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Tue, 30 March 2021

BrahMos Armed Su-30MKI Fighters take part in India-US Naval Exercise in the Indian Ocean

In a first, Su-30MKIs of the Indian Air Force (IAF), armed with BrahMos supersonic cruise missiles, took part in the ongoing naval exercise with the United States taking place in the Indian Ocean, a report in the Times of India says.

The exercise gave the BrahMos-armed Su-30MKI fighters, based at the Thanjavur Air Base in Tamil Nadu, an opportunity to practice maritime strike.

BrahMos-armed Su-30MKIs are based at the Thanjavur Air Base in Tamil Nadu

The deployment of BrahMos-armed Su-30MIKs at Thanjavur has given India the option of hitting enemy targets deep in the Indian Ocean. Taking off from Thanjavur, a Su-30MKI, equipped with an air-launched BrahMos, can go right up to the Malacca Strait, a narrow maritime chokepoint between Malaysia and Singapore, that links the Indian with the Pacific Ocean and the South China Sea.

This can prove to be a headache for China —accentuate its 'Malacca Dilemma' — if the conflict unfolding in the Himalayas escalates and expands to the maritime domain. A large part of China's trade, including nearly 80 per cent of its oil supplies, passes through this narrow 500 nautical-mile-long waterway.

The fighters can also hit targets in the Southern and Western Indian Ocean.

BrahMos-armed Su-30MKIs can strike targets in China and Pakistan from standoff distances and from within the Indian airspace in some cases.

The participation of this package in a military exercise with the US suggests that it has proven its lethality and is fully operational. It is also a message to China, which has been increasing its presence in the Indian Ocean.

Apart from BrahMos-armed Su-30MKIs, India's P-8I submarine-hunting aircraft and stealth frigate INS Shivalik also took part in the naval exercise. The US sent its nuclear-powered aircraft carrier USS Theodore Roosevelt for the exercise along with Arleigh Burke-class guided-missile destroyers USS Russell and USS John Finn and Ticonderoga-class guided-missile cruiser USS Bunker Hill.

The naval exercise comes just weeks after the first leadership-level meeting of the Quad on 12 March, in which Prime Minister Narendra Modi, US President Joe Biden, Australian Prime Minister Scott Morrison and Japanese Prime Minister Yoshihide Suga had participated. US Secretary of Defence Lloyd Austin was in New Delhi between 19 and 21 March and held talks

with National Security Advisor Ajit Doval and External Affairs Minister S Jaishankar, among others.

In April, Australia and Japan will also join the exercise, completing the Quad. France will also participate, making the exercise a 'Quad Plus' engagement.

http://www.indiandefensenews.in/2021/03/brahmos-armed-su-30mki-fighters-take.html

Tue, 30 March 2021

India's commissioning of nuclear missile tracking vessel: security implications for Pakistan – OpEd

By Sher Bano

Just a few months ago, in October 2020, India secretly commissioned its first nuclear missile tracking vessel 'VC-11184'. However, this information was made public very recently in March 2021, while all the trials and tests were conducted last year. The commissioning was postponed on account of the COVID-19 global pandemic. With this, India has become the fifth country in the world to acquire such capability. Though acquisition of such a vessel would enhance India's overall ballistic missile defence shield, its employment during a crisis would deteriorate the delicate strategic balance in the region. The enhancement in the Indian missile defence shield specifically at sea would likely undermine the effectiveness of Pakistan's delivery systems especially the ballistic missiles. Other than that, it could raise the chances of Indian miscalculation and would increase India's temptation to go for a 'splendid first strike' based on assumption that the missile tracking vessel would detect any incoming missile being fired in retaliation.

Currently, only four other countries China, Russia, France, and the US have been operating the same vessels that can detect the missiles launched at the sea. VC-11184 can detect missiles from a much longer range or one can say unlimited range because it has the ability to navigate in the ocean. The vessel has 15,000 tons displacement and consists of three 'dome-shaped antennas' with sensors and other electronic warfare equipment. Power of about 14 MW would be generated by the ship in order to provide power to its tracking radars and sensors. However, as of now most of the information pertaining to the capabilities of the vessel is being kept secret by the Indian Navy. As per reports, the vessel would be jointly operated by India's 'DRDO' (Defense Research and Development Organization), 'NTRO' (National Technical Research Organization), and the 'Indian Navy'.

Indian acquisition of such an offensive and aggressive capability at sea would likely have serious implications for the strategic stability of the region. It would provide India with a greater sense of security in the Indian Ocean Region (IOR). This would likely undermine the effectiveness and viability of Pakistan's cruise and ballistic missiles in a crisis situation. The probability of absorbing the opponent's retaliatory strike undermines the deterrence capability of the state that aims to deter the enemy through its ballistic and cruise missiles. Hence this deterrence instability would result in the subversion of strategic stability between the nuclear-armed rivals in South Asia by decreasing the vulnerabilities of the state having ballistic missile defense. Moreover, India's enhancement of ballistic missile defence would also threaten the nuclear deterrent stability leading

to strategic instability. One other destabilizing factor would be the intensification of the arms race between the two states. The Indian leadership having the false sense of confidence that they are invulnerable to any retaliation by Pakistani strategic forces might go for an offensive strike whenever there is a crisis situation. Furthermore, the Indian missile defence shield would complement the counterforce and surgical strike temptations of the hawkish Indian leadership. Hence such deployment by India would push both the states towards pre-emption.

In light of India's growing naval modernization and enhancement of its ballistic missile defence system at sea, Pakistan needs to re-think about its counterbalance strategy. In this regard, it might be more feasible for Pakistan to increase the size and further modernize its ballistic missile force. Pakistani missile designers can increase the speed of missiles and further enhance their effectiveness to penetrate the Indian missile defenses. Furthermore, Pakistan needs to arm its missiles with advanced technologies that could defy the 'ISR' (Intelligence, surveillance, and tracking system) of the Indian defensive weapons. In this regard, Pakistan can also utilize its 'MIRV' (Multiple Independently Targetable Re-entry Vehicles) technologies in order to make the Indian missile defence overwhelmed by ballistic missiles flurry. MIRV can launch weapons directed at different targets which can also be used against missile defence. While simultaneously it can also destroy or disrupt the radars. Pakistan may also improve its missile efficacy by employing and developing chaff, jamming, decoys, thermal shielding, warheads that have a low infrared signature, evasive trajectories.

The fragile strategic balance of the South Asian region being threatened by India's ambitions to become the regional power and enhancement of its offensive capabilities have made it obligatory for Pakistan to develop its sea-based nuclear capability. There would be very less incentive for any state to go for the first strike if both states have the invincible second-strike capability. Moreover like India, Pakistan might also need to develop an early warning system that can monitor and detect the Indian missiles. Lastly, since the South Asian region does not consist of any arms control measure that could resist any crisis leading to assured destruction, it's high time for a conflict resolution and arms control mechanism that could restrict the use of offensive capabilities by the nuclear adversaries.

(The writer is working as a Research Affiliate at the Strategic Vision Institute (SVI), a non-partisan think-tank based out of Islamabad, Pakistan.)

https://www.eurasiareview.com/29032021-indias-commissioning-of-nuclear-missile-tracking-vessel-security-implications-for-pakistan-oped/

Defence News

Defence Strategic: National/International

THE ECONOMIC TIMES

Mon, 29 March 2021

Cochin Shipyard's Rs 170 cr shipbuilding facility in West Bengal to be operational by June

Synopsis

Cochin Shipyard Limited, through its wholly-owned subsidiary Hooghly Cochin Shipyard Limited (HCSL), is currently setting up a modern shipbuilding facility at Nazirgunge, West Bengal at an estimated project cost of Rs 169.76 crore, as per a document of the Ministry of Shipping.

Public sector Cochin Shipyard NSE 0.78 % is expected to operationalise a Rs 170 crore modern shipbuilding facility that it is building in West Bengal by June 2021. The state-owned company, under the administrative control of the Ministry of Ports, Shipping and Waterways, recently emerged as the lowest bidder for a Rs 10,000-crore contract by the Indian Navy to build next generation missile vessels.

Representative Image

Cochin Shipyard Limited, through its wholly-owned subsidiary Hooghly Cochin Shipyard Limited (HCSL), is currently setting up a modern shipbuilding facility at Nazirgunge, West Bengal at an estimated project cost of Rs 169.76 crore, as per a document of the Ministry of Shipping.

"The facility is expected to be operationalised in the first quarter of the financial year 2021-22," the document said.

HCSL targets to construct various types of vessels like Ro-Ro vessels, river-sea cargo vessels for bulk, liquids, containers, passenger vessels and other watercraft for the inland waterways.

Cochin Shipyard has also commissioned a new marine engineering training institute 'Vigyana Sagar', which was dedicated to the nation by Prime Minister Narendra Modi on February 14, 2021.

The company recently inked a pact with Dredging Corporation NSE 5.42 % and IHC Holland BV to locally build world-class dredgers in India.

Currently, India depends on foreign dredgers for dredging work worth about Rs 2,000 crore per annum.

CSL, India's leading shipyard, can build ships up to 1,10,000 dead weight tonnage (DWT) and repair ships up to 1,25,000 DWT.

The yard has delivered two of India's largest double hull Aframax tankers each of 95,000 DWT.

https://economictimes.indiatimes.com/industry/transportation/shipping-/-transport/cochin-shipyards-rs-170-cr-shipbuilding-facility-in-west-bengal-to-be-operational-by-june/articleshow/81733032.cms?from=mdr

THE ECONOMIC TIMES

Tue, 30 March 2021

In a first, IAF participates in exercise Desert Flag VI in UAE

Exercise Desert Flag VI, UAE

In reflection of its gradual expansion of defence ties with the United Arab Emirates, India participated in a multilateral air exercise in the Gulf nation alongside several other key players, including the US and France. The sixth edition of the exercise 'Desert Flag-VI' was conducted from March 4 to 27 at Al Dhafra air base in the United Arab Emirates.

Participants

The exercise was also joined by Saudi Arabia and Bahrain, while Jordan, Greece, Qatar, Egypt and South Korea participated as observer forces.

In a first

"The Indian Air Force participated in the exercise for the first time, fielding Su-30MKI fighter aircraft," the Defence Ministry said. "During the exercise, the IAF flew large force engagement (LFE) missions in near realistic environment involving many aircraft of varied types. The IAF successfully undertook all the planned missions, both by day and night," the ministry said.

Objective

The objective of the exercise was to expose participating forces to large force deployment, sharpen tactical capabilities, and enhance interoperability along with fostering closer relations. The exercise in the UAE with friendly forces afforded a unique opportunity to gain valuable learning experience to all the participating forces.

Boosting defence ties

The defence and security ties between India and the UAE are expanding steadily. In February, India sent a warship to Abu Dhabi to participate in two naval defence exhibitions. Chief of Army Staff Gen MM Naravane visited the UAE in December last in the first ever visit by a head of the 1.3 million strong Army to the strategically important Gulf nation. Gen Naravane held extensive talks with senior military officials of the UAE and discussed avenues for enhancing bilateral defence cooperation.

https://economictimes.indiatimes.com/news/defence/why-india-should-reduce-engagement-with-china/myopic-jingoism/slideshow/81651598.cms

Hindustan Times

Tue, 30 March 2021

3 Rafale fighters to land in India on March 31, UAE to give mid-air refuelling

The India-French strategic ties have deepened further with Paris providing New Delhi with the latest technology through the joint development route

By Shishir Gupta

New Delhi: Three Rafale fighter jets are flying from France to India on Wednesday evening with key ally United Arab Emirates (UAE) Air Force's Airbus 330 multi-role transport tankers providing mid-air refuelling over the Gulf of Oman. The Rafale fighters will join the Golden Arrows Squadron in Ambala, taking the squadron strength to 14.

According to sources in Dassault Aviation, manufacturers of Rafale, the three fighters will take off from Merignac airbase in Bordeaux at 7am on March 31 and are expected to land in Gujarat around 7pm. The next batch of nine aircraft will take off next month, out of which five will be inducted at Hashimara airbase in north Bengal. The Rafale fighter is equipped with top of the line smart weapon systems and is designed for optimum damage to the adversary.

The three fighters will take off from Merignac airbase in Bordeaux at 7am on March 31 and are expected to land in Gujarat around 7pm.

While the Indian Air Force (IAF) will get its two squadrons of Rafale fighters as per the 2021 delivery schedule, the Modi government is interested in the joint development of French Safran military aircraft engines in India under the Aatmanirbhar Bharat mission. Although the Rafale is powered with two M88-3 Safran engines with a thrust of 73 Kilo Newton, the national security planners want Safran engines of higher thrust (90 -100 KN) to power Defence Research and Development Organisation's (DRDO's) advanced multi-role combat aircraft (AMCA). AMCA will have two engines and will be equipped with state-of-the-art weaponry. DRDO's Tejas project is at present powered by GE-404 engines. All the military manufacturing will be concluded under government to government route with no room for any agent or middle-man.

The India-French strategic ties have deepened further with Paris providing New Delhi with the latest technology through the joint development route. The India specific Rafales not only have the best weapons package available but this will continue to be upgraded from time to time.

https://www.hindustantimes.com/india-news/3-rafale-fighters-to-land-in-india-on-march-31-uae-to-give-mid-air-refuelling-101617015856170-amp.html

अमर उजाला

Tue, 30 March 2021

बढ़ेगी वायुसेना की ताकत: 31 मार्च को भारत आएंगे तीन और राफेल लड़ाकू विमान

सार

- ***चीन और पाकिस्तान के साथ सीमा पर तनाव जारी***
- ***भारत सरकार सेनाओं को मजबूत करने में जुटी***
- **31** ***मार्च को तीन राफेल विमान पहुंचेंगे अंबाला***
- ***अप्रैल के मध्य में नौ और राफेल भारत पहुंचेंगे***

विस्तार

भारत सरकार चीन और पाकिस्तान जैसे पड़ोसी देशों के साथ जारी तनाव के बीच देश की सेनाओं को और ताकतवर बनाने में जुटी है। जल्द ही भारतीय वायुसेना (आईएएफ) की ताकत में और अधिक इजाफा होने वाला है। जानकारी के अनुसार **31** मार्च को तीन और राफेल लड़ाकू विमान अंबाला में लैंड करेंगे। इसके बाद अप्रैल के मध्य तक नौ और राफेल लड़ाकू विमान फ्रांस से भारत पहुंचेंगे।

राफेल एयरक्राफ्ट - फोटो : Amar Ujala

फ्रांसीसी और भारतीय राजनयिकों की ओर से दी गई जानकारी के मुताबिक, भारतीय वायुसेना की एक टीम तीन राफेल को अंबाला लाने के लिए पहले ही फ्रांस पहुंच चुकी है। उम्मीद है कि राफेल के इन तीन लड़ाकू विमानों की खेप **31** मार्च को भारत पहुंच जाएगी। जानकारी के अनुसार तीन राफेल विमान बॉरडॉक्स में मेरिग्नाक एयरबेस से **31** मार्च की सुबह सात बजे उड़ान भरेंगे और शाम सात बजे के करीब गुजरात में लैंड करेंगे। नौ विमानों का अगला जत्था अप्रैल में भारत आएगा। इनमें से पांच विमानों को उत्तरी बंगाल में हाशिमारा एयरबेस पर तैनात किया जाएगा।

बता दें कि भारत ने फ्रांस सरकार के साथ सितंबर, **2016** में **36** राफेल लड़ाकू विमान खरीदने के लिए **59,000** करोड़ रुपये का रक्षा सौदा किया था। फ्रांस की कंपनी दसॉ एविएशन से पांच राफेल विमानों का पहला बेड़ा **28** जुलाई को भारत पहुंचा था। इस बेड़े ने फ्रांस से उड़ान भरने के बाद संयुक्त अरब अमीरात में हाल्ट किया था, जहां उसने ईंधन भरा था। राफेल के पहले बेड़े को जब वायुसेना में शामिल किया गया था, तब रक्षा मंत्री राजनाथ सिंह ने इसे गेम चेंजर करार दिया था। उनका दावा था कि राफेल के साथ वायुसेना ने तकनीकी स्तर पर बढ़त हासिल कर ली है। राफेल नवीनतम हथियारों और सुपीरियर सेंसर से लैस लड़ाकू विमान है।

भारतीय वायुसेना के अंबाला स्थित गोल्डन एरो स्क्वाड्रन ने जुलाई, **2020** और जनवरी, **2021** के बीच **11** राफेल लड़ाकू विमानों को पहले ही वायुसेना में शामिल कर लिया गया है। इन्हें लद्दाख सीमा पर तैना किया गया है। बता दें कि मई **2020** की शुरुआत से ही चीन के साथ सीमा गतिरोध के बाद सेना हाई अलर्ट पर है।

इसके साथ ही केंद्र सरकार फ्रांस की साफरान मिलिट्री एयरक्राफ्ट इंजिनों के संयुक्त विकास में भी रुचि दिखा रही है। उल्लेखनीय है कि राफेल लड़ाकू विमानों में **74** किलो न्यूटन के थ्रस्ट वाले दो एम**88-3**

साफ्रान इंजिन दिए गए हैं। लेकिन, राष्ट्रीय सुरक्षा योजनाकर्ता चाहते हैं कि डीआरडीओ के अत्याधुनिक मल्टीरोल कॉम्बैट एयरक्राफ्ट के लिए अधिक थ्रस्ट वाले (**90** से **100** किलो न्यूटन) इंजिन चाहते हैं।

https://www.amarujala.com/india-news/indian-air-force-3-rafale-fighters-landing-next-week-9-more-in-april-to-add-to-iaf-s-firepower-ambala

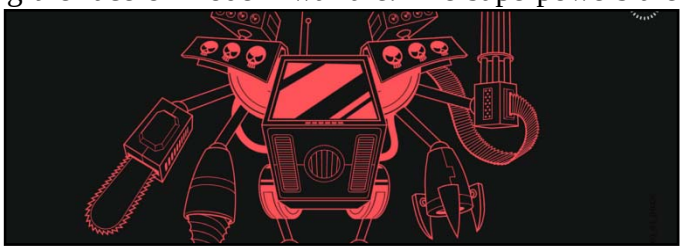
Tue, 30 March 2021

5 AI Tools For Modern Warfare

Check out the top AI tools for modern warfare

By Ambika Choudhury

Inarguably, artificial intelligence is changing the face of modern warfare. The superpowers are engaged in a pitched arms race on the back of advances in AI-powered autonomous systems, unmanned arms vehicles, drones, lasers, etc. Military theorists are now doubling down on AI research to turbocharge their country's warfare capabilities.



Here, we list five AI tools used in modern warfare.

1. Lethal Autonomous Weapons (LAWS)

AI-powered autonomous weapon systems are set to become force multipliers in future wars. The weapon system would have either decision making or aiding decision-making component to activate the launch. Currently, militaries and defence departments of several nations are already on their way to deploy autonomous AI lethal systems called Lethal Autonomous Weapons (LAWS).

LAWS are highly sophisticated AI-powered weapons that use sensors and artificial intelligence to identify and destroy targets. It can select and engage targets based on a set of predetermined criteria. At present, no fully autonomous weapon can operate independently.

2. AI-Enabled Drones

With each passing day, drones are gaining more autonomy. AI-enabled weapon systems such as armed drones would selectively target the militia without collateral damage. For instance, at the 2019 LIMA exhibition, Ziyan UAV unveiled a Chinese attack drone called Blowfish A2.

According to sources, the attack drone can carry radar, jamming devices, guns or bombs under its spine. Later, the company introduced Blowfish A3, which can carry multiple types of machine guns and features a different aerodynamic design allowing the gun to shoot at more angles mid-flight.

3. AI-Powered Killer Robots

Researchers worldwide have already started developing killer robots, which can carry out attacks without human intervention. Robots with AI and computer vision with IoT can help in target identification and classification.

4. Integrated Speech Solution

Integrated Speech Solution is an end-to-end voice translation system that leverages automatic speech recognition (ASR), machine translation and speech-to-text to translate multiple languages. Recently, a conversational AI startup Gnani.ai designed an integrated speech solution for the Indian Armed Force, Ministry of Defence.

The solution can translate Mandarin to English to assist the armed forces, the intelligence agencies and local law enforcement authorities. The solution has a wide range of applications, including cross border intelligence, voice surveillance, monitoring telephone/internet conversations, intercepting radio and satellite communication etc.

5. AI-Based Landmine Detection System

An automated decision system for landmine detection sweeps the ground to look for mines. The system works by using a sensor to capture real-time images of the area of interest. The captured images are then fed to a computing unit to be digitally processed before being analysed. Researchers have been developing these systems for a few years now, For instance, DRDO's Daksh – electrically powered Remotely Operated Vehicle (ROV) serve as Bomb Disposal Units for the army, paramilitary forces etc.

COMRADES (Cooperative Multirobot Automated Detection) system is a multi-robot system for humanitarian demining. Another example is Minect.ai, an AI-based landmine detection system that detects landmines and other projectiles using neural networks. The device can process visual data streams from multiple sources, including drones, robots and smartphones, in real-time to recognise and pinpoint the location of landmines.

https://analyticsindiamag.com/5-ai-tools-for-modern-warfare/

Business Standard

Mon, 29 March 2021

India, South Korea agree on joint production, export of military hardware

The decisions were taken during delegation-level talks between Defence Minister Rajnath Singh and his South Korean counterpart Suh Wook

New Delhi: In a significant move, India and South Korea have agreed to go for joint production and export of military hardware, enhance intelligence sharing and boost cooperation in cyber and space domains as part overall expansion of defence and security ties, official sources said on Sunday.

Photo: Shutterstock

The decisions were taken during delegation-level talks between Defence Minister Rajnath Singh and his South Korean counterpart Suh Wook on Friday with both sides resolving to give a major push to ramp up ties in strategically key areas, they said.

The South Korean minister was on a three-day visit to India from Thursday last that was focused on boosting bilateral defence and military cooperation.

In the field of defence industrial cooperation, the sources said the two sides decided to focus on joint research, joint production and joint export.

"There were extensive discussions on it," said a source.

South Korea has been a major supplier of weapons and military equipment to India. In 2019, the two countries finalised a roadmap for cooperation in joint production of various land and naval systems. In the talks, the South Korean minister also expressed keenness in seizing the opportunities in India's two defence corridors, particularly by investing in joint ventures under the 'Aatmanirbhar Bharat' (self-reliant India) initiative.

The government is working on setting up two defence industrial corridors in the country, one in Uttar Pradesh and another in Tamil Nadu, with an aim to ensure connectivity among various defence industrial units.

The sources said issues regarding multilateral and regional cooperation in the emerging regional security scenario were also discussed between Singh and Wook.

It is learnt that China's military assertiveness in the region figured in the talks.

The two sides also agreed to increase focus on cyber and space cooperation besides resolving to continue to focus on streamlining the intelligence exchange mechanism.

In the talks, the two ministers exchanged views on the impact of Covid-19 pandemic on the defence and security engagements as well as best practices followed by the armed forces to deal with the pandemic. The sources said the Korean minister also highlighted the congruence between India's Act East Policy and his country's Southern Policy.

In light of India's experience in the UN peacekeeping operations, the Indian side conveyed to the South Korean delegation that it will ensure an appropriate participation in the upcoming UN Peacekeeping Ministerial meet in that country in December 2021.

The South Korean minister also visited Agra where he was shown capabilities of India's special forces. He also interacted with top executives of defence public sector undertakings and representatives of industry chamber FICCI.

(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/current-affairs/india-south-korea-agree-on-joint-production-export-of-military-hardware-121032800693_1.html

mint

Mon, 29 March 2021

India, US begin two-day Naval drill in Indian Ocean

Participants of the Malabar exercise — India, US and Japan — were joined by the Australian navy in the drill

By Elizabeth Roche

The navies of India and the US on Sunday started a two-day exercise in the eastern Indian Ocean region, reflecting the growing congruence in their defence and military partnership.

The exercise comes a week after US defence secretary Lloyd Austin visited India as part of his three-nation first overseas tour.

The trip to Japan, South Korea, and India is seen as underscoring the strong commitment of US President Joe Biden's administration to its relations with its close allies and partners in the Indo-Pacific region.

The Indian Navy deployed its warship INS Shivalik and long-range maritime patrol aircraft P8I in the passage exercise or 'PASSEX', while the US Navy deployed the USS Theodore Roosevelt carrier strike group, a spokesman for the Indian Navy said.

The naval exercise was aimed at consolidating the synergy and interoperability achieved during the Malabar exercise (PTI)

A carrier battle group or carrier strike group consists of an aircraft carrier and a large number of destroyers, frigates and other ships.

The naval exercise was aimed at consolidating the synergy and interoperability achieved during the Malabar exercise that took place in November 2020, an individual close the development said.

Besides India, the US and Japan, which have been participating in the Malabar series of exercises, the Australian navy had joined the drill for the first time in 2020, making it an exercise of the forces of the Quad countries.

“In a first, enhancing jointmanship, Indian Air Force (IAF) fighters were also included in the exercise affording the IAF an opportunity to practice air interception and air defence with the US Navy," the spokesman said. During the US defence secretary’s visit last week, India and the US resolved to consolidate their robust defence cooperation through deeper military-to-military engagement with Austin describing the partnership as a “stronghold" of a free and open Indo-Pacific. In July 2020, the Indian Navy carried out a military exercise with a US Navy carrier strike group led by the nuclear-powered aircraft carrier USS Nimitz off the coast of the Andaman and Nicobar Islands.

https://www.livemint.com/news/india/india-us-start-two-day-naval-exercise-in-eastern-indian-ocean-region-11616937328099.html

IDN INDIAN DEFENCE NEWS
Global Defence, Aerospace & Security

Tue, 30 March 2021

Chinese VT4 Tank emerges during military parade in pakistan

The first public appearance of the Chinese VT4 main battle tank during the annual military parade in Pakistan that was held in Karachi on March 25, 2021. In 2019, Pakistan has selected the VT4 in the framework of the acquisition program of at least 100 new MBTs.

The Chinese-made VT4 main battle tank was officially presented for the first time to the public during the annual military in Pakistan, March 25, 2021. (Picture source Pakistan armed forces).

Chinese NORINCO VT4 is mainly built for overseas export

In September 2020, it was announced that Pakistan Army has inducted Chinese-made VT-4 Main Battle Tank. Currently, different types of main battle tanks are already in service with the Pakistani armed forces including 300 local-made Al-Khalid, 315 Russian T-80U, 500 local-made Al-Zarrar, 400 Chinese Type-69, and 268 Type-85-IIAP.

The VT4 is one of the latest generations of main battle tanks manufactured by the Chinese defence industry. The tank was unveiled in 2012 during the International Defence Exhibition Eurosatory that was held in Paris, France. The VT4 is now in service with China, Nigeria, Pakistan, and Thailand. The export variant of the VT4 is called MBT-3000.

The VT4 is armed with one 125mm smoothbore gun fitted with a thermal sleeve and fume extractor. It is fed by an automatic loader that holds a total of 22 projectiles and charges which can be loaded at the rate of eight per minute. The second armament includes one 7.62 mm coaxial machine gun and one remotely operated weapon station mounted on the commander cupola which is armed with one 12.7mm heavy machine gun. The cannon can also fire the anti-tank guided missile 9K119 Refleks with a range of up to 5 km.

The VT4 hull and turret are of all-welded steel armour construction. The tank can be fitted with explosive reactive armour (ERA), offering a high level of protection against shaped charges and specially hardened kinetic energy penetrators. The VT4 tank is powered by a water-cooled turbocharged electronic-controlled diesel engine developing 1,300 hp. It can run at the maximum speed of 70 km/h with a maximum cruising range of 500 km.

http://www.indiandefensenews.in/2021/03/chinese-vt4-tank-emerges-during.html

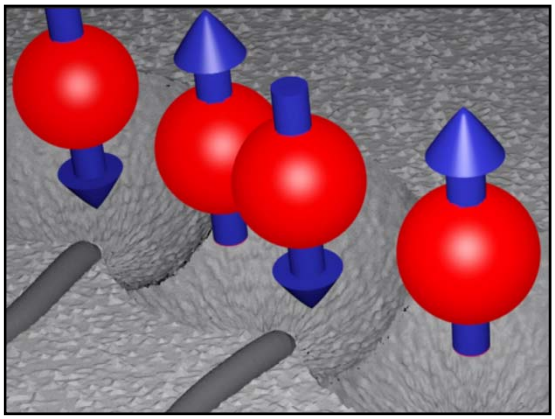
Tue, 30 March 2021

The road to quantum computing is paved in qubits

By Dr. Jürgen Graf

The race for the quantum computer will most likely be decided at the quantum bit (qubit) – the smallest information unit of the quantum computer. The coupling of several qubits into a computing system is currently one of the greatest challenges in the development of quantum computers. A key question is which physical system and which material are best suited for qubits. Development of qubits based on superconductors has advanced farthest—but there are increasing signs that silicon semiconductor technology may be a promising alternative with decisive advantages in chip production.

The classical bit is the smallest data storage unit of our current computers. It can take on exactly two values: One and zero—or in other words: A current either flows ("one") or does not flow ("zero"). The quantum bit, on the other hand, is not limited to these two states: It can assume an intermediate state of one and zero at the same time, known as "superposition." Only at the moment of measurement is this intermediate state brought to a fixed value. In other words: Whereas normal bits have a defined value at any given time, qubits take on a defined value only at the respective moment of measurement. This property is the basis for the massive computing power that quantum computers can harness for some problems.



AG Burkard | Schematic image of the new spin qubits consisting of four electrons (red) with their spins (blue) in the surrounding semi-conductor structure (grey)

This makes storage of such quantum information much more complicated—a simple "current on/current off" is not enough. Instead, the fastest and smallest processes in space and time serve as the basis: Quantum states of electrons or photons can be used to implement a qubit. In the case of silicon quantum bits, the intrinsic angular momentum of a single electron—the electron spin—is used for information storage. Here, the rotational direction of the electron in combination with its quantum state encodes the quantum information. This is, understandably, highly fragile, as even the most subtle disturbances at the atomic level can affect the angular momentum of an electron and destroy the quantum information.

Today's challenge: Coupling quantum bits

An even more difficult task is interconnecting quantum bits because a single quantum bit is not sufficient to carry out an arithmetic operation. Just like standard computers, quantum computers require multiple (quantum)bits to be linked together to form a computing system: Consequently, the individual qubits must be able to interact with each other. If the qubits to be coupled are far apart on the chip, one qubit must first be brought into the vicinity of the other with a kind of "quantum bus" to enable a computing operation.

In the case of the spin-based qubit, this means that the angular momentum of an electron must be transported or transferred to another electron precisely and with a minimum of disturbance—and not just once, but potentially thousands or even millions of times. A challenge for science—interconnecting the qubits is currently probably the biggest obstacle in the development of quantum computers. "It makes a difference whether you set up a single quantum bit or whether you team up

tens, hundreds or thousands of them. Interactions can occur between the qubits that are difficult to control," describes Professor Guido Burkard, professor of theoretical condensed matter physics and quantum information at the University of Konstanz.

Currently, the most advanced quantum computer prototypes achieve coupling of some 20 to 50 qubits. "This is a major success already. However, there is still a long way to go before we come to an actual application. Thousands or millions of qubits are needed to perform meaningful arithmetic operations," says Guido Burkard.

The potential of silicon

The most advanced quantum computer systems to date are based on superconductors. Superconductor-based systems are extremely powerful, but they have to contend with limitations: They do not operate at room temperature, but at temperatures just above absolute zero (at around -273 C). In addition, superconductors are relatively energy-intensive and comparatively large from the point of view of technical miniaturization, so that only a small number of superconductor-based qubits fit on a chip.

Alongside the further development of superconductor qubits, research is also going into alternative systems. Silicon is one of the most promising materials: "We believe that silicon-based semiconductor qubits offer great prospects," explains Guido Burkard. Silicon-based quantum bits have the advantage that, being only a few nanometres in size, they are decidedly smaller than superconductor systems. Consequently, many more of them can be put into a computer chip—potentially millions. "Moreover, industry already has decades of experience with silicon semiconductor technology. The development and production of silicon-based qubits benefits enormously from this—which is no small advantage," Guido Burkard explains.

As early as 2017, Guido Burkard's research team, in collaboration with Princeton University and the University of Maryland, succeeded in creating a stable "quantum gate" for silicon qubits—i.e. a switching system for initially two-qubit systems that was capable of performing all the basic operations of the quantum computer. A milestone on which the physicists are now building: "Our task now is to scale up and interconnect as large a number of silicon qubits as possible with a minimum of crosstalk," Burkard says. To achieve this goal, he has now joined forces with leading research teams in the field of qubit development within the framework of three large research networks at the levels of Europe, Germany and Baden-Württemberg.

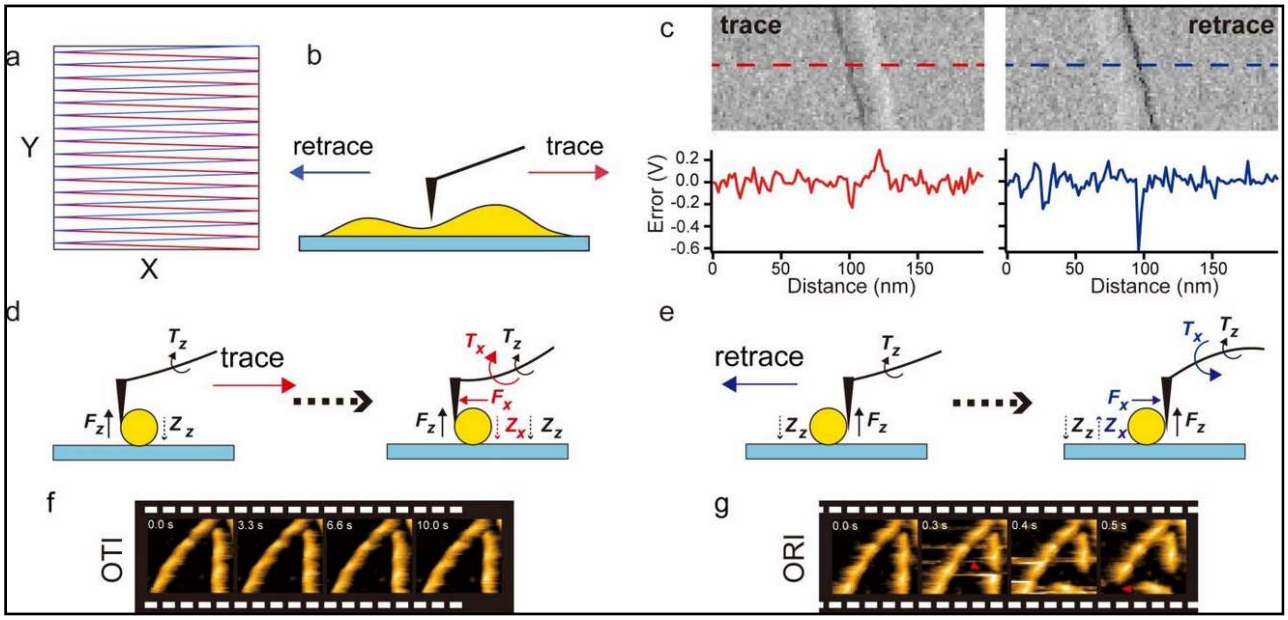
Provided by University of Konstanz

https://phys.org/news/2021-03-road-quantum-paved-qubits.html

Tue, 30 March 2021

Faster and less-invasive atomic force microscopy for visualizing biomolecular systems

High-speed atomic force microscopy (HS-AFM) is an imaging technique that can be used for visualizing biological processes, for example the activity of proteins. Nowadays, typical HS-AFM frame rates are as high as 12 frames per second. In order to improve the capabilities of the method, so that it can be applied to an ever expanding range of biological samples, better video rates are needed, though. Moreover, faster recording times imply less interaction between the sample and the probe—a tip scanning the sample's surface—making the imaging procedure less invasive. Now, Shingo Fukuda and Toshio Ando from Nano Life Science Institute (WPI-NanoLSI), Kanazawa University have developed an alternative HS-AFM approach to increase the frame rate up to 30 frames per second.



(a) Raster scanning: Trace scanning (red line) and retrace scanning (blue line) of the sample stage, (b) directions of tip scanning relative to sample in trace and retrace scanning processes,(c) difference in feedback control error between the trace and retrace scanning processes. Error images of the actin filament oriented nearly along the Y-axis (top) and the error profile (bottom),(d, e) difference in the directions of torques produced by lateral and vertical forces exerted on the cantilever from the sample during trace (d) and retrace (e) scanning processes, (f, g) HS-AFM images of actin filaments captured at 10 fps in the OTI (f) and ORI (g) modes. In the ORI mode, actin filaments were quickly broken. Credit: Kanazawa University

An AFM image is generated by laterally moving a tip around just above a sample's surface. During this xy-scanning motion, the tip's position in the direction perpendicular to the xy-plane (the z-coordinate) will follow the sample's height profile. The variation of the z-coordinate of the tip then produces a height map—the image of the sample.

Fukuda and Ando worked on HS-AFM in the so-called amplitude-modulation mode. The tip is then made to oscillate with a set amplitude. While scanning a surface, the oscillation amplitude will change because of height variations in the sample's structure. To get back to the original amplitude, a correction to the tip-sample distance needs to be made. How large the correction needs to be is related to the sample's surface topology, and is dictated by the so-called feedback control error of the setup. The scientists noted that the feedback control error is different when the tip moves in opposite directions, called tracing and retracing. This difference is ultimately due to the different physical forces at play when the tip is 'pulled' (tracing) and when it is 'pushed' (retracing).

Based on their insights into the physics of the tracing and retracing processes, Fukuda and Ando developed an imaging regime that bypasses retracing. This then needs to be properly accounted for in the controlling algorithm. The researchers tested their only-trace-imaging mode on actin filament samples. (Actin is a protein very common in cells.) The imaging was not only faster, but also less invasive—the filaments broke much less frequently . They also recorded polymerization processes (through protein-protein interactions); again, the method was found to be faster and less disturbing compared to the standard AFM tracing-retracing operation.

The scientists are confident that their "simple and highly effective method will soon be installed in the existing and upcoming HS-AFM systems, and will improve a wide range of HS-AFM imaging studies in biophysics and other fields."

More information: Shingo Fukuda et al, Faster high-speed atomic force microscopy for imaging of biomolecular processes, *Review of Scientific Instruments* (2021). DOI: 10.1063/5.0032948

Journal information: *Review of Scientific Instruments*

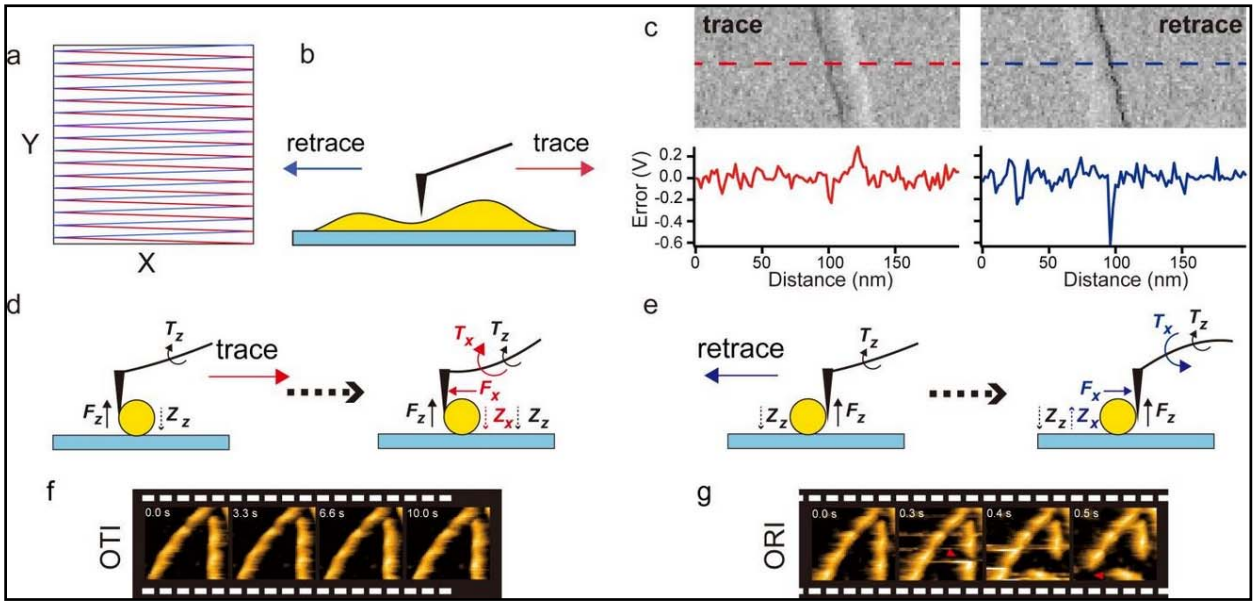
https://phys.org/news/2021-03-faster-less-invasive-atomic-microscopy-visualizing.html

PHYS.ORG

Tue, 30 March 2021

A new way to observe laser interactions could improve laser-based manufacture

Despite the enormous amount of research over the decades into lasers and their applications, scientists have difficulty accurately and directly observing fine details of their interactions with materials. For the first time, researchers have found a way to acquire such data from a production laser using low-cost equipment. The technique could vastly improve the accuracy of items cut or etched with lasers. Given the ubiquity of lasers, this could have wide-ranging implications in laboratory, commercial and industrial applications.



(Lower left) The laser makes a hole in a material. (Upper left) The fluence of the laser is measured. (Lower right) Measurements of the fluence and the hole depth are superimposed. (Upper right) The relationship between these measurements is then determined so that hole depth can be calculated based solely on the fluence. Credit: © 2021 Sakurai et al.

Lasers are used in an extraordinarily wide range of applications in the modern world. One area in particular that is increasingly important is in manufacture, as the level of precision at which a laser can operate is far greater than that of equivalent physical tools. However, this level of

precision could be even higher in theory, leading to a new generation of yet unimagined technologies. One significant way in which laser precision could be improved is a better means to obtain feedback on the way the laser interacts with a material. That would confer greater control and less uncertainty in the cutting and etching actions of a production laser. This problem has proven surprisingly difficult to tackle until now.

"To measure how far into a surface a laser has cut often requires tens or hundreds of depth readings. This is a substantial barrier for fast, automated laser-based production systems," said Professor Junji Yumoto from the Department of Physics at the University of Tokyo. "So we have devised a new way to determine and predict the depth of a hole produced by laser pulses based on a single observation rather than tens or hundreds. This finding is an important step forward in improving the controllability of laser processing."

Yumoto and his team sought to determine the depth of a laser hole using the minimal amount of information possible. This led them to look at what is known as the fluence of a laser pulse, which is the optical energy the pulse delivers over a given area. Until recently, expensive imaging equipment was required to observe this fluence, and lacked sufficient resolution. But thanks to developments in other areas of electronics and optics, a relatively simple Raspberry Pi Camera Version 2 proved suitable for the job.

As their test laser apparatus made a hole on sapphire, the camera directly recorded the fluence distribution of a laser pulse. Then a laser microscope measured the hole shape. By superimposing these two results and using modern numerical methods, the team produced a large and reliable data set that could accurately produce the relation between fluence and hole depth.

"This would be correspondent with the extraction of about 250,000 data points from a single measurement," said Yumoto. "Our new method could efficiently provide big data for machine learning and new numerical simulation methods to improve the accuracy and controllability of laser processing for manufacture."

More information: Haruyuki Sakurai, Kuniaki Konishi, Hiroharu Tamaru, Junji Yumoto, & Makoto Kuwata-Gonokami. Direct correlation of local fluence to single-pulse ultrashort laser to ablated morphology. *Communications Materials*. doi.org/10.1038/s43246-021-00138-x

https://phys.org/news/2021-03-laser-interactions-laser-based.html

MEDICAL NEWS TODAY

Tue, 30 March 2021

A common cold virus may help fight COVID-19

- ***A lab-based study has found that a virus that causes the common cold can trigger an innate immune response against SARS-CoV-2, the virus responsible for COVID-19.***
- ***In theory, infections with the common cold virus could inhibit the transmission of SARS-CoV-2 among members of a population and reduce the severity of infections.***
- ***Further research could lead to control strategies or treatments that exploit such interactions between viruses.***

For decades, scientists have been hunting for a cure for the common cold, with little success.

However, recent research hints that this bothersome — though usually mild — infection may be a hidden ally in the fight against pandemic viruses such as influenza and SARS-CoV-2.

Human rhinoviruses (HRVs), which cause more than half of all common colds, are the most widespread respiratory viruses in humans.

suggests that HRVs may have inhibited the spread of the influenza A virus subtype H1N1 across Europe during the 2009 flu pandemic.

Experts believe that the HRVs did this by inducing human cells to produce interferon, which is part of the body's innate immune defenses against viral infection.

Research has shown that SARS-CoV-2 is susceptibleTrusted Source to the effects of interferon.

This finding led scientists at the MRC-University of Glasgow Centre for Virus Research in the United Kingdom to speculate whether HRVs could help combat the spread of SARS-CoV-2 and limit the severity of infections.

Human respiratory cells

To find out, the researchers infected cultures of human respiratory cells in the lab with either SARS-CoV-2, an HRV, or both viruses at the same time.

The cultures closely mimicked the outer layer of cells, called the epithelium, that lines the airways of the lungs.

SARS-CoV-2 steadily multiplied in the cells that the team had infected with this virus alone. However, in cells also infected with HRV, the number of SARS-CoV-2 virus particles declined rapidly until they were undetectable just 48 hours after the initial infection.

In further experiments, the scientists found that HRV suppressed the replication of SARS-CoV-2, regardless of which virus infected the cells first.

Conversely, SARS-CoV-2 had no effect on the growth of HRV.

To test their hunch that HRV was inhibiting SARS-CoV-2 by triggering the cells' innate immune response, the researchers repeated their experiments in the presence of a molecule that blocks the effects of interferon.

Sure enough, the molecule restored the ability of SARS-CoV-2 to replicate in cells infected with HRV.

"Our research shows that human rhinovirus triggers an innate immune response in human respiratory epithelial cells, which blocks the replication of the COVID-19 virus, SARS-CoV-2," says senior author Prof. Pablo Murcia.

“This means that the immune response caused by mild, common cold virus infections could provide some level of transient protection against SARS-CoV-2, potentially blocking transmission of SARS-CoV-2 and reducing the severity of COVID-19,” Prof. Murcia adds.

Mathematical simulation

The researchers used a mathematical simulation to predict how different numbers of HRV infections of varying lengths might affect the spread of SARS-CoV-2 through a population.

The results showed that the number of new SARS-CoV-2 infections in a population is inversely proportional to the number of HRV infections.

The model predicts that if the common cold virus were to become sufficiently widespread and persistent, it could temporarily prevent SARS-CoV-2 from spreading.

“The next stage will be to study what is happening at the molecular level during these virus-virus interactions to understand more about their impact on disease transmission,” says Prof. Murcia.

“We can then use this knowledge to our advantage, hopefully developing strategies and control measures for COVID-19 infections,” he adds.

The research appears in *The Journal of Infectious Diseases*.

In their paper, the researchers speculate that mild HRV infections might be mutually beneficial for the virus and its human hosts.

They write that the immune system may have evolved to allow HRV to replicate and transmit to new hosts. In return, the virus keeps more severe and potentially lethal viral infections at bay.

Real-world limitations

At the Science Media Centre in London in the United Kingdom, other scientists welcomed the research but flagged some potential limitations.

Gary McLean, who is a professor in molecular immunology at London Metropolitan University in the U.K., said that the major limitation was that the study involved just one of the 160 or more possible strains of rhinovirus.

He said there was no guarantee that each strain would have the same effect on SARS-CoV-2 infections.

He added that translating results from a lab experiment to real life is “very tricky,” saying:

“Although it is likely that a common cold virus, such as rhinovirus, would induce a strong innate immune response that could block SARS-CoV-2 infections, it would still require both infections to occur at a similar time.”

In addition, he pointed out that intensive infection control measures over the past year have made the common cold less prevalent, reducing the potential for HRV-triggered innate immunity to combat the spread of SARS-CoV-2.

https://www.medicalnewstoday.com/articles/a-common-cold-virus-may-help-fight-covid-19#Real-world-limitations