

July
2022

समाचार पत्रों से चयित अंश Newspapers Clippings

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खंड : 47 अंक: 134 15 जुलाई 2022

Vol.: 47 Issue: 134 15 July 2022



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पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

गुरुवार, 14 जुलाई 2022 4:00 अपराह्न

पूर्व भूमिका (कर्टेन रेज़र) वाई-3023 (दूनागिरी) का लॉन्च

दूनागिरी नाम के एक प्रोजेक्ट 17ए फ्रिगेट को 15 जुलाई 2022 को कोलकाता के गार्डेन रीच शिपबिल्डर्स एंड इंजीनियर लिमिटेड से हुगली नदी में लॉन्च किया जाएगा। इस कार्यक्रम में माननीय रक्षामंत्री श्री राजनाथ सिंह मुख्य अतिथि होंगे। पी-17ए फ्रिगेट्स श्रेणी के इस चौथे पोत का नाम उत्तराखंड राज्य की एक पर्वत श्रृंखला के नाम पर रखा गया है। यह पी-17 फ्रिगेट (शिवालिक) श्रेणी का पोत है जो संशोधित स्टील्थ फीचर, उन्नत हथियार और सेंसर तथा प्लेटफॉर्म मैनेजमेंट सिस्टम से लैस है। दूनागिरी, पूर्ववर्ती दूनागिरी (लिएंडर) श्रेणी के एसडब्ल्यू फ्रिगेट का संशोधित स्वरूप है जिसने 5 मई 1977 से 20 अक्टूबर 2010 तक 33 वर्ष तक अपनी सेवा दी और विभिन्न चुनौतीपूर्ण ऑपरेशंस तथा बहुराष्ट्रीय अभ्यासों का गवाह रहा। किसी पोत की आत्मा उसकी क्षमता में निहित होती है और वह वैसा ही क्षमतावान अन्य पोत तलाशती है।

पी-17ए प्रोजेक्ट के पहले दो पोत 2019 और 2020 में क्रमशः एमडीएल और जीआरएसई में लॉन्च किए गए थे। तीसरा पोत (उदयगिरी) इस साल 17 मई 2022 को एमडीएल में लॉन्च किया गया। इस चौथे पोत का इतने कम समय में लॉन्च किया जाना इस बात का प्रमाण है कि देश एक केन्द्रित दृष्टिकोण के साथ स्वनिर्भर पोत निर्माण की दिशा आगे बढ़ रहा है। पी-17ए पोतों का डिजाइन भारतीय नौसेना के डायरेक्टरेट ऑफ नेवल डिजाइन (डीएनडी) ने स्वदेश में तैयार किया है और इससे पहले भी वह विभिन्न श्रेणियों के स्वदेशी युद्धपोतों का डिजाइन सफलतापूर्वक तैयार कर चुका है। यह 'आत्मनिर्भर भारत' के प्रति देश के अथक प्रयासों का परिणाम है और इसके तहत उपकरणों एवं प्रणाली के लिए 75 प्रतिशत ऑर्डर एमएसएमई समेत विभिन्न स्वदेशी फर्मों को दिए जा रहे हैं।

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1841497>

Thu, 14 Jul 2022

Dunagiri- Project 17A Frigate to be Launched on Friday

On Friday, 'Dunagiri' under Project 17A, will be launched into the Hooghly river at Garden Reach Shipbuilders and Engineers Limited (GRSE), Kolkata, in the presence of defence minister Rajnath Singh. The frigate is the fourth ship under Project 17A and has been named after a mountain range located in the state of Uttarakhand. According to an official statement, these are follow-on of the P17 Frigates (Shivalik Class). They have better platform management systems, stealth features, sensors, and advanced weapons. This is the reincarnation of the erstwhile 'Dunagiri', the Leander Class ASW Frigate. The erstwhile 'Dunagiri' was in service for 33 years of service from May 05 1977 till October 2010. While in service it had participated in several multinational drills at sea, and witnessed many various challenging operations.



According to an official statement, these are follow-on of the P17 Frigates (Shivalik Class). They have better platform management systems, stealth features, sensors, and advanced weapons.

Background

As it has been reported earlier, the first two ships of P17A Project were launched in 2019 at Mazagon Dock Limited (MDL) and the other one in 2020 at GRSE. Also, Udaygiri, the third ship was launched at MDL earlier this year in May. Now the launch of the fourth ship is a positive indication of self-reliance of the Indian Navy in ship building.

Who has designed these frigates?

According to the Indian Navy, the ships under P17A have been designed in-house by the Directorate of Naval Design (DND). The DND has in the past successfully designed several classes of indigenous warships. As a major step towards Atmanirbhar Bharat in Defence,

according to the official statement more than 75 percent of the orders for equipment & system are being placed on domestic companies.

More about Project 17A

These multi-role ships will be playing a critical role in the emerging international maritime threats and also will help in dealing with China's bullying in the Indian Ocean Region (IOR). There will be seven frigates built under P-17 A for the Indian Navy which will be equipped with advanced stealth capability. The construction of these ships is taking place at MDL (four) and GRSE, Kolkata (three).

<https://www.financialexpress.com/defence/dunagiri-project-17a-frigate-to-be-launched-on-friday/2594265/lite/>



Thu, 14 Jul 2022

Exclusive: The Story Behind Developing First Made-In-India '9mm Machine Pistol'

Acting on the ethos of 'Aatmanirbharta', the Indian Defence Ecosystem has been developing cutting-edge technology and ammunition to provide thrust to India's military might. The state-of-art defence equipment not only takes India towards self-reliance in critical areas but it also equips our armed forces with latest defence arsenals. One such example in this league is India's first indigenous '9mm Machine Pistol', which has been jointly developed by Defence Research Development Organisation (DRDO), Indian Army and Hyderabad-based Lokesh Machines Limited.

Designed and developed in a record time of four months, the made-in-India Machine Pistol fires the in-service 9mm ammunition and sports an upper receiver made from aircraft grade aluminium and lower receiver from carbon fiber. Interacting exclusively with Prasar Bharati News Service (PBNS), Director of Lokesh Machines Limited M. Srinivas said, "The Machine Pistol is the first-of-its kind weapon with less than 2 kilograms in weight and recently the Ministry of Home Affairs (MHA) conducted extensive trials and they were surprised as there were no stoppages."



The trails went through for more than a week, in different terrains (Sand, water, and air) and India's first indigenous '9mm Machine Pistol' performed really well, Srinivas added. Notably, the 3D Printing process of the pistol has been used in designing and prototyping various parts including trigger components made by metal 3D printing.

The significance of 9mm Machine Pistol

The indigenously developed weapon has immense potential in Indian Armed forces as personal weapon for heavy weapon detachments, commanders, tank and aircraft crews, drivers/dispatch riders, radio/radar operators, Closed Quarter Battle, counter insurgency and counter terrorism operations among others. The 9mm Machine Pistol also has a huge employability option with the central and state police organizations as well as VIP protection duties and Policing. Further, it is likely to have production cost under Rs 50,000 each and has potential for exports as well. Keeping the vision of Aatmanirbhar Bharat, the weapon is aptly named “Asmi” meaning “Pride, Self-Respect & Hard Work”, this small step will pave way for self reliance and it is expected that the Services and Paramilitary Forces (PMFs) will induct this weapon soon.

Building ‘Aatmanirbhar Bharat’

Primarily a Computer Numerical Control (CNC) company manufacturer, Lokesh Machines limited got motivated by the clarion call by Prime Minister Narendra Modi for Aatmanirbhar Bharat. The Hyderabad-based manufacturing firm then entered into the defence sector. “With a manufacturing background, we wanted to develop some equipment for the defence. While doing that we did get an opportunity to develop India’s first 9mm machine pistol along with the Indian Army and DRDO’s Armament Research & Development Establishment (ARDE), Pune,” Director of Lokesh Machines Limited mentioned. Taking about Lokesh Machines Limited’s contribution in defence sector, M. Srinivas said they are also developing components for the erstwhile Ordnance factories (now 7 Defence Public Sector Undertakings) for a 7.62×51 mm light machine gun and this will hopefully India’s first light machine gun.

<https://newsonair.com/2022/07/14/exclusive-the-story-behind-developing-first-made-in-india-9mm-machine-pistol/>



Thu, 14 Jul 2022

HAL CMD Launches Metal Cutting for Titanium Bulkhead of AMCA Stealth Fighter



The Chairman and Managing Director of Hindustan Aeronautics Limited, an Indian state-owned aerospace and defence company, Mr R Madhavan launched the ‘Metal Cutting for Titanium

Bulkhead of 5th generation AMCA Aircraft' as part of technology development at Aircraft Manufacturing Division, Nashik, on 13th July. On the occasion Dr. A K Ghosh, PD (AMCA) ADA, and senior officers from DMRL, ADA, and other Government agencies also present.

It is expected that according to the plan, the first prototype rollout of AMCA is expected by 2023 and the first flight by 2024. However, HAL is looking to start production between 2026-28 and full-fledged production will commence by 2029. The AMCA MK-2 Will feature an Indigenous 125kn trust engine to be developed jointly by DRDO & Safran which is expected to be ready in the next 7-8 years.

<http://www.indiandefensenews.in/2022/07/hal-cmd-launched-metal-cutting-for.html?m=1>



Thu, 14 Jul 2022

Army Seeks Patent for New Combat Dress

Six months after having unveiled a new pattern and design of a combat uniform for the troops, the Indian Army has applied for a patent that will prevent its sale at shops. The Army had, in April, applied for the patent at the office of the Controller General of Patents, Designs and Trade Marks. The patent and intellectual property rights (IPR) are expected soon.

2-Pronged Approach

Instructions have been issued to Army personnel, prohibiting them to buy the new uniform from unauthorised vendors. Once the patent process is completed, any unauthorised shopkeeper selling the new combat uniform will face legal action. The newly introduced combat uniform will be available through the Central Procurement and Canteen Stores Department (CSD). From next month, the Army personnel will be able to procure the cloth from the CSD.

A deliberate roll-out plan by the Army aims to switch to the new design by mid-2025, keeping in view the available stock and life of the current uniform. The uncontrolled proliferation of the existing combat uniform has led to vulnerabilities in the security of military establishments. To stem this, the Army plans to take a stern action against the dealers who sell unauthorised but similar-looking uniform and fabric of the new pattern. It has come to light that certain cloth and tailoring shops in the vicinity of Army Cantonments and military stations have started stocking unauthorised variants of the new uniform. In a two-pronged approach, strict instructions have been issued to Army personnel, prohibiting them to buy the new uniform from unauthorised vendors. Once the IPR process is completed, any unauthorised shopkeeper selling the new combat uniform will face legal action.

The Delhi Police, in coordination with the military police, have conducted awareness campaign among shopkeepers in the Delhi Cantonment to prevent the sale of the new uniform. The uniform is unique in its creation as it has an exclusive digital camouflage pattern, contemporary and functional design, and a lighter yet stronger and more breathable fabric.

<http://www.indiandefensenews.in/2022/07/army-seeks-patent-for-new-combat-dress.html?m=1>

Thu, 14 Jul 2022

F/A-18 Demonstrates Ability to Launch from Indian Carriers with 'Upsized' Loadout

Boeing has concluded a demonstration of the F/A-18 Super Hornet's ability to launch from Indian aircraft carriers with two Boeing AGM-84 Harpoon missiles, which exceeds New Delhi's requirement for its multirole carrier-borne fighters (MRCBF) program. The capability was demonstrated at the Indian Navy's Shore Based Test Facility (SBTF) at INS Hansa in Goa, India, between late-May and early-June 2022, said Alain Garcia, vice-president International Business Development at Boeing India, in an interview with Janes. The demonstrations were done as part of trials to validate the F/A-18's ability to operate from Indian carriers.

Under the MRCBF, the Indian Navy is planning to acquire 57 carrier-borne fighter aircraft that will operate from its Indigenous Aircraft Carrier (IAC), which will be in service as INS Vikrant once it is commissioned. The 37,000-ton vessel completed its final sea trials in early-July 2022 and is scheduled to be commissioned in August 2022.

<http://www.indiandefensenews.in/2022/07/fa-18-demonstrates-ability-to-launch.html?m=1>

Fri, 15 Jul 2022

Negotiations for Indo-French AMCA Engine in Progress

Negotiations are in progress between Safran and India for the joint development of a new 110 kN engine for India's Advanced Medium Combat Aircraft (AMCA). India's negotiations with French engine manufacturer Safran for the co-development of a new engine for India's Advanced Medium Combat Aircraft (AMCA) has become protracted because of continuing discussions over crucial points, Janes has learnt. The French company has submitted a proposal to India's Ministry of Defence (MoD) to co-develop a new 110 kN thrust engine. The engine is to be developed with the Gas Turbine Research Establishment (GTRE) of India's Defence Research and Development Organisation (DRDO).

A DRDO source told Janes that negotiations over the joint development are in progress. Janes has learnt that points in the negotiation include developmental costs, transfer of technology (ToT), intellectual property, and export rights following development of the engine. Safran officials met India's Defence Minister Rajnath Singh on 5 July, to discuss their projects in India.

“Our meeting with the defence minister involved updating him about our plans in India,” Jean-Paul Alary, CEO of Safran Aircraft Engines told Janes on 8 July. “We want to grow our activity on the military side in India – of course, we talked about the Rafale. We discussed the long-term future about what we can do in India when it comes to military engines,” Alary added. Alary also

added that any potential deal on an engine for the AMCA remains in the discussion stage. “India is interested and so there is more to come,” he said. If a deal is signed, Safran said that it could potentially take until the end of the decade for the new engine to be developed.

<http://www.indiandefensenews.in/2022/07/negotiations-for-indo-french-amca.html?m=1>



Thu, 14 Jul 2022

Kargil Vijay Diwas: Kargil War Revisited

By Lt General Vinod Bhatia (Retd)

In the annals of military history, soldiers and scholars the world over will continue to study and marvel at the recapture of the Kargil Heights by the Indian Armed Forces. The sacrifices and valour of the soldiers and leaders remain unmatched in military history. As we celebrate the 23rd ‘Kargil Diwas’ on 26 July, we pay homage to the 527 Indian soldiers who made the supreme sacrifice, achieving the near impossible. General Pervez Musharraf, the then Pakistan army chief in an audacious plan (Operation Koh – e – Paima) occupied key heights on the Indian side of the Line Of Control (LoC), dominating the Zojila – Drass – Kargil – Leh national highway, thus effectively cutting off the major road link to Leh.

The audacious plan was executed in the winter of 1999 when movement in the snow-clad ridges was least expected. The plan was not new, as it had been discussed and discarded by the Pakistan army on more than a few occasions. However, General Pervez Musharraf saw this as a win-win plan, the success or even failure of the plan would achieve multiple objectives. The intrusions, if successful, would cut off the road to Leh from Zojila, thus adversely impacting the sustenance of troops and the local population. This would also facilitate Pakistan’s offensive in Siachen to creep up and occupy the Salto Ridge. At the strategic level, the intrusions will bring back the focus to J&K among the international community. Equally and more importantly, Operation KP as it was nicknamed would stymie the peace process initiated by the historic bus ride by the then Indian Prime Minister Atal Bihari Vajpayee in February 1999 to Lahore.

It needs to be remembered that led by Pervez Musharraf, the three Pakistan Chiefs refused to salute the Indian Prime Minister at Lahore, stating that they will not salute the PM of an enemy nation. As the Pakistan Army drives the ‘India Policy’ the Indian intelligence community should have interpreted this strategic signaling as a warning of Pakistan’s intent to derail the political process. Whether Operation KP succeeded or not one thing was certain, this would weaken the Pakistan government thus paving the way for a military takeover. History is witness that Pervez Musharraf has been the longest ruling military dictator in Pakistan. Another major factor that contributed to Musharraf’s confidence in executing Operation KP was the fact that with Pakistan going overtly nuclear on 28 May 1998 as a response to India’s nuclear tests on 11 May 1998, he was certain that India would not dare to wage a full-scale war as a response option. The international community and the US, in particular, would never allow it, and again he was proved right. All factors and assessments indicated a certain success for the audacious KP plan. Launched at the height of winter in February 1999, everything was going as per plan for

Pakistan, till early May 1999. It is also now claimed that Pervez Musharraf in one of his visits to the troops who had intruded, spent a night on the Indian side of the LoC.

India and the Armed Forces were definitely taken by surprise by this bold and imaginative plan. The failure was at all levels, wherein the intelligence agencies failed to discern not only the internal dynamics within Pakistan but also the strategic intent. The intelligence failure at the strategic, operational and tactical level, however, did not deter the Indian army from doing what it does best, that is to ensure territorial integrity and succeed at all costs, irrespective of the probability of success. The Indian army, by far one of the most battle-hardened and combat-rich forces in the world, proved once again that they are capable of achieving the near impossible when the nation requires it.

The first reported intrusion was in the Batalik sector by a shepherd on 03 May. The enormity of the intrusions and intent dawned on the Indian Army only at a much later date in mid-May. The Pakistan Army led by their crack Special Service Group (SSG), which was once commanded by Musharraf himself, was comfortable in their belief that they had achieved a victory without even firing a shot. Much to their disbelief, they were surprised by an extremely violent and concerted effort by the Indian Army and Air Force to recapture the Kargil heights by May. The induction of 8 Mountain Division under the dynamic leadership of the then Major General Mohinder Puri, a soldier and leader par excellent was a game changer. The Division went about their task of recapturing the peaks with unmatched professionalism and valour, with the Indian soldiers and leaders proving once again the old army dictum “ *The difficult we do immediately, the impossible takes some time*”. The troops were spurred on by numerous visits of the then Chief General VP Malik.

During the Operations the then Director General Infantry Gen Shankar Prasad sent me to Kargil; to get first-hand feedback on the efficacy of infantry operations. What was heartening was the self-belief and the morale of our soldiers and leaders always willing to achieve the impossible. The report highlighted a number of issues, reinforcing the nation’s trust and confidence in the soldiers. The Kargil war led to much-needed structural changes in the national security architecture and defence reforms. The Kargil review committee headed by K Subramaniam was followed by the Group of Minister’s report. Media played a vital role in the war, igniting the imagination and interest of all Indians and the world, literally bringing the battle to the bedrooms. Information operations thus became an integral part of our strategy. Vikram Batra, Manoj Pande, Sanjay Kumar, Yogendra Yadav, Anuj Nayyar, and Vijayant Thappar among many other war heroes will always be remembered by a grateful nation. During the many battles, 26 officers made the supreme sacrifice a very high number. In addition, 501 soldiers sacrificed their lives in the highest traditions of the army, living up to and fighting for the ‘Nam, Namak and Nishan’ of their respective units and regiments. A heavy cost to pay. Today as we celebrate the Kargil Diwas, let us recollect the many sacrifices of the soldiers and air warriors who ensured victory against all odds by lighting a candle in prayer.

<https://www.financialexpress.com/defence/kargil-vijay-diwas-kargil-war-revisited/2593993/lite/>

US House Recommends CAATSA Waiver for India

Keeping complex geopolitics of the day in mind, the US House of Representatives recommended a waiver for India from punitive US sanctions that could potentially be imposed on New Delhi for buying Russian defence equipment. The waiver was part of an amendment on strengthening US-India defence relations proposed by Indian American Congressman Ro Khanna. The House voted on Thursday to pass the amendment considered to be an important signal. Working assiduously behind the scenes, Khanna managed to gather bipartisan support for the measure, making its passage almost certain. The amendment essentially argues that a strong US-India defence partnership is critical in light of increasing threats in the Indo-Pacific and that US sanctions would be counter productive at this time.

A waiver for India under Countering America's Adversaries Through Sanctions Act (CAATSA) is in the "best interests" of the US since India needs to maintain its Russian weapon systems as it faces "immediate and serious" threats from China along the border, the amendment said. Khanna termed his amendment "historic," calling it a "huge" marker in bilateral relations. "Getting one chamber on record with a vote against sanctions is important," one analyst said. The amendment is attached to the National Defence Authorisation Act (NDAA) for 2023, an annual legislation that funds the vast US defence budget. While it passed the House, the amendment must still clear the Senate to be truly meaningful. Although Khanna is confident the amendment will survive the Senate, it's not a guarantee given the stance of a few key senators on domestic developments in India.

Interestingly, the US Congress already granted the State Department the requisite authority to waive CAATSA sanctions back in 2019, giving the executive branch flexibility in the matter. But the Joe Biden administration is yet to make a decision on the India case. It seems the Biden team prefers to let sleeping dogs lie instead of highlighting an issue that could prove politically difficult in light of Russia's war against Ukraine and India's stand on the ongoing conflict. The CAATSA sword has been hanging over the US-India relationship ever since India went for the Russian S-400 missile defence system. Khanna's amendment urges the Biden Administration to take a position, grant a waiver and remove the uncertainty surrounding the matter.

<https://economictimes.indiatimes.com/news/defence/us-house-recommends-caatsa-waiver-for-india/articleshow/92883893.cms?from=mdr>

Thu, 14 Jul 2022

US Successfully Tests Two Hypersonic Missiles

The United States successfully tested two Lockheed Martin Corp hypersonic missiles recently, the Pentagon said on Wednesday, amid growing concerns Russia and China have had more success developing their own hypersonic weapons. The US Air Force confirmed it successfully tested its Air-Launched Rapid Response Weapon (ARRW) booster on Tuesday off the California coast. Reuters reported the ARRW test earlier on Wednesday in which the booster was carried aloft under the wing of a B-52H before it was launched. In previous tests, the weapon did not detach from the plane. "This second successful test demonstrates ARRW's ability to reach and withstand operational hypersonic speeds, collect crucial data for use in further flight tests, and validate safe separation from the aircraft," Lockheed said in a statement.

Air Force Brigadier General Heath Collins, program executive officer, Armament Directorate, said, "We have now completed our booster test series and are ready to move forward to all-up-round testing later this year." The "all-up-round" includes the booster and the warhead. Hypersonic weapons travel in the upper atmosphere at more than five times the speed of sound, or about 6,200 km (3,853 miles) per hour. In a separate hypersonic weapon test, the Defence Advanced Research Projects Agency (DARPA) confirmed it successfully performed the first test of its Operational Fires hypersonic weapon. The test was conducted at White Sands Missile Range in New Mexico.

The successful tests show progress among the myriad US hypersonic weapons development efforts, which have in cases been beleaguered by failed tests, growing questions about cost and increasing concerns the United States is falling behind in what has become a superpower arms race. Operational Fires is a ground-launched system that will "rapidly and precisely engage critical, time-sensitive targets while penetrating modern enemy air defences." DARPA has requested and received \$45 million for OpFires in fiscal year 2022. One of Lockheed Martin's concepts for the DARPA weapon is to use an existing High Mobility Artillery Rocket System (HIMARS) launcher, like those sent to Ukraine, to launch the weapon. These successful tests come after a failed June 29 test flight of a different type of hypersonic weapon, the Common Hypersonic Glide Body, at the Pacific Missile Range Facility in Hawaii.

Defence contractors hope to capitalize on the shift to hypersonic weapons not only by building them, but also by developing new detection and defeat mechanisms. Arms makers like Lockheed, Northrop Grumman Corp and Raytheon Technologies Corp have all touted their hypersonic weapons programs to investors as the world's focus shifted to the new arms race for an emerging class of weapon.

<http://www.indiandefensenews.in/2022/07/us-successfully-tests-two-hypersonic.html?m=1>

A Deep Learning Technique to Generate DSN Amplification Attacks

Deep learning techniques have recently proved to be highly promising for detecting cybersecurity attacks and determining their nature. Concurrently, many cybercriminals have been devising new attacks aimed at interfering with the functioning of various deep learning tools, including those for image classification and natural language processing. Perhaps the most common among these attacks are adversarial attacks, which are designed to "fool" deep learning algorithms using data that has been modified, prompting them to classify it incorrectly. This can lead to the malfunctioning of many applications, biometric systems, and other technologies that operate through deep learning algorithms. Several past studies have shown the effectiveness of different adversarial attacks in prompting deep neural networks (DNNs) to make unreliable and false predictions. These attacks include the Carlini & Wagner attack, the Deepfool attack, the fast gradient sign method (FGSM) and the Elastic-Net attack (ENA).

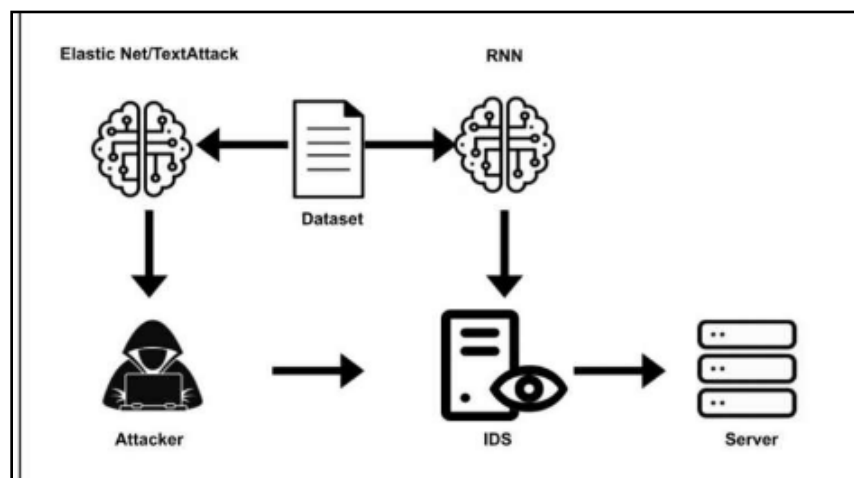


Diagram outlining the structure of the team's experiment.

Researchers at the Citadel have recently developed a DNN that can detect a type of cyberattack known as distributed denial of service (DDoS) DSN amplification, and then used two different algorithms to generate adversarial examples that could trick their DNN. Their findings, published in a paper pre-published on arXiv, further confirm the unreliability of deep learning methods for DSN attack detection and their vulnerability to adversarial attacks. DDoS DSN amplification attacks exploit vulnerabilities of domain name system (DNS) servers to amplify the queries made to them, ultimately flooding them with information and bringing the servers down. These attacks can cause significant disruption to online services, including those run by both small and big

multinational companies. Over the past few years, computer scientists have developed several deep learning techniques that can detect DDoS DSN amplification attacks. Nonetheless, the team at the Citadel showed that these techniques could be circumvented using adversarial networks.

"Much of the current work in the field of adversarial learning has been conducted in image processing and natural language processing with a wide variety of algorithms," Jared Mathews and his colleagues wrote in their paper. "Two algorithms of interest are the Elastic-Net Attack on Deep Neural Networks (EAD) and TextAttack." EAD and TextAttack are two algorithms that have proved to be particularly good at creating tampered data that would be misclassified by DNNs. Mathews and his colleagues thus developed a technique for detecting DDoS DSN amplification attacks and then tried to fool it using adversarial data generated by the EAD and TextAttack algorithms. "In our experiment the EAD and TextAttack algorithms are applied to a Domain Name System amplification classifier," the researchers wrote in their paper. "The algorithms are used to generate malicious DDoS adversarial examples to then feed as inputs to the network intrusion detection systems neural network to classify as valid traffic."

In their tests, Mathews and his colleagues found that the adversarial data generated by EAD and TextAttack could fool their DNN for DDoS DSN amplification attack detection 100% and 67.63% of the time, respectively. These results thus highlight the significant flaws and vulnerabilities of existing deep learning-based methods for detecting these attacks. "We show that both image processing and natural language processing adversarial learning algorithms can be applied against a network intrusion detection neural network," the researchers wrote in their paper. In the future, the work by this team of researchers at the Citadel could inspire the development of more effective tools for detecting DDoS DSN amplification attacks, which can detect adversarial data and correctly classify it. In their next studies, the researchers plan to test the effectiveness of adversarial attacks on a particular type of algorithms for detecting DNS amplification attacks, those targeting the so-called constrained application protocol (CoAP) used by many IoT devices.

<https://techxplore.com/news/2022-07-deep-technique-dsn-amplification.html>

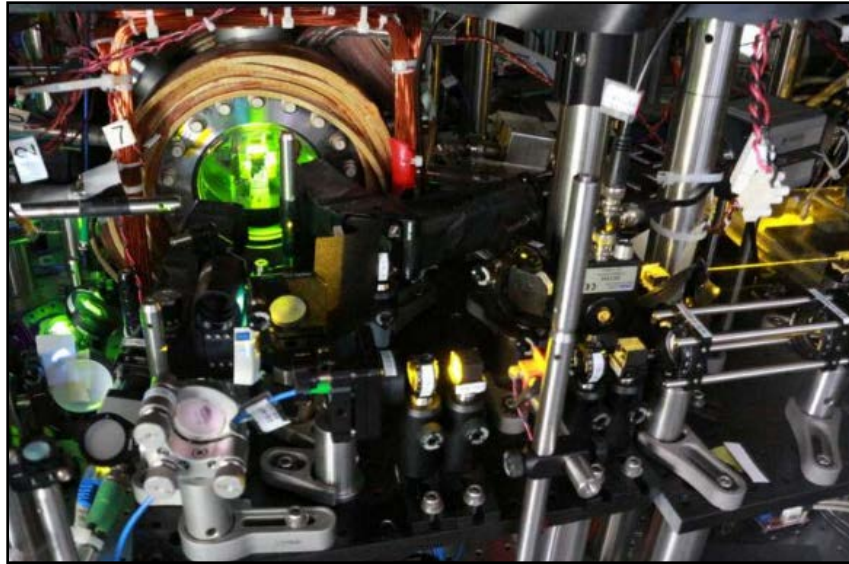


Thu, 14 Jul 2022

Physicists Harness Quantum 'Time Reversal' to Measure Vibrating Atoms

The quantum vibrations in atoms hold a miniature world of information. If scientists can accurately measure these atomic oscillations, and how they evolve over time, they can hone the precision of atomic clocks as well as quantum sensors, which are systems of atoms whose fluctuations can indicate the presence of dark matter, a passing gravitational wave, or even new, unexpected phenomena. A major hurdle in the path toward better quantum measurements is noise from the classical world, which can easily overwhelm subtle atomic vibrations, making any changes to those vibrations devilishly hard to detect.

Now, MIT physicists have shown they can significantly amplify quantum changes in atomic vibrations, by putting the particles through two key processes: quantum entanglement and time reversal.



MIT researchers used a system of lasers to first entangle, then reverse the evolution of a cloud of ultracold atoms.

Before you start shopping for DeLoreans, no, they haven't found a way to reverse time itself. Rather, the physicists have manipulated quantumly entangled atoms in a way that the particles behaved as if they were evolving backward in time. As the researchers effectively rewound the tape of atomic oscillations, any changes to those oscillations were amplified, in a way that could be easily measured. In a paper appearing today in *Nature Physics*, the team demonstrates that the technique, which they dubbed SATIN (for signal amplification through time reversal), is the most sensitive method for measuring quantum fluctuations developed to date.

The technique could improve the accuracy of current state-of-the-art atomic clocks by a factor of 15, making their timing so precise that over the entire age of the universe the clocks would be less than 20 milliseconds off. The method could also be used to further focus quantum sensors that are designed to detect gravitational waves, dark matter, and other physical phenomena. "We think this is the paradigm of the future," says lead author Vladan Vuletic, the Lester Wolfe Professor of Physics at MIT. "Any quantum interference that works with many atoms can profit from this technique."

The study's MIT co-authors include first author Simone Colombo, Edwin Pedrozo-Peñafiel, Albert Adiyatullin, Zeyang Li, Enrique Mendez, and Chi Shu. A given type of atom vibrates at a particular and constant frequency that, if properly measured, can serve as a very precise pendulum, keeping time in much shorter intervals than a kitchen clock's second. But at the scale of a single atom, the laws of quantum mechanics take over, and the atom's oscillation changes like the face of a coin each time it is flipped. Only by taking many measurements of an atom can scientists get an estimate of its actual oscillation—a limitation known as the Standard Quantum Limit. In state-of-the-art atomic clocks, physicists measure the oscillation of thousands of ultracold atoms, many times over, to increase their chance of getting an accurate

measurement. Still, these systems have some uncertainty, and their time-keeping could be more precise.

In 2020, Vuletic's group showed that the precision of current atomic clocks could be improved by entangling the atoms—a quantum phenomenon by which particles are coerced to behave in a collective, highly correlated state. In this entangled state, the oscillations of individual atoms should shift toward a common frequency that would take far fewer attempts to accurately measure. "At the time, we were still limited by how well we could read out the clock phase," Vuletic says. That is, the tools used to measure atomic oscillations were not sensitive enough to read out, or measure any subtle change in the atoms' collective oscillations.

Reverse the sign

In their new study, instead of attempting to improve the resolution of existing readout tools, the team looked to boost the signal from any change in oscillations, such that they could be read by current tools. They did so by harnessing another curious phenomenon in quantum mechanics: time reversal. It's thought that a purely quantum system, such as a group of atoms that is completely isolated from everyday classical noise, should evolve forward in time in a predictable manner, and the atoms' interactions (such as their oscillations) should be described precisely by the system's "Hamiltonian"—essentially, a mathematical description of the system's total energy. In the 1980s, theorists predicted that if a system's Hamiltonian were reversed, and the same quantum system was made to de-evolve, it would be as if the system was going back in time.

"In quantum mechanics, if you know the Hamiltonian, then you can track what the system is doing through time, like a quantum trajectory," Pedrozo-Peñafiel explains. "If this evolution is completely quantum, quantum mechanics tells you that you can de-evolve, or go back and go to the initial state." "And the idea is, if you could reverse the sign of the Hamiltonian, every small perturbation that occurred after the system evolved forward would get amplified if you go back in time," Colombo adds. For their new study, the team studied 400 ultracold atoms of ytterbium, one of two atom types used today's atomic clocks. They cooled the atoms to just a hair above absolute zero, at temperatures where most classical effects such as heat fade away and the atoms' behavior is governed purely by quantum effects. The team used a system of lasers to trap the atoms, then sent in a blue-tinged "entangling" light, which coerced the atoms to oscillate in a correlated state. They let the entangled atoms evolve forward in time, then exposed them to a small magnetic field, which introduced a tiny quantum change, slightly shifting the atoms' collective oscillations.

Such a shift would be impossible to detect with existing measurement tools. Instead, the team applied time reversal to boost this quantum signal. To do this, they sent in another, red-tinged laser that stimulated the atoms to disentangle, as if they were evolving backward in time. They then measured the particles' oscillations as they settled back into their unentangled states, and found that their final phase was markedly different from their initial phase—clear evidence that a quantum change had occurred somewhere in their forward evolution. The team repeated this experiment thousands of times, with clouds ranging from 50 to 400 atoms, each time observing the expected amplification of the quantum signal. They found their entangled system was up to 15 times more sensitive than similar unentangled atomic systems. If their system is applied to

current state-of-the-art atomic clocks, it would reduce the number of measurements these clocks require, by a factor of 15.

Going forward, the researchers hope to test their method on atomic clocks, as well as in quantum sensors, for instance for dark matter. "A cloud of dark matter floating by Earth could change time locally, and what some people do is compare clocks, say, in Australia with others in Europe and the U.S. to see if they can spot sudden changes in how time passes," Vuletic says. "Our technique is exactly suited to that, because you have to measure quickly changing time variations as the cloud flies by."

<https://phys.org/news/2022-07-physicists-harness-quantum-reversal-vibrating.html>



Thu, 14 Jul 2022

Importance of the Science of Measurement in the Quantum Revolution

In an article recently published in *Nature Physics*, experts from NPL and partner organizations from around the globe explore the critical role of National Metrology Institutes (NMIs) in the quantum revolution. You may have heard how quantum science is causing an impending revolution of science and technology, and its potential to enable quantum computing, uncrackable cryptography and teleportation. This new quantum era is underpinned by metrology, the science of measurement. Quantum effects are inherent to the international system of measurements, SI—which makes the world go around in a harmonious way. NMIs are in charge of the SI implementation, which demands of them to master the highest level of quantum control.

Based on this expertise, NMIs play a leading role in the evolving world of quantum technologies. From developing new devices for generating and detecting individual quanta, to improving understanding of the latest materials such as graphene, the international NMI community is helping to make the far-reaching possibilities of quantum a reality. With the quantum revolution underway, the need for independent and impartial testing and evaluation is critical. As National Laboratories, it falls to us to provide this support which enables responsible quantum innovation and industrialization. From established technologies such as random number generation to less mature technologies such as quantum computing, their development is underpinned by metrology and the unbiased testing it enables. Our expertise and impartiality is needed to write the rulebooks—standards—for new quantum technologies. In a virtuous cycle, we are able to exploit novel quantum technologies for the benefit of metrology itself, which in turn benefits society.

<https://phys.org/news/2022-07-importance-science-quantum-revolution.html>

