than the macroscale by focusing light onto a metallic tip.

"This provides new access for us to understand where imperfections are located so we can reduce decoherence and help reduce losses in superconducting quantum devices," Professor Rakić said.

"We found that commonly used fabrication recipes unintentionally introduce imperfections into the silicon chips, which contribute to decoherence."

"And we also showed that surface treatments reduce these imperfections, which in turn reduces losses in the superconducting quantum circuits."

Associate Professor Arkady Fedorov said this allowed the team to determine where in the process defects were introduced and optimize fabrication protocols to address them.

"Our method allows the same device to be probed multiple times, in contrast to other methods that often require the devices to be cut up before being probed," Dr. Fedorov said.

"The team's results provide a path towards improving superconducting devices for use in quantum computing applications."

In future, THz SNOM could be used to define new ways to improve the operation of quantum devices and their integration into a viable quantum computer.

The results are published in *Applied Physics Letters*.

More information: Xiao Guo et al, Near-field terahertz nanoscopy of coplanar microwave resonators, *Applied Physics Letters* (2021). DOI: 10.1063/5.0061078

Journal information: *Applied Physics Letters*

CNBC

Thu, 02 Sept 2021

Covid could trigger a spike in dementia cases, say Alzheimer's experts

By Yen Nee Lee

Key Points

- ***The ongoing Covid-19 pandemic could cause a significant rise in the number of dementia patients in the long term, said the Alzheimer's Disease International.***
- ***Some research has shown that Covid infections can increase a person's likelihood of developing dementia and cause dementia symptoms to show up earlier, the group said.***
- ***The group's Medical and Scientific Advisory Panel, made up of global experts on dementia, has set up a working group to study the link between Covid and dementia.***

Singapore — The world may not be prepared for an impending wave of dementia and the additional cases that Covid-19 could bring, according to a group representing over 100 Alzheimer's and dementia associations globally.

The Alzheimer's Disease International is urging the World Health Organization and governments around the world to "urgently fast track research on the potential impact of COVID-19 on increasing dementia rates."

It says the pandemic could cause a significant rise in the number of dementia patients in the long term, as some research has shown that Covid infections can increase a person's likelihood of developing dementia and cause dementia symptoms to show up earlier.

People wearing masks wait to cross a road in the Shibuya district on Feb. 2, 2020 in Tokyo, Japan.

Dementia generally refers to a deterioration in the brain that impairs memory, thoughts, behavior and emotion. Alzheimer's disease is the most common form of dementia, and there is currently no cure for dementia.

In the short term, "dementia rates may drop temporarily as a result of the high number of deaths of people with dementia due to COVID-19, with between 25 to 45 percent of all COVID-19 deaths estimated to be of those with dementia," the London-based group said in a media release Wednesday. But over the longer term, the number of people with dementia "could rise significantly due to the neurological impact of COVID-19," it added.

Since the coronavirus first emerged in China in late 2019, more than 217 million cases of Covid-19 have been reported — and over 18 million were detected in the last 28 days, according to official data compiled by Johns Hopkins University.

The actual number of Covid cases globally is likely higher than what has been reported. That's in part due to factors such as lack of testing to uncover infections and insufficient capacity to report cases.

Covid and dementia

More should be done to understand the link between Covid dementia, said the Alzheimer's Disease International (ADI).

“Many dementia experts around the globe are seriously concerned by the link between dementia and the neurological symptoms of COVID-19,” said Paola Barbarino, chief executive of ADI.

The group’s Medical and Scientific Advisory Panel, made up of global experts on dementia, has set up a working group to study that link and make recommendations on how to deal with the problem.

Dr. Alireza Atri, a cognitive neurologist and chair of the advisory panel, said he’s “particularly concerned” about the effects the so-called long Covid. That includes symptoms such as loss of taste and smell, “brain fog” or a loss of mental clarity, as well as difficulties with concentration, memory and thinking, he added.

Atri, who’s director of Banner Sun Health Research Institute in the U.S., explained that Covid can damage and clot micro vessels in the brain, hurt the body’s immunity and cause inflammation.

That can give “easier access to things that can harm your brain” and cause symptoms of neurological disorders — such as dementia — to show up earlier, the doctor said.

Wave of dementia cases

The World Health Organization estimated that around 50 million people have dementia globally, with nearly 10 million new cases every year.

Even before Covid-19, forecasts showed that dementia cases could rise from 55 million to 78 million by 2030, according to ADI. Costs associated with dementia, including medical care and expenses, could rise to $2.8 trillion annually, the group added.

“We urge the WHO, governments and research institutions across the globe to prioritise and commit more funding to research and establish resources in this space, to avoid being further overwhelmed by the oncoming pandemic of dementia,” Barbarino said.

A greater understanding of the link between Covid and dementia can help authorities to manage the increased prevalence of dementia, and identify symptoms as early as possible, said Barbarino.

“Knowing the warning signs and symptoms of dementia enables people to seek out more information, advice and support, potentially leading to a diagnosis,” she said.

“We need people to be aware of the possible link between long-COVID and dementia, so they know to self-monitor for symptoms and catch it in its tracks.”

https://www.cnbc.com/2021/08/31/covid-could-cause-significant-rise-in-dementia-cases-alzheimers-group.html