Jan
2021

समाचार पत्रों से चयित अंश
Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

खंड : 46 अंक : 13 19 जनवरी 2021

Vol. : 46 Issue : 13 19 January 2021

रक्षा विज्ञान पुस्तकालय
Defence Science Library
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र
Defence Scientific Information & Documentation Centre
मेटकॉफ हाउस, दिल्ली - 110 054
Metcalfe House, Delhi - 110 054

CONTENTS

DRDO News

DRDO Technology News

Press Information Bureau
Government of India

Ministry of Defence

Mon, 18 Jan 2021 6:19PM

DRDO hands over Motor Bike Ambulance 'Rakshita' to CRPF

Institute of Nuclear Medicine and Allied Sciences (INMAS), Delhi based DRDO laboratory, handed over Rakshita, a bike-based casualty transport emergency vehicle to Central Reserve Police Force (CRPF) in a ceremony held at CRPF HQ in New Delhi on 18 January 2021. DS & DG (LS), DRDO, Dr AK Singh handed over the model of Rakshita to DG CRPF, Dr AP Maheshwari, followed by the flagging off the contingent of 21 bikes on the occasion.

The bike ambulance will help in overcoming the problems faced by Indian security forces and emergency healthcare providers. It will provide life-saving aid for evacuation of injured patients from low intensity conflict areas. This will be handy in the congested streets and remote locations, where access through ambulance is difficult and time consuming. The bike can respond to a medical emergency need of patients faster than a four-wheeler due to its functionality and integrated emergency medical support system.

Rakshita is fitted with a customized reclining Casualty Evacuation Seat (CES), which can be fitted in and taken out as per requirement. Other major features are the head immobilizer, safety harness jacket, hand and foot straps for safety, adjustable footrest, physiological parameter measuring equipment with wireless monitoring capability and auto warning system for driver. The vital parameters of the patient can be monitored on the dashboard mounted LCD. It is also equipped with air splint, medical and oxygen kit for on spot medical care.

This bike ambulance is useful not only for the paramilitary and military forces but has potential civil applications too.

Secretary DD R&D and Chairman DRDO Dr G Satheesh Reddy appreciated the efforts of scientists for this indigenous and cost-effective solution to a common challenge faced by our security forces.

https://pib.gov.in/PressReleasePage.aspx?PRID=1689731

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Mon, 18 Jan 2021 6:19PM

डीआरडीओ ने मोटर बाइक एम्बुलेंस 'रक्षिता' सीआरपीएफ को सौंपी

भारतीय रक्षा अनुसंधान और विकास संगठन के दिल्ली स्थित नामिकीय औषिध तथा संबद्ध विज्ञान संस्थान (आईएनएमएएस) ने आज बाइक आधारित कैजुअल्टी ट्रांसपोर्ट इमरजेंसी वाहन, 'रक्षिता', को एक समारोह में केंद्रीय रिजर्व पुलिस बल (सीआरपीएफ) को सौंपा। समारोह नई दिल्ली स्थित केंद्रीय रिजर्व पुलिस बल (सीआरपीएफ) के मुख्यालय में आयोजित किया गया। डीआरडीओ के डीएस एवं डीजी (एलएस) डॉ. ए के सिंह ने 'रक्षिता' के मॉडल को केंद्रीय रिजर्व पुलिस बल (सीआरपीएफ) के महानिदेशक एपी माहेश्वरी को सौंपा, जिसके बाद इस अवसर पर 21 बाइकों के एक दल को झंडी दिखाकर रवाना किया गया।

यह बाइक एम्बुलेंस भारतीय सुरक्षा बलों और आपातकालीन स्वास्थ्य सेवा प्रदाताओं के सामने आने वाली समस्याओं में तत्काल मदद करेगी। यह कम तीव्र संघर्ष वाले इलाकों से घायलों को निकालने के दौरान जीवन रक्षक सहायता प्रदान करेगी। यह संकीर्ण सड़कों और दूरदराज के इलाकों के लिए उपयुक्त होगी, जहां एम्बुलेंस के माध्यम से पहुंचना मुश्किल और अधिक समय लेने वाला है। यह बाइक एम्बुलेंस अपनी कार्यक्षमता और एकीकृत आपातकालीन चिकित्सा सहायता प्रणाली के चलते चार-पहिया एम्बुलेंस की तुलना में तेजी से रोगियों के लिए एक चिकित्सा आपातकालीन आवश्यकता उपलब्ध करा सकती है।

बाइक एम्बुलेंस 'रक्षिता' में एक स्वनिर्धारित रिक्लाइनिंग कैजुअल्टी इवैक्यूएशन सीट (सीईएस) लगाई गई है, जिसे आवश्यकता के अनुसार उपयोग किया जा सकता है। 'रक्षिता' में हेड इम्मोबिलाइज़र, सुरक्षा हार्नेस जैकेट, हाथों और पैरों की सुरक्षा के लिए सुरक्षा पट्टियाँ, ड्राइवर के लिए वायरलेस मॉनिटरिंग क्षमता और ऑटो चेतावनी प्रणाली के साथ फ़िज़ियोलॉजिकल पैरामीटर मापने वाले उपकरण भी अन्य प्रमुख विशेषताओं में शामिल है। घायल साथी के हाल की रियल टाइम निगरानी डैशबोर्ड पर लगे एलसीडी पर की जा सकती है। बाइक एंबुलेंस मौके पर ही स्वास्थ्य सुविधा प्रदान करने के लिए एयर स्प्लिंट, मेडिकल और ऑक्सीजन किट से भी लैस है।

यह बाइक एम्बुलेंस न केवल अर्धसैनिक और सैन्य बलों के लिए उपयोगी है, बल्कि नागरिकों के लिए भी इसका उपयोग किया जा सकता है।

डॉ. जी. सतीश रेड्डी, अध्यक्ष डीआरडीओ और सचिव डीडी आरएंडडी ने हमारे सुरक्षा बलों के सामने आने वाली चुनौतियों के जवाब में इस स्वदेशी और लागत प्रभावी समाधान के लिए वैज्ञानिकों के प्रयासों की सराहना की।

https://pib.gov.in/PressReleasePage.aspx?PRID=1689808

Tue, 19 Jan 2021

India provides spares for air surveillance radar to Sri Lanka

By Sidhant Sibal

Story Highlights

- ***Indian Air Force's An-32 aircraft had landed with the spares on January 10 and was formally handed over by Indian High Commissioner to Sri Lanka Gopal Baglay to Commander of Sri Lanka Air Force, Air Marshal Sudarshana Pathirana.***

As part of a high-level defence engagement with Sri Lanka, India earlier this month provided the country with 341 Indra Radar spares worth 200 Sri Lankan million. The spares will be used to provide support to the four Indra MK-11 air surveillance radars gifted to India by Sri Lankan Air Force in 2011.

Indian Envoy to Sri Lanka Gopal Baglay handing over radar spares. Pic Courtesy: Indian High Commission Photograph:(WION)

Indra MK II radar is a mobile 2d Radar capable of detecting low flying aircraft. They have been developed by the Electronics and Radar Development Establishment (LRDE) wing of the Defense Research and Development Organization (DRDO). It is manufactured by Bharat Electronics and is the cornerstone of the Sri Lanka Air Force.

Indian Air Force's An-32 aircraft had landed with the spares on January 10 and was formally handed over by Indian High Commissioner to Sri Lanka Gopal Baglay to Commander of Sri Lanka Air Force, Air Marshal Sudarshana Pathirana.

India has also completed the annual life extension checks of 54 shoulder-launched surface to air IGLA missiles of the Sri Lankan Air force. This coincided with the handing over of the spare parts.

The Indian mission in Sri Lanka in a statement said, "the expeditious positioning of the spares and the Igla Missiles is indicative of the growing cooperation, camaraderie and friendship between the two nations, with Sri Lanka being accorded the status of ‘Priority One’ partner by India."

The IGLA missile system was gifted to Sri Lanka by India in 2007 and as a "goodwill gesture," the annual life extension checks are taken by Indian Air Force. In fact, IAF training teams had assisted Sri Lanka Air Force in setting up the system and have also conducted multiple courses on the missile system.

The development comes even as under its SAGAR vision - Security and Growth for All in the Region, India has been reaching out to many Indian ocean countries. November of 2020 saw India-Sri Lanka-Maldives NSA level trilateral with focus on more increased cooperation amid challenges like piracy, maritime security and counter-terror.

https://www.wionews.com/india-news/india-provides-spares-for-air-surveillance-radar-to-sri-lanka-357451

HT Auto
DRIVE YOUR PASSION

Tue, 19 Jan 2021

Royal Enfield Classic 350CC modified into bike ambulance Rakshita by DRDO, CRPF

- ***Rakshita is built on a Royal Enfield Classic 350CC and comes with quick fit in and fit out casualty evacuation seat***

As many as 21 'Rakshita'- bike ambulances were inducted into Central Reserve Police Force (CRPF) on Monday for the evacuation of the security force personnel in remote regions.

Dr AP Maheshwari, DG CRPF and Dr AK Singh, DS & DG (LS), DRDO unveiled the bike ambulance today at CRPF Headquarters in New Delhi developed by the Defence Research and Development Organisation's (DRDO) Institute of Nuclear Medicine and Allied Sciences (INMAS) in collaboration with CRPF for golden hour life-saving aid and evacuation.

DG CRPF expressed his gratitude to team INMAS for their unrelenting efforts put in developing the bike ambulance and commended their tireless dedication and professional efficiency.

Bike ambulance Rakshita, developed by CRPF and DRDO, launches. (Photo courtesy: Twitter/@ANI)

"In its endeavour to provide impregnable internal security to the nation, CRPF is actively deployed across the country. Most of these deployments are in remote and inhospitable areas like Left Wing Extremism (LWE) affected areas, North East, etc. where evacuation of sick or battle injured personnel becomes a challenge. Many times, late evacuation results in the loss of precious lives of CRPF. To mitigate this, in 2018 CRPF approached INMAS with the idea of developing an ambulance on motorbikes which is frequently used by CRPF for patrolling in these theatres," said Dr AK Singh, DS & DG (LS), DRDO.

He further said that the INMAS promptly put up a team of scientists and experts to make the idea a reality. The team developed a prototype and improved it with the feedback from CRPF personnel deployed in disturbed areas.

Carefully custom-built to the needs of an emergency evacuation, Rakshita is built on a Royal Enfield Classic 350CC and comes with quick fit in and fit out casualty evacuation seat (CSE) that has customised design reclining, hand immobilizer and harness jacket, physiological parameter measuring equipment with monitoring capability and auto warning system for the driver, dashboard-mounted LCD for measuring vital parameters, air splint medical and oxygen kit, saline and oxygen administration on the move, adjustable footrest, and hand and foot strap for safety among others.

This equipment makes Rakshita on-spot medical care and injured transport system which is not just indigenous and cost-effective but can also reach inaccessible or remote locations by traversing unmotorable roads, narrow streets, congested or unpaved roads that are otherwise inaccessible by the conventional four-wheeled ambulances.

This story has been published from a wire agency feed without modifications to the text. Only the headline has been changed.

https://auto.hindustantimes.com/auto/news/bike-ambulance-rakshita-developed-by-crpf-and-drdo-launches-41610949951987.html

Business Standard

Tue, 19 Jan 2021

At $43 mn each, Hindustan Aeronautics' Tejas Mark 1A seeks export market

At Rs 315 crore ($43 million) per fighter, the Tejas Mark 1A would be a viable competitor in the international market for light fighters. It would be less so if taxes took up its cost to Rs 385 crore

By Ajai Shukla

New Delhi: On Wednesday, the Ministry of Defence (MoD) announced the Union Cabinet's clearance for Hindustan Aeronautics Ltd (HAL) to build 83 Tejas Mark 1A light combat aircraft (LCA) for Rs 45,696 crore. This raised concerns that the improved version of the current Tejas Mark 1 fighter would cost a daunting Rs 550 crore each.

However, senior government sources have clarified to *Business Standard* that each Tejas Mark 1A will cost no more than Rs 315 crore to build, with the total manufacturing cost adding up to Rs 26,145 crore.

The balance of the Cabinet clearance includes allocations for tax and for maintenance and support infrastructure in the two operational air bases that will be home to the four squadrons of the Tejas Mark 1A.

Of the Cabinet's total allocation, government taxes and levies constitute about 20 per cent, or about Rs 9,000 crore. Effectively, the Ministry of Finance will be appropriating a large chunk of the defence budget through taxing an indigenous weapons platform.

In major arms manufacturing countries, such as the USA, defence equipment and weaponry is exempt from excise and sales tax.

True, taxation of defence equipment merely amounts to money going from one government pocket to another. However, it would have serious implications when it comes to export of the Tejas Mark 1A. The government has emphasised the need for promoting export, which would reduce the fighter's cost through manufacture in larger numbers.

At Rs 315 crore ($43 million) per fighter, the Tejas Mark 1A would be a viable competitor in the international market for light fighters. It would be less so if taxes took up its cost to Rs 378 crore ($51 million). Competitors, such as the Sino-Pakistan JF-17 Thunder, are cheaper with a unit cost of $25-30 million. However, the Tejas Mark 1A outperforms them in avionics and weaponry.

This is through performance enhancements introduced into the Tejas Mark 1A, compared to the current Mark 1. The Mark 1A features the Israeli Elta EL/AESA 2052 active electronically scanned array (AESA) radar, replacing the Mark 1's manually scanned Elta EL/M 2032 radar. None of the light fighters competing with the Tejas features an AESA radar, which provides a massive advantage in air-to-air as well as air-to-ground combat.

The Tejas Mark 1A also scores in electronic warfare (EW), being equipped with an Israeli self-protection jammer (SPJ), carried in an external pod under the fighter's wing.

Finally, an operational edge is provided by the Mark 1A's air-to-air missiles. Its primary "beyond visual range" (BVR) missile is the indigenous Astra, one of the Defence R&D Organisation's (DRDO's) outstanding successes. In addition, the Mark 1A is integrated with the shorter-range ASRAAM missile, built by European consortium, MBDA; and with the Israeli Derby and Russian R-73 missiles.

While the Tejas LCA programme has been run by the DRDO, through an organisation called the Aeronautical Development Agency (ADA), developing and manufacturing the Tejas Mark 1A was entrusted to HAL. However, ADA, which holds all the source codes of the Tejas, charged HAL a sum of Rs 800 crore for its partnership.

The amount cleared by the Cabinet also includes expenditure on setting up operational infrastructure for flying the Tejas Mark 1A from two Indian Air Force (IAF) bases, which are still unidentified. Each airbase will house two Tejas Mark 1A squadrons.

Each of these two airbases will operate a Technical Training School, in which maintenance technicians and even pilots will undergo continuous training and upgrading of their technical skills. The cost of setting up each of these training establishments will be over Rs 300 crore.

An expenditure of Rs 1,202 crore has also been budgeted for setting up "ground support equipment" (GSE) and "ground handling equipment" (GHE) in both the Tejas Mark 1A airbases. This equipment is required for the ground end of flying operations – getting the fighter aircraft started up and airborne, carrying out maintenance checks and a certain level of repair and replacement of modules.

A large sum has been cleared for the Tejas Mark 1A's "maintenance running list of spares" (MRLS), which is a large inventory of spares and modules that operational squadrons and depots holds in reserve. This is so that, in the event of an aircraft component or module requiring to be replaced, it is readily available with the airbase and there is no waiting period while the part is obtained from a central depot.

IAF sources indicate that HAL initially submitted a cost estimate of Rs 59,000 crore, which was brought down by the Cost Negotiation Committee by Rs 12,000 crore. In fact, the reason for HAL's high initial estimate was the IAF's demand that the Tejas fighter's engine – the F-404IN engine, built by US firm General Electric (GE) – be manufactured in India with transfer of technology (ToT) from GE.

Eventually, this plan was dropped due to the high cost demanded by GE for ToT and licence to build the F-404IN engine in India. Buying ready-built engines from GE brought down the project cost by Rs 12,000 crore.

Graphic: Tejas cost breakdown

1.	Basic cost of 83 fighters	:	Rs 26,145 crore
2.	ADA consultancy charges	:	Rs 800 crore
3.	Maintenance running list of spares	:	Rs 8,000 crore
4.	Technical training schools	:	Rs 600 crore
5.	GSE/GHE	:	Rs 1,202 crore
6.	Central taxes	:	Rs 9,000 crore
TOTAL (about)		**:**	**Rs 45,696 crore**

https://www.business-standard.com/article/current-affairs/at-43-mn-each-hindustan-aeronautics-tejas-mark-1a-seeks-export-market-121011800019_1.html

The Tribune

Mon, 18 Jan 2021

Govt sets up stiff targets for home production of Tejas

At present, only 50% of jet is made in India, while engine and radar come from US and Israel

By Ajay Banerjee

New Delhi: Getting a green signal on making the next version of the Light Combat Aircraft (LCA), Tejas, the government has set stiff targets on indigenisation of the jet.

It has tasked that a set of technologies, which have not been done in India before, be attempted and crucially laid out money for speeding up the manufacturing process.

Last week, the Cabinet Committee on Security (CCS) headed by Prime Minister Narendra Modi, gave a nod to the procurement of 83 LCA for the Indian Air Force (IAF) to be manufactured by Hindustan Aeronautics Limited (HAL).

The jets will be in two variants — 73 of these will be "Tejas Mk-1A" configuration, while 10 jets will be the "Tejas Mk-1" configuration used as a trainer aircraft. The project will cost Rs 45,696 crore.

At present, only 50 per cent of the jet is made in India, while the engine and the latest radar — called AESA — come from the US and Israel, respectively.

Currently, the aircraft has around 344 systems fitted in it and 210 systems are indigenous and 134 of them are imported, said a senior functionary.

By the time, the first aircraft gets produced by HAL, it is targeted that the imported systems will be reduced to approximately 80. Tejas is expected to be the backbone of the IAF fighter fleet in years to come and is slated to be produced in high numbers. The production will be done at a new state-of-the-art facility in Bengaluru.

The HAL has created the facilities to house the additional production line of LCA. Once ready, the facility would be spread across 35 acres and a built-up area of 34,893 sq m. The phase 1 of the facility is ready and is spread across 24,077 sq m.

Specialised facilities and hangars for structural assembly of aircraft are being created and simulation software packages have been added.

https://www.tribuneindia.com/news/nation/govt-sets-up-stiff-targets-for-home-production-of-tejas-199970

Tue, 19 Jan 2021

ASMI: India's first indigenous machine pistol

DRDO and Indian Army have jointly developed India's first indigenous 9mm Machine Pistol 'ASMI' which is in line with PM Modi's vision of Atmanirbhar Bharat

By Arfa Javaid

Defence Research and Development Organisation (DRDO) and Indian Army have jointly developed India's first indigenous 9mm Machine Pistol 'ASMI'. It is in line with Prime Minister Modi's vision of Atmanirbhar Bharat or Self-reliant India.

This announcement comes nearly a month after a 'Carbine', jointly developed by the ARDE and the Ordnance Factory Board (OFB) completed its final phase of user trials by the Army and was ready for induction. It not only replaced the ageing 9 mm carbine which is currently in use by the armed forces but also aimed at modernising the armoury of the Central Armed Police Forces and State Police Forces.

Specifications

Mass: 1.7 - 2 kg (empty)

Barrel Length: 203.2 mm

Cartridge: 9x19mm Parabellum

Action: Straight Blowback

Rate of Fire: 600 rounds/min

Effective Firing Range: 100 m

Feed System: 33 round Glock magazine

Sights: Picatinny rail provided

ASMI

Key Highlights:

- Infantry School, Mhow and DRDO's Armament Research & Development Establishment (ARDE), Pune have designed and developed the weapon using their respective expertise in the complementary areas.
- 9mm Machine Pistol has been developed in a period of 4 months.
- It fires the in-service 9mm ammunition, sporting an upper receiver made from aircraft-grade Aluminium and lower receiver from carbon fibre.
- 3D Printing process has been used in designing and prototyping its various parts. This includes trigger components made by metal 3D printing.
- The weapon has a production cost under Rs. 50,000 each and has a potential for exports.
- ASMI has been designed by Lieutenant Colonel Prasad Bansod.
- The weapon is named 'ASMI' which means Pride, Self Respect and Hard Work.

Significance:

The weapon has a huge potential in Armed forces as a personal weapon for heavy weapon detachments, commanders, tank and aircraft crews, drivers/dispatch riders, radio/radar operators, Closed Quarter Battle, counter-insurgency, counter-terrorism operations, and so forth.

The weapon also finds huge employability with the Central and State Police Organizations, VIP protection duties and Policing. It is expected that the Services and Paramilitary Forces (PMFs) will induct this expeditiously.

https://www.jagranjosh.com/general-knowledge/all-you-need-to-know-about-indias-first-indigenous-machine-pistol-asmi-1610972409-1

INDIA TODAY

Tue, 19 Jan 2021

Indian Army to induct double-humped camels to assist with patrolling in eastern Ladakh

The Indian Army believes that the double-humped camels will prove helpful in patrolling the area along the Line of Actual Control (LAC) in eastern Ladakh

By Rouf A Roshangar

Leh: Indian Army is set to induct double-humped camels into the force very soon. These animals will be used to carry essential items and other infantry paraphernalia all the way to high altitude areas.

Officials believe each double-humped camel can carry five times more than local ponies found in Ladakh. The Indian Army had been using these local ponies for transportation of essential items until now.

In Ladakh, the number of these double-humped camels is very low and only around 250-300 can be found in the cold desert, particularly in the Nobra valley.

However, the Indian Army believes that the double-humped camels will prove helpful in patrolling the area along the Line of Actual Control (LAC). This is the same area bordering China.

Double-humped camels being trained by Indian Army in Ladakh (Photo Credits: Rouf Ahmad Roshangar/India Today)

The Defence Research and Development Organisation (DRDO) in Leh has, in fact, concluded research on the double-humped or Bactrian camels. This research shows that these camels can carry a load of 170 kilograms at an elevation of 17,000 feet in the eastern Ladakh region.

Eastern Ladakh is also where Indian and Chinese troops have been engaged in an intense military standoff since May of last year. Both countries have since engaged in multiple diplomatic and military talks at the highest level to achieve disengagement.

https://www.indiatoday.in/india/story/indian-army-to-induct-double-humped-camels-to-assist-with-patrolling-in-eastern-ladakh-1760319-2021-01-18

Defence News

Defence Strategic: National/International

THE TIMES OF INDIA

Tue, 19 Jan 2021

After Tejas, India moves ahead to procure more MiG-29s & Sukhois

By Rajat Pandit

New Delhi: India is now formally moving ahead to procure 21 MiG-29 and 12 Sukhoi-30MKI fighters from Russia, along with upgrades of their existing fleets, after the Cabinet Committee on Security approved the production of 83 indigenous Tejas jets last week.

For starters, the RFP (request for proposal) for the 21 MiG-29 fighters, whose bare airframes are lying in a mothballed condition in Russia since the later-1980s, will soon be issued to Russian state-run defence export arm Rosoboronexport, said defence sources on Sunday.

Along with the 83 new Tejas, which will be inducted in the January 2024-December 2028 timeframe under the Rs 46,898 crore deal cleared by the CCS, the additional MiG-29s and Sukhois are meant to stem the freefall in the number of IAF fighter squadrons.

With the progressive phasing out of the obsolete MiG-21s, MiG-23s and MiG-27s, the force is down to just about 30 squadrons (each has 16-18 jets) when at least 42 are required to tackle the "collusive" threat from China and Pakistan. The remaining four MiG-21 "Bisons" squadrons are also slated to retire by 2024.

The defence ministry in July last year gave the initial nod for the acquisition of the 21 MiG-29s with the latest avionics and electronic warfare suites, and further upgrade of the 59 existing jets to "ensure commonality across the fleet", at a cost of Rs 7,418 crore.

The cost of 12 new twin-seat Sukhois, along with advanced electronic warfare capabilities as well as additional supplies and spares, in turn, was estimated to be Rs 10,730 crore.

While 42 Sukhois are now being modified to carry the precision-strike BrahMos supersonic cruise missiles, the entire fleet will also subsequently be "fully enhanced" with more advanced avionics, radars and weapons to further bolster their combat capabilities.

IAF also plans to get the "acceptance of necessity" by this April-May for its long-term mega "Make in India" project for 114 new fighters for over $20 billion under the "strategic partnership" policy.

The French Rafale fighter will obviously be the frontrunner if India goes ahead with this project, having already bought 36 of them under the Rs 59,000 crore deal inked in September 2016. The other six contenders are F/A-18 and F-21 (US), Gripen-E (Sweden), Sukhoi-35 and MiG-35 (Russia) and the Eurofighter Typhoon.

https://timesofindia.indiatimes.com/india/after-tejas-india-moves-ahead-to-procure-more-mig-29s-sukhois/articleshow/80320199.cms

Business Standard

Tue, 19 Jan 2021

Drone maker ideaForge bets big on Indigenisation for armed forces

The Army signed a $20-million deal with the Infosys-backed drone maker last week

By Arindam Majumder

New Delhi: When Indian and Chinese forces were engaged in Ladakh last year, the Indian Army realised it needed better vigilance. The army floated an order for a large number of unmanned aerial vehicles, popularly called drones.

This is crucial, as India's drone market is primarily flooded by Chinese drones

Last week, the army signed a $20-million contract with home-grown drone maker ideaForge, to procure undisclosed quantities of a high-altitude variant of SWITCH UAV, an indigenous system used in surveillance operations. While the Indian armed forces have inducted ideaForge drones in the past, this is, by far, the biggest single order the company has landed.

Founder Ankit Mehta, an IIT alumnus who started ideaForge in 2008, while in college sees this as a victory of the military's indigenisation attempts, one which will improve trust in made-in-India equipment. Buoyed by the order, Mehta is now in talks with foreign military forces for his products. "When we went for the trial, it turned out, we were the only one to fulfil the operational need that includes functioning in tough mountainous regions but doing it from a fairly large distance from the base location, with very high-quality imagery," Mehta said. ideaForge competed with the likes of Tata Group, Dynamatic Technologies, and Israel's Elbit.

"We customised our product, the requirement of which came up after the tension at the China border. Since we have been developing this technology for a long time, we were confident of meeting the military's expectations, mainly of it being lightweight and the quality of the imagery," he said. The deal has cemented ideaForge's position as India's largest drone maker for defence, homeland security, and industrial applications, experts said.

This is crucial, as India's drone market is primarily flooded by Chinese drones. "Without complete control of technology, it is not possible to customise a product in a short time. The companies that have higher control of their technology will be able to deliver it better. The airframe, autopilot is our software. We also build the control station and communication systems," Mehta said.

The company, backed by marquee institutional investors such as WRVI, Infosys and Qualcomm, is open to looking for a new source of funding to expand product portfolio. "We can look at like-minded investors. We believe that any amount of support is going to help us take the next leap," he said.

https://www.business-standard.com/article/companies/drone-maker-ideaforge-bets-big-on-indigenisation-for-armed-forces-121011801548_1.html

mint

Tue, 19 Jan 2021

Rafale jet to be showstopper in Republic Day flypast

A total of 38 Indian Air Force (IAF) aircraft and four helicopters of the Indian Army will participate in the flypast at the Republic Day parade on January 26 this year

A total of 38 Indian Air Force (IAF) aircraft and four helicopters of the Indian Army will participate in the flypast at the Republic Day parade on January 26 this year.

The Public Relation Officer (PRO) of IAF on Monday said, "A total of 42 aircraft including 15 fighters, five transport aircraft, 17 helicopters and one vintage aircraft of the Indian Air Force will participate in this year's flypast. Four helicopters of the Indian Army will also participate in the flypast."

Rafale jet to be showstopper in Republic Day flypast

The formations that will be seen during the parade include 'Rudra', 'Sudharshan', 'Rakshak', 'Eklavya' and 'Brahmastra'.

"The flypast would be flown in two blocks. The first block is planned along with the parade between 10:04 am to 10:20 am and the second block is planned after the parade between 11:20 am to 11:45 am," IAF added.

The first block, comprising of three formations, would be led by Nishan formation comprising of four Mi17-V5 aircraft carrying the National flag and ensigns of the three services (timed 10 seconds ahead of Parade Commander).

Following Nishan will be Dhruv, a 4-aircraft formation of the Army Aviation Corps. The third and last formation in the block is Rudra, which is commemorative of the Swamim Vijay Jayanti of the 1971 war and comprises of single Dakota flanked by two Mi 17-1Vs in a Vic formation (timed with the marching contingent from Bangladesh).

The second block will comprise of nine formations. The first two formations would be Sudarshan and Rakshak. Sudarshan will comprise of one Chinook and two Mi-17-1Vs, while Rakshak would be led by a single Mi-17-1V with four Apache aircraft.

Following Rakshak would be the Bhim formation of three C-130 aircraft. This would be followed by the Netra and Garuda formations. While Netra is unchanged from last year, Garuda formation will include a pair of MiG 29s along with two Sukhoi Su-30MKI formatting on a single C-17.

The fifth formation is Eklavya comprising of one Rafale, two Jaguars and two MiG-29s which would be followed by three Su-30s in Trinetra formation carrying out the traditional Trishul manoeuvre. Trailing Trinetra will be three Sarang helicopters flying in Vijay formation.

The flypast would culminate with a single Rafale under Brahmastra under formation that shall carry out a Vertical Charlie abeam the dais (shows stopper), said IAF.

Five Rafale fighter planes were formally inducted into the IAF in September last year. India is procuring the fighter planes from France. (ANI)

https://www.livemint.com/news/india/rafale-jet-to-be-showstopper-in-republic-day-flypast-11611015960244.html

SAMBAD
ସମ୍ବାଦ

Tue, 19 Jan 2021

Odisha-born Lt General CP Mohanty all set to be next Vice Chief of Indian Army

Bhubaneswar: Millions of Odias in the State and across the globe have a reason to rejoice as a son of the soil is tipped to become the Vice Chief of the Indian Army. As per media reports, Jagatsinghpur-born Chandi Prasad Mohanty is likely to be appointed the 42nd Vice Chief of the Indian Army.

Chandi Prasad will be the first Odia officer to be appointed as the Vice Chief, the second highest appointment in Indian Army after Chief of Army Staff. He will be replace Lt Gen SK Saini, who is retiring on 31st January, 2021.

Currently Chandi Prasad is working as the General Officer Commanding in-chief of the Southern Command.

Chandi Prasad is the eldest son of JK Mohanty and Late Dr. Sarada Kumari Mohanty of Jayabada in Jagatsinghpur town. His mother Late Dr. Sarada Kumari was the first lady PhD in Odia Literature and his father JK Mohanty retired as the District Sub Registrar of Puri.

One of his brother KP Mohanty is working as the General Manager in Indian oil Corporation in Panipat whereas the other Mr. DP Mohanty is an advocate.

Chandi Prasad studied up to Class VI at Bagashai UP School and then went to the Rashtriya Indian Military College, Dehradun. He completed his military training in the National Defence Academy, Khadakwasla and Indian Military Academy, Dehradun. He is a 1982 batch Infantry Officer of Rajput Regiment.

https://sambadenglish.com/odisha-born-lt-general-cp-mohanty-all-set-to-be-next-vice-chief-of-indian-army/

THE HINDU

Tue, 19 Jan 2021

Southern Command Chief visits ENC

Issues pertaining to security discussed

Visakhapatnam: Lt. General C.P. Mohanty, General Officer Commanding-in-Chief (GOC-in-C), Southern Command, arrived in the city on a two-day visit to the Eastern Naval Command (ENC), on Monday.

He discussed various issues concerning security with Vice Admiral Atul Kumar Jain, Flag Officer Commanding-in-Chief, Eastern Naval Command.

The visit assumes significance as the Indian defence forces are shifting towards the integration of all components into Theatre specific Commands.

During the visit, the GOC-in-C reviewed the training of the Army component of the Amphibious Task Force which is presently undergoing joint training with the Indian Navy in Visakhapatnam.

Integration of forces

The Army Commander was briefed on various aspects of joint training, integration of forces and validation of operational tasks. The GOC-in-C visited various frontline ships of the ENC on the Eastern seaboard. He interacted with the participating contingent and crew members onboard the ships.

The General Officer commended the high level of operational preparedness and training standards of the Eastern Fleet.

https://www.thehindu.com/news/national/andhra-pradesh/southern-command-chief-visits-enc/article33604568.ece

mint

Tue, 19 Jan 2021

IAF hosts French Air and Space Force at Jodhpur for 4-day bilateral exercise

By Elizabeth Roche

- ***Codenamed Ex-Desert Knight 21, the bilateral exercises will start on 20 January and continue till 24 January***
- ***India considers France to be one of its key strategic partners with cooperation spanning defence, technology, space, diplomacy, smart cities and waste management***

New Delhi: The Indian Air Force is hosting its French counterpart, the Air and Space Force (Armée de l'Air et de l'Espace) at Air Force Station Jodhpur for bilateral exercises in Jodhpur later this week.

Codenamed Ex-Desert Knight 21, the bilateral exercises will start on 20 January and continue till 24 January. "The French forces are currently deployed in Asia as part of their 'Skyros Deployment', and will transit through India" with the exercises taken place on the occasion, a person familiar with the development said.

"The aim of the exercise is to provide operational exposure and share best practices towards enhancing combat capability. Both the forces will participate with fighter, transport, and tanker aircraft. The current exercise is in addition to the 'Garuda' series that the two Air Forces engage in, and is indicative of the earnestness of Indian Air Force and French Air and Space Force to enhance and further mutual co-operation by making use of the available opportunities for fruitful interaction," the person said.

India considers France to be one of its key strategic partners with cooperation spanning defence, technology, space, diplomacy, smart cities and waste management. India has military hardware of French origin in the inventory of its navy and air force. Paris is currently delivering the India ordered multirole Rafale aircraft for the Indian Air Force. About a third of India's order of 36 aircraft have been delivered so far. At the UN too, India and France have been collaborating together on issues like terrorism.

https://www.livemint.com/news/india/iaf-hosts-french-air-and-space-force-at-jodhpur-for-4-day-bilateral-exercise-11610978374322.html

THE ECONOMIC TIMES

Tue, 19 Jan 2021

China's J-20 fighter turns 10

Synopsis

Kept under tight secrecy, the CAC fighter achieved its maiden flight on 11 January 2011, while US Secretary of Defense Robert Gates was in China on an official visit. Taking him by surprise, he later admitted that US intelligence agencies underestimated China's ability to develop a new-generation fighter.

Hong Kong: China, particularly the People's Liberation Army Air Force (PLAAF), is extremely proud of its beefy J-20 stealth fighter. Significantly, the aircraft recently celebrated its tenth birthday as a flying machine within the world's third-largest air force, though it remains one of the world's most enigmatic fighters.

Kept under tight secrecy, the Chengdu Aerospace Corporation (CAC) fighter achieved its maiden flight on 11 January 2011, while US Secretary of Defense Robert Gates was in China on an official visit. Taking him by surprise, he later admitted that US intelligence agencies underestimated China's ability to develop a new-generation fighter.

The J-20 formally entered PLAAF service in 2017, the same year the US military began deploying F-35 fighters to Japan. The first combat unit to adopt it from late 2018 or early 2019 was the 9th Air Brigade at Wuhu in the Eastern Theater Command. This base is some 280km inland from Shanghai, and hosts one of the PLAAF's premier fighter units. The J-20's first deployment to the Eastern Theater Command emphasizes the strategic priority that the PLA places on Taiwan. This command also counters Japan and the USA.

Prior to that, the J-20 was only deployed in two units dedicated to operational evaluation and tactical training (the 176th Air Brigade at Dingxin Air Base and 172nd Air Brigade at Cangzhou Air Base, respectively).

At least 40 J-20s have been produced so far, but certainly no more than 60-70. It is alleged that CAC set up a fourth J-20 production line in 2019, each line able to produce one fighter per month. At this rate, the J-20 should approach total production numbers of the American F-22 by 2027. This would amount to at least 200 fighters, making it the world's second-most common stealth fighter behind the F-35.

The 20.8m-long J-20 aircraft is intended as an air superiority fighter able to compete with the American-built F-22 or F-35. The J-20 has achieved a credible combat capability, maturing over its ten-year lifespan. It is typical for China to continuously update an interim product with fairly rapid spiral development, and this is true of the J-20.

Indeed, it continues to grow in capability. Its weapon suite will expand beyond the 200km-range PL-15 beyond-visual-range missile and the shorter-range PL-10. It cannot currently carry the 400km-range PL-X very long-range missile that has so far appeared only on the Flanker family and JH-7/A.

A new and smaller beyond-visual-range missile could increase the payload from four missiles to six in the ventral weapon bay. A relatively recent scale model features a right-shoulder protrusion, which could indicate an internal gun will soon be fitted too. Also expected are a small-diameter strike weapon and a cruise missile.

The fighter's sensors should improve as well. However, arguably the greatest enhancement will be WS15 engines, for which the J-20 was specifically designed for maximum maneuverability and supercruising (sustained supersonic flight).

Thus, the Pentagon in its 2020 report on China's military stated: "...The PLAAF is preparing upgrades for the J-20, which may include increasing the number of air-to-air missiles the fighter can carry in its low-observable configuration, installing thrust-vectoring engine nozzles, and adding supercruise capability by installing higher-thrust indigenous WS15 engines."

It is believed the Russian AL-31FN engines have not been fitted on the production line since mid-2019, with preference being given to the indigenous WS10 engine, which is also used on the J-10 fighter.

The South China Morning Post published an article in July 2020 claiming an updated J-20B had been unveiled to senior military leaders and that military production was starting. It said the major improvement was the inclusion of thrust vector control, which improves the aircraft's agility. Later, pictures on the internet last October showed the J-20 fitted with WS10C engines with serrated afterburner nozzles.

Production of WS10C-powered J-20s will continue, but even the WS10 is just an interim step. As confirmed by the Pentagon, the ultimate engine destined for the J-20 is the WS15 to help the aircraft achieve its ideal kinematic performance. However, the WS15 failed its final evaluation in 2019, and the coronavirus pandemic is known to have impacted its development too. Developing reliable jet engines has always been a technological thorn in China's side, forcing it to import from Russia in the interim.

Recently, an Aviation Corporation of China (AVIC) computer-generated image showed a twin-seat version of the J-20, underscoring that such a variant will probably appear one day too. If correct, this would be the world's first twin-seat stealth fighter, as Russia and the USA only operate single-seat stealth fighters. Usually, only strike or fighter-bomber aircraft have a two-man crew.

Apart from this aforementioned image, there has been scant evidence of a dual-seat J-20 so far. Nonetheless, it would be suitable for controlling a loyal wingman or drones, and some even contend it could act as a "spotter" for Chinese long-range anti-ship missiles to improve the kill chain. However, the latter would seem to be a task better suited to the DR-8 supersonic stealth drone unveiled in the 2019 Beijing parade.

So how does the J-20 rate compared to its peers from Russia and the USA? Given the cloak of secrecy surrounding this Chinese platform and the absence of any combat, it is an almost impossible question to satisfactorily answer.

Andreas Rupprecht, a German expert on the PLAAF, was asked the same question about the J-20's performance by the online aviation website Hush Kit. He declined to give a direct assessment, but did say: "I'm convinced that the F-22 was actually the benchmark for CAC, but I'm also convinced that it was clear to CAC that developing a twin-engine heavy fighter and a stealth aircraft for the first time after the J-10 would be a huge challenge. All of this is coupled with the knowledge that one has hardly any experience in this area and, above all, that the engines will still only be temporary solutions."

Rupprecht continued, "On the other hand, it has been around 15 years since development of the F-22, and a lot has happened in China in the area of electronics, sensors and materials since then. But it's important to note that the predecessor of the J-20 in PLAAF service is the Flanker and this came from a completely different period, was for a completely different requirement and was designed by a company with vastly more experience. So in conclusion, I'm sure the J-20 is no worse than a J-11B in all areas of performance, but certainly - especially with the current interim engines - it does not come close to an F-22. I do not presume to make any further judgment."

Despite the greater capabilities of the J-20, the type makes up less than several percent of the total PLAAF combat fleet. Most Chinese fighters are still quite dated. The Pentagon's 2020 report stated: "The PLAAF and PLA Navy (PLAN) Aviation continue to field greater numbers of fourth-generation aircraft (now more than 800 of 1,500 total operational fighters, not including trainers) and probably will become a majority fourth-generation force within the next several years."

Of course, the J-20 is not China's only stealth fighter. There also exists the FC-31 that first flew in October 2012. It was rejected by the PLAAF in favor of the J-20, but Shenyang Aircraft Corporation engineers have been busy improving the design; an improved FC-31 variant flew in December 2016 with structural modifications to the canopy, wings and tails. The FC-31 is being marketed to international customers, but none have nibbled the bait yet.

The 2020 Pentagon report noted, "...Development continues on the smaller FC-31/J-31 for export or as a future naval fighter for the PLAN's next class of aircraft carriers." Indeed, this alludes to persistent speculation that the PLAN will adopt the FC-31 as its fifth-generation fighter for use aboard carriers as a replacement for the large and heavy J-15.

The FC-31's airframe is smaller (better for stowage and maneuverability aboard a crowded carrier deck or hangar) than the J-20's. It will need reinforced landing gear, folding wings and a tail hook, however. The aircraft could eventually receive WS13E jet engines (in the 9-ton thrust class). These could even be supplanted by the WS19 jet in the 10-11-ton thrust class in the late 2020s. Many ascribe the nomenclature J-35 to such a PLAN carrier-borne design, but this is not official.

In December 2019, the Shenyang Institute said it had begun developing a new type of fighter jointly with the AVIC Manufacturing Technology Institute the year before. Later, a statement by the Chinese Aeronautical Establishment on its WeChat public account - and promptly deleted - promised a new-generation fighter would perform its maiden flight in 2021. Fu Qianshao, a Chinese air defense expert, told the Global Times tabloid this could well be a new carrier-based fighter based on the FC-31.

The PLAN's need for a new carrier-borne fighter is quite urgent, since the incumbent J-15 cannot compete with F-35B or F-35C variants operated by the USA. If a maiden flight were to occur this year, it would likely take another five years for it to enter service; however, this could potentially be shortened slightly given the already long test program of the FC-31.

The second flying FC-31 demonstrator - with serial number '31003' - was transferred to the PLAAF's test flight establishment early last year. That signifies it is now more than just a Shenyang-owned aircraft, and something of direct interest to the PLA.

Addressing the FC-31, Rupprecht explained, "I try to be cautious as possible, since nothing is yet confirmed, but all hints towards the idea that this type has been selected by the PLAN as the J-15's successor and future carrier-borne fighter. Allegedly named 'J-35', a first prototype is said be ready and we expect its unveiling, if not even its maiden flight, early this year."

China has not rested on its laurels with either the J-20 or FC-31, for it is currently developing a sixth-generation fighter as well. Wang Haifeng, chief designer at the Chengdu Aircraft Research and Design Bureau, posits that it will be ready by 2035. This new fighter will incorporate such technologies as artificial intelligence, greater stealth and the ability to control drones, he disclosed in a WeChat interview published in January 2019.

The possibility exists that other features such as lasers, variable-cycle engines, hypersonic weapons and swarm warfare could be added to China's next-generation fighter too. To date, there has been no official pronouncement of such a fighter, but we can be sure that Chinese engineers are already working on this future design.

If this sixth-generation fighter is to be ready for service by 2035, this would suggest a maiden flight at least five years prior to that, and low-rate initial production commencing in approximately 2032-33. Working backwards from this estimated 2035 timeframe, the prototype would then have to emerge by 2028 at the latest to meet the target.

Given that the J-10 appeared 13 years prior to the J-20, this suggests a slightly slower cycle of 17 years between the J-20 and sixth-generation fighter appearing. Even if such a new fighter appears, the J-20 could continue in production.

Instead of merely defending its borders, China is looking at a more proactive approach to defeating enemies beyond its landmass. Fighters like the J-20 and potential J-35 will enable this, and one might eventually see such aircraft asserting themselves in places like the Indian Ocean in the future.

Developing new fighters is hugely expensive, but China has demonstrated political will, martial ambition and heavy investment to make it happen. The J-20 is a mere ten years young and has a long life ahead of it.

https://economictimes.indiatimes.com/news/defence/chinas-j-20-fighter-turns-ten/articleshow/80328358.cms

Business Standard

Tue, 19 Jan 2021

ISRO decides to partner with industry to launch space-themed merchandise

ISRO to identify and authorise parties, agencies on non-exclusive basis for a registration fee

By TE Narsimhan

The Indian Space Research Organisation (ISRO) plans to rope in industry to manufacture and sell space theme-based merchandise.

ISRO officials said that of late, many agencies interested in creating customised articles, handicrafts approached it for the themes

Customised ISRO-theme based articles, models can play a game-changing role in creating awareness and kindling interest of the students, children and public, in the domain of space science & technology, propagating the achievements and laurels that ISRO has brought to the nation, said the country's space agency.

ISRO officials said that of late, many agencies interested in creating customised articles, handicrafts approached it for the themes.

ISRO proposes to identify and authorise parties, agencies on "non-exclusive basis", with a registration fee for sharing the themes, general arrangement drawings, images or any other design for enabling the parties to use appropriately without causing any damage to the pride of the department.

Specific samples of Isro identifiers, shall be catalogued and made available on Isro's website, under CBPO, updated from time to time. Parties or agencies interested in creating these merchandise items, articles can make use of these resources by registering with the space agency.

Isro said that the partner should avoid using the Isro identifier, imagery, etc. on products such as doormats, slippers, or any such items, which affects the reputation or image of the organisation. Wherever 3D models and 2D drawings are being used to make scaled models, LEGO sets, jigsaw puzzle, etc., extra care shall be taken to ensure accuracy.

Isro will audit the manufacturer's products and even terminate the license agreement, over violation of the guidelines.

The rates for the merchandise shall be reasonable in line with market conditions, as there is no brand value charged by ISRO.

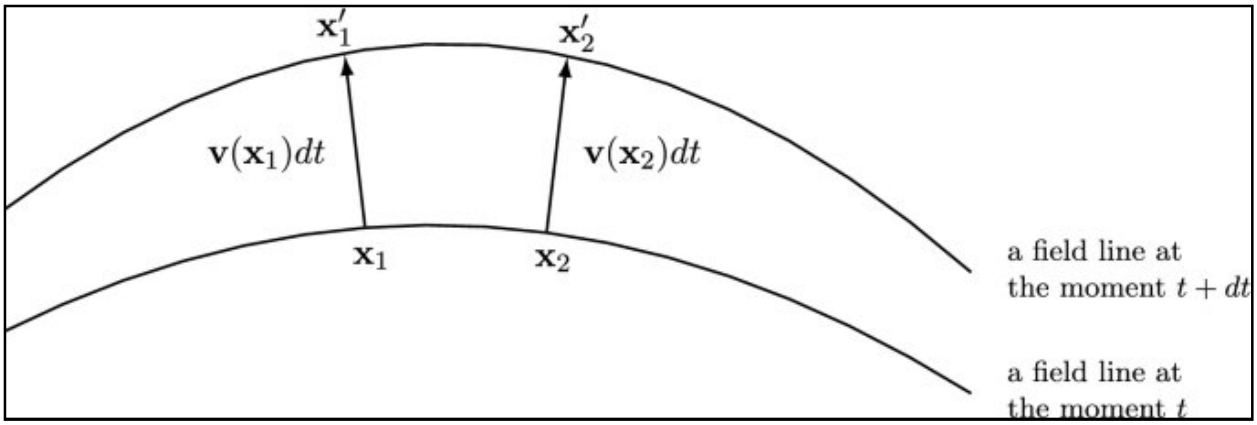
https://www.business-standard.com/article/current-affairs/isro-decides-to-partner-with-industry-to-launch-space-themed-merchandise-121011800289_1.html

Tue, 19 Jan 2021

Tracking the evolution of Maxwell knots

By Robert Lea

Maxwell equations govern the evolution of electromagnetic fields with light being a particular solution of these equations in spaces devoid of electric charge. A new study published in *EPJ C* by Alexi Morozov and Nikita Tselousov, from the Moscow Institute of Physics and Technology and the Institute of Transmission Problems, Russia, respectively, details peculiar solutions to the Maxwell equations—so-called Maxwell knots. The research could have applications in the fields of mathematical physics and string theory.



The picture demonstrates the condition that the vector field v should obey to define self-consistent time evolution of the field lines. For any two points on a field line at the moment t the ends of the vectors vdt at the corresponding points lie on a field line that is defined at the moment t+dt DOI 10.1140/epjc/s10052-020-08745-7

"We usually think of light as the plane waves. It was a breakthrough when 'knotted' light solutions were discovered," explains Tselousov. "The knot nature of these solution consists in the structure of the electric and magnetic field lines. One can observe that some of the field lines are closed loops and non-trivially knotted."

Electric and magnetic field lines change over time obeying the Maxwell equations. As the fields change their field lines somehow move in the space. Whilst researchers can't track an arbitrary field line, closed field lines are special and can be observed as they evolve over time.

"In our paper, we make a conjecture, that knotted field lines move in a very special manner in which the knotted structure remains," Tselousov continues. "In other words, one can say that this time evolution never involves self-crossings or crossings of two field lines."

Tselousov believes that should this conjecture—arrived at with the use of complex computer simulations—be correct, the conservation of the knots implies that their evolution is integrable—capable of undergoing the mathematical function integration. This means that its evolution can be related to other models and systems—in particular with non-linear equations—that are known to share this property.

"It is very rare and always a pleasure to observe the integrable properties of systems because it means deeper understanding and possible further progress. We plan to move in this direction and find more connections with integrability," Tselousov concludes. "In my mind, one of the stunning facts is that light, so familiar to everyone, conceal secrets that we used to ignore for centuries."

More information: A. Morozov et al. Are Maxwell knots integrable?, *The European Physical Journal C* (2020). DOI: 10.1140/epjc/s10052-020-08745-7

https://phys.org/news/2021-01-tracking-evolution-maxwellknots.html

PHYS.ORG

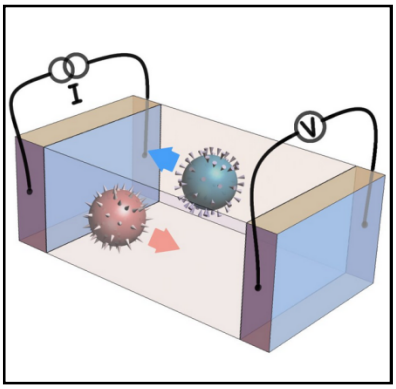
Tue, 19 Jan 2021

The long-range transport of deconfined magnetic hedgehogs

By Ingrid Fadelli

Spintronics is an emerging area of research that aims to develop devices that transmit, process and store information leveraging the intrinsic angular momentum of electrons, known as spin. A key objective of spintronics studies is to identify strategies to use magnetic insulators to achieve the transport of signals over long distances.

Magnetic insulators are a class of materials widely used worldwide, mainly due to their ability to conduct electrical charges. Just like metals conduct electrical charges, magnetic insulators can conduct spins. Nonetheless, as spins are rarely conserved in materials and tend to disappear over long distances, so far, using magnetic insulators to achieve long-range transport has proved highly challenging.



In a three-dimensional magnetic insulator, deconfined magnetic hedgehogs and antihedgehogs are driven to travel oppositely, resulting in a net hedgehog current that could achieve long-range transport. Credit: Zou, Zhang & Tserkovnyak, PRL (2021).

Researchers have recently demonstrated the long-range transport of magnetic hedgehogs, 3-D topological spin structures that are often observed in common magnets. Their work, outlined in a paper published in *Physical Review Letters*, could have important implications for the development of spintronic devices.

"Our idea is to resort to topological spin textures rather than spins themselves for the purpose of long-range transport," Shu Zhang, one of the researchers who carried out the study, told Phys.org. "The magnetic hedgehog is one type of topologically protected spin texture that generically exits in three-dimensional magnets. Our work shows that the hedgehog current is a well conserved quantity and can be explored to achieve long-range transport in magnetic insulators."

The recent study by Zhang and her colleagues is based on a theoretical construct known as the topological conservation law, which allowed the researchers to leverage the idea of hydrodynamics of topological spin textures. This idea has previously been explored in a series of studies led by physicist Yaroslav Tserkovnyak.

"The main theoretical approach we applied in our study is classical field theory," Zhang explained. "We describe the space-time distribution of the spins as a continuous vector field, on top of which the topological textures and their currents can be defined and studied. We found that the mathematical description of the hedgehog currents actually bears an analogy to the most renowned field theory, that of electromagnetism."

When they set out to investigate long-range transport, Zhang and her colleagues specifically considered a 'typical' experimentally feasible setup, in which a hedgehog's current is injected and detected using metal contacts attached to the two ends of a magnet. In their paper, they propose that in this scenario, a magnet could be seen as a conductor that transports the current of topological spin textures with a finite conductance. This idea ultimately highlights the potential of using magnetic insulators to achieve transport over long distances.

"I think it is very exciting to envision the possibility that regular magnetic insulators can be used for long-range transport," Zhang said. "This will make the realization of various spin circuitries possible with high energy efficiency because of the absence of Joule heating."

In the future, the study could inspire other research teams to investigate the transport dynamics of topological spin textures further, particularly those of magnetic hedgehogs, which are widely

available. The development of effective strategies to control these dynamics would ultimately open up new possibilities for enabling the long-distance transmission of information in spintronic devices using 3-D magnetic materials.

"We hope to see our ideas tested in experiments soon," Zhang said. "Our current work is based on classical or semiclassical considerations of spins. In the future, it would be interesting to see how topological spin textures could contribute to the transport in quantum magnets."

More information: Topological transport of deconfined hedgehogs in magnets. *Physical Review Letters*(2021). DOI: 10.1103/PhysRevLett.125.267201

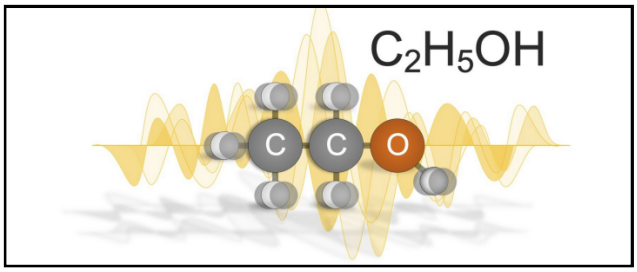
Journal information: *Physical Review Letters*

https://phys.org/news/2021-01-long-range-deconfined-magnetic-hedgehogs.html

Tue, 19 Jan 2021

Alcohols exhibit quantum effects

Skoltech scientists and their colleagues from the Russian Quantum Center revealed a significant role of nuclear quantum effects in the polarization of alcohol in an external electric field. Their research findings are published in The *Journal of Physical Chemistry*.



Credit: Skolkovo Institute of Science and Technology

Molecular liquids, such as water or alcohols, are known to be polar. Polarity results from the charge separation mechanism, the microscopic description of which still bears some open questions. In fact, the basic description of the polarization rests on a hundred-years-old concept: the dielectric polarization is connected to the molecular dipole moment due to their hydroxyl functional group (-OH). Orientations of these dipoles would explain the high polarizability of alcohols and the corresponding high dielectric constant, but the discrepancy between the measured dielectric constants and those determined by calculations shows that other mechanisms not considered so far may play an important role, too. As the exact mechanism of the dielectric response of alcohols is still unclear, new ideas should be proposed and tested.

"To address the problem, we experimentally investigated and compared the dielectric responses of a series of monohydric alcohols with different molecular chain lengths and found remarkable similarities which could not be explained by the conventional mechanism of rotating molecular dipoles," says Dr. Ryzhov, a Skoltech Research Scientist in charge of the experimental part of the study. "Notwithstanding the conventional wisdom, we found that the basic mechanism of the dielectric polarization in alcohols to be of a quantum mechanical nature: the tunneling of excess protons and the consequent formation of intermolecular dipoles with proton-holes. These dipoles are the actual ones that determine the dielectric response from dc up to THz, irrespective of the molecule geometry, hence orientation," adds Professor Ouerdane from the Skoltech Center for Energy Science and Technology (CEST). "Our research provides a new insight into the properties of liquid dielectrics. The core assumption of our model pertains to a novel understanding of dielectric polarization phenomena in polar liquids by means of nuclear quantum effects," concludes Vasily Artemov, a Senior Research Scientist at Skoltech and the leading author of the paper.

More information: Vasily G. Artemov et al. Nonrotational Mechanism of Polarization in Alcohols, *The Journal of Physical Chemistry B* (2020). DOI: 10.1021/acs.jpcb.0c09380

Journal information: *Journal of Physical Chemistry B* , *Journal of Physical Chemistry A*

https://phys.org/news/2021-01-alcohols-quantum-effects.html

Tue, 19 Jan 2021

Using drones to create local quantum networks

By Bob Yirka

A team of researchers affiliated with several institutions in China has used drones to create a prototype of a small airborne quantum network. In their paper published in the journal *Physical Review Letters*, the researchers describe sending entangled particles from one drone to another and from a drone to the ground.

Target acquisition. The beams from one drone are visible over the testing area. Credit: X.-H. Tian, H.-Y. Liu, & Z. Xie/Nanjing Univ.

Computer scientists, physicists and engineers have been working over the last several years toward building a usable quantum network—doing so would involve sending entangled particles between users and the result would be the most secure network ever made. As part of that effort, researchers have sent entangled particles over fiber cables, between towers and even from satellites to the ground. In this new effort, the researchers have added a new element—drones.

To build a long-range quantum network, satellites appear to be the ideal solution. But for smaller networks, such as for communications between users in the same city, another option is needed. While towers can be of some use, they are subject to weather and blockage, intentional or otherwise. To get around this problem, the researchers used drones to carry the signals.

The work involved building a small laser-generating device and affixing it to one of the drones. As it fired, photons were split in two, creating entangled pairs. One of the paired photons was directed toward another drone while the other was directed to a ground station. The drone that received the entangled photon served only as a relay—after refocusing, the photon was forwarded to a third drone, which then sent it to a second ground station. Motorized devices were used on the drones to ensure transmitters and received lined up properly for transmission of the entangled photons.

In the prototype, the photons were sent just one kilometer, but the researchers suggest that moving the drones higher would allow for transmission over distances up to 300 kilometers. They suggest the technology could also be adapted to include moving vehicles on the ground. They further note both the drones and the ground stations could also be connected to a network that included satellites. And they also point out their work was the first to send entangled particles between two moving devices.

More information: Hua-Ying Liu et al. Optical-Relayed Entanglement Distribution Using Drones as Mobile Nodes, *Physical Review Letters* (2021). DOI: 10.1103/PhysRevLett.126.020503

Journal information: *Physical Review Letters*

https://phys.org/news/2021-01-drones-local-quantum-networks.html

Tue, 19 Jan 2021

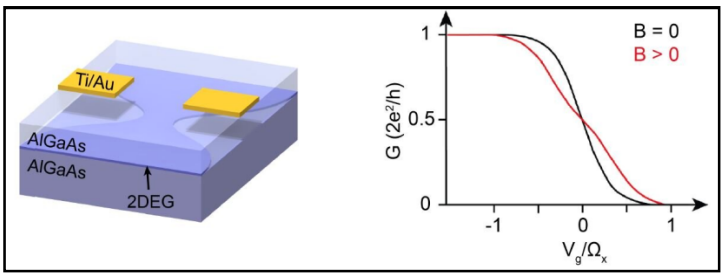
One-dimensional quantum nanowires fertile ground for majorana zero modes

Why is studying spin properties of one-dimensional quantum nanowires important?

Quantum nanowires–which have length but no width or height–provide a unique environment for the formation and detection of a quasiparticle known as a Majorana zero mode.

A new UNSW-led study overcomes previous difficulty detecting the Majorana zero mode, and produces a significant improvement in device reproducibility.

Potential applications for Majorana zero modes include fault-resistant topological quantum computers, and topological superconductivity.



Quantum point contact structure (left) in which an applied voltage constricts electron movement to one dimension, with conductance (right) showing effect of applied magnetic field (red). Credit: UNSW

Majorana fermions in 1-D wires

A Majorana fermion is a composite particle that is its own antiparticle.

Such unusual particle's interest academically and commercially comes from their potential use in a topological quantum computer, predicted to be immune to the decoherence that randomizes the precious quantum information.

Majorana zero modes can be created in quantum wires made from special materials in which there is a strong coupling between their electrical and magnetic properties.

In particular, Majorana zero modes can be created in one-dimensional semiconductors (such as semiconductor nanowires) when coupled with a superconductor.

In a one-dimensional nanowire, whose dimensions perpendicular to length are small enough not to allow any movement of subatomic particles, quantum effects predominate.

New method for detecting necessary spin-orbit gap

One-dimensional semiconductor systems with strong spin-orbit interaction are attracting great attention due to potential applications in topological quantum computing.

The magnetic 'spin' of an electron is like a little bar magnet, whose orientation can be set with an applied magnetic field.

In materials with a 'spin-orbit interaction' the spin of an electron is determined by the direction of motion, even at zero magnetic field. This allows for all electrical manipulation of magnetic quantum properties.

Applying a magnetic field to such a system can open an energy gap such that forward -moving electrons all have the same spin polarization, and backward-moving electrons have the opposite polarization. This 'spin-gap' is a pre-requisite for the formation of Majorana zero modes.

Despite intense experimental work, it has proven extremely difficult to unambiguously detect this spin-gap in semiconductor nanowires, since the spin-gap's characteristic signature (a dip in its conductance plateau when a magnetic field is applied) is very hard to distinguish from unavoidable the background disorder in nanowires.

The new study finds a new, unambiguous signature for the spin-orbit gap that is impervious to the disorder effects plaguing previous studies.

"This signature will become the de-facto standard for detecting spin-gaps in the future," says lead author Dr. Karina Hudson.

Reproducibility

The use of Majorana zero modes in a scalable quantum computer faces an additional challenge due to the random disorder and imperfections in the self-assembled nanowires that host the MZM.

It has previously been almost impossible to fabricate reproducible devices, with only about 10% of devices functioning within desired parameters.

The latest UNSW results show a significant improvement, with reproducible results across six devices based on three different starting wafers.

"This work opens a new route to making completely reproducible devices," says corresponding author Prof Alex Hamilton UNSW).

"New signatures of the spin gap in quantum point contacts" was published in *Nature Communications* in January 2021.

More information: K. L. Hudson et al. New signatures of the spin gap in quantum point contacts, *Nature Communications* (2021). DOI: 10.1038/s41467-020-19895-3

Journal information: *Nature Communications*

https://phys.org/news/2021-01-one-dimensional-quantum-nanowires-fertile-ground.html

COVID-19 Research News

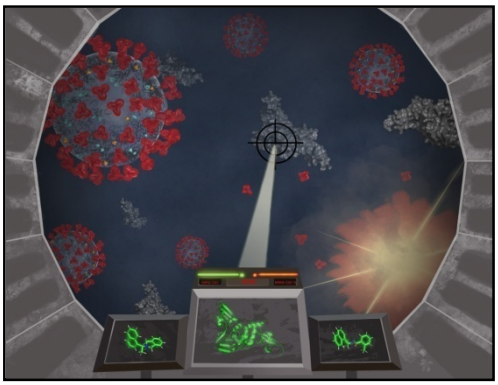
PHYS.ORG

Tue, 19 Jan 2021

Researchers find inhibitors effective against a coronavirus enzyme

While the first vaccines have been developed against the pathogen SARS-CoV-2, studies are still underway to identify effective drugs for treating coronavirus infections. Scientists in Gießen, Mainz, and Würzburg in Germany involved in a fundamental research project have now identified potential starting points that could contribute to the development of drugs able to combat the pathogen responsible for the current COVID-19 pandemic as well as the coronaviruses in general. These include inhibitors that home in on a particular viral enzyme. "The inhibitors attack this enzyme and render it inactive, meaning the virus can no longer proliferate," explained principal investigator Professor Tanja Schirmeister of Johannes Gutenberg University Mainz (JGU). "Based on our findings, it may be possible to develop drugs that are not only effective against the current coronaviruses, but that will also be effective against any which emerge in the future."

The team of researchers at the JGU Institute of Pharmaceutical and Biomedical Sciences led by Tanja Schirmeister first focused on the virus which caused the pandemic of 2002/2003, now known as SARS-CoV. At the time, they investigated two important viral enzymes and were able to develop an inhibitor for one of the two enzymes. They took the same approach in the current study. "As there are homologous enzymes present in SARS-CoV-2, we have tested our old inhibitors on these enzymes and on the virus itself," said Schirmeister. These enzymes are proteases that the virus needs to reproduce. If these proteolytic enzymes are inhibited, the viruses can no longer replicate.



The essential protease is targeted and attacked by novel inhibitors, leading to the eradication of the virus. Credit: Hannah Maus, Lea Maus

Discovering the structures of proteases and related structure-activity relationships

The first priority was uncovering the structure of the proteases. With the aid of computer programs, the researchers then identified drugs that would be suited to these structures. For this, the Mainz team collaborated with computer-aided drug design (CADD) experts led by Professor Christoph Sotriffer at Julius-Maximilians-Universität of Würzburg. The Mainz-based team then synthesized and tested promising candidates at JGU. "Potential inhibitors are first designed on the drawing board, then we determine how effective they are," explained Schirmeister. Her group tested some 40 to 45 different compounds against SARS-CoV-2, including all the previous inhibitors that had already been used against SARS-CoV. "We also synthesized substances that we expected not to be effective. This enabled us to verify that the data provided by the computer models is valid."

The tests were first undertaken using the target enzyme, which is the papain-like protease necessary for the viruses' proliferation. However, a positive result does not necessarily mean that the inhibitor also stops the virus from reproducing. The next step was to use it against the virus itself. If this result is also positive, then it is necessary to evaluate the potential toxicity of the agent to ensure that cells infected by the virus are not impaired.

Inhibitors demonstrate antiviral effects

In addition to the medicinal chemistry teams in Mainz and Würzburg, the multi-stage process also involved virologists led by Professor John Ziebuhr of Justus Liebig University Giessen. The study shows that non-peptide molecules can inhibit the target enzymes and also have an antiviral effect. The research team also suspects that the inhibitors identified may have an even greater role to play. "They represent a starting point for further research into pan-coronaviral inhibitors thanks to the similarity in the proteases of these viruses," stated Tanja Schirmeister. "This means that it may lead to the discovery of broadly acting antivirals that are effective against previously known and newly emerging coronaviruses." Thanks to their work, the results of which have been published in the journal *ChemMedChem*, the cooperation partners have also gained a deeper understanding of the mechanisms which bind the inhibitors to the enzymes.

More information: Armin Welker et al. Structure-Activity Relationships of Benzamides and Isoindolines Designed as SARS-CoV Protease Inhibitors Effective against SARS-CoV-2, *ChemMedChem* (2020). DOI: 10.1002/cmdc.202000548

Journal information: *ChemMedChem*

https://phys.org/news/2021-01-inhibitors-effective-coronavirus-enzyme.html