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

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CONTENTS

S. No.	TITLE	Page No.
	DRDO News	1-1
	DRDO Technology News	1-1
1.	Preliminary design of Navy TEDBF officially revealed, to feature stealth characteristics	1
	Defence News	2-11
	Defence Strategic National/International	2-11
2.	Surgeon Vice Admiral Naveen Chawla takes over as Director General Medical Services (Navy)	2
3.	In 2020 India showed it can meet all challenges from virus to borders: PM	3
4.	'India will be known as a big producer of defence equipment	4
5.	India to hold high-level meeting to decide 'trusted sources' for supplying IT-related equipment	5
6.	India's defence needs money. If Budget can't provide it, we need to change how we fight	6
7.	Troops adequately sensitised to take action to thwart acts of aggression along LAC, Says Lt Gen Joshi	8
8.	Indian Army gets 6,000 new Israeli Light Machine Guns	9
9.	Boeing gets permission from US government to offer F-15EX Jet to India: Official	10
10.	Boeing pitches Super Hornets to Indian Navy	11
	Science & Technology News	12-17
11.	Zapping quantum materials with lasers tells us how atoms relate	12
12.	Physicists develop record-breaking source for single photons	13
13.	Efficient fluorescent materials and OLEDs for the NIR	14
	COVID-19 Research News	16-17
14.	Covid-19 is seasonal, new research suggests	16

Preliminary design of Navy TEDBF officially revealed, to feature stealth characteristics

During 21st Dr. Srinivasan Memorial Lecture – 2021, organized by Aeronautical Society of India in Association with Vikram Sarabhai Space Centre (VSSC), DRDO Chairman G Satheesh Reddy gave some important details about the upcoming TEDBF aircraft for Navy.

In the slide shared by Chairman, we can see that TEDBF is going to have a maximum take off weight (MTOW) of 26 tons. It will be very interesting to see the maximum take off weight TEDBF can achieve from STOBR carrier.

At the same we can see a preliminary design of Deck Based Fighter. In the preliminary design we can clearly see a canards integration with aircraft. These canards will help in generating more lift for the aircraft while launching from aircraft carrier.

From the design we can also notice that the ADA (Aeronautical Development Agency) is trying to incorporate stealth characteristics in the frontal fuselage of the aircraft. This means the aircraft is going to have a very low Radar Cross Section (RCS) from front.

Although generally design body used to avoid canards in order to increase stealth characteristics of the aircraft.

TEDBF is also going to be a delta wing aircraft (derived from Tejas) but these wings can also be foldable, so that it can fit in the hangar and lift of Indian aircraft carrier.

As per G Satheesh Reddy, the Twin Engine Deck Based Fighter (TEDBF) will take its first flight by 2026 and by this calculation the fighter aircraft can enter into the service of Indian Navy, somewhere around 2029-30.

DRDO is working on Twin Engine Deck Based Fighter (TEDBF) to replace Navy carrier Based Fighter MiG-29K. Indian Navy has gone through a rough experience with Russian MiG-29K and by 2030 Navy requires new fighter jets to replace its existing fleets.

<http://www.indiandefensenews.in/2021/01/preliminary-design-of-navy-tedbf.html>



TEDBF preliminary design - Slide from G. Satheesh Reddy lecture

Defence Strategic: National/International



Press Information Bureau
Government of India

Ministry of Defence

Thu, 28 Jan 2021 8:30PM

Surgeon Vice Admiral Naveen Chawla takes over as Director General Medical Services (Navy)

Surg VAdm Naveen Chawla, VSM has assumed appointment of Director General Medical Services (Navy) on 28 Jan 21. Prior to assuming the present appointment, the Flag Officer held the coveted appointment of Director General Hospital Services (AF) in the office of DGAFMS.

An alumnus of Armed Forces Medical College, Pune he was commissioned on 17 Dec 1983 in the Armed Forces Medical Services. During his 37 years of service, the Flag Officer has held numerous important administrative and staff appointments like Director General Hospital Services (Armed Forces), Command Medical Officer, HQWNC and Executive Officer, INHS Asvini. He has the unique distinction of Commanding two out of three largest Indian Naval Hospitals, namely INHS Asvini and INHS Sanjivani.

The Flag Officer has served on several afloat platforms including Fleet Medical Officer of the Eastern Fleet. He is a renowned teacher and in addition to being the Professor of Pathology is also an MD examiner at Maharashtra University of Health Sciences.

For his dedication and devotion to the service, the Flag Officer was awarded VSM in 2015.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1693034>



In 2020 India showed it can meet all challenges from virus to borders: PM

Modi said India last year showed it is capable of taking all steps to meet challenges, be it from coronavirus or at its borders

New Delhi: Prime Minister Narendra Modi said on Thursday that India last year showed it is capable of taking all steps to meet challenges, be it from coronavirus or at its borders.

"We have to strengthen the emotion with which we dealt with big challenges last year, with one nation with one heart. We have to completely remove the ill effects of the pandemic on our economy," he said at a rally of the National Cadet Corps (NCC) here.

According to government projections released earlier this month, India's GDP is estimated to contract by a record 7.7 per cent during 2020-21 due to the COVID-19 pandemic.

The prime minister said, "Last year, India has shown that its capable of taking steps to meet all challenges, be it from coronavirus or at its borders."

Indian and Chinese armed forces are engaged in a bitter standoff at their border areas in eastern Ladakh since May last year.

"Whether it is developing protective shield of the vaccine or destroying with modern missiles intentions of those challenging India, the country is capable on all fronts," he stressed.



PM Narendra Modi | File photo

If India is 'aatmanirbhar' (self-reliant) in vaccine, it is also trying with equal vigour to modernise its armed forces, Modi said.

The prime minister asserted that all steps are being taken to ensure that every wing of India's armed forces is the best, adding that the country now has excellent "war machines".

Referring to mid-air refuelling of three Rafale fighter aircraft while they were on way to India on Wednesday, Modi said it was done in UAE and Saudi Arabia, and Greece also helped. "This highlights our growing ties with the Gulf countries," he said.

This was the third batch of Rafale fighter jets that arrived in India after flying non-stop from France.

About his government's efforts to boost domestic defence manufacturing, Modi said, "India will soon be known as a big producer of defence equipment instead of a big market as it is today."

He said the indigenously developed Tejas fighter jet is exhibiting its glory in the sea and sky and an order of more than 80 of these aircraft have been placed by the government recently.

"India is focusing on all necessary research and development so that it does not remain behind in developing artificial intelligence related warfare capabilities," Modi mentioned.

(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/in-2020-india-showed-it-can-meet-all-challenges-from-virus-to-borders-pm-121012801237_1.html

‘India will be known as a big producer of defence equipment

While talking about the Centre’s efforts to usher in domestic manufacturing of defence equipment the Prime Minister said “The day is not far when India will be known as a big producer of defence equipment instead of a big market.”

Edited By Ayshee Bhaduri

New Delhi: Prime Minister Narendra Modi, while addressing a rally of the National Cadet Corps (NCC) at Cariappa Ground in Delhi on Thursday, said India will soon be known for being a producer of defence equipment and not just a market.

While talking about the Centre’s efforts to usher in domestic manufacturing of defence equipment the PM said “The day is not far when India will be known as a big producer of defence equipment instead of a big market.”

Referring to the flagship ‘Aatmanirbhar’ programme of the government, the Prime Minister said that India has successfully exhibited its indiegnous capabilities on all fronts, including in the production of Covid-19 vaccines.



The Prime Minister wore an NCC cap, inspected the guard of honour, and reviewed the march pasts by NCC contingents (ANI/Twitter)

"Whether it is developing protective shields of the vaccine or destroying with modern missiles intentions of those challenging India, the country is capable on all fronts," he said.

PM Modi also said that the government is taking every necessary step to modernise all wings of its armed forces, asserting that India has in its possessions some excellent “war machines”.

The Prime Minister praised NCC cadets for their help during the coronavirus pandemic and other natural disasters. He said: "Be it the floods or any other calamity, NCC cadets helped the people of this country last year. During the Corona pandemic, lakhs of cadets worked with the administration and society across the country. Their work is commendable."

PM Modi also declared that keeping in line with the announcements made during last year’s Independence Day, 1 lakh NCC cadets are being trained by the armed forces, with one third of them being girl cadets.

"On August 15, last year, it was announced that NCC will be given new responsibilities in around 175 districts in the coastal and border areas. For this, around 1 lakh NCC cadets are being trained by Army, Navy and Air Force. Out of these, one third are girl cadets,"

Union defence minister Rajnath Singh, chief of defence staff General Bipin Rawat, and three armed services Chiefs were also present for the occasion. The Prime Minister wore an NCC cap, inspected the guard of honour, and reviewed the march pasts by NCC contingents.

<https://www.hindustantimes.com/india-news/india-will-be-known-as-a-big-producer-of-defence-equipment-instead-of-a-big-market-pm-modi-101611830756363.html>

India to hold high-level meeting to decide 'trusted sources' for supplying IT-related equipment

The Chinese manufacturers have already supplied equipment to a number of critical government sectors

By Srinjoy Chowdhury

India does not have a 'negative list, which means, like many other countries, India has not said it doesn't want telecom and information technology-related components by any firm. Many countries have expressly forbidden the use of Chinese equipment in the telecom and information technology sectors, but India has not done that.

On the basis of a recent Union Cabinet decision, a high-level meeting is being held in February to work out what constitutes a 'trusted source'. Very simply, the criteria to decide whether a firm can be trusted and in which sectors, will be decided.

The meeting will be attended by representatives of the home, external affairs, commerce, information technology and law ministries, the departments of telecommunications and promotion of industry and trade as well as two representatives from industry and an independent member, probably an IIT professor.

The issue that is likely to be looked at is what impact any foreign firm has on national security. And what linkages the IT or telecommunications firm has with its own country's security set-up, it's government and military.

India is not mentioning any country. But clearly, the elephant in the room is China. The Chinese manufacturers have already supplied equipment to a number of critical government sectors. They were all allowed in because they were L1, or the lowest bidder. The meeting could call for different policies.

<https://www.timesnownews.com/india/article/india-to-hold-high-level-meeting-to-decide-trusted-sources-for-supplying-it-related-equipment/713035>



Representational Image | Photo Credit: PTI

India's defence needs money. If Budget can't provide it, we need to change how we fight

India's Service chiefs or retired senior officers need to tell hard facts to the government. Can we actually fight a two-front war?

By Tara Kartha

Even as China flexes its muscles along Ladakh, and pokes and prods at other spots along the borders, there is apprehension whether India's declining defence budget can ever be adequately beefed up to deal with a clear and emerging threat. This comes alongside the Ministry of Statistics lowering projections of GDP shrinkage to 7.7 per cent, which is even worse than the 7.5 per cent estimated by the Reserve Bank of India. There is enough there to worry the Narendra Modi government, and Nirmala Sitharaman's trick last year of presenting one of the lowest defence budgets since 1962 as an actual increase can't be repeated at a time when there's an enemy at the gates. But then it's the difficult situations that should produce imaginative thought. There's a way. But for that, be willing to think differently about how you fight.

Holes in the budget

First, the budget figures themselves are enough to make you weep. The most recent report of the Parliamentary Standing Committee on Defence (PSCOD) notes a severe gap 'across departments' in projections and actual allocations, which has been steadily rising for all three Services — the Army, the Air Force, and the Navy. The Army takes the largest share (almost 56 per cent in 2019-20) but still struggles with modernisation because its revenue to capital ratio is 83:17 rather than a desired 60:40. That means there's little or nothing left for buying equipment after pay and allowances have been cleared. At almost 14 lakh, we now seem to have the largest ground force in the world, after China cut its army by 50 per cent in a modernisation push in 2019. The second-largest land power is North Korea. That's a comment in itself. Add to this, a pension bill that is larger than Pakistan's entire defence budget, and you get the picture.



Defence Minister Rajnath Singh with CDS Gen Bipin Rawat, Army chief Gen MM Naravane, Navy Chief Admiral Karambir Singh, Air Chief Marshal R.K.S. Bhadauria | PIB

Then there's the budget's snowballing effect on modernisation. The Navy inducted just two submarines in 15 years. Compare that with the two new subs China reportedly inducted just in 2020, even while its fleet size is three-times larger. The SDC rather plaintively asks why most existing submarines are being 'maintained' for more than 25 years, when it has been informed that maximum life is exactly 25 years. The Air Force has had its Rafale fleet cut down from a planned 126 to 36, while talk of buying 110 new fighter aircraft seems to have been turned around to buy local. That's not to play down the Tejas. It all just comes together in a rather blurry picture. Reportedly, we just spent Rs 5,000 crore for 'emergency' purchases after the Ladakh stand-off began. That speaks poorly of India's current capability, apart from the fact that it slices up the cake remaining for 2021-22.

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Getting it right: Just who do you have to fight?

First, the Parliamentary Standing Committee on Defence's hearings over the years are replete with gallant Service officers telling the panel that they would still manage India's defence no matter what. That's admirable, but someone, either the Service chiefs or a group of retired senior service officers, need to tell the hard facts to the government. Can we actually fight a two-front war? And as the PSCOD notes, our equipment is not enough for more than 10 days of hard

fighting, presumably along one front. These and other ‘ifs and buts’ need to be made clear to the government. Consider the Pentagon reaction to defence cuts under Barack Obama. The 2012 National Defense Strategy said the US’ Department of Defense would make “clear distinctions both *among* the key sizing and shaping missions... and *between* these mission areas and all other areas of the defense program”. That was a clear message — as manpower was being reduced, the department could not and would not be able to fulfil everything Congress demanded of it. By all means, tell them what you can do. But also tell them what you can’t.

At a second level, the government, in turn, needs to tell the Services what it actually expects from them. For instance, military exercises that envisage a drive deep into Pakistan are never going to happen, not under a nuclear overhang. Do we need to be ready to ‘get back the whole of Kashmir’? No, nobody wants it. Besides, we can’t deal with the slice we have. A rationalisation of tasking helps to pare down the list of acquisition to what you need, versus all those goodies you’re never going to get. The newly created Department of Military Affairs could focus on cutting out the flab in expectations. The numbers will then come down by themselves.

Just what kind of warfare can we afford?

Choice of warfare is always about relative advantage. Remember that Gandhi’s strategy of non-violence was not just a moral stand. It was fine strategic sense. When the other side has more guns, go under and use the moral bludgeon. And it worked. From our massive movement of men and machines to Ladakh, it seems that the government is planning to reverse 1962, which speaks of resolve. But don’t replicate that warfare in this day and age. A lesson in how to win a war and grab back (some) of what you lost can be found in the Azerbaijan-Armenian war where the Azeris used drones and technology to showcase the future of warfare. The technology is hardly new, particularly after the highly successful drone attack on Saudi oil facilities in 2019 that severely disrupted oil production.

Luckily, the Indian Army is already there, announcing mock operations using some 75 drones. But that’s only half the battle. Try getting the Air Force to see sense and switch a part of its mission away from fighters to the more prosaic unmanned vehicles. The fact is that the age of the flamboyant fighter pilot is almost over except in public relations wars with Pakistan. For the Navy, think instead of drones coupled with long-range reconnaissance aircraft as the option for future policing of the oceans. It’s far cheaper, and produced much faster, than those photo-friendly frigates, which you can keep ready when you choose to project power. Not to occupy foreign lands, but just reach out a long arm. And if anyone has difficulties with this, *Foreign Affairs* points out that China is already exporting armed drones to 11 countries, including, most recently, Pakistan.

Drones are just one aspect of rapidly evolving technology that goes from mind games and Artificial Intelligence to energy weapons, and space. Explore those where we have a particular strength to ‘make in India’, and quickly.

Bring on those missiles

For those still pining for 1962 comparisons and the appalling non-use of the Air Force, don’t forget our missiles. Not the nuclear-capable long-range Agnis, but their smaller cousins such as the Prahar (150 km) or the Pranash (200 km) solid fuel missiles. That range fills the gap between the MLRS (multiple launch rocket systems) and the nuclear-capable Prithvi. The latter is being targeted for export as one of the cheapest missiles available on the international market, which speaks for itself. Short-range missiles, in actuality, have only marginally more ‘kill power’ than heavy artillery. But they have one important trait – deterrence. Both sides know that escalating to missiles is a whole new level. That’s why deploying them defensively and in large numbers is important. As China jabs us along multiple locations with the precise intention of stretching our land force, deploy missiles at each new location. That should make them pause.

Outsourcing is not just for the IT industry

Other options for the armed forces to raise money exists, instead of such quick fix and decidedly questionable ideas as selling of defence lands. Because the budget problem will remain, you’ll

have nothing to sell next year or the year after that. Instead, consider outsourcing specific services, particularly logistics to firms with dedicated expertise in the area as Britain has done. True, the 'last mile' will still have to be covered, but it does mean erasing costs of an entire arm. There's more, but it requires the Indian bureaucracy to loosen up, and allow a dynamic force to raise its own funds. The ideas are there, tied down by files and lack of flexibility.

As Winston Churchill said, never let a good crisis go to waste. This is the time for letting loose not the dogs of war, but a tsunami of good ideas that will build up the force, and not erode morale by suggestions such as extending retirement and cutting pensions. All it requires is a pen and some doodling, and a willingness to think differently in the Ministry of Defence, in particular. Open out those windows and let some fresh air in.

The author is former director, National Security Council Secretariat. Views are personal.

<https://theprint.in/opinion/indias-defence-needs-money-if-budget-cant-provide-it-we-need-to-change-how-we-fight/593651/>



Fri, 29 Jan 2021

Troops adequately sensitised to take action to thwart acts of aggression along LAC, Says Lt Gen Joshi

He stressed that the situation along the Line of Actual Control (LAC) is stable and negotiations are being held with the PLA for a peaceful resolution of the situation from a position of equivalence

Udhampur: Asserting that any effort by the Chinese military to change status quo along the border has faced effective opposition, Northern Army Commander Lt Gen Y K Joshi on Thursday said the troops on the ground have been adequately sensitised to undertake actions required to thwart acts of aggression.

He stressed that the situation along the Line of Actual Control (LAC) is stable and negotiations are being held with the PLA for a peaceful resolution of the situation from a position of equivalence.

"That notwithstanding, necessary measures have been put in place to respond to any threat over the entire spectrum of conflict," Lt Gen Joshi told PTI in an interview here. He was replying to questions about current security situation along the LAC and the winter strategy to deal with China.



Image for representation

Around four months ago, Indian troops occupied a number of strategic heights in the Mukhpari, Rechin La and Magar hill areas around the southern bank of the Pangong lake, after the Chinese military attempted to intimidate them in the area on the intervening night of August 29 and 30 last year.

"Any effort by the PLA to change the status quo was and is being effectively countered. The troops on ground have been adequately sensitized to undertake any action which is required to thwart any act of aggression," Lt Gen Joshi said.

The troops are highly motivated and have dealt with inclement weather and vagaries of super high-altitude area with characteristic élan and perseverance, he said.

On tactical and operational levels, the army commander said, "We have continuously upgraded our capabilities, tactics, techniques and procedures, and infrastructure while dialogue continues at different levels for resolution of the situation."

It is a complex and intricate process, which needs diligence and patience, Lt Gen Joshi said.

"The Indian Army had always respected the agreements and abided by the protocols related to peace and tranquillity, which now have been rendered null and void."

He said, "We are expecting fresh protocols of military behaviour along the LAC to be one of the key derivatives of the negotiations". The soldiers are well conversant with the alignment of the LAC and will ensure its sanctity at all times, he added.

<https://www.news18.com/news/india/troops-adequately-sensitised-to-take-action-to-thwart-acts-of-aggression-along-lac-says-lt-gen-joshi-3356996.html>

**INDIA
TODAY**

Fri, 29 Jan 2021

Indian Army gets 6,000 new Israeli Light Machine Guns

The Indian Army received the first consignment of 6,000 Israeli Negev Light Machine Guns out of the 16,000 ordered last year under the Fast Track Procedure

By Abhishek Bhalla

New Delhi: The Indian Army received the first consignment of 6,000 Israeli Negev Light Machine Guns out of the 16,000 ordered last year under the Fast Track Procedure.

Sources told India Today TV that the guns were delivered earlier this month and are undergoing inspections. The remaining guns are expected to be delivered by March, sources added.

The Defence Ministry had given approval in March 2019 for the long-standing demand of a modern state-of-the-art Light Machine Gun (LMG) for the armed forces.

The nod was given by the Defence Acquisition Council headed by Defence Minister Rajnath Singh.

The Acquisition Wing of the Ministry of Defence had signed the capital acquisition contract with Israel Weapons Industries for procurement of 16,479 LMGs at a cost of Rs 880 crore.



Israeli Negev Light Machine Gun
(Photocredit: Defence.Capital)

In March 2020, India had signed a contract with Israel Weapons Industries (IWI) to procure 16,479 LMGs under Fast Track Procedure, which are worth Rs. 880 crore.

Indian Army required 40,000 LMGs in addition to assault rifles. The induction of new LMGs will add to the Army's firepower amid the continuing tussle with China and skirmishes with Pakistan at the LoC, sources have said. The Negev 7.62X51 mm Light Machine Gun is a combat-proven weapon and currently used by several countries around the globe. The guns will enhance the lethality and range of a soldier in combat situations, according to sources.

Under FTP equipment, procurement can be expedited in face of delays impacting the capacity of forces. Sources have claimed that the weapon is needed for urgent operational needs and critical operations. It will boost the confidence of the frontline troops and provide much-needed combat power to the Armed Forces, the Defence Ministry had said while approving the procurement earlier.

<https://www.indiatoday.in/india/story/indian-army-gets-6-000-new-israeli-light-machine-guns-1763771-2021-01-29>

Boeing gets permission from US government to offer F-15EX Jet to India: Official

The top contenders for the deal include Lockheed's F-21, Dassault Aviation's Rafale, the Eurofighter Typhoon, Russian aircraft MiG 35 and Saab's Gripen

New Delhi: US aerospace major Boeing on Thursday said it received approval from the US government to offer its F-15EX multi-role combat jet to the Indian Air Force.

Ankur Kanaglekar, the head of fighters sales of Boeing Defence and Space in India, said the F-15EX can offer a future-ready and multi-role solution to the IAF in the form of unmatched payload and performance.

Interacting with a group of journalists, he said Boeing has received marketing licence from the US government for the F-15EX, paving the way for its supply to India. F-15EX is the latest and most advanced version of the multi-role, all-weather and day and night versions of the F-15 aircraft family.

In April 2019, the IAF issued an RFI (request for information) or initial tender to acquire 114 jets at a cost of around USD 18 billion, which is billed as one of the world's biggest military procurements in recent years.

The top contenders for the deal include Lockheed's F-21, Dassault Aviation's Rafale, the Eurofighter Typhoon, Russian aircraft MiG 35 and Saab's Gripen.

The company said the F-15EX will be exhibited at the next edition of Aero India in Bengaluru beginning next week.

Boeing also shared its 2021 growth strategy for the Indian market and exuded confidence in the fundamentals of India's aviation and defence industry.

The company reiterated its commitment to being trusted partners to the Indian armed forces and airline customers as the world weathers the challenges of the pandemic.

"India's aerospace industry is persevering through the global pandemic, which has brought significant challenges. The nation's fundamental growth drivers remain resilient and robust, making India an attractive business destination globally, and Boeing is committed to the advancement of India's aerospace industry," said Salil Gupte, president, Boeing India.

"We are excited about the potential for partnership and growth in India and look forward to the dialogue with our customers, partners and industry at Aero India 2021," he said.

The company said it will hold discussions with customers and industry partners about its range of capabilities in multi-role fighter aircraft, vertical lift platforms, aerial multi-role tankers, unmanned systems and commercial platforms, in addition to technologies, services, world-class sustainment and training capabilities.

It said Boeing's exhibit at Aero India themed 'Building The Future Together' will focus on its partnerships with India's armed forces and highlight the strategic investments the company has made to develop the country's indigenous aerospace and defence ecosystem.

"At the exhibit, Boeing will feature a range of advanced capabilities including the F/A-18 Block III Super Hornet, F-15EX, KC-46A, AH-64E Apache, P-8I, Chinook, 737-10 and 787-9," it said.

In his comments, Kanaglekar mentioned that Boeing discussed the advantages of the F/A-18 Block III offering for the Indian Navy.



Boeing's F-15EX multi-role combat jet. (Source: Boeing.com)

“The Super Hornet’s unique differentiators for the Indian Navy include its two-seater carrier-compatibility capability which provides operational flexibility, and opportunities to integrate future technologies related to manned-unmanned interface from aircraft carriers,” he said.

“The F/A-18 Super Hornet recently successfully concluded ski-jump tests at Naval Air Station Patuxent River, Maryland, demonstrating its compatibility with Indian Navy carriers,” Kanaglekar said. In addition, the company announced the Boeing India Repair Development and Sustainment (BIRDS) hub initiative that envisions a competitive MRO ecosystem for engineering, maintenance, skilling, repair and sustainment services of defence and commercial aircraft in India.

It said the initiative is a first that will benefit Indian customers with best-in-class solutions, efficient turnaround times, and optimal economic value, all available in-country.

<https://indianexpress.com/article/india/boeing-f-15ex-indian-air-force-7165617/>

BusinessLine

Fri, 29 Jan 2021

Boeing pitches Super Hornets to Indian Navy

Bengaluru: Boeing pitching to sell Super Hornets - F/A-18 Block III to Indian Navy. The company in its India news conference on Thursday discussed the advantages of the F/A-18 Block III offering for the Indian Navy and said, “The Super Hornet’s unique differentiators for the Indian Navy include its two-seater carrier-compatibility which provides operational flexibility to integrate future technologies related to manned and unmanned interface from aircraft carriers.”

The F/A-18 Super Hornet recently concluded ski-jump tests at Naval Air Station Patuxent River, Maryland, demonstrating its compatibility with Indian Navy carriers.

The company also shared information about the F-15EX, which is the latest and most advanced version of the F-15 aircraft family. “The F-15EX can offer a future-ready, multi-role solution to the Indian Air Force in the form of unmatched payload, performance, and persistence by integrating leading edge technologies, networks, weapons and sensors,” said Ankur Kanaglekar, Director, India Fighters Lead, Boeing Defense, Space & Security.



F/A-18 Super Hornet (Block III)

BIRDS hub

Boeing also announced the Boeing India Repair Development and Sustainment (BIRDS) hub initiative that envisions an ecosystem for engineering, maintenance, skilling, repair and sustainment services of defence and commercial aircraft in India, as part of its commitment to support and strengthen indigenous aerospace and defence capabilities in the country.

The initiative is a first that will benefit Indian customers with best solutions, efficient turnaround times, and optimal economic value, all available in-country. The BIRDS Hub will also focus on skill development programmes that will help suppliers develop capabilities and gain experience across Boeing platforms.

Commercial aviation

“Due to Covid-19 impact on the commercial aviation market, forecasts indicate that it will take around three years for air travel to return to 2019 levels and a few years beyond that to return to long term growth trends,” said Salil Gupte, President, Boeing India. “India’s domestic passenger market relative to total passenger travel (domestic and international) presents an opportunity for a quicker recovery when the Covid-19 pandemic abates. India is expected to grow at a world-leading compound annual growth rate of 5.2 percent through 2039. This is mainly contributed by the rapidly growing middle class in India,” he added.

<https://www.thehindubusinessline.com/news/boeing-pitches-super-hornets-to-indian-navy/article33685873.ece#>

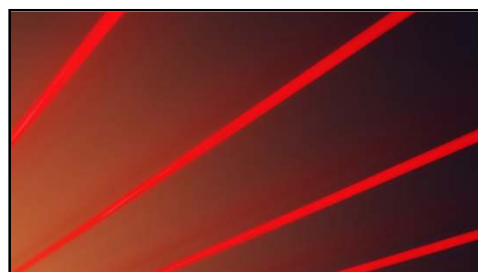
Fri, 29 Jan 2021

Zapping quantum materials with lasers tells us how atoms relate

By Lex Kemper

Phase transitions are a fundamental piece of physics and chemistry. We're all familiar with different phases of water, for example, but this idea of a system of particles changing what it looks like and how it behaves is really ubiquitous in science. And while we know the outcome of water changing into ice, the precise process leads to many different kinds of ice: sometimes ice is transparent and other times not, and the difference has to do with how you freeze it. Thus, studying how a phase transition happens tells us a lot about fundamental physics, and about the resulting phases on both sides.

At the quantum physics level, the same idea applies. We can see the change of a system from one state to another as we slowly change the temperature across the critical temperature; for example, we can see that the material becomes hard, just like we can watch ice form. But we don't see the details on an atomic level as they happen. In this work, we were able to overcome that and open a window onto how the atoms are rearranging themselves from one phase of the system to another on atomic (picosecond) time scales.



Credit: Johannes Plenio on Pexels

In this particular work, we studied CeTe_3 . It is part of a larger class of materials, the rare earth tri-tellurides. If you look at its atomic structure at high temperatures, this material is built like a stacked net of squares. As the temperature decreases, the squares turn into rectangles. There are two directions this can happen in (let's call them A and B), but the material only picks one. Which one depends on happenstance—local stresses and strains in the material caused by defects.

In the experiment, we used ultrashort intense laser pulses to briefly take the system out of its "A" rectangle state and watched how it tried to reform. Since there is no particularly strong driving force towards either rectangle state, the system formed both A and B rectangles. As one of the rectangles (on picosecond atomic timescales) dominates the other, small puddles of the "wrong" state remain, which are difficult to get rid of and last for nanoseconds (100x longer).

These results tell us about fundamental aspects of how phase changes happen, how various parts of the materials "talk" to each other to align their atoms so the patterns match up, and what the energy landscape is on which all of this happens.

When we know what is happening with quantum materials and how they change their state on the atomic level, we can use that knowledge to develop new and better devices, like MRI machines, and better computer memory.

More information: Faran Zhou et al. Nonequilibrium dynamics of spontaneous symmetry breaking into a hidden state of charge-density wave, *Nature Communications* (2021). DOI: [10.1038/s41467-020-20834-5](https://doi.org/10.1038/s41467-020-20834-5)

Journal information: [Nature Communications](https://www.nature.com)

<https://phys.org/news/2021-01-zapping-quantum-materials-lasers-atoms.html>

Physicists develop record-breaking source for single photons

Researchers at the University of Basel and Ruhr University Bochum have developed a source of single photons that can produce billions of these quantum particles per second. With its record-breaking efficiency, the photon source represents a new and powerful building-block for quantum technologies.

Quantum cryptography promises absolutely secure communications. A key component here are strings of single photons. Information can be stored in the quantum states of these light particles and transmitted over long distances. In the future, remote quantum processors will communicate with each other via single photons. And perhaps the processor itself will use photons as quantum bits for computing.

A basic prerequisite for such applications, however, is an efficient source of single photons. A research team led by Professor Richard Warburton, Natasha Tomm and Dr. Alisa Javadi from the University of Basel, together with colleagues from Bochum, now reports in the journal *Nature Nanotechnology* on the development of a single-photon source that significantly surpasses previously known systems in terms of efficiency.

"Funnel" guides light particles

Each photon is created by exciting a single "artificial atom" (a quantum dot) inside a semiconductor. Usually, these photons leave the quantum dot in all possible directions and thus a large fraction is lost. In the photon source now presented, the researchers have solved this problem by positioning the quantum dot inside a "funnel" to send all photons in a specific direction.

The funnel is a novel micro-cavity that represents the real innovation of the research team: The micro-cavity captures almost all of the photons and then directs them into an optical fiber. The photons, each about two centimeters long, emerge at the end of an optical fiber.

The efficiency of the entire system—that is, the probability that excitation of the quantum dot actually results in a usable photon—is 57 percent, more than double that of previous single-photon sources. "This is a really special moment," explains lead author Richard Warburton. "We've known for a year or two what's possible in principle. Now we've succeeded in putting our ideas into practice."

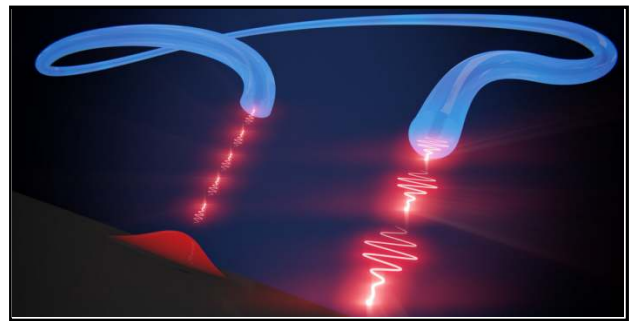
Enormous increase in computing power

The increase in efficiency has significant consequences, Warburton adds: "increasing the efficiency of single photon creation by a factor of two adds up to an overall improvement of a factor of one million for a string of, say, 20 photons. In the future, we'd like to make our single-photon source even better: We'd like to simplify it and pursue some of its myriad applications in quantum cryptography, quantum computing and other technologies."

More information: A bright and fast source of coherent single photons, *Nature Nanotechnology* (2021). DOI: [10.1038/s41565-020-00831-x](https://doi.org/10.1038/s41565-020-00831-x) , www.nature.com/articles/s41565-020-00831-x

Journal information: *Nature Nanotechnology*

<https://phys.org/news/2021-01-physicists-record-breaking-source-photons.html>



The new single-photon source is based on excitation of a quantum dot (shown as a bulge on the bottom left), which then emits photons. A micro-cavity ensures that the photons are guided into an optical fiber and emerge at its end. Credit: University of Basel, Department of Physics

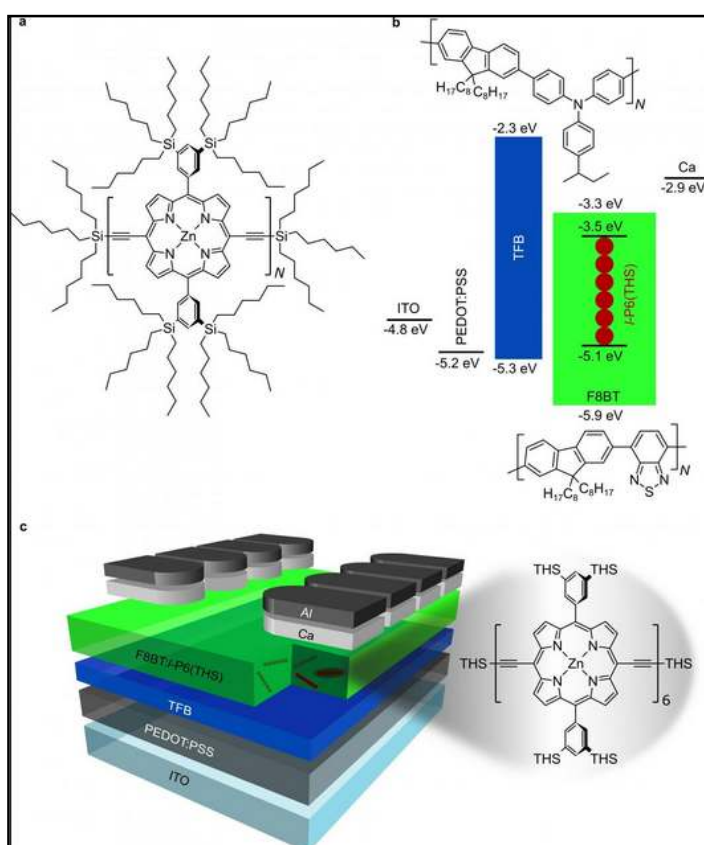
Efficient fluorescent materials and OLEDs for the NIR

Near-infrared emitters (NIR) will be of crucial importance for a variety of biomedical, security and defense applications, as well as for (in) visible light communications and the internet-of-things (IoT). Researchers from the UK and Italy have developed porphyrin oligomer NIR emitters which afford high efficiencies despite being totally free from heavy metals. They demonstrated organic light-emitting diodes (OLEDs) at 850 nm with 3.8% peak external quantum efficiency, together with a novel quantitative model of device efficiency.

The ability to manipulate near-infrared (NIR) radiation has the potential to enable a plethora of technologies not only for the biomedical sector (where the semitransparency of human tissue is a clear advantage) but also for security (e.g. biometrics) and ICT (information and communication technology), with the most obvious application being to (nearly or in) visible light communications (VLCs) and related ramifications, including the imminent Internet of Things (IoT) revolution. Compared with inorganic semiconductors, organic NIR sources offer cheap fabrication over large areas, mechanical flexibility, conformability, and, potentially, biocompatibility.

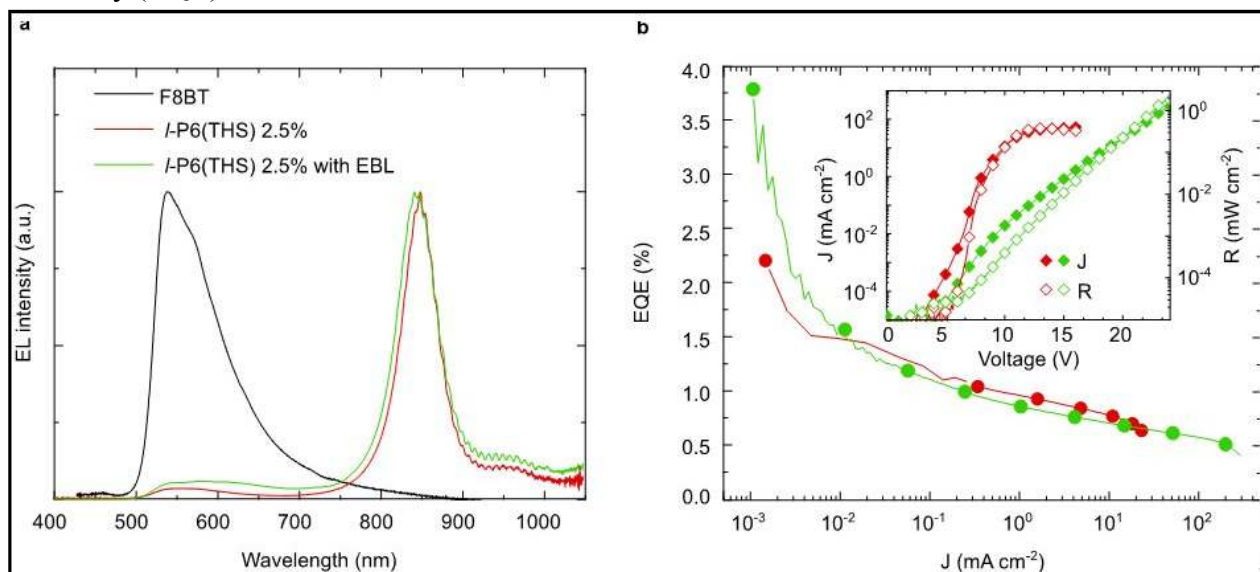
However, the emission efficiency of organic emitters in the NIR is hindered by the detrimental effects of certain types of aggregation/packing of the emitters in the solid state and by the generally observed increase of non-radiative rates upon reduction of the energy gap (EG), i.e. the so-called "energy-gap law" (EG-law) for radiationless transitions. Hybrid organic/inorganic innovative materials such as perovskite methylammonium lead halide and quantum dots may offer a high external quantum efficiency (EQE) alternative, but their heavy-metal content will prevent their use in most applications, especially biocompatible or wearable ones. Toxicity issues can also affect phosphorescent materials incorporating toxic heavy elements.

In a new paper published in *Light: Science & Applications*, an international team of scientists, led by Professor Franco Cacialli at University College London and Professor Harry Anderson at the University of Oxford report novel non-toxic and heavy-metal-free organic NIR emitters and



(a) Molecular structure of the I-PN(THS) oligomer series. (b) Band diagram for the materials employed in the OLEDs. TFB (Poly[(9,9-dioctylfluorenyl-2,7-diyl)-alt-(4,4'-(N-(4-sec-butylphenyl)diphenylamine))] and F8BT molecular structures are illustrated respectively above and below the relative band diagrams. (c) OLED architecture including ITO patterned glass substrate, poly(3,4-ethylene dioxythiophene) doped with poly(styrene sulfonate) (PEDOT:PSS) hole-transport layer, TFB electron/exciton blocking layer, F8BT-I-P6(THS) NIR light-emitting layer and Ca/Al cathode. Credit: Alessandro Minotto, Ibrahim Bulut, Alexandros G. Rapidis, Giuseppe Carnicella, Maddalena Patrini, Eugenio Lunedei, Harry L. Anderson, and Franco Cacialli

OLEDs characterized by emission peaking at ~ 850 nm and a maximum 3.8% external quantum efficiency (EQE).



EL spectra of the OLEDs incorporating F8BT:l-P6(THS) as active layer collected at 15 and 24 V (i.e. the maximum radiance voltages) without and with EBL respectively (a), EQE versus current density (b) and corresponding JVR curves (inset). Credit: Alessandro Minotto, Ibrahim Bulut, Alexandros G. Rapidis, Giuseppe Carnicella, Maddalena Patrini, Eugenio Lunedei, Harry L. Anderson, and Franco Cacialli

The authors use optical spectroscopy to elucidate how it is possible to leverage the increasing spatial extent of excited states with oligomer length to favorably manipulate the competition between radiative and nonradiative processes (quantified by the radiative and nonradiative rates, k_r and k_{nr} respectively), while simultaneously suppressing aggregation. Surprisingly, instead of a decreasing photoluminescence quantum yield (PLQY) with oligomer length (and thus with reducing gap), a steady increase and eventual saturation of the PLQY is observed at around the hexamer (l-P6(THS)).

While surprising, this behavior can be understood by considering that in these systems conjugated triple-bond-based bridges between the porphyrins allow effective intra-molecular electronic coupling among the macrocycles, and so enable the radiative (singlet) excited state (exciton) to delocalize over increasing portions of the molecule. This forces an increasing mismatch of the spatial extent of the radiative (singlet) and of the non-radiative (triplet) excitons, in view of the intrinsically localized nature of the triplets. Such a mismatch is expected to suppress intersystem crossing (ISC) between singlets and triplets and therefore the non-radiative rate (k_{nr}). In addition, exciton delocalization is also expected to favor decoupling from vibrational ladders (and thus circumvent the EG-law).

Remarkably, the growth of the nonradiative rate as a function of the decrease of the energy gap (forced by the increased oligomer length) is characterized in these systems by a logarithmic rate an order of magnitude smaller than in previous studies. Second, bulky trihexylsilyl side chains are attached to the porphyrins to prevent aggregation quenching, through steric hindrance, which limits π - π interactions (see chemical structure in Figure 1).

The basic photophysics and material design breakthrough has been confirmed by incorporating an F8BT:l-P6 (THS) blend in OLEDs, with which an average EQE of 1.1% and a maximum EQE of 3.8% at a peak wavelength of 850 nm were demonstrated (Figure 2). A novel quantitative model was also developed to analyze the results, which implies the importance of triplets to singlets conversion processes (e.g. reverse inter-system crossing, and/or thermally activated delayed fluorescence) to account for the EQE values beyond the apparent limit imposed by spin-statistics.

The EQEs presented in the paper are, to the best of the authors knowledge, the highest reported so far in this spectral range from a 'heavy-metal-free' fluorescent emitter.

The authors summarize the significance of their work, noting that, "Not only do our results demonstrate milder increases of knr with (reducing) EG than in the literature, but, most importantly, they also provide a general strategy for designing high-luminance NIR emitters."

"In the short term, they may enable further development of OLEDs in this challenging spectral range for a wide range of potential applications spanning from the life-sciences (biochemical wearable sensors, in vivo sub-surface bio-imaging, to name just two), security (e.g. biometrics), horticulture, and (in) visible light communications (iVLC), a serious contestant to alleviate the bandwidth demands of the imminent Internet-of-thing (IoT) revolution."

"More importantly, and in perspective, these findings are significant to a range of disciplines."

More information: Alessandro Minotto et al, Towards efficient near-infrared fluorescent organic light-emitting diodes, *Light: Science & Applications* (2021). DOI: [10.1038/s41377-020-00456-8](https://doi.org/10.1038/s41377-020-00456-8)

Journal information: [Light: Science & Applications](https://phys.org/news/2021-01-efficient-fluorescent-materials-oleds-nir.html)
<https://phys.org/news/2021-01-efficient-fluorescent-materials-oleds-nir.html>

COVID-19 Research News

mint

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Covid-19 is seasonal, new research suggests

By Neetu Chandra Sharma

- *Illinois researchers have suggested that covid-19 cases and mortality rates, among other epidemiological metrics, are significantly correlated with temperature and latitude across 221 countries*

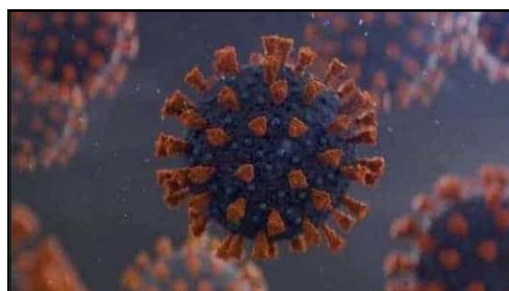
New Delhi: Covid-19 may be seasonal like flu, a global analysis of the pandemic by the University of Illinois, Chicago, has suggested.

In a paper, published in *Evolutionary Bioinformatics*, Illinois researchers have suggested that covid-19 cases and mortality rates, among other epidemiological metrics, are significantly correlated with temperature and latitude across 221 countries.

Early in the pandemic, researchers and public health officials had suggested SARS-CoV-2 may behave like other coronaviruses, many of which rear their heads in fall and winter. But data was lacking, especially on the global scale. The research aims to fill this specific knowledge gap.

Researchers downloaded relevant epidemiological data (disease incidence, mortality, recovery cases, active cases, testing rate, and hospitalization) from 221 countries, along with their latitude, longitude, and average temperature. They pulled the data from 15 April, because that date represents the moment in a given year in which seasonal temperature variation is at its maximum across the globe. That date also coincided with a time during the early pandemic when covid-19 infections were peaking everywhere.

The research team then used statistical methods to test if epidemiological variables were correlated with temperature, latitude, and longitude. The expectation was that warmer countries closer to the equator would be the least affected by the disease.



Early in the pandemic, researchers and public health officials had suggested SARS-CoV-2 may behave like other coronaviruses, many of which rear their heads in fall and winter, but data was lacking.

"Our worldwide epidemiological analysis showed a statistically significant correlation between temperature and incidence, mortality, recovery cases, and active cases. The same tendency was found with latitude, but not with longitude, as we expected," said Gustavo Caetano-Anollés, professor in the Department of Crop Sciences, affiliate of the Carl R. Woese Institute for Genomic Biology at Illinois, and senior author on the paper.

While temperature and latitude were unmistakably correlated with covid-19 cases, researchers pointed out climate was only one factor driving seasonal covid-19 incidence worldwide.

They accounted for other factors by standardizing raw epidemiological data into disease rates per capita and by assigning each country a risk index reflecting public health preparedness and incidence of co-morbidities in the population.

The idea was that if the disease was surging in countries with inadequate resources or higher-than-average rates of diabetes, obesity, or old age, the risk index would appear more important in the analysis than temperature. But that wasn't the case. The index did not correlate with the disease metrics at all.

"One conclusion is that the disease may be seasonal, like the flu. This is very relevant to what we should expect from now on after the vaccine controls these first waves of covid-19," said Caetano-Anollés.

"Our results suggest the virus is changing at its own pace, and mutations are affected by factors other than temperature or latitude. We don't know exactly what those factors are, but we can now say seasonal effects are independent of the genetic makeup of the virus," Caetano-Anollés says.

Caetano-Anollés notes more research is needed to explain the role of climate and seasonality in covid-19 incidences, but he suggests the impact of policy, such as mask mandates, and cultural factors, such as the expectation to look out for others, are key players as well. However, he doesn't discount the importance of understanding seasonality in battling the virus.

Researchers also humans' own immune systems could be partially responsible for the pattern of seasonality. For example, a person's immune response to the flu can be influenced by temperature and nutritional status, including vitamin D, a crucial player in immune defences. With lower sun exposure during the winter, one doesn't make enough of that vitamin. But it's too soon to say how seasonality and immune systems interact in the case of covid-19, the researchers said.

<https://www.livemint.com/science/health/covid19-is-seasonal-new-research-suggests-11611820498528.html>

