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ThePrint

Thu, 04 March 2021

India, Philippines sign key defence pact, set ball rolling for BrahMos missile sale

The agreement is a framework for procurement of defence equipment by the Philippines from India but is not a contract for Brahmos supersonic missiles

By Snehesh Alex Philip

New Delhi: India and Philippines have signed a key enabling pact that will pave the way for government-to-government deals on defence equipment including the supersonic BrahMos cruise missile in the future.

The 'Implementing Arrangement' concerning the procurement of defence material and equipment was signed by the two countries at the Camp Aguinaldo, headquarters of the Armed Forces of the Philippines Tuesday.

Indian Ambassador to Philippines, Shambu S. Kumaran, signed the pact on behalf of New Delhi.

Sources in the defence and security establishment told ThePrint that this does not mean that the much awaited BrahMos deal is happening anytime soon.

The deal was signed by the two countries at Camp Aguinaldo, headquarters of the Armed Forces of the Philippines Tuesday | Facebook

They explained that the agreement involves the procurement of defence equipment by the Philippines from India.

"This is sort of a foundational agreement for government-to-government contracts. This does not mean that a contract for BrahMos is being signed," a source said.

The Straits Times quoted the Philippines Defence Secretary Delfin Lorenzana, who witnessed the signing ceremony, as saying, "We are buying the BrahMos missiles."

Lorenzana said the agreement served as a guide for the Philippines and India on "policies and procedures in the defence procurement".

It also served as a "legal framework for the procurement under the government-to-government modality," he added.

The Brahmos sale

Plans for the possible sale of the Indo-Russian BrahMos supersonic cruise missiles to the Philippines had hit a roadblock in December last year with Manila citing budgetary limitations caused by the Covid-19 pandemic.

Roman Babushkin, the Deputy Chief of Mission at the Russian Embassy in India, had earlier said in December that the Indo-Russian joint venture (JV) firm — BrahMos Aerospace — is looking at exporting the weapons to other countries, starting with the Philippines.

ThePrint had then reported that the Russian statement had come as a surprise to the Indian security and defence establishment, because while talks were underway with the Philippines, the modalities were yet to be worked out.

BrahMos is the only supersonic cruise missile in the world that flies at three times the speed of sound (2.8 Mach). It is much sought-after because it can be used for both coastal defence and ground attack.

India had offered a $100 million line of credit for the purchase of the weapon.

While India is working to extend the range of the BrahMos missile, the version that will be exported will come with a "normal range" of 290 km.

https://theprint.in/defence/india-philippines-sign-key-defence-pact-set-ball-rolling-for-brahmos-missile-sale/615300/

THE TIMES OF INDIA

Thu, 04 March 2021

BrahMos missiles' supply: India signs key pact with Philippines for sale of 'defence equipment'

New Delhi: India on Tuesday signed a key pact with the Philippines for the sale of "defence material and equipment", which are likely to include BrahMos cruise missiles.

Philippine Defence Secretary Delfin Lorenzana, who was also present at the pact's signing ceremony in Manila, has reportedly said that his country is buying BrahMos missiles.

Philippine Department of National Defense (DND) said on Facebook on Tuesday that Defence Undersecretary Raymundo Elefante and India's Ambassador to the Philippines Shambu S. Kumaran signed an "implementing arrangement" for "procurement of defence material and equipment".

The Facebook post said Lorenzana was also present at the signing ceremony.

"We are buying the BrahMos missiles," Lorenzana was quoted as saying by The Straits Times. There was no statement from the Indian side.

India and Russia have been planning to export the BrahMos supersonic cruise missile to the Philippines and several other countries, Russian Deputy Chief of Mission in India Roman Babushkin had said on November 12 in an online briefing.

The BrahMos missile is produced by an Indo-Russian joint venture and it can be launched from submarines, ships, aircraft or from land platforms.

On October 18 last year, a naval version of the BrahMos missile was successfully test-fired from an indigenously-built stealth destroyer of the Indian Navy in the Arabian sea.

Days later, the Indian Air Force test-fired an air-launched version of the BrahMos missile from a Sukhoi fighter aircraft in the Bay of Bengal.

A number of countries including in the Gulf region have shown interest in procuring the missile.

India has already deployed a sizeable number of the original BrahMos missiles and other key assets in several strategic locations along the LAC with China in Ladakh and Arunachal Pradesh.

The IAF is also integrating the Brahmos supersonic cruise missile on over 40 Sukhoi fighter jets to bolster the overall combat capability of the force.

https://timesofindia.indiatimes.com/india/brahmos-missiles-supply-india-signs-key-pact-with-philippines-for-sale-of-defence-equipment/articleshow/81316210.cms

Business Standard

Thu, 04 March 2021

Govt opened up space, atomic energy and DRDO sectors for youth: PM Modi

He further added that in this year's budget, the government has given more focus on the making of institutions and their access

Prime Minister Narendra Modi on Wednesday said that the Central government has opened up several sectors including agriculture, space, atomic energy and Defence Research and Development Organisation (DRDO) for the talented youth of the country, adding that keeping knowledge and research within limits is an injustice to the nation.

"It is an injustice to the nation to keep knowledge and research within limits. With this mindset, we are opening up several sectors such as agriculture, space, atomic energy and DRDO for our youth that is full of potential," PM Modi said while speaking at a webinar on the implementation of Union Budget 2021 in the education sector.

Prime Minister Narendra Modi | Photo: PTI

He further added that in this year's budget, the government has given more focus on the making of institutions and their access.

"For the first time in India, we are developing a National Research Foundation, at a cost of Rs 50,000 crore," the Prime Minister said.

Talking about the reforms in the technology sector, PM Modi said, "There's a new tradition of Hackathons for start-ups in India. It will strengthen both the youth as well as the industry."

"Under National Initiative for Developing and Harnessing Innovation, over 3,500 startups have been nurtured," Modi added.

Urging institutions to adopt the best practices so as to train the youth with the global skills in sync with global demand, PM Modi said, "The institutions and individuals in the education sector have to work together to bring international campuses to India and adopt the best practices across the globe in collaboration and added that people must map the skillsets in sync with global demand and the youth must be prepared on the same lines."

Elaborating on the steps being taken by the Central Government during this year's Budget for the education sector, he said, "For building an 'Atmanirbhar Bharat', it is important that the youth have self-confidence. Self-confidence comes when youth has faith in their education, skills and knowledge."

Prime Minister also underlined the need to use the talents of anyone across India and said, "it is very important to come out of the linguistic barrier to make it possible.

(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)

https://www.business-standard.com/article/news-ani/govt-has-opened-space-atomic-energy-and-drdo-sectors-for-youth-pm-modi-121030300532_1.html

THE TIMES OF INDIA

Thu, 04 March 2021

Opened up space sector, DRDO to boost research: Modi

By Surendra Singh

New Delhi: PM Narendra Modi on Wednesday said the Centre has opened up several sectors, including space, atomic energy and Defence Research and Development Organisation (DRDO) with an aim to encourage research and innovation among youth.

"In India of the 21st century, we have to keep the 19th century mindset behind. There is a saying that 'knowledge is such an asset that doesn't grow when you keep it with you but it grows when you share it'. If we limit knowledge and research, then we will do injustice to our youth. With this mindset, we are opening up several sectors such as space, atomic energy, DRDO and agriculture for youth of this country who are full of potential," Modi said while speaking at a webinar on the implementation of Budget in the education sector.

Two important steps have been taken to give a boost to innovation and the R&D ecosystem. For the first time, Indian solutions of international standards related to the meteorology sector have been found and are being improved. "We have also taken a very big step in geospatial data reforms. Such data is now freely made available to Indian youth, entrepreneurs and desi startups, and they should make the most of it," he said while referring to sweeping changes in India's mapping policy.

"For the first time in India, we are developing a National Research Foundation, at a cost of Rs 50,000 crore. This will give a boost to research work in academia and industry. The desi pharma and vaccine research has provided the country security and respect (amid the pandemic). Seven national institutes on pharmaceutical education and research have already been declared Institutes of National Importance. Now, efforts are being made to expand the scope of biotechnology research to boost food production and help increase farmers' income," he said.

Talking about the reforms in the technology sector, the PM said, "There's a new tradition of hackathons for start-ups in India. It will strengthen both the youth as well as the industry. Under the National Initiative for Developing and Harnessing Innovation, over 3,500 startups have been nurtured."

Modi said the country's focus should be on the hydrogen mission. "India has tested the hydrogen vehicle. Now, we have to make our industry ready to utilise hydrogen as a fuel for transport," he said. The government is also going to launch a deep sea mission that will be goal-oriented, based on a multi-sector approach and will help the country unlock the potential of the blue economy, he said.

The PM said, "For building an 'Atmanirbhar Bharat', it is important that the youth have self-confidence. Self-confidence comes when youth have faith in their education, skills and knowledge. For meeting global demands, we have to make our youth industry-ready and upgrade their skills. Simultaneously, we have to be 'vocal' about 'local'."

https://timesofindia.indiatimes.com/india/opened-up-space-sector-drdo-to-boost-research-modi/articleshow/81321842.cms

The EurAsian Times

Thu, 04 March 2021

Tejas Jets – US Engine, Israeli Radar & Indian tech make LCA Tejas a deadly Fighter Jet: Analysis

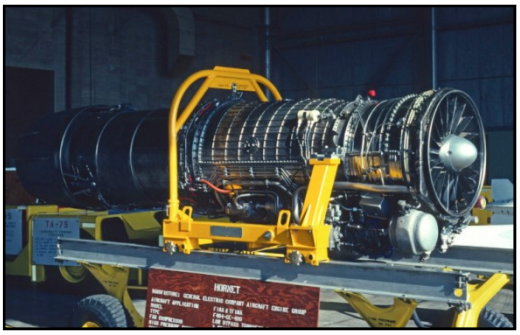
A combination of a US-made engine, Israeli radar and electronic warfare equipment, and Indian technology is set to make the HAL Tejas a formidable fighter jet

By Manjis Asthana

Developed by the state-owned Hindustan Aeronautics Limited (HAL), Tejas is a single-engine, fourth-generation, multirole light combat aircraft (LCA). Given its capabilities, experts see Tejas as the future aircraft for the Indian Air Force.

It has been designed by the Aeronautical Development Agency (ADA) in collaboration with HAL's Aircraft Research and Design Centre (ARDC) for the primary use of the Air Force and the Navy under the LCA program.

The development of the HAL Tejas fighter is considered a flagship project under Prime Minister Narendra Modi's 'Make in India' initiative.



General Electric's F404 engine

The initiative puts a major focus on the country's ambition to become self-reliant in the field of defense manufacturing, and the Tejas fighter jet project by the Bengaluru-headquartered HAL is a shining example of it.

As per government estimates, the LCA Tejas fighter is 60 percent Indian by value with the figure expected to go up in the coming years as India takes steps to cut foreign dependence on its parts.

The fighter jet program has used an interesting combination of Indian tech, American engines, and Israeli radar and electronic warfare (EW) systems.

It wasn't India's original plan to acquire the American engine as it had already eyed the acquisition of home-grown Kaveri jet engines.

Developed by the Defence Research and Development Organisation (DRDO), the Kaveri was a low bypass twin-spool turbofan jet engine slated to provide an 80 KN power pack and adequate 'thrust to weight' ratio for the Tejas.

However, it was deemed insufficient for the requirements of the Tejas, and a decision was taken to procure General Electric's GE F404 engine.

At a time when neighbors Pakistan and China have faced troubles in receiving advanced components from other nations, India on the other hand found itself spoiled for choices.

After the failure of the Kaveri engine, India had reportedly received orders of assistance from Russia, France, the US, and the UK. Finally, India chose to pick the US-made GE F404 engine.

The American engine will provide that much-needed stability and reliability to the Tejas fighter jet at a time when China's most advanced fifth-generation J-20 fighter has been plagued with engine problems.

Produced by GE Aviation, the General Electric F404 is a family of afterburning turbofan engines falling in the 10,500–19,000 lbf (47–85 kN) class (static thrust).

The engine provides a maximum thrust of 11,000 lbf (48.9 kN) and a thrust of 17,700 lbf (78.7 kN) with an afterburner. The overall pressure ratio of the engine stays at 26:1, the Bypass ratio is 0.34:1, with the Thrust-to-weight ratio being 4.8 (dry), 7.8 (afterburning).

As per General Electric, the F404 is one of the most versatile engines in its class, making it a compelling option for applications around the world.

The engine was also praised by former Indian Air Force chief Birender Singh Dhanoa, saying that the American-made engines had excellent fuel efficiency and that he had rarely seen that among the contemporary fighter jets that he had flown during his career.

Like in the case of the engine, countries such as France, Israel, and Sweden had shown interest to supply the radar and EW equipment for the Tejas.

India chose to procure ELM-2052 active electronically scanned array (AESA) radars and ELL-8222WB electronic warfare (EW) suites from Elta Systems, a subsidiary of the Israel Aerospace Industries (IAI).

The EL/M-2052 advanced Airborne Fire Control Radar (FCR) has been designed for air superiority and advanced strike missions.

It is based on fully solid-state active phased array technology, which enables the radar to achieve a longer detection range, high mission reliability, and a multi-target tracking capability of up to 64 targets.

On the other hand, the ELL-8222SB airborne Electronic Warfare (EW) self-protection jammer has been based on cutting-edge Active Phased Array technology which allows high sensitivity target detection and transmission of accurate and narrowly focused high power directional beams.

It creates the most effective target jamming available currently, making the fighter stand supreme in aerial combat.

https://eurasiantimes.com/us-made-engine-israeli-radar-indian-tech-make-lca-tejas-a-formidable-fighter-jet

The Tribune

Thu, 04 March 2021

India's Tejas to be flown by Lankan pilots

New Delhi: Indian Air Force planes flew over 'Galle Face' in Colombo Sri Lanka as part of display in the neighbouring country.

Tejas multi-role combat jet. File photo

An IAF contingent comprising Surya Kiran & Sarang aerobatic display teams, respectively, and the light combat aircraft -- the Tejas -- are part of the display teams as the Sri Lanka Air Force (SLAF) is celebrating its 70th anniversary.

The IAF contingent arrived in Colombo on February 27. The flypast will be significant and reminiscent of the IAF's Suryakiran Display Team performance at the Golden Jubilee celebrations of SLAF, two decades ago. The Tejas Trainer sent to Sri Lanka will afford the opportunity of independent sorties for the Sri Lanka Air Force pilots.

During the deployment, the officers from the Sri Lanka Air Force and Sri Lanka Navy will also have first-hand experience onboard the Indian Navy's Maritime Patrol Aircraft Dornier. Sri Lanka Air Force pilots and Sri Lanka Navy observers will fly along with the Indian crew.

During the course of the two-day visit, the IAF Chief is scheduled to interact with various dignitaries and the heads of Services of the Armed Forces of Sri Lanka.

70th Anniv of Sri Lanka Air Force

An IAF contingent comprising Surya Kiran & Sarang aerobatic display teams and the light combat aircraft — the Tejas — are part of the display teams as the Sri Lanka Air Force (SLAF) celebrates its 70th anniversary.

https://www.tribuneindia.com/news/world/indias-tejas-to-be-flown-by-lankan-pilots-220331

Firstpost.

Tue, 02 March 2021

Amid tensions at LAC, India and China ramp up drone technology to boost operational preparedness

India is preparing for the next generation of warfare by building indigenous capacities for unmanned platforms, including drones

Turkish drone manufacturer Baykar Defense has reportedly begun the phase of conceptual design. Over the years, Turkey has made rapid strides in drone technology by the right mix of planned financial investment and technical know-how.

Representational Image. ANI

Ever since the ongoing conflict between Armenia and Azerbaijan broke out, the world has taken note of the extensive use of high-end military technology by using armed/unarmed drones. A number of videos have flooded social media demonstrating how artificial intelligence-based weapons system are being used and how they will shape the future of warfare.

Taking a cue from this, India and China have been bolstering their arsenal amid the border standoffat eastern Ladakh.

As per this *India Today* report, India is preparing for the next generation of warfare by building indigenous capacities for unmanned platforms. Hindustan Aeronautics Limited (HAL) had unveiled a blueprint of its plans to bring in such platforms during the Aero India show in Bengaluru earlier this year.

India is the world's third-biggest military spender worldwide after the United States and China.

According to *Hindustan Times,* Unmanned Aerial Vehicles (UAVs), or drones as they are popularly called, constitute one area where India lags behind and ends up relying on costly imports from countries such as the USA and Israel.

According to experts cited in this report, the standoff was an 'eye-opener' for both India and China to ramp up deployments and surveillance equipment to solve issues at this 'long-neglected border, including 'strategic area denial' and 'border clarification'.

China one of the biggest manufacturer of drones

China also seems to have taken note of the value added by drones to warfare, and it has been stepping up its game. According to the Stockholm International Peace Research Institute (SIPRI), which tracks global arms flows, China has not just built drones for the People's Liberation Army but also exported 163 large weapons-capable UAVs to 13 countries from 2008 to 2018. It even gave four Wing Loong II armed drones to Pakistan to protect the China-Pakistan Economic Corridor and Gwadar port.

According to *Global Times,* the mouthpiece of the Chinese Communist Party, the need of the hour for the Chinese government is to deploy "more smart equipment like drones" along the

country's borders. As per the newspaper, the proposal to deploy "more sophisticated, larger drones in its arsenal" came after the months-long border standoff between China and India.

But before we understand where India stands with drones, let us take a look at what drones are.

What are UAVs or drones?

Unmanned Aerial Vehicles (UAVs), or drones, have been around for nearly four decades now. These were initially developed for intelligence, surveillance and reconnaissance (ISR). Armed with an array of sensors and having long endurance, the UAVs gave real-time intelligence of the battlefield to direct the fire of various weapon systems.

As per this *Print.in* report, the US, Israel and China are the biggest manufacturers of drones of all types.

China used to initially rely on imports but has now become a leading manufacturer and seller of these modern weapons and has both unarmed and armed drones in its inventory.

So where does India stand?

So far, India has been using drones primarily for ISR purposes, reports *The Wire.in.* Amid the recent standoff with China, bolstering its military with the latest technology is the need of the hour, for which India has already been making moves in the combat drone/UCAV spectrum. The Indian Army is in possession of around 90 Heron Surveillance drones and the Harop loitering munition. Additionally, the army is planning to acquire more of these from Israel.

In August 2020, the defence approved the upgrade of Heron UAVs. The upgrade will include arming some of these drones, sources in the Indian security establishment told *India Today.*

Recently, Indian Army Chief General MM Naravane spoke at a webinar, asserting how the use of disruptive technologies like drones is the future of warfare.

Underlining the use of drones by Azerbaijan recently in Idlib and Armenia, he said the offensive technology has challenged the traditional prima donnas: the tanks, the artillery and the dug-in infantry.

Indicating that India is also enhancing its drone warfare capabilities, he referred to the Indian Army showcasing swarm drone offensive striking multiple targets during the Army Day Parade earlier this year.

He also stated that India has been looking at ramping up its drone capabilities and that during the recent Aero India show, several indigenous platforms were on display.

Hindustan Aeronautics Limited (HAL) has started work on an ambitious project, modelled on US project Skyborg, that will allow teaming up of unmanned aircraft and vehicles with manned jets. It would be used with currently manned fighter jets such as LCA Tejas and Rafale. This would both complement and maximise the effectiveness of these planes.

According to this *India Today* report, during the defence expo in Lucknow in February last year, HAL and Israel Aerospace Industries (IAI) from Israel and Dynnamatic Technologies Limited signed an agreement for the manufacturing of drones.

Another big project in the pipeline is the Rustom-2.

Rustom-2, India's medium-altitude long-endurance drone being developed by the Defence Research and Development Organisation, is targeted to achieve a huge milestone in April when it will take off from its test range in Karnataka's Chitradurga to fly for more than 18 hours at a height of over 27,000 feet, reports *Hindustan Times.*

"This will be a huge step," a senior government official told the newspaper about the indigenously-developed unmanned aerial vehicle (UAV) designed for strategic reconnaissance and surveillance operations.

Recently, Lt. General Y K Joshi (GoC-in-C Northern Command), in an interview with *News18,* said that the Indian Army had been given a 'free hand' by the government in operational preparedness against China during the standoff. As per Joshi, the success in the disengagement was the result of joint efforts at the military and diplomatic levels, which is being constantly monitored using Unmanned Aerial Vehicles (UAVs) and men on the ground.

With inputs from agencies
https://www.firstpost.com/india/amid-tensions-at-lac-india-and-china-ramp-up-drone-technology-to-boost-operational-preparedness-9361941.html

The EurAsian Times

Thu, 04 March 2021

As India's drone industry takes wing, Turkey emerges as a 'UAV superpower'

At a time when India has started investing in military drone technology, Turkey has taken another leap forward by designing its first artificial intelligence (AI)-powered combat drone

By Mansij Asthana

Turkish drone manufacturer Baykar Defense has reportedly begun the phase of conceptual design. Over the years, Turkey has made rapid strides in drone technology by the right mix of planned financial investment and technical know-how.

DRDO's Rustom-2 drone

Turkey's emergence as a 'drone superpower' was "by no means peaceful and comes as a result of various confrontations between Russian and Turkish proxies in the Near East," according to Nicholas Velazquez, who writes for Geopolitical Monitor.

The capabilities demonstrated by the Bayraktar TB2 UAV in the Libyan and Syrian civil wars have consolidated Turkey's position as a drone superpower. It has now joined the august company of the US, Israel, China, and the UK that have achieved many milestones in the UAV domain.

Indian Drone Industry

In contrast, India seems to be taking baby steps in the UAV sector with the country recently setting up a dedicated Drones Directorate to focus on the UAV. While drones have been in use for military purposes since 1999, their commercial usage was legalized only in 2018.

The Indian drone market has grown rapidly in the past two years. An industry report indicates that the market for drones in the country is expected to reach around $885.7 million by the end of this year.

In light of the projected growth, the country will have to produce UAVs meant for different sectors, and it looks like New Delhi is moving forward with it.

The country's premier research institute, the Defence Research and Development Organisation (DRDO), is currently developing the indigenous Rustom-2 medium-altitude long-endurance drone. "This will be a huge step," said a senior government official.

The indigenously-developed drone has been designed for strategic reconnaissance and surveillance operations. In April, India will test-fly the homegrown Rustom-2 drone from the Chitraguda test range in Karnataka. It is learned that the drone will fly for more than 18 hours at a height of over 27,000 feet.

Also known as the Tactical Airborne Platform for Aerial Surveillance-Beyond Horizon 201 (Tapas-BH), the Rustom-2 drone successfully completed the last flight test in October last year after flying at an altitude of 16,000 feet for a period of eight hours.

Currently, the DRDO Bharat light surveillance quadcopter drone, which has been developed by DRDO for the Indian Army, is considered the most advanced homegrown drone.

Although India is moving forward, how long it will take to catch up with the likes of Turkey, only time will tell.

Turkey Making Rapid Progress

The development of an AI-powered combat drone has been labeled as the "top priority program" by Haluk Bayraktar, General Manager of Baykar Defense.

"The privately-owned company will complete the conceptual design phase by 2023, the centennial of the Turkish republic," said Bayraktar.

The upcoming AI-powered drone will possess the ability to fly at an operating altitude of 40,000 feet and will be able to carry out missions for five hours while being connected to a satellite communications data network.

In addition, the drone will be super-speedy with a cruise speed of 0.8 Mach. It will be able to carry a maximum of 1 ton of payload and would be used in close air support, strategic assault, hostile air defense system attacks, and missile assault missions.

https://eurasiantimes.com/indias-drone-industry-takes-wing-turkey-emerges-as-a-uav-superpower

Hindustan Times

Thu, 04 March 2021

Experts slam claim that human activity not behind Chamoli disaster

By Neeraj Santoshi, Jayashree Nandi, Amanjeet Singh Salyal

- ***Dhyani added that the burden on the ecology due to construction on Himalayan slopes made the region prone to disasters.***

Chandigarh, Dehradun, New Delhi: Experts on Wednesday criticised a statement by a top official of a research body under the DRDO who said human activity was "not the immediate cause" for the glacial breach and the deadly floods in Uttarakhand's Chamoli district last month, and that there was a need to look at "demographic pressures". Over 70 people died after the February 7 floods that occurred after a lake breached at Nanda Devi glacier in the upper reaches of Himalayas, triggering flash floods that hit Raini village and nearly washed away two hydropower plants downstream.

The Defence Geo-Informatics Research Establishment – a premier research body under the Defence Research and Development Organisation (DRDO) that is studying the reasons for the February floods – said the tragedy was not "immediately" a human-induced disaster. tragedy is concerned in our preliminary investigations the role of human activity is not the immediate cause," said Sinha. "It [glacial breach] was far away from the area where several constructions [NTPC hydel power project in Tapovan and Rishi Ganga hydel plant] are taking place," Sinha added.

Experts have repeatedly pointed out that glacial retreat due to climate crisis along with infrastructure projects such as dams could lead to large-scale disasters in the ecologically sensitive regions, while the proximity of human settlements could exacerbate loss of life and damage to property in Uttarakhand.

Hemant Dhyani, member of the Supreme Court-appointed expert body to study the environmental impact of hydropower projects after the deadly 2013 Kedarnath floods, questioned how the February disaster was not linked to human activity.

"Tragedy happened because over 200 people were working in two dams quite close to the glacial region. Had these dams not been here, the flash floods would have subsided without any loss to life and property", he said.

Dhyani added that the burden on the ecology due to construction on Himalayan slopes made the region prone to disasters.

"And our expert body had also said that these paraglacial zones (sediment hot spots in Himalayas close to the glaciers) are vulnerable areas and warned that such disasters can take place in these areas..." he said. The environmental activist was referring to another SC-appointed committee, of which he was a part and which had recommended against development projects in the Rishi Ganga catchment area in 2014. But all recommendations of the panel were not accepted by the government. "The Chamoli tragedy happened because they built dams so close to the glaciers. And this is the main human trigger in this tragedy," said Anil Joshi, founder of Dehradun-based NGO Himalayan Environmental Studies and Conservation Organization (HESCO).

Experts echoed their views.

"It's a preposterous statement. The official is belittling the tragedy... How can one ignore the impact of human induced climate change on the Himalayas... Any more unplanned construction or anthropogenic pressure on Uttarakhand will be suicidal," said Mallika Bhanot of the Ganga Ahvaan NGO.

Professor Anil Kulkarni of the Divecha Center for Climate Change at the Indian Institute of Science also cautioned there was a need to study the issue first. "We need to study the issue very critically before passing any judgement on this disaster. What was the distance between the Rishi Ganga power plant and the ice or rock which fell? Whether during the construction phase the project caused any micro-tremors? We don't know anything yet and there should be scientific rigour in investigation before concluding anything," said Kulkarni.

On Wednesday, Sinha also said, "There are certain indications before such disasters take place and for forecasting them we need to develop gadgets which can map such indications..."

https://www.hindustantimes.com/india-news/experts-slam-claim-that-human-activity-not-behind-recent-flood-101614799919874.html

ThePrint

Thu, 04 March 2021

Self-reliance in defence, cyber challenges in focus at Combined Commanders' meet starting today

Prime Minister Narendra Modi is set to address the Combined Commanders' Conference, which will be held in Gujarat between 4 and 6 March

By Aamrita Nayak Dutta

New Delhi: Indigenisation and self-reliance in defence, and challenges in the sphere of cyber space and unmanned systems will be key focus areas at the Combined Commanders' Conference beginning Thursday, ThePrint has learnt.

Prime Minister Narendra Modi will address the top commanders of the three defence forces at the tri-services event, which will be held at Kevadia in Gujarat between 4 and 6 March.

Defence Minister Rajnath Singh and senior Ministry of Defence officials will also be present at the event. Chief of Defence Staff (CDS) General Bipin Rawat will participate in the event for the first time after he took over as India's first CDS in 2020.

The last Combined Commanders' Conference was held in Jodhpur in 2018.

The event will also see participation of Junior Commissioned Officers and jawans from the Army and their equivalents in the other two services, for the first time, in specific sessions on HR issues pertaining to the military.

Apart from discussions on the operational readiness of the armed forces in the backdrop of the stand-off with China and continuing disengagement at the Line of Actual Control (LAC), self-reliance in defence will be among the key focus areas at the conference, defence sources told ThePrint.

"The defence purchase policies which came through recently, prioritising indigenous procurements, will be discussed. There would also be talks on the quality aspects of defence PSUs and the Ordnance Factory Board," said a source.

Last year, the Defence Acquisition Procedure, 2020, was unveiled, which prioritises capital acquisitions from domestic players over foreign ones.

The defence ministry last month earmarked around 64 per cent of its modernisation funds under the capital acquisition budget for 2021-22 — a sum of over Rs 70,000 crore — for purchases from the domestic sector.

Other subjects to be discussed

At the event, there would also be discussions on the dynamics of future warfare, underlining the emerging technologies in different spheres and the creation of joint theatre commands such as the Air Defence Command and the Maritime Theatre Command. These commands are expected to be raised in the next few months.

According to an *ANI* report, PM Modi is also expected to be briefed on the restructuring of the Army formations in view of the recent Chinese aggression in the Ladakh sector.

ThePrint had reported that the Army is planning to repurpose one of its existing strike corps as the Mountain Strike Corps.

Facilitating innovation in armed forces will also be discussed during one of the sessions at the event, said the source quoted above.

"A presentation by the DRDO (Defence Research and Development Organisation) chief is also on cards on the futuristic and indigenous systems which are in the pipeline for the organisation," the source said, adding an innovation and start-up display will also be organised.

During the last Combined Commanders' Conference, the government had cleared the creation of the Defence Cyber Agency and Defence Space Agency along with their research components.

https://theprint.in/defence/self-reliance-in-defence-cyber-challenges-in-focus-at-combined-commanders-meet-starting-today/615351/

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Wed, 03 March 2021 4:57PM

CAS visit to Sri Lanka

Air Chief Marshal RKS Bhadauria PVSM AVSM VM ADC, Chief of the Air Staff arrived at Colombo today on an invitation from Air Marshal Sudarshana Pathirana, Commander of Sri Lanka Air Force (SLAF). SLAF is celebrating its 70th anniversary on 02 Mar 21 and presentation of the President's colours to two of its Units on 05 Mar 21.

As part of his visit, the CAS will attend the inaugural ceremony on 03 Mar 21, during which a Flypast and Aerobatic Display is scheduled. The air show at Galle Face Colombo will see participation by an IAF contingent comprising of Suryakiran & Sarang Aerobatic Display Teams and Tejas LCA. The IAF contingent arrived in Colombo on 27 Feb 21. The flypast will be significant and reminiscent of the IAF's Suryakiran Display Team performance at the Golden Jubilee celebrations of SLAF, two decades ago.

During the course of the two day visit, CAS is scheduled to interact with various dignitaries and the heads of Services of the Armed Forces of Sri Lanka. IAF and SLAF have had consistent cooperative exchanges over the years and interact regularly through Headquarter level Air Staff talks to share valuable experiences in the fields of ground and flying training, professional military education, HADR & operational best practices. Recent years have also seen the two Air Forces increase inter-personnel engagements through exchange visits of serving personnel and families to both countries.

The presence of the CAS during the inaugural day of the Air Show reinforces the strength of IAF-SLAF ties. The visit will further strengthen the existing cooperative process and open up newer avenues of mutual interest.

https://pib.gov.in/PressReleasePage.aspx?PRID=1702240

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 03 March 2021 4:57PM

भारतीय वायुसेना अध्यक्ष की श्रीलंका यात्रा

भारतीय वायुसेना अध्यक्ष एयर चीफ मार्शल आर.के.एस. भदौरिया परम विशिष्ट सेवा मेडल, अति विशिष्ट सेवा मेडल, वीएम और एडीसी आज कोलम्बो पहुंचे। वे श्रीलंका एयर फोर्स के कमांडर एयर मार्शल सुदर्शन पथिराना के निमंत्रण पर वहां गए हैं। 02 मार्च 2021 को श्रीलंका एयरफोर्स की 70वीं वर्षगांठ है। इस कार्यक्रम में आगामी 05 मार्च 2021 को वह अपनी दो यूनिटों को प्रेसिडेंट क्लर्स प्रदान करेगी।

अपनी यात्रा के अंतर्गत भारतीय वायुसेना अध्यक्ष 03 मार्च 2021 को कार्यक्रम के उद्घाटन समारोह में हिस्सा लेंगे। इस दौरान फ्लाई पास्ट और एरोबैटिक डिसप्ले किया जाएगा। कोलम्बो के गाले फेस में होने वाले एयर शो में भारतीय वायुसेना की एक टुकड़ी भी शामिल होगी, जिसमें सूर्य किरण और सारंग एयोबेटिक डिसप्ले टीमें और तेजस एलसीए भी हिस्सा लेंगे। भारतीय वायुसेना की यह टुकड़ी 27 फरवरी 2021 को कोलम्बो पहुंच चुकी है। इस अवसर पर होने वाला फ्लाई पास्ट बहुत महत्वपूर्ण और दो दशक पहले हुए श्रीलंका एयर फोर्स के स्वर्ण जयंती समारोह में भारतीय वायुसेना की सूर्य किरण डिसप्ले टीम द्वारा किए प्रदर्शन की याद दिलाने वाला होगा।

अपनी दो दिन की यात्रा के दौरान भारतीय वायुसेना अध्यक्ष की मुलाकात श्रीलंका के बहुत से गणमान्य व्यक्तियों और सशस्त्र सेनाओं के प्रमुखों से होगी। भारतीय वायुसेना और श्रीलंका एयरफोर्स पिछले कई साल से लगातार सहयोगपूर्ण आदान-प्रदान कार्यक्रम करते रहे हैं और नियमित तौर पर मुख्यालय स्तर पर संपर्क में हैं। इन दोनों के बीच सतह पर कार्य और आकाश में उड़ान प्रशिक्षण, व्यवसायिक सैन्य शिक्षा, एचएडीआर और परिचालन संबंधी प्रक्रियाओं के संबंध में अनुभवों का आदान-प्रदान होता रहता है। हाल के वर्षों में दोनों वायुसेनाओं के अधिकारियों और उनके परिवारों ने एक-दूसरे के देश की यात्राएं की हैं और परस्पर संपर्क बढ़ा है।

एयर शो के उद्घाटन दिवस पर भारतीय वायुसेना अध्यक्ष की मौजूदगी भारतीय वायुसेना और श्रीलंका एयरफोर्स के संबंधों को मजबूत करेगी। इस यात्रा से मौजूदा सहयोग प्रकिया और मजबूत होगी व परस्पर दिलचस्पी के क्षेत्रों में नए आयाम खुलेंगे।

https://pib.gov.in/PressReleasePage.aspx?PRID=1702275

Press Information Bureau
Government of India

Ministry of Defence

Wed, 03 March 2021 5:25PM

MDL pays interim dividend of Rs 92.56 crore for FY 2020-21

Raksha Mantri Shri Rajnath Singh received an interim dividend cheque of Rs 92.56 crore for Financial Year (FY) 2020-21 from Defence Public Sector Undertaking (PSU) Mazagon Dock Shipbuilders Limited (MDL) in New Delhi on March 03, 2021. Chairman & Managing Director (CMD), MDL Vice Admiral Narayan Prasad (Retd) handed over the cheque to the Raksha Mantri in the presence of Secretary (Defence Production) Shri Raj Kumar.

With this, MDL has paid a total dividend of Rs 138.73 crore to the Government of India during FY 2020-21 including final dividend of Rs 46.17 crore for FY 2019-20. The company has declared interim dividend of Rs 109.11 crore @ 54.10 per cent of equity capital for FY 2020-21, Government share being 84.83 per cent.

The CMD also briefed Shri Rajnath Singh about the delivery of 3rd Scorpene submarine Karanj, due for commissioning on March 10, 2021 and commencement of sea trials of first ship Visakhapatnam of Project P-15B which is due for delivery later this year.

https://pib.gov.in/PressReleasePage.aspx?PRID=1702255

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Wed, 03 March 2021 5:25PM

एमडीएल ने वित्त वर्ष 2020-21 के लिए 92.56 करोड़ रुपये का अंतरिम लाभांश दिया

रक्षा क्षेत्र का सार्वजनिक उपक्रम (पीएसयू) मझगांव डॉक शिपबिल्डर्स लिमिटेड (एमडीएल) ने रक्षा मंत्री श्री राजनाथ सिंह को 03 मार्च, 2021 को नई दिल्ली में वित्तीय वर्ष 2020-21 के लिए 92.56 करोड़ रुपये का अंतरिम लाभांश चेक प्रदान किया। एमडीएल के अध्यक्ष एवं प्रबंध निदेशक (सीएमडी) वाइस एडमिरल नारायण प्रसाद (सेवानिवृत्त) ने रक्षा मंत्री को सचिव (रक्षा उत्पादन) श्री राज कुमार की उपस्थिति में यह चेक सौंपा।

इसके साथ ही मझगांव डॉक शिपबिल्डर्स लिमिटेड (एमडीएल) ने वित्त वर्ष 2020-21 के दौरान भारत सरकार को कुल 138.73 करोड़ रुपये का लाभांश दिया है जिसमें वित्त वर्ष 2019-20 के लिए 46.17 करोड़ रुपये का अंतिम लाभांश शामिल है। कंपनी ने वित्त वर्ष 2020-21 के लिए इक्विटी पूंजी के 54.10 प्रतिशत की दर से 109.11 करोड़ रुपये का अंतरिम लाभांश घोषित किया है, सरकारी हिस्सेदारी 84.83 प्रतिशत है।

अध्यक्ष एवं प्रबंध निदेशक (सीएमडी) वाइस एडमिरल नारायण प्रसाद (सेवानिवृत्त) ने श्री राजनाथ सिंह को 10 मार्च, 2021 को कमीशन की जाने वाली तीसरी स्कॉर्पीन पनडुब्बी करंज की डिलीवरी के बारे में भी जानकारी दी, साथ ही प्रोजेक्ट पी 15बी के पहले पोत विशाखापट्टनम, जिसकी इस वर्ष आपूर्ति होनी तय की गई है, के समुद्री परीक्षण की शुरुआत होने की जानकारी भी दी।

https://pib.gov.in/PressReleasePage.aspx?PRID=1702287

INDIA TODAY

Thu, 04 March 2021

Setting up theatre commands key agenda for military top brass meet with PM

The issue of setting up theatre commands for the three services will be the key agenda for discussion during the upcoming Combined Commanders' Conference

By Abhishek Bhalla

New Delhi: Setting up theatre commands for better utilisation of resources aimed at bringing in synergy among the armed forces and self-reliance in the defence sector will be the key agenda for deliberations in the Combined Commanders' Conference that will also be attended by Prime Minister Narendra Modi.

The Combined Commanders' Conference is scheduled to be held between March 4 and 6 in Kevadia, Gujarat. (File photo)

The Combined Commanders' Conference 2021 is scheduled to be held between March 4 and 6 in Kevadia, Gujarat.

Defence Minister Rajnath Singh will address top commanders of the Indian Army, Air Force and the Navy on March 5 and Prime Minister Narendra Modi will address them on March 6.

"Setting up a new 'Air Defence Command' and 'Maritime Command' will be discussed in details. The timeline for implementation of 'Air Defence Command' will also be deliberated," said an official.

A 'Maritime Command', a separate command for Jammu and Kashmir, the need to have a focused command for China and a separate 'Air Defence Command' is part of the blueprint for the joint theatre commands that are part of the major restructuring exercise within the armed forces.

The joint or theatre commands for the military could start rolling out by 2022.

The 'Air Defence Command' will bring together all resources of the Air Force, Army and the Navy, and will be headed by a three-star Indian Air Force officer.

Similarly, the 'Maritime Command' will have all assets of the three services under one command headed by a naval officer controlling all sea operations.

The newly created Department of Military Affairs headed by the Chief of Defence Staff Gen Bipin Rawat is working towards creation of 'joint military commands'.

Gen Rawat has a mandate to gradually bring all service commands under one umbrella in a time-bound manner, sources said.

Currently there are 19 commands and only two out of these are tri-service commands. These are the Andaman and Nicobar Command and Strategic Forces Command that is in charge of nuclear assets.

During the conference, top officials in the defence ministry will give presentations and key areas of discussions will also include self-reliance, officials said.

https://www.indiatoday.in/india/story/setting-up-theatre-commands-key-agenda-for-military-top-brass-meet-with-pm-1775330-2021-03-03

The Tribune

Thu, 04 March 2021

Army conducts integrated battle drills with tanks and helicopters

Rudra, the Army's latest aviation combat platform, is the weaponised version of the Dhruv utility helicopter developed by Hindustan Aeronautics Limited

By Vijay Mohan

Chandigarh: As part of their annual training cycle, formations of the Western Command are undertaking field exercises to validate operational concepts and hone their war fighting skills.

An integrated exercise, Rudra Kavach, was conducted between mechanised columns comprising tanks and infantry combat vehicles and the Rudra attack helicopter squadron by the Yol-based Rising Star Corps, with the Army stating that all mission parameters have been achieved.

Integrated exercise Rudrakavach carried out between mechnanized columns and Rudra attack helicopter squadron by the Western Command of the Indian Army. Tribune photo

The Jalandhar-based Vajra Corps also carried out a drill, described by the Army as a display of high level of synergy, precision and lethality by elements on the ground and Army aviation assets on the western front training grounds. Live ammunition was fired by armoured vehicles and Rudra during the exercise.

Rudra, the Army's latest aviation combat platform, is the weaponised version of the Dhruv utility helicopter developed by Hindustan Aeronautics Limited (HAL) and is meant for providing close air support to manoeuvring ground formations. It is equipped with infrared and thermal imaging sights, a 20 mm nose gun and rocket pods, with provision for anti-tank guided missiles.

The Army operates about 58 Rudra helicopters, with another 20 in the pipeline. These have also been deployed in Ladakh following the stand-off with China along the Line of Actual Control and are expected to be an important element of high altitude deployment.

Apart from the Rudra, Army Aviation also has plans to induct over a hundred Light Combat Helicopter being developed by HAL.

Armed helicopters form an important element of combat capability and act as force multipliers. Heli-borne combat support to the Army is also provided by the Air Force with its AH-64 Apache, Mi-35 and Lancer helicopter gunships along with armed Mi-17 and Chetak helicopters.

https://www.tribuneindia.com/news/nation/army-conducts-integrated-battle-drills-with-tanks-and-helicopters-220030

THE HINDU

Thu, 04 March 2021

IAF joins multinational air exercise in UAE

IAF Chief in Colombo on a visit coinciding with 70th anniversary of Sri Lankan Air Force

The Indian Air Force is for the first time participating in the annual multinational large force employment warfare exercise, Desert Flag VI, hosted by the United Arab Emirates Air Force which began on Wednesday.

Chief of Air Staff R.K.S. Bhadauria. File Photo.

Separately, IAF chief Air Chief Marshal R.K.S. Bhadauria arrived in Colombo on a two-day visit coinciding with the 70th anniversary celebrations of the Sri Lankan Air Force.

The air show at Galle Face in Colombo will see the participation of an IAF contingent comprising Suryakiran aerobatic team, Sarang helicopter display teams and Tejas Light Combat Aircraft (LCA).

Multilateral exercise

The other countries taking part in the exercise scheduled from March 3 to 27 include Bahrain, France, Saudi Arabia, South Korea and the U.S.

"The IAF is participating with six Su-30 MKI, two C-17 and one IL-78 tanker aircraft. C-17 Globemaster will provide support for induction and de-induction of the IAF contingent," an IAF statement said. Su-30 MKI aircraft will undertake long range ferry, routing direct from India to the exercise area with aerial refuelling support from IL-78 tanker aircraft, it stated.

The aim of the exercise is to provide operational exposure to the participating forces while training them to undertake simulated air combat operations in a controlled environment.

Stating that the large-scale exercise involving diverse fighter aircraft from across the globe will provide the participating forces a unique opportunity to exchange knowledge, experience, enhance operational capabilities and interoperability, the IAF added that exercising and interaction with the participating nations in a dynamic and realistic warfare environment would also contribute to strengthening international relations.

https://www.thehindu.com/news/national/iaf-joins-multinational-air-exercise-in-uae/article33983773.ece

PHYS.ORG

Thu, 04 March 2021

Heat-free optical switch would enable optical quantum computing chips

In a potential boost for quantum computing and communication, a European research collaboration reported a new method of controlling and manipulating single photons without generating heat. The solution makes it possible to integrate optical switches and single-photon detectors in a single chip.

Publishing in *Nature Communications*, the team reported to have developed an optical switch that is reconfigured with microscopic mechanical movement rather than heat, making the switch compatible with heat-sensitive single-photon detectors.

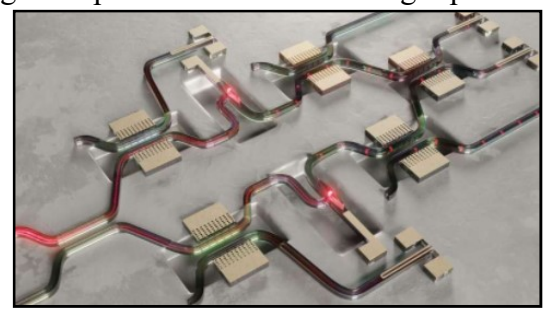


Illustration of a controlled quantum circuit enabled by the reported heat-free switches. Credit: Lucas Schweickert

Optical switches in use today work by locally heating light guides inside a semiconductor chip. "This approach does not work for quantum optics," says co-author Samuel Gyger, a Ph.D. student at KTH Royal Institute of Technology in Stockholm.

"Because we want to detect every single photon, we use quantum detectors that work by measuring the heat a single photon generates when absorbed by a superconducting material," Gyger says. "If we use traditional switches, our detectors will be flooded by heat, and thus not work at all." The new method enables control of single photons without the disadvantage of heating up a semiconductor chip and thereby rendering single-photon detectors useless, says Carlos Errando Herranz, who conceived the research idea and led the work at KTH as part of the European Quantum Flagship project, S2QUIP.

Using microelectromechanical (MEMS) actuation, the solution enables optical switching and photon detection on a single semiconductor chip while maintaining the cold temperatures required by single-photon detectors.

"Our technology will help to connect all building blocks required for integrated optical circuits for quantum technologies," Errando Herranz says.

"Quantum technologies will enable secure message encryption and methods of computation that solve problems today's computers cannot," he says. "And they will provide simulation tools that enable us to understand fundamental laws of nature, which can lead to new materials and medicines."

The group will further develop the technology to make it compatible with typical electronics, which will involve reducing the voltages used in the experimental setup.

Errando Herranz says that the group aims to integrate the fabrication process in semiconductor foundries that already fabricate on-chip optics—a necessary step in order to make quantum optic circuits large enough to fulfill some of the promises of quantum technologies.

More information: Reconfigurable photonics with on-chip single-photon detectors, Gyger, et al *Nature Communications*, DOI: 10.1038/s41467-021-21624-3

Journal information: Nature Communications

https://phys.org/news/2021-03-heat-free-optical-enable-quantum-chips.html

PHYS.ORG

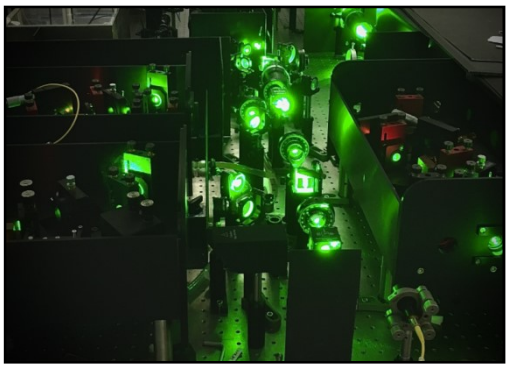
Thu, 04 March 2021

Researchers unveil issues with nuclear theory, observe no magic behavior at N=32 in charge radii of potassium isotopes

By Ingrid Fadelli

Measuring the size of atomic nuclei has sometimes been useful to probe aspects of nucleon-nucleon interaction and the bulk properties of nuclear matter. The charge radius of atomic nuclei, which can be extracted using laser spectroscopy techniques, is sensitive to both the bulk properties of nuclear matter and particularly subtle details of the interactions between protons and neutrons.

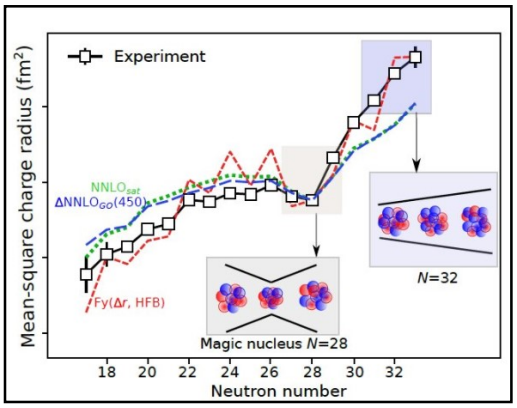
Many recent studies have thus examined the properties of nuclei with unbalanced proton-to-neutron ratios, known as exotic nuclei. These exotic nuclei have been found to exhibit new phenomena and thus have proved valuable for testing nuclear theory and improving the current understanding of nuclear forces.



Laser systems at the laboratory of the CRIS group at ISOLDE, CERN. Credit: Koszorus et al

Among other things, examining exotic nuclei can help to identify new magic numbers. In this context, the term 'magic numbers' refers to the number of protons or neutrons that correspond to completely filled shells in these nuclei.

A research team led by physicists at Instituut voor Kern-en Stralingsfysica, KU Leuven, in Belgium and by Peking University in China have recently carried out a study examining exotic potassium isotopes with 32 neutrons, which was predicted to be a magic number. Their paper, published in *Nature Physics*, presents evidence that challenges state-of-the-art nuclear theories.



Experimentally measured changes in the mean-square charge radii of potassium isotopes (white squares) are compared to the predictions of state-of-the-art nuclear CC (green and blue) and DFT theory (red). The gray box illustrates the trend of the charge radii across the neutron magic N=28, while the red box shows that the N=32 isotopes do not exhibit similar behavior. Credit: Koszorus et al.

"The magic character of a proton or neutron number, among others, is reflected in a smaller size of the magic nucleus, compared to its neighbors," Agota Koszorus, one of the researchers who carried out the study, told Phys.org. "There are several well know magic numbers such as 2, 8 20 or 28, however in the mass region of the potassium isotopes, 32 has been proposed as a new magic neutron number. The goal of our experiment was to measure the charge radius of the potassium isotope which has 33 neutrons and allow for the comparison of the size of the proposed magic N=32 isotope to its lighter (N=31) and heavier (N=33) neighbors."

Identifying new magic numbers has been the key objective of many recent studies investigating nuclear structures. Studying neutron-rich isotopes such as the ones examined by Koszorus and her colleagues, however, can be very challenging, for several reasons.

Firstly, these isotopes can only be produced at radioactive ion beam facilities like ISOLDE at CERN. In addition, they generally have very short half-lives (e.g., 110 ms long in the case of ^{52}K). This means that once they are produced researchers have a very limited time to prepare them for

measurements and to actually examine them. In the specific case of ^{52}K, an additional challenge was the large isobaric contamination in the beam produced at ISOLDE.

"*N*=32 is one proposed new neutron magic number in the Ca region based on the nuclear mass measurement and 2^+ energies measurement," Xiaofei Yang, another researcher involved in the study, told Phys.org. "However, this magic effect has not yet been confirmed from the nuclear moments or radii measurements due to the limited experimental information in the Ca region."

Koszorus, Yang and their colleagues were the first to study charge radii above *N*=32 and this ultimately allowed them to determine whether the "magic effect" appeared in the nuclear radii. A further objective of their study was to investigate the recent progress made in the development of models based on nuclear theory.

"Even though at the ISOLDE facility the ions are mass selected before they are delivered to the experimental setups, there is a stable chromium isotope with very similar mass, which is abundant in nature, and in the environment of the production site of ISOLDE," Koszorus explained. "This meant that while every second 200 ^{52}K isotopes were delivered to our experimental setup, 6 million stable Cr isotopes were also delivered, which resulted in overwhelming background rates. We therefore had to modify our setup to rely on detection of the beta particles emitted in the radioactive decay of ^{52}K. The stable Cr could therefore not contribute to the background."

Interestingly Koszorus, Yang and their colleagues found no sign of magic behavior in the evolution of the potassium isotope's nuclear size across the *N*=32 neutron number. The researchers also compared their observations to the results of calculations based on state-of-the-art theoretical nuclear models, namely the energy density functional (DFT) method and the coupled cluster (CC) theory.

"The DFT is an ideal method for heavier nuclei, whereas the CC model is more suitable for light and medium mass nuclei," Koszorus said. "The potassium region is a compelling meeting ground to test these approaches simultaneously. Both theoretical methods need information about the nuclear interactions. For this purpose, state-of-the art nuclear structure models were applied: The DFT calculations employed highly successful Fayans energy density functional and CC calculations used ab-initio chiral potential."

The researchers found that the theoretical models successfully predicted the changes in the mean-square charge radii that they observed in isotopes below the *N*=28 magic number. The models they tested appeared useful for modeling isotopes with unpaired protons and neutrons.

"From the comparison between the measured and predicted changes in the mean-square charge radii it is clear that the calculations perform very well in predicting the general trend below the *N*=28 magic number, successfully taking on the challenge of modeling isotopes with unpaired protons and neutrons," Koszorus said. "At a closer look, however, it becomes apparent that the ab initio coupled cluster calculations fall short in predicting the steep increase in the charge radii of the neutron rich isotopes."

The researchers hypothesized that the issues and inconsistencies between the coupled cluster calculations and their measurements could be rooted in the many-body nature of the CC model. On the other hand, while the Fayans DFT model predicted the general trend they observed very well, it overestimated the variation between the size of odd and even mass isotopes.

Overall, these findings suggest that existing nuclear theories might need to be perfected further before they can effectively predict magic numbers in exotic isotopes. In other words, it would seem that the current understanding of the nuclear properties and structure of neutron-rich isotopes is still very limited. In the future, the methods used by this team of researchers could be used to study other exotic isotopes with short lifespans.

"The story of the newly emerging magic numbers around the potassium isotopes is far from over, and another magic number was proposed at neutron number 34," Koszorus said. "The study of these nuclei requires even higher experimental efficiently since the production yields are below 100 ions per second. We are continuously working on technical developments to improve our

experimental setup and soon we will be ready to push the limits or the current state-of-the-art techniques and test our understanding of the nuclear structure of very neutron-rich isotopes nuclei."

A key goal of many contemporary nuclear physics studies is to explore the limits and properties of atomic nuclei governed by nuclear forces, in order to better understand their structure. In their next studies, Koszorus, Yang and their colleagues also plan to develop increasingly advanced laser spectroscopy techniques, as these could be used to examine atomic nuclei with greater precision and collect more reliable measurements.

More information: Charge radii of exotic potassium isotopes challenge nuclear theory and the magic character of $N = 32$. *Nature Physics*(2021). DOI: 10.1038/s41567-020-01136-5.

Journal information: Nature Physics

https://phys.org/news/2021-03-unveil-issues-nuclear-theory-magic.html

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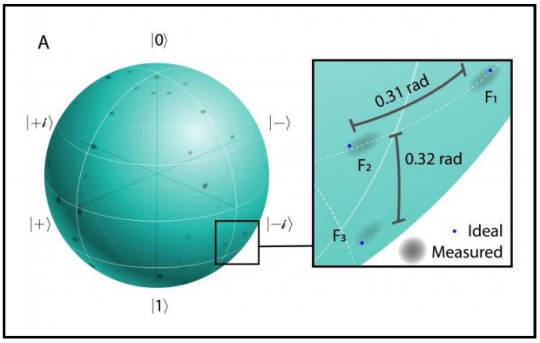
Researchers realize quantum communications milestone using light

By Scott S Jones

Few terms are more ubiquitous in the scientific arena these days than "quantum."

Technologies based on the notoriously tricky laws of quantum mechanics promise to enable computers much more powerful than today's fastest supercomputers, unhackable secure communications and unprecedented sensing capabilities necessary for further scientific discovery.

But for these technologies to see the light of day, researchers must develop efficient quantum communications networks that connect quantum devices while preserving the delicate states of the particles used to transmit information.



Each point on the sphere of this visual representation of arbitrary frequency-bin qubit states corresponds to a unique quantum state, and the gray sections represent the measurement results. The zoomed-in view illustrates examples of three quantum states plotted next to their ideal targets (blue dots). Credit: Joseph Lukens and Adam Malin/ORNL, U.S. Dept. of Energy

A team of researchers at the Department of Energy's Oak Ridge National Laboratory, along with colleagues at Purdue University, has taken an important step toward this goal by harnessing the frequency, or color, of light. Such capabilities could contribute to more practical and large-scale quantum networks exponentially more powerful and secure than the classical networks we have today.

Specifically, the team is harnessing the properties of light and the principles of quantum mechanics to transfer information, making the network itself a photonic quantum information processor. This approach is promising for several reasons.

For starters, photons travel at the speed of light, allowing the information to get from point A to point B as quickly as possible. Photons generally don't interact with each other or the surrounding environment, ensuring the information won't get scrambled or become corrupted in transit. "Light is really the only viable option for quantum communications over long distances," said project leader Joseph Lukens, an ORNL research scientist, Wigner Fellow and DOE Early Career Award winner who helped detail the team's results in *Physical Review Letters*.

The team used light to produce frequency-bin qubits, or single photons that reside in two different frequencies simultaneously, to demonstrate fully arbitrary communications operations in frequency encoding for the first time. While frequency encoding and entanglement appear in many

systems and are naturally compatible with fiber optics, using these phenomena to perform data manipulation and processing operations has traditionally proven difficult. Such operations, however, are required for basic networking functions in quantum communications and, by extension, the realization of a vast range of quantum technologies.

Using a technology developed at ORNL known as a quantum frequency processor, the researchers demonstrated widely applicable quantum gates, or the logical operations necessary for performing quantum communication protocols. In these protocols, researchers need to be able to manipulate photons in a user-defined way, often in response to measurements performed on particles elsewhere in the network. Whereas the traditional operations used in classical computers and communications technologies, such as AND and OR, operate on digital zeros and ones individually, quantum gates operate on simultaneous superpositions of zeros and ones, keeping the quantum information protected as it passes through, a phenomenon required to realize true quantum networking.

By proving that their configuration could transform any qubit state into a different qubit state, the team demonstrated practical information transfer. "If you can do arbitrary operations, you can do any of the fundamental quantum communication protocols such as routing based on frequency conversion," said Lukens.

Theirs is one of many different systems, but among the most promising considering the results. As an example, the team successfully demonstrated upwards of 98% fidelity—a quantitative measure of accuracy—using their custom configuration.

While frequency-bin quantum networking has been historically difficult to control, the team's toolbox, Lukens said, makes it much more controllable. Not only that, it's a naturally produced system that translates well to existing fiber optics. In fact, the system was devised using classical telecom components such as phase modulators. These factors make the technology less expensive and more attractive to industries looking to apply it. Furthermore, this domino effect advances both classical and quantum communications simultaneously, thus advancing the team's methods and possibly bringing large-scale quantum networks one step closer to reality.

Their next experiment will involve implementing their system on a photonic integrated circuit. "There are lots of unforeseen applications," said Lukens. "Frequency encoding is naturally produced by many different systems, and it's very well suited to optical fiber, so the potential application space should be broad."

More information: Hsuan-Hao Lu et al. Fully Arbitrary Control of Frequency-Bin Qubits, *Physical Review Letters* (2020). DOI: 10.1103/PhysRevLett.125.120503

Journal information: Physical Review Letters

https://phys.org/news/2021-03-quantum-milestone.html

MEDICAL NEWS TODAY

Thu, 04 March 2021

Covid-19: 5 blood proteins predict critical illness and death

By James Kingsland

- ***A study suggests that among people hospitalized for COVID-19, blood levels of five proteins are higher in those who will go on to require critical care.***
- ***These proteins are associated with a type of immune cell that may promote excessive inflammation and blood clotting in the lungs.***
- ***Some of the same proteins are at elevated levels in people with obesity.***
- ***If further studies confirm the findings, the discovery could lead to new tests and treatments for severe COVID-19.***

According to the Centers for Disease Control and Prevention (CDC), about 81% of people with COVID-19 develop only mild or moderate symptoms, such as fever and a cough.

However, about 14% of all patients go on to develop breathing difficulties and low blood oxygen levels.

Approximately 5% become critically ill and may need treatment in an intensive care unit for acute respiratory distress and multiple organ failure.

Previous research has implicated the following risk factors in the development of severe COVID-19:

- immune signaling molecules called cytokines
- two types of immune cell: monocytes and macrophages
- a blood-clotting factor

Five key proteins in a person's blood may predict their risk of developing severe COVID-19. Thana Prasongsin/Getty Images

However, it remains unclear why some people with severe illness recover while others become critically ill.

In a new study, researchers at Yale School of Medicine in New Haven, CT, showed that levels of five protein biomarkers in the blood of COVID-19 patients in the hospital strongly predict who will become critically ill.

All five proteins play a role in the activation of another type of immune cell, known as a neutrophil.

"If a diagnostic test [for these biomarkers] could be ordered early, it could give us a better sense of who is more likely to become critically ill and will benefit from a higher level of care and consideration for therapies that affect the immune system early on in their hospitalization," says lead author Dr. Hyung Chun, M.D., associate professor of cardiovascular medicine and pathology and director of translational research at the Yale Pulmonary Vascular Disease Program.

"Many of these drugs do carry potential side effects, and these tests may help identify those patients who would benefit the most," he adds.

The study paper appears in the journal *Blood Advances*.

Screening proteins in the blood

The researchers used "proteomic profiling" to screen proteins in blood samples from 85 participants, including 13 asymptomatic controls. At least 23 of these individuals gave a blood sample on their first day of hospitalization with COVID-19.

Some of the participants went on to require treatment in the intensive care unit, whereas others did not.

The researchers used a machine-learning algorithm to identify five proteins that were the best predictors of who would become critically ill.

These protein biomarkers were better predictors of critical illness than some cytokines linked to severe COVID-19, say the scientists.

They were also good predictors of mortality. None of the individuals with low levels of these biomarkers died.

All five proteins are associated with the activation of neutrophils, which start life in the bone marrow before entering the bloodstream.

To confirm the importance of these immune cells for predicting worse outcomes in COVID-19, the researchers also analyzed blood test results from more than 3,000 people who were admitted to the Yale New Haven Hospital system.

This analysis revealed that people who had elevated neutrophil counts shortly after their admission to the hospital were more likely to die from the disease.

The authors write:

"This signature of neutrophil activation was predictive of in-hospital mortality and, most compellingly, was elevated at the time of hospital admission in patients who only later progressed to critical illness, thus preceding and predicting the onset of critical illness."

Obesity connection

Neutrophils are the immune system's "first responders" at the site of infection and injury, but they can also cause collateral damage through excessive inflammation.

Previous research has linked some of the protein biomarkers that the new study identified to obesity.

According to the CDC, having obesity triples a person's risk of hospitalization with COVID-19, and body mass index (BMI) positively correlates with mortality from the disease.

The researchers note that while obesity involves chronic, low grade inflammation, COVID-19 causes hyperinflammation that can lead to tissue damage and organ failure.

There is also evidence, the researchers note, that neutrophils may play a role in the excessive thrombosis, or blood clotting, that doctors see in critically ill patients with the disease.

Indirect evidence

The authors write that one limitation of their study was that it did not demonstrate that neutrophils are the source of the five protein biomarkers.

However, they add that there are several other lines of evidence to support this hypothesis.

For example, four of the proteins are well-established products of neutrophils. In addition, the new study found that levels of each of the five proteins correlated closely with the concentration of neutrophils in the participants' bloodstreams.

https://www.medicalnewstoday.com/articles/covid-19-5-blood-proteins-predict-critical-illness-and-death