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# 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

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## CONTENTS

S. No.	TITLE	Page No.
<b>DRDO News</b>		<b>1-6</b>
<b>DRDO Technology News</b>		<b>1-6</b>
1.	Def Min inaugurates DRDO's hypersonic wind tunnel test facility: What this means for future of defence tech	1
2.	What is Hypersonic Wind Tunnel Facility (HWT)? Know its significance, functioning here	2
3.	India's DRDO delivers three systems to armed forces	4
4.	F/A-18 operation on Indian carriers successfully demonstrated: Boeing	5
<b>Defence News</b>		<b>6-21</b>
<b>Defence Strategic National/International</b>		<b>6-21</b>
5.	Is the Indian Army ready for Theatre Level Unified Command Operations?	6
6.	Indian Army and the need for technological support to the tactical edge	8
7.	Tread warily on Maritime Theatre Command	9
8.	In message to China, Modi bats for fair code in South China Sea	11
9.	Indian Navy to get bigger, improved and better-armed SSBN ARIGHAT early next year	12
10.	Vice Admiral Sandeep Naithani AVSM VSM Assumes Charge as the Controller Warship Production and Acquisition	13
11.	Chennai to host Defence Expo empowering MSME from Mar 19-21, 2021	14
12.	Impact of 5G on India: Opportunities and risks for Indian defence forces	15
13.	Boeing touts success of launch tests for fighter pitched to Indian Navy	17
14.	Defence ministry approves procurement of equipment worth Rs 27,000 cr; L&T Defence to bid for 50% orders	18
15.	अमेरिका के फाइटर जेट F/A-18 ने पास किया सबसे मुश्किल टेस्ट, जानिए Indian Navy को कैसे होगा फायदा	19
16.	Moscow's relationship with China, Pakistan independent of its ties with India — Russian envoy	20
<b>Science &amp; Technology News</b>		<b>22-31</b>
17.	2020: A defining year for Indian space sector	22
18.	Depth-dependent valence stratification in a lithium-rich layered cathode	24
19.	Researchers invent method to 'sketch' quantum devices with focused electrons	26
20.	High pressure causes hydrogen variants to collapse	27
21.	Optoelectronic devices that emit warm and cool white light	28
22.	Researchers unveil the origin of Oobleck waves	29
<b>COVID-19 Research News</b>		<b>30-31</b>
23.	Study finds how Covid-19 hastens stroke risk	30
24.	New research: Coronavirus spike protein imaged in its natural state	31

## Def Min inaugurates DRDO's hypersonic wind tunnel test facility: What this means for future of defence tech

*The DRDO's Hypersonic Wind Tunnel will provide a big boost to India's ambitions of developing indigenous hypersonic cruise missiles*

### Key Highlights

- According to reports, only the United States and Russia have similar facilities
- In general, Mach 5 is considered the differentiating threshold between supersonic and hypersonic wind tunnels
- In September this year, the DRDO made a huge technological breakthrough when it successfully tested its hypersonic technology demonstrator vehicle (HSTDV)

Defence Minister Rajnath Singh, on Saturday, inaugurated the Defence Research and Development Organisation's (DRDO) state-of-the-art Hypersonic Wind Tunnel (HWT) test facility placing India in a select group of nations with the technology.

According to reports, only the United States and Russia have similar facilities. The indigenously-developed facility has the capability to simulate hypersonic airflow and will prove crucial in India's quest to develop futuristic aerospace and defence technologies.

### How does a wind tunnel work?

Simply put, a wind tunnel enables one to carry out testing of aerospace technologies without actually having to test them in real-life environments. The practice of understanding how airflow affects the performance of a cruise missile, a rocket or an airplane is known as aerodynamics. A wind tunnel then, essentially works off a simple idea – if one cannot collect air flow data when a projectile is in the sky, why not have the airflow past the stationary projectile while it's on the ground?

In a rudimentary sense, a wind tunnel is just a large pipe that wraps around in a circle with a fan located in its centre. When the fan is turned on, air is blown through the pipe. However, in order to control the speed of airflow, the pipe is made narrower and wider at different sections. The narrower the pipe, the faster the air must flow to move through it.

In general, Mach 5 is considered the differentiating threshold between supersonic and hypersonic wind tunnels. However, there exist hypersonic wind tunnels capable of simulating airflow at much greater speeds up to Mach 11.



Defence Minister Rajnath Singh inaugurates the Hypersonic Wind Tunnel Facility in Hyderabad on Saturday, December 19. | Photo Credit: Twitter

## 'A new class of military threat'

In light of the concerted focus on hypersonic technology by militaries across the world, a hypersonic wind tunnel is critical to configuring how a projectile could withstand immense temperatures and air-flow mid-flight. In September this year, the DRDO made a huge technological breakthrough when it successfully tested its hypersonic technology demonstrator vehicle (HSTDV) powered by a scramjet engine.

Although not a weapon itself, the successful test flight of the HSTDV was a significant milestone in the nation's quest to develop hypersonic and long-range cruise missiles. The scramjet engine - an upgrade on the ramjet engine - enables supersonic combustion, allowing it to operate efficiently at speeds much greater than Mach 3 (supersonic speeds). The HSTDV can achieve cruise speeds of up to Mach 6 and rise to an altitude of 32.5km in just 20 seconds.

The American think-tank, RAND Corp, has called hypersonic missiles “a new class of military threat.” Capable of reaching speeds in excess of 5,000 km per hour while retaining manoeuvrability, hypersonic missiles can effectively penetrate missile defence systems and drastically reduce the time an adversary has to respond to an attack.

However, the technology has several civilian applications as well. It is believed that the development of the scramjet engine will allow India to launch small satellites into orbit at low cost. Currently, India has to rely extensively on the facilities of other nations in this regard.

<https://www.timesnownews.com/india/article/def-min-inaugurates-drdo-s-hypersonic-wind-tunnel-test-facility-what-this-means-for-future-of-defence-tech/697173>



Tue, 22 Dec 2020

# What is Hypersonic Wind Tunnel Facility (HWT)? Know its significance, functioning here

*Rajnath Singh recently inaugurated the advanced Hypersonic Wind Tunnel (HWT) test during his visit to Defence Research and Development Organisation's (DRDO's) Dr APJ Abdul Kalam Missile Complex in Hyderabad. India has become the third country after Russia and US to have such a facility*

*By Tulika Tandon*

In the handover ceremony, Indian Defence Minister Rajnath Singh presented the Indian Army with Border Surveillance System (BOSS), an all-weather electronic surveillance system.

## Why in News?

Union Defence Minister Rajnath Singh recently inaugurated the advanced Hypersonic Wind Tunnel (HWT) test during his visit to Defence Research and Development Organisation's (DRDO's) Dr APJ Abdul Kalam Missile Complex in Hyderabad.

## About Mega Hypersonic Wind Tunnel Facility?

1. It is the state-of-the-art Hypersonic Wind Tunnel Test facility which is a pressure vacuum-driven enclosed free jet facility having a nozzle exit diameter of 1 meter.
2. It can simulate Mach No 5 to 12
3. India is the third country after the USA and Russia to have such a large facility in terms of size and operating capability.
4. It is an indigenous development built in partnership with Indian industries.



Hypersonic Wind Tunnel India

5. As per the press release by Defence Services, the facility is provided with the capability to "simulate hypersonic flow over a wide spectrum and will play a major role in the realization of highly complex futuristic aerospace and defence systems."

**Significance:**

1. This indigenously-developed facility has the capability to simulate hypersonic airflow and will prove crucial in India's quest to develop futuristic aerospace and defence technologies.
2. It is a great effort on part of DRDO thus giving a boost to make in India.

**How does wind tunnel work?**

1. Wind Tunnels are large tubes with air passing at high speed through them.
2. These tunnels direct air around an object which makes it reach the flying stage.

**What is Hypersonic Wind Flow?**

1. The Hypersonic flow is when the speeds are much higher than the speed of the sound that is 330 m/s.
2. It can be achieved at Mach 5 or greater.
3. The Hypersonic test facility includes shock layer, viscous interaction layer, entropy layer and stagnation temperature of the flow.

**Differences on the basis of Mach Number**

1. Mach number is less than 0.8- subsonic
2. Mach number is between 0.8 and 1.2- Transonic
3. Mach number is 1- Speed of the sound
4. Mach number of between 1.2 and 5.0-Supersonic sounds
5. Mach number is between 5 and 10- Hypersonic sounds
6. Mach number is greater than 8.8- Hypervelocity

It may not be a weapon, but the successful test of Hypersonic Wind Flow Tunnel is a significant milestone in the nation's quest to develop hypersonic and long-range cruise missiles. It is a response to China's DF-17 which is a developing hypersonic cruise missile. Hypersonic is the future in defence and India is leading the race now.

<https://www.jagranjosh.com/general-knowledge/what-is-hypersonic-wind-tunnel-facility-hwt-know-its-significance-functioning-here-1608557831-1>

## India's DRDO delivers three systems to armed forces

*The Government of India has formally handed over three indigenously developed Defence Research and Development Organisation (DRDO) systems to the three branches of armed forces*

In the handover ceremony, Indian Defence Minister Rajnath Singh presented the Indian Army with Border Surveillance System (BOSS), an all-weather electronic surveillance system.

Designed and developed by Instruments Research & Development Establishment (IRDE) in Dehradun, the system is capable of automatically detecting any intrusion in high-altitude sub-zero temperature areas.

The system, which can be operated remotely, has already been deployed at the Ladakh border area for surveillance.

The Indian Air Force received the ASTRA Mk-I Missile, a Beyond Visual Range (BVR) missile system. The missile can be fired from Sukhoi-30, Light Combat Aircraft (LCA), Mig-29 and Mig-29K aircraft.

It is developed by Defence Research & Development Laboratory (DRDL) Hyderabad and produced by Bharat Dynamics, Hyderabad.

Additionally, Minister Singh handed over the Indian Maritime Situational Awareness System (IMSAS), a software system that will provide a global maritime situational picture, marine planning tools and analytical capabilities to Indian Navy.

This system was conceived and developed jointly by the Centre for Artificial Intelligence & Robotics (CAIR) in Bengaluru and Indian Navy, while BEL developed it.

At the event, Singh also complimented the DRDO scientists for their work in developing critical defence systems.

In October, DRDO completed the final user trial of the third-generation anti-tank guided missile (ATGM) NAG.

The NAG system is designed to destroy or defeat enemy tanks equipped with composite and reactive armour.

<https://www.army-technology.com/news/india-drdo-systems/>



DRDO Bhavan in Delhi. Credit: Imahesh3847.



## F/A-18 operation on Indian carriers successfully demonstrated: Boeing

*Demonstrations were held on a shore-based facility at Naval Air Station Patuxent river in Maryland, U.S.*

*By Dinakar Peri*

New Delhi: Boeing on Monday announced the successful demonstration of the compatibility of its F/A-18 Super Hornet fighter jets with the Indian Navy's aircraft carriers as part of its pitch for the Navy's fighter procurement.

The demonstrations, which were held in coordination with U.S. Navy on a shore-based facility at the Naval Air Station Patuxent river in Maryland, U.S., show that the F/A-18 Super Hornet would do well with the Indian Navy's Short Takeoff but Arrested Recovery (STOBAR) system and validate earlier simulation studies done over the last two years, a senior company official said.



F/A-18 Super Hornet demonstration from shore based test facility in US. | Photo Credit: Special Arrangement

“The first successful and safe launch of the F/A-18 Super Hornet from a ski-jump begins the validation process to operate effectively from Indian Navy aircraft carriers,” said Ankur Kanaglekar, Head, India Fighters Sales, Boeing Defense, Space and Security.

The F/A-18 Block III Super Hornet would not only provide superior war-fighting capability to the Indian Navy but also create opportunities for cooperation in naval aviation between the U.S. and India, Mr. Kanaglekar said, pitching it as a “lynchpin” for cooperation between Indian and U.S. Navies. However, he said, the fighter requirements of the Indian Navy and the IAF were different.

### ‘Force multiplier’

He also highlighted the ability of F/A-18 to interface with the Navy's P-8I as a “force multiplier” and also with other platforms under induction.

The Navy has contracted 24 Lockheed MH-60R multi-role helicopters with deliveries to begin next year.

As part of Boeing's proposed “By India, for India” sustainment program, the Block III Super Hornets could be serviced in partnership with the Indian Navy as well as India and U.S. based partners throughout the lifecycle of the aircraft, Mr. Kanaglekar said. This would further develop advanced expertise in aircraft maintenance in India, resulting in higher availability of the aircraft, at competitive pricing and reduced risk for the Indian Navy.

### DRDO's offer

The Indian Navy currently evaluates responses from aircraft manufacturers received in response to a Request For Information (RFI) floated in 2017 for 57 twin-engine deck-based fighters. However, with the Defence Research and Development Organisation (DRDO) recently offering to develop a twin-engine deck based jet, the Navy is in the process of cutting down the number of fighters from 57 to around 36.

The Navy's sole carrier in service INS Vikramaditya and the under-construction indigenous Aircraft Carrier (IAC)-I Vikrant both have a ski-jump with a STOBAR mechanism.

As reported by *The Hindu* early this month, Navy Chief Admiral Karambir Singh said the Navy was trying to do the tender along with the Indian Air Force (IAF) which, officials had stated, if accepted the 57 tender would be combined with the IAF's 114 jet tender.

<https://www.thehindu.com/news/national/boeing-says-successful-demonstration-of-f-18s-landing-on-indian-navy-carriers/article33383680.ece>

## Defence News

# Defence Strategic: National/International

 **FINANCIAL EXPRESS**  
Read to Lead

Tue, 22 Dec 2020

## Is the Indian Army ready for Theatre Level Unified Command Operations?

*In his first interaction with the media earlier this year, Gen Rawat had indicated that there could be several commands including the Peninsular Command (for the southern part of the state), an Air Defence Command and other commands in the eastern, northern and western regions*

*By Huma Siddiqui*

Gen Bipin Rawat as country's first-ever Chief of Defence Staff (CDS) is going to complete one year soon. Besides other matters, the tri-service operations for more synergy in the functioning, new Theatre Level Commands including Air Defence Command come under his purview. As has been reported earlier, Gen Rawat had announced that the Indian military will complete theatisation process by 2023.

### What does Theaterisation mean?

In his first interaction with the media earlier this year, Gen Rawat had indicated that there could be several commands including the Peninsular Command (for the southern part of the state), an Air Defence Command and other commands in the eastern, northern and western regions.

The Joint Doctrine document published in 2017 is detailed regarding the expectations of a Theatre Level Command and Indian Army has to specifically, address its present technological gaps before participating in a Joint development of niche Unified Command tactics.

A Theatre Command shall have specific units from the three services: the specialised units from the Army, Navy and Air Force shall operate under a common Theatre Commander to gain a Tactical advantage over the adversary.

### Why?

Rationalization of warfighting resources, the efficiency of executions and to face the Threat from our main adversary China, which has an established Theatre Level commands.



The boots on the ground require more technology on a soldier himself and it can be a race against time to digitalise the human-centric Army. (Representational image: IE)



## **Is the Indian Army ready for Theatre Command?**

No. Theatre Command shall be highly dependent on the inter-operability amongst the units for the three services, which is not yet available. Already, the Indian Army has multiple issues like SDR based modern Joint Tactical Radio communication implementation for Tactical advantages. The availability of a modern fully secure digital communication for voice and data services amongst the Tank units is important to achieve Situational Awareness and, in turn, these Tank units are to be digitally integrated with IAF fighter jets operating in an Air support role. Army requires to now include the well-evolved defensive and offensive tactics of IAF within its own Real-time operation schemes for an effective exploitation of the Air assets.

Which means that the Joint operations of Indian Army with IAF shall be far more than a mere hierarchal organization for communicating orders in modern interoperable warfare. Each Theatre Command probably is going to highlight more of the inter-service interoperability shortcomings as a hurdle to achieving the desired efficiency standards which are re-defined now for Theatre Level outcomes.

“Maybe it is time for the Army to introspect their warfare Doctrines and Concepts before inclusive operations with the IAF assets as a single Theatre Level Command,” a senior officer observed.

Indian Army being the main beneficiary by having control over more number of full-fledged Theatre Level Commands in the future shall do well by shouldering more technically responsibility to operationalise the Theatre level warfighting capabilities. This may support Maritime Theatre Command (MTC) and Air Defence Command to be more objective in approach while operating with the Land forces.

### **Why?**

The IAF operates some of the latest multirole fighter jets and sharing of such resources under a Unified Command by Indian Army may not be fully leveraging the IAF capabilities due to want of hi-tech systems like Battlefield Management systems. IAF has developed its own advance Teal Time Integrated Air Command and Control System (IACCS) for Command and Control of Air assets. An inter-linking of IACCS with equivalent Battlefield Management System (as and when it evolves) shall leverage the true potential of Land-Air integration.

Defining the Battlefield Management level philosophies at this late a stage for a Theatre Command implementation that too involving latest IAF assets may be detrimental to the early readiness of these Land-based Theatre Commands. The boots on the ground require more technology on a soldier himself and it can be a race against time to digitalise the human-centric Army.

The interoperability in a multinational Task Force where Indian Land forces too shall be participating under a Theatre level, requires far more digital effort now by Indian Armed Forces than ever before.

### **Complete Theatrisation process by 2023**

The CDS has said it will take three years to have complete Theatrisation. With Army having larger representation in all the Tri-services organizations, it may be a prudent mandate to make Indian Army responsible for centrally implementing the Theatre Level technological solutions (like Tactical Data Link, Software Defined Radios etc.) for the tri-services, even when Maritime and Air Defence Theatre Commands are likely to be formed prior to the launch of Land-based Theatre Commands of the Army.

<https://www.financialexpress.com/defence/is-the-indian-army-ready-for-theatre-level-unified-command-operations/2154363/>

# Indian Army and the need for technological support to the tactical edge

*The triad that exists to ensure the success of troops being launched into any conflict is based on technology, tactics and training*

*By Maj Gen Jagatbir Singh*

The triad that exists to ensure the success of troops being launched into any conflict is based on technology, tactics and training. Many years ago Richard Simpkin in his famous book ‘Race to the Swift’ talked about the fifty-year cycle when a decisive weapon or technology changed the nature of the battlefield and led to transformative changes in tactics and ushered in a revolution in military affairs. It has happened since the beginning of the conflict and recent weapons can be the machine guns, tanks, aircraft and helicopters all that led to victories for the armies that were able to adapt to the then-emerging technologies.

Today this change is in the form of nuclear weapons which are used mainly as a deterrent and the need to grasp the changes taking place in Space-based assets, 5G technologies and AI in combating the enemy. The book ‘Unrestricted Warfare’ by the two Chinese Colonels talks of conflicts taking place in arenas and manners not visualized earlier and their words while introducing the book that “the only rule in unrestricted warfare is that there are no rules” are telling to say the least. Warfare is going to transcend all boundaries and aspects of society.

The truth is that today there are a large number of analysts who feel that the Indian Army is not grasping the emerging technologies and is more focused on infantry in spite of the reassurances by both the CDS and Army Chief regarding the future of warfare and technology. And that technology will become the key driver for future conflicts. There is no doubt that warfare in future needs the latest technology and technical oriented personnel to manage the complex systems be it missiles, tanks, guns, aircraft and ships. There is also no doubt that the cycle of fifty years is fast reducing and obsolete in technologies are taking place faster. At the other end, you have to have access to this technology and finally the money to buy it. So, to simply say that we as an Army are not focused on technology is untrue. Moreover, having been part of a Project handling the induction of new technology while in Service, the issues of availability of commercial technology and the same being ruggedised and adapted to function effectively across all terrains with adequate secrecy was always a challenge.

There are areas where we are very advanced as far as induction of weapons with the latest technologies are concerned, a case in point is the development of missiles by the DRDO, however, there is no hiding the fact that their success has not been as spectacular in other fields to namely the Arjun tank and nether was HAL able to deliver the LCA in the given time frame. With the ushering in of Aatmanirbhar, there is a need to have greater accountability and reducing the gap between expectations and delivery of technologies and at the same time we need to involve both our Universities and the Private Sector to a greater degree. This is an opportunity that needs to be seized and they need to exploit emerging technologies to enable long term and holistic solutions to our security requirements.

As far as imports are concerned there is no doubt that induction of new equipment is often caught up in procedural delays, no Artillery guns were upgraded for over thirty years due to the



There is no doubt that warfare in future needs the latest technology and technical oriented personnel to manage the complex systems be it missiles, tanks, guns, aircraft and ships. (Photo source: AP)

fallout of Bofors and the infantry is yet to get delivery of the new carbines. The induction of the Rafale has also been witness to many delays. Unless you have the weapons and systems in place you cannot train on them and unless you train on them you will be found wanting especially when faced with a peer enemy.

At the same time, everything cannot be adaptive, innovative, modernized and transformative. While there is an increasing age and obsolescence in some of our core equipment, it is imperative to examine specific areas such as all-weather surveillance and targeting, drone and counter-drone technologies, night fighting capabilities and communication technologies to include battlefield management systems.

There is also a hubris that needs to be overcome, which exists in most armies; the presumption that tactical competency will overcome technical proficiency. This is a dangerous assumption.

*(The author is an Indian Army Veteran. Views are personal)*

<https://www.financialexpress.com/defence/indian-army-and-the-need-for-technological-support-to-the-tactical-edge/2154173/>

# The Tribune

Tue, 22 Dec 2020

## Tread warily on Maritime Theatre Command

*Merely articulating a joint doctrine does not mean we are ready to put aside years of inter-service rivalry and single service operating peculiarities. The IAF was the first to express reservations on the proposed theaterisation, for fear of its valuable air power assets being parcelled out to new entities. We should take our time evolving into an Integrated Defence Force such as that of Israel or Japan*

*By Group Captain Murli Menon (retd)*

The historical backdrop to India's penchant for theaterisation goes back to the 1999 Kargil war and the two committees that followed — headed by K Subrahmanyam and Naresh Chandra — which made a slew of recommendations to the government regarding higher defence management. The creation of the Chief of Defence Staff (CDS) was prime among those recommendations and the incumbent can be seen at work now, the latest salvo being the Integrated Maritime Theatre study by the Vice Chief of the Naval Staff (VCNS) that is due for submission shortly. This study supposedly recommends the creation of the Maritime Theatre Command (MTC), earlier referred to as the Peninsular Theatre Command. Be that as it may, the ongoing border stand-off with China threatens to reinforce India's land-oriented war focus.

There is no gainsaying the fact that like the Kargil Review Committee (KRC) diktats, India's defence planning for the coming years needs to factor in our country's strategic location and world view, given how we are seen as a virtual fulcrum power between the Mediterranean and South China seas, enhancing the critical need to keep the Sea Lines of Communication open during peace and war. The creation of an Integrated Maritime Command could be seen in this light, also giving much-needed fillip to India's expected emergence as a viable maritime entity. In order to be able to effect the desired power projection matrix in the region as also to maintain good relations with other seafaring nations such as Japan, Australia, Vietnam, Indonesia, Thailand, Singapore and Malaysia, a strong maritime organisation is inescapable. There's also a need to coordinate our strategic posture meaningfully with other littoral



**IMPERATIVE: It is high time India asserted itself as a maritime power. PTI**

states such as Sri Lanka, Maldives, Madagascar, Iran and Oman. It is thus high time India asserted itself as a maritime power.

Presently, we have seven commands each in the Army and the Air Force and three regional commands in the Navy. Besides, we have the integrated CDS, Strategic Forces Command and Andaman & Nicobar Integrated Command already functional. It is understood that the agenda for the CDS is to reorganise the existing single service commands into five integrated commands for enhanced operational and functional efficiency. The Indian Armed Forces Joint Doctrine Manual came out in 2017; it talks about theaterisation of the military, including the creation of the then Peninsular Theatre Command and now the MTC, an Air Defence Command under the IAF's aegis and three Army Theatre Commands — west, north and east — to deal with the threat from Pakistan and China. The MTC, whose implementation is expected as early as 2022 once the Cabinet Committee on Security (CCS) gives its approval, would address the overall maritime threat. Organisationally, no additional liabilities of posts or ranks are expected, the structure itself being culled from the existing command structures of the Army, Navy and Air Force. The Navy, of course, would see the churning first, with the proposed merger of its Western and Eastern Commands. As per the VCNS study's recommendation, the Chief of the Naval Staff (CNS) would apparently lose his importance to a Maritime Theatre Commander to whom the Western and Eastern Naval C-in-Cs would report. The CNS's role is expected to be reduced to 'raising, training and sustaining' the Navy.

The reported naval proposals have understandably created a flutter among the traditionalists in all the three services. The 'extremists' feel that the move for theaterisation is akin to 'fixing what ain't broke'. After all, the Indian armed forces have done well in all wars so far with the existing system, they aver. Integrated war-fighting could well be made a reality through mandatory tri-service postings and service courses, they further argue. But the KRC's and Naresh Chandra Committee's viewpoint about the need for 'integrating and restructuring the security ecosystem' has validity too.

India has a need to retain its influence in its defined strategic space, which includes the ability for overseas deployment of the military for political intervention or evacuation of its citizens. Some of this capability was demonstrated recently in the evacuations necessitated from Sri Lanka, Maldives and the Middle East during the Covid-19 crisis. However, care should be exercised to ensure that we do not attempt to overhaul a working system unnecessarily, bringing in change for the sake of change. Integrated commands for special forces, space and logistics may be more urgent in terms of achieving effective integrated war-fighting in the subcontinental context. Theaterisation could perhaps wait a few years, and be done in a phased manner. Merely articulating a joint doctrine does not mean we are ready to put aside years of inter-service rivalry and single service operating peculiarities. The IAF was the first to express reservations on the proposed theaterisation, for fear of its valuable air power assets being parcelled out to different new entities, at times also headed by a non-specialist C-in-C. Now, it does take a while for any nation to make such drastic changes in its war-fighting philosophy and so also we should take our time evolving into an Integrated Defence Force such as that of Israel or Japan.

Integration of the Ministry of Defence and the service headquarters, integration of defence manufacturing, integration of tri-service logistics, communications and procurements are other low-hanging fruit the government could target initially. Given the volatile security situation in our neighbourhood, we do not have the luxury of ambling through an organisational change such as theaterisation, compromising war-fighting efficacy ad interim. Therefore, much more of war-gaming, think tank inputs and hands-on experience through international exercises would be called for before the Indian military treads the path of new-fangled concepts such as Theatre Commands.

<https://www.tribuneindia.com/news/comment/tread-warily-on-maritime-theatre-command-187735>



## In message to China, Modi bats for fair code in South China Sea

By Sachin Parashar

New Delhi: China's shadow loomed over the India-Vietnam virtual summit on Monday with PM Narendra Modi stressing to his counterpart Nguyen Xuan Phuc that negotiations for a Code of Conduct (CoC) in the disputed South China Sea (SCS) waters should not undermine the interests of other countries or third parties in the region while hailing Hanoi as a pillar of India's Act East policy.

The summit saw the two countries sign seven agreements in areas as diverse as defence, petrochemicals and renewable and nuclear energy with the highlight being a framework agreement for cooperation between defence industries. The agreement is expected to help Vietnam utilise two defence lines of credit India announced earlier, \$500 million and \$100 million, for the Asean country.

Modi's reiteration of India's position on CoC is significant as both India and the US fear that China could influence Asean countries into accepting an agreement that ignores the rights of third countries that are not party to the South China Sea disputes. Beijing has so far seemed reluctant to incorporate or acknowledge these rights in the CoC.

India and Vietnam announced implementation of the High Speed Guard Boat (HSGB) manufacturing project for Vietnam Border Guard Command under the \$100 million line of credit with India handing over a completed vessel. Seven more HSGBs will be manufactured in Vietnam. As defence remains the central pillar of India's comprehensive strategic partnership with Vietnam, both leaders also agreed to further institutionalise such exchanges through mutual logistics support, regular ship visits, joint exercises, exchanges in military science and technology, information sharing, and also cooperation in UN peacekeeping.

As expected, in the light of growing Chinese expansionism which has affected both India and Vietnam, the two countries discussed the security situation in the SCS in detail with both leaders reaffirming the importance of maintaining peace, stability, security and freedom of navigation and overflight in the region. In a joint vision document, they also underlined the significance of pursuing peaceful resolution of disputes in accordance with international law, particularly the 1982 United Nations Convention on the Law of the Sea (UNCLOS), without resorting to threat or use of force.

"Both leaders underscored the importance of non-militarisation and self-restraint in the conduct of all activities by claimants and all other states, and avoidance of actions that could further complicate the situation or escalate disputes affecting peace and stability," the document said.

Modi reiterated that Vietnam was an important pillar of India's Indo-Pacific vision. "Both leaders agreed to explore practical cooperation based on convergences between our Indo-Pacific Oceans' Initiative (IPOI) and the Asean Outlook on Indo-Pacific (AOIP) which Vietnam subscribes to," MEA secretary (east) Riva Ganguly Das said.

Importantly for India, as the countries prepare to take over as non-permanent members of the UNSC, Vietnam resolved to combat terrorism in all its forms and manifestations, including cross-border terrorism, terror financing networks and safe havens, and said it would be put into action through greater coordination in bilateral, regional and global efforts. While Vietnam is encouraging



PM Modi at the virtual summit with his Vietnamese counterpart



India to invest more in its oil and gas sector, another contentious area with China given the SCS disputes, the focus on renewable energy is something new in bilateral ties.

There was a discussion in the context of both India and Vietnam concurrently serving as non-permanent members of the UN Security Council, Das said.

"Both prime ministers agreed that India and Vietnam should work closely to actively promote 'reformed multilateralism' to make international organisations, including the UN Security Council, more representative, contemporary and capable of dealing with current challenges. Vietnam reiterated its strong support for India's permanent membership in an expanded UNSC," she added.

<https://timesofindia.indiatimes.com/india/in-message-to-china-modi-bats-for-fair-code-in-south-china-sea/articleshow/79848125.cms>

**R. REPUBLICWORLD.COM**

Tue, 22 Dec 2020

## Indian Navy to get bigger, improved and better-armed SSBN ARIGHAT early next year

*The bigger, improved & better-armed Arighat is in the final stages of sea trials.*

*It is likely to be commissioned into service in Indian Navy next year*

*By Shivani Sharma*

The bigger, improved and better-armed Arighat is in the final stages of sea trials and is likely to be commissioned into service early next year. After teething troubles, India's nuclear submarine programme — the country's costliest defence project, monitored directly by National Security Adviser Ajit Doval — has made big strides in recent years.

### Indian Navy to get 2nd nuclear SSBN Arighat

In October 2018, the veil of secrecy around the programme was lifted for the first time when India acknowledged that INS Arihant, its first SSBN — a nuclear-powered submarine equipped with nuclear-tipped ballistic missiles — had completed its first deterrence patrol. Now, Arighat is in the final stages of sea trials and is likely to be commissioned into service early next year.



"It should be done (commissioned) early next year," a source said. The submarine has performed well during sea trials and its commissioning has been delayed by the outbreak of Covid-19.

With the Arihant-class project now working at "assembly-line pace", the programme has also got a new vertical — SSNs or nuclear-powered submarines which, unlike the SSBNs, are armed with missiles with conventional warheads. In 2019, the government granted Rs 100 crore for the initial phase of development of these submarines. With success in the initial design phase, the programme has received clearance from the government for the detailed design phase. This means that the government will now deploy more resources for this project.

### India plans to build 6 SSNs with a displacement capacity

Approvals for this project were given in 2015, a year after the National Democratic Alliance (NDA) came to power. The initial design work had begun at the Gurgaon-based Submarine Design Centre sometime around 2017 and considerable progress has been made since.

The Hyderabad-based, state-owned Mishra Dhatu Nigam, has been asked to develop an indigenous special alloy for the hull of the submarine to allow it to dive much deeper than the

Arihant-class boats. The nuclear reactor being developed for the SSNs will also be more powerful than the one on the Arihant-class submarines.

Like SSBNs, SSNs are powered by a nuclear reactor and can remain underwater for long periods of time, much longer than diesel-electric submarines or SSKs, which have to surface at regular intervals to charge their batteries which power them underwater. At the same time, operating SSNs is not as complex as SSBNs as these boats are not armed with nuclear-tipped missiles.

Although the effort behind the projects is indigenous with 60 per cent of the components for the Arihant-class being sourced from local manufacturers, the Indian Navy has benefited from close design-and-technical cooperation with Russia.

The next two SSBNs after INS Arihant and Arighat, identified as S4 and S4\* for now, are under construction at the Ship Building Centre in Visakhapatnam and are likely to enter service with the Indian Navy sometime around 2024. These two boats will displace at least 1,000 tons more than the 6,000 tonne INS Arihant. The boats will be capable of carrying eight 3,500 km range K-4 Submarine Launched Ballistic Missile (SLBM) while INS Arihant can carry only four of these. The first Arihant-class is currently equipped with a dozen 750 km range K-15 Sagarika SLBMs. While the K-15 has entered service, K-4 is still being tested.

<https://www.republicworld.com/india-news/general-news/indian-navy-to-get-bigger-improved-and-better-armed-ssbn-arighat-early-next-year.html>



*Tue, 22 Dec 2020*

## **Vice Admiral Sandeep Naithani AVSM VSM Assumes Charge as the Controller Warship Production and Acquisition**

Pune: Vice Admiral Sandeep Naithani, AVSM, VSM, has assumed charge as the Controller Warship Production and Acquisition on December 21, 2020. A graduate of the National Defence Academy, Khadakwasla Pune, he was commissioned into the Electrical Branch of the Indian Navy on 01 Jan 1985.

The Admiral is a Post Graduate in Radar and Communication Engineering from IIT Delhi and a distinguished alumnus of the Defence Services Staff College (DSSC) and the National Defence College (NDC).

The Admiral has held various challenging appointments during his illustrious naval career spanning over three and a half decades. The officer has served onboard the aircraft carrier Viraat in various capacities. He has tenanted important appointments in Naval Dockyards at Mumbai and Visakhapatnam and in the Staff, Personnel and Materiel Branches of Naval Headquarters. The Admiral also commanded the premier electrical training establishment of the Navy, INS Valsura.

As a Flag Officer, the Admiral has served as the Assistant Chief of Materiel (Modernisation) in Naval Headquarters, Chief Staff Officer (Technical), HQ WNC, the Admiral Superintendent of Naval Dockyard Mumbai, the Director-General Naval Project at Mumbai, and the Programme Director, HQ ATPV.

<https://www.psuconnect.in/news/vice-admiral-sandeep-naithani-avsm-vsm-assumes-charge-as-the-controller-warship-production-and-acquisition/25981>



## Chennai to host Defence Expo empowering MSME from Mar 19-21, 2021

More than 400 large, medium, small and micro (MSMEs) units were expected to participate in the defence industry related expo-empowering MSMEs to be held here from March 19 to 21, 2021.

The Defence Ministry has given approval to the city-based Swatantra Foundation to host the expo at the Chennai Trade Centre.

The Aerospace Industry Development Association of Tamil Nadu (AIDAT) and Tamil Nadu Small and Tiny Industries Association (TANSTIA) will be the Co-organisers of the expo.

The main aim of the expo was to connect the Indian MSME sector companies who have the capacity and the capability to cater to the Defence Sector.

A Conference and Seminar on Opportunities for MSMEs in Indian Defence Sector – Building an Atma Nirbhar Eco System is also being planned concurrently with the Expo.

The main objective was to connect MSMEs to end users in the Services, Indian Defence Manufacturing majors and the various R&D institutions under DRDO and DPSUs, to build and harness the capacity and capability of MSME sector to cater to the needs of Defence sector, to create a broad and sustainable Supply Chain base for a vibrant MSME sector for Defence and Defence Exports, to provide a forum for MSME and Defence sector buyers to interact and identify mutually beneficial areas of business opportunities and to enable an eco-system for Innovation by promoting new Start Ups and Academia-Industry collaborations.

Leading firms like Larsen and Toubro, Bharat Forge, Super Auto Forge, the Ordnance Factories, DGQA, Hindustan Shipyard, LMW, LCC and few other large units have already agreed to participate and exhibit their products in the expo.

The Expo will give opportunity for Tier 1 and OEs to seek out and develop prospective suppliers.

According to expo Convenor and Secretary S Ramasubramanian, 'the B2B meet is the key during the expo where we expect real time business generation to happen.'

'We are planning to have at least 120 one hour sessions of B2B meet between the Large, Medium and MSEs', he added.

<https://www.defencenews.in/article/Chennai-to-host-Defence-Expo-empowering-MSME-from-Mar-19-21,-2021-1033172>



## Impact of 5G on India: Opportunities and risks for Indian defence forces

*Sourcing any piece of 5G equipment from China's telecommunications giants is likely to be very risky from the standpoint of the Indian armed services*

*By Kartik Bommakanti*

With India still remaining undecided about the integration of Huawei's 5G into its communications networks, what are the consequences of 5G for the Indian defence forces? The answer to this question is a complex one. 5G will bring enormous benefits to the Indian armed services over the next decade at least. It is widely regarded to be state-of-the-art technology, which will have a bearing on military operations. Yet the Government of India (GoI) is yet to make a decisive call regarding where to source 5G from. China's Huawei still remains a potential contender for the supply of some 5G equipment. Huawei's 5G offer is very competitive in a field consisting of Qualcomm, Eriksson and Nokia. While the Indian government in its latest announcement clearly stated that it will not allow 5G gear from "non-trusted" sources — implying Huawei and another Chinese company ZTE will not make the cut — the GoI remains unsure about whether it wants to unambiguously exclude the two Chinese 5G suppliers.

The government has identified these companies as likely to install "trap door" or "back door" technologies that could enable Chinese spy agencies to conduct espionage. These technologies, if installed by Huawei or ZTE, will in all likelihood jeopardise India's national security. 5G brings great benefits to the civilian and commercial telecommunications sectors. It will generate higher data rates, rapid transmission enabled by high bandwidth, and beyond the benefits it brings to the civilian sector, there are considerable military benefits as well.



The Government of India remains unsure about whether it wants to unambiguously exclude the two Chinese 5G suppliers — Huawei and ZTE.

Military planners in India, just as they are in other countries, are likely to seize this opportunity to integrate 5G hardware and software for their current and future capabilities. 5G will have faster response rates as opposed to 4G, wider bandwidth and extremely quick transmission and reception of imagery and battlefield conditions. Nevertheless, 5G spectrum presents challenges to a range of the military's technical capacities. The armed services, even before the current military stand-off following Chinese military action in Ladakh in early May this year, did caution the Modi-led GoI on including 5G equipment sourced from the Peoples Republic of China (PRC) as it could interfere with military communications and seriously impair the Army's capacity to defend India along its extensive land frontier with the PRC.

For instance, 5G will have an impact on defence electronic systems. These electronics are part of the terrestrial radar networks and man-portable radio sets which impact communications. There are two forms of interference the GoI will need to consider when it chooses to integrate 5G into the country's telecommunications network covering wireless as well as wired services. The first is natural: the mountain terrain and heavy rainfall is likely to interfere with 5G equipment the Indian Army will use in the coming years; and the second is interference from other users, which could potentially affect the complete performance of 5G systems.



If India is going to source wireless communication from Huawei or ZTE, China will be using the same.

Unlike the commercial users of 5G who might not want to invest in robust protection gear from interference due to high cost, the Indian armed services will be compelled to do so. They will need to invest in rugged transportable equipment that keep interference to a minimum in an operating environment. To ensure the effective and complete performance of 5G for the Indian military, the government has to get technical experts to undertake computer simulations to obviate or limit interference. The armed services are likely to face ubiquitous obstacles, such as high-powered jamming signals of the opponent. 5G has high bandwidth. Consequently, jammers will follow into the millimeter wave range to jam systems at close range. All users, including commercial and military users, will depend on 28 GHz and beyond for short distance transmission. This is unlike 4G which has a longer wavelength and lower frequency signals, generally 3.5 GHz and below. Across wireless networks, bandwidth at lower frequencies, as is the case with 4G, has effectively limited the capacity to transmit at higher speeds to the MB/s range. 5G developers are expecting to increase it to the 1 GB/s range, which will be feasible only at short ranges. If India is going to source wireless communication from Huawei or ZTE, China will be using the same.

In this context, sourcing any piece of 5G equipment from China's two telecommunications giants is likely to be very risky from the standpoint of the Indian armed services. The GoI has to also factor in how 5G might interfere with space-based signal transmission. Transmission to ground-based receivers from space could suffer. For instance, in the United States, L1 signal transmission from a Global Positioning Satellite (GPS) is specifically created for civilian and commercial use and designed to at least limit or tolerate interference from adjacent spectrum in space systems, but not from terrestrial systems from the adjacent band. Interference of 5G with GPS signals are an issue not just for civilians, but very importantly the US military. Taking all these factors into account, the GoI needs to think through exactly where it sources 5G equipment as well as preventing 5G's interference with space-based transmission from terrestrial networks.

Interference of 5G with GPS signals are an issue not just for civilians, but very importantly the US military.

Nevertheless, the Modi government has conveyed "mixed signals" or appears conflicted about the extent to which it wants to exclude Huawei from the Indian telecommunications market. Despite the higher cost of alternative sources of 5G equipment and the absence of any native Indian capacity to build 5G hardware and software, it would be wiser to choose non-Chinese sources. Being familiar with their own 5G devices, the Chinese will be better positioned to generate signal interference and jam electronic transmissions of the Indian military. Temporising over the decision to include Huawei or ZTE is seemingly reasonable, but when weighed against the foregoing analysis, it is best the government not dither and make a clear call.

The views expressed above belong to the author(s).

<https://www.orfonline.org/expert-speak/impact-5g-india-opportunities-risks-indian-defence-forces/>



## Boeing touts success of launch tests for fighter pitched to Indian Navy

*Boeing is offering the Indian Navy the Block III variant of the Super Hornet*

US aerospace giant Boeing on Monday released footage of its F/A-18 E/F Super Hornet fighter taking off from a 'ski-jump' during tests aimed at winning a contract from the Indian Navy for 57 aircraft.

In August, Boeing had revealed that it was conducting tests for launching the Super Hornet off a ski-jump at the US Navy's base at Patuxent River in Maryland.

### What are ski-jumps?

The US Navy uses catapults to launch aircraft, such as the Super Hornet, from its aircraft carriers. A catapult imparts additional momentum to the aircraft, enabling it to take off with maximum weight from a carrier, which has less runway length than an airfield. But catapults have high-power generation requirements that are typically not available on non-nuclear-powered aircraft carriers, such as those the Indian Navy will use for the foreseeable future.

The Indian Navy's existing aircraft carrier, the INS Vikramaditya, and the under-construction Vikrant, have ski-jumps. A ski-jump is a curved ramp at the end of a runway that force an aircraft upwards without it reaching maximum speed. The website of the US F-35 stealth fighter explains a ski-jump as simultaneously launching "aircraft upward and forward, enabling take-offs with more weight and less end-speed than required for an unassisted horizontal launch".

A US Navy publication, *Naval Aviation News*, had reported about the tests of the Super Hornet from the ski-jump in late November and published a photograph.

Interestingly, *Naval Aviation News* reported representatives from the Indian embassy in the US had witnessed a ski-jump launch.

### What the tests mean

Ankur Kanaglekar, a Boeing executive, told *The Hindu*, "The first successful and safe launch of the F/A-18 Super Hornet from a ski-jump begins the validation process to operate effectively from Indian Navy aircraft carriers."

Kanaglekar touted the capabilities of the 'Block III' variant of the Super Hornet that Boeing is offering the Indian Navy. The Block III variant offers more advanced electronics and cockpit displays and the capacity to be fitted with extra fuel tanks atop its wings to boost range.

"The F/A-18 Block III Super Hornet will not only provide superior war fighting capability to the Indian Navy but also create opportunities for cooperation in naval aviation between the United States and India. The F/A-18 Block III Super Hornet will offer unrivalled growth potential to the Indian Navy through single and two-seater carrier-compatible variants and the ability to interface with the P-8I as a force multiplier," Kanaglekar was quoted as saying by *News 18*.

Boeing had touted ski-jump compatibility for the Super Hornet to attract the Indian Navy as far back as 2008. In 2008, a Boeing official told *Hindustan Times* about simulations of ski-jump launches. "In our simulation, we discovered that not only could the Super Hornet take-off from a ski-jump, but could do so with a significant weapons load," the official told *Hindustan Times*.



A Super Hornet taking off from a ski-jump | [Twitter handle of Boeing](#)

The Super Hornet and the naval variant of the Rafale, named the Rafale-M, are considered the front-runners for the Indian Navy's requirement for 57 jets.

<https://www.theweek.in/news/india/2020/12/21/boeing-touts-success-of-launch-tests-for-fighter-pitched-to-indian-navy.html>



*Tue, 22 Dec 2020*

## **Defence ministry approves procurement of equipment worth Rs 27,000 cr; L&T Defence to bid for 50% orders**

The Defence Acquisition Council has given approval to procure equipment worth Rs 27,000 crore domestically. One of the beneficiaries of this could be L&T Defence.

Speaking to CNBC-TV18, JD Patil, Whole-time Director, L&T Defence said, “Out of the Rs 28,000 crore which have been cleared, about Rs 27,000 crore will happen in India. For L&T Defence, directly we should be bidding somewhere around 12,000-13,000 crore out of it; so roughly about 50 percent.”

“If we are looking at the New Generation Offshore Patrol Vessels (NGOPVs) or for that matter the modular bridge or the combat Unmanned Aerial Vehicles (UAVs) which are being looked at by the navy, and BRAHMOS are programs we certainly will directly get involved,” he added.

From the Rs 13,000 crore L&T Defence will bid, Patil expects to surely win about Rs 11,500 crore worth of bids.

“One program which is our own product which is now getting into production that is about Rs 2,500 crore which certainly is ours. The NGOPVs is a program where we have world beating price point and that is another one we should have an extremely good chance. That is a Rs 9,000 crore program. So between the two, about Rs 11,500 crore I would say we have an extremely high chance of winning.

On growth, he said, “We have an assurance that there would be a certain volume of purchases which will happen from Indian industry. If that is precisely what one has to look at, if I look at the next 5-6 years, the private industry, someone of our maturity, should grow in the defence space at least at about 18-20 percent CAGR.”

<https://www.cnbctv18.com/videos/business/defence-ministry-approves-procurement-of-equipment-worth-rs-27000-cr-lt-defence-to-bid-for-50-orders-7788061.htm>

## अमेरिका के फाइटर जेट F/A-18 ने पास किया सबसे मुश्किल टेस्ट, जानिए Indian Navy को कैसे होगा फायदा

बोइंग और अमेरिकी नेवी ने हाल ही में F/A-18 सुपर हॉर्नेट का एक सफल परीक्षण पूरा किया है। इस जेट ने स्की जंप को रैंप से सफलतापूर्वक अंजाम दिया है। टेस्ट सफल होने के बाद जेट की भारतीय एयरक्राफ्ट कैरियर्स पर क्षमताओं के सफल प्रदर्शन की भी झलक मिलती है।

बोइंग और अमेरिकी नेवी ने हाल ही में F/A-18 सुपर हॉर्नेट का एक सफल परीक्षण पूरा किया है। इस जेट ने स्की जंप को रैंप से सफलतापूर्वक अंजाम दिया है। इस टेस्ट के सफल होने के बाद इस फाइटर एयरक्राफ्ट की भारतीय एयरक्राफ्ट कैरियर्स पर क्षमताओं के सफल प्रदर्शन की भी झलक मिलती है। यह परीक्षण, अमेरिका के राज्य मैरीलैंड में नेवल एयर स्टेशन पैट्यूक्सेंट रीवर पर यह टेस्ट पूरा किया गया है। इस टेस्ट के बाद यह साबित हो गया कि सुपर हॉर्नेट, इंडियन नेवी के शॉर्ट टेकऑफ बट अरेस्टेड रिकवरी सिस्टम यानी STOBAR पर खरा उतर सकता है। इस टेस्ट के साथ ही बोइंग की तरफ से पूर्व में दिए गए बयानों की भी पुष्टि होती है।

### बोइंग का दावा ताकत होगी दोगुनी

बोइंग डिफेंस स्पेस एंड सिक्योरिटी के इंडिया फाइटर्स सेल्स के हेड अंकुर कनाग्लेकर ने इस पर बयान दिया, 'स्की जंप से F/A-18 सुपर हॉर्नेट के पहले और सुरक्षित लॉन्च के बाद इंडियन नेवी के एयरक्राफ्ट कैरियर्स पर प्रभावी तरीके से इसके संचालन की प्रमाणीकरण की प्रक्रिया शुरू होती है। F/A-18 Block III सुपर हॉर्नेट न सिर्फ इंडियन नेवी को उच्च स्तर की युद्धक क्षमता प्रदान करेगा बल्कि अमेरिका और भारत के बीच नौसैनिक उड़्डयन के क्षेत्र में करीबी सहयोग के मौके भी पैदा करेगा।' उन्होंने बताया कि जेट, नौसेना को सिंगल और टू-सीटर के जरिए कई ऐसे वैरिएंट्स प्रदान करेगा जिससे इंडियन नेवी की क्षमताओं में इजाफा होगा। हालांकि अभी तक भारतीय नौसेना की तरफ से इस पर कोई भी टिप्पणी नहीं की गई है।



### भारतीय नौसेना के लिए क्यों फायदेमंद

बोइंग कंपनी पिछले काफी समय से F/A-18 Block III सुपर हॉर्नेट को भारतीय नौसेना के लिए आगे बढ़ा रही है। कंपनी के मुताबिक वह कम खरीद कीमत पर मॉडर्न वॉर फाइटर टेक्नोलॉजी मुहैया कराएगी। कंपनी ने तो यहां तक दावा किया है कि हर फ्लाइट की कीमत भारत के वहन करने के योग्य होगी क्योंकि इसका रख-रखाव आसान होने वाला है। F/A-18 Block III में कई टेक्नोलॉजी प्रयोग की हैं जो अंतरराष्ट्रीय ग्राहकों और यूएस नेवी के अनुकूल हैं। जेट में एडवांस्ड नेटवर्क टेक्नोलॉजी के साथ ही लंबी दूरी के लिए फ्यूल टैंक्स, नया एडवांस्ड कॉकपिट सिस्टम, लंबी दूरी तक पता लगा सकने वाली इनफ्रारेड सर्च एंड ट्रैक डिटेक्शन के साथ ही 10,000 घंटों से ज्यादा की लाइफ दी गई है। यह जेट यूएस नेवी का सबसे एडवांस्ड जेट है जिसे ज्यादा से ज्यादा हथियार इंस्टॉल किए गए हैं। इन हथियारों की क्षमता हवा से जमीन पर हमला करने में पांच गुना ज्यादा और हवा से हवा में हमला करने में दोगुनी है।

<https://www.tv9hindi.com/knowledge/boeing-f-a-18-super-hornet-successfully-completes-ski-jump-big-hope-for-indian-navy-416235.html>

## Moscow's relationship with China, Pakistan independent of its ties with India — Russian envoy

*Nikolay Kudashev, Russian Ambassador to India, says Moscow would encourage enhanced dialogue between India and China as it believes this is 'key to regional security and stability'*

*By Nayanima Basu*

New Delhi: Russia Monday said its growing bilateral relationship with China and Pakistan are “independent” of its ties with India, and once again reiterated its concerns over the Indo-Pacific initiative as well as the Quad Security Dialogue (Quad).

Nikolay Kudashev, Russian Ambassador to India, said Moscow is “friend” to both New Delhi and Beijing, and Russia wants both these countries to have a dialogue and resolve the border standoff at the Line of Actual Control (LAC) in Ladakh.

“As a friend to both India and China, we would encourage enhanced dialogue between both the governments. Between New Delhi and Beijing, we believe this is key for the future progress ties and to the regional security and stability,” the ambassador said Monday at a press conference.



Nikolay Kudashev, Russian Ambassador to India | Twitter | @ANI

He added that Russia does not have issues with the “Indian vision” of the Indo-Pacific strategy and that it is not a party to the South China Sea dispute that China has with other countries.

“We are not party to the tensions between India and China, nor are we party to the South China Sea dispute, but our preference and our message to the region will be an unifying agenda. The concept of the larger Eurasian partnership which should bring the two ends together should be considered that brings in all visions — Indian, Chinese, Russian and others — to a common platform,” he said.

This comes days after Russian Foreign Minister Sergei Lavrov said the western world, particularly the US, is making India a party to “anti-China” policies like Indo-Pacific and Quadrilateral Security Dialogue, also called the Quad.

India responded stating that New Delhi enjoys a “friendly and long-standing relationship” with Moscow, which stands on its own merit and that it follows an Indo-Pacific strategy stance “for a free, open and inclusive region”.

On Russia’s growing ties with Pakistan, the ambassador said Moscow’s relationship with Islamabad is poised to further develop and it is “independent” of their ties with India.

“Russia’s ties with Pakistan is independent in nature similar to our ties with India. We are going to develop this relationship (with Pakistan) further. We are focused on fighting terrorism, drugs smuggling and other issues. It is based on the same values based on which we have ties with India,” he added.

### **‘There is no unified vision for Indo-Pacific’**

Roman Babushkin, Deputy Chief of Mission, Russian Embassy in India, said: “While we understand India’s concept of Indo-Pacific, let’s not forget that there is no unified vision for Indo-Pacific currently because we know that many countries promote this vision and some are non-inclusive, while India’s concept of Indo-Pacific is inclusive.”

“But non-inclusive mechanisms have been created and that leads to some apprehensions,” he added.

Babushkin also said there is no regionwide concept of the Indo-Pacific like the East Asia Summit.

The summit is a premier forum in the Asia-Pacific region dealing with issues relating to security and defence. It has 18 members including the 10 ASEAN countries (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam) along with Australia, China, India, Japan, New Zealand, the Republic of Korea, Russia and the United States.

Babushkin said the Indo-Pacific is not creating a “rules-based” order as there are no rules that have been laid down by the strategy.

“These are attempts by some countries to create more containment and more lines of alienation in the region that threatens to jeopardise the basic principles for regional cooperation, for example, the unity of ASEAN,” he said.

Babushkin also said the Quad is “detrimental to the region’s stability, security”.

**‘Defence ties between Russia & India will continue to grow’**

According to Babushkin, India and Russia has opened a new chapter in their defence cooperation with the export of Brahmos missiles to Philippines.

He said soon the Indo-Russian joint venture (JV) firm BrahMos Aerospace will start exporting these missiles to other countries.

On the issue of US imposing sanction on Turkey for purchasing the S-400 air defence system, a weapon that India is also buying, ambassador Kudashev said, “Those are unilateral actions... What has been the outcome of those sanctions in last four years? None.”

Russia also said it is looking forward to participating in the Aero-India 2021 as it is going to be one of the biggest exhibitors by demonstrating Su-57, Su-35 and MiG-35 fighter jets, helicopters Ka-52, Ka-226, Mi-17B-5, Mi-26 as well S-400 and Buk systems, among others.

“As far as current deals are concerned, we are advancing well, including with S-400 supplies. If relevant decisions to start works related to Ka-226 helicopters and AK-203 rifles production are expedited, soon we will see good progress, which is especially important due to deep interests expressed by the Indian armed forces,” Kudashev said.

<https://theprint.in/diplomacy/moscows-relationship-with-china-pakistan-independent-of-its-ties-with-india-russian-envoy/571002/>



## 2020: A defining year for Indian space sector

*By Venkatachari Jagannathan*

Chennai: Even though the year 2020 would be known as Covid-19 year, it could also be termed as the defining year for the Indian space sector to put it in a different orbit with the private sector as a co-traveller of the Indian Space Research Organisation (ISRO).

As a part of that, the Department of Space (DoS) recently signed an agreement with Chennai based small rocket company Agnikul Cosmos Pvt Ltd to access the facilities and technical expertise available in ISRO centres.

According to DoS, this is the first of its kind agreement to be signed after the establishment of Indian National Space Promotion and Authorisation Centre (IN-SPACe), the authorisation and regulatory body for enabling private players to undertake space activities in India.

Under the agreement, Agnikul Cosmos will be provided access to the facilities and technical expertise available in ISRO centers to proceed with their launch vehicle/rocket development programme.

Couple of days later, Syzygy Space Technologies Pvt Ltd, commonly known as Pixxel, signed up with NewSpace India Ltd - DoS' commercial arm - to launch its first satellite using ISRO's Polar Satellite Launch Vehicle (PSLV) rocket early 2021.

Pixxel plans to have its Firefly constellation consisting of 30 small earth observation satellites by the end of 2022.

The DoS has also come out with three draft policies - Draft Space Based Communication Policy of India 2020 (Spacecom Policy-2020), Draft Space Based Remote Sensing Policy and Revised Technology Transfer Policy Guidelines - to enable the private sector play a greater role in the space field.

The DoS Secretary and ISRO Chairman K. Sivan said a policy for launch vehicles and rockets, space exploration and also a comprehensive Space Act will also be announced.

In effect, after insipid first half, the year 2020 turned a bit interesting after the Central government decided to open up the sector for private players.

During the start of 2020, Sivan had said that ISRO had planned to have 25 launches, including Aditya-L1 satellite, Geo Imaging Satellite (GISAT-1), realisation of Small Satellite Launch Vehicle (SSLV) or small rocket (carrying capacity 500 kg), navigation satellite with indigenous atomic clocks and Indian Data Relay Satellite System (IDRSS), and GSAT-20 satellite with electric propulsion.

Sivan also said that India will embark on its third moon mission -- 'Chandrayaan-3' -- and attempt to land a lander on the lunar surface sometime in 2020-21.

The year began well for ISRO with the launch of the 3,357 kg communication satellite GSAT-30 by the European space agency Arianespace rocket Ariane 5 on January 17.

ISRO also showcased its robot/half-humanoid -- Vyommitra -- which was part of its human space mission programme 'Gaganyaan'.

The first setback of the year for ISRO came on March 4, when it had to call off the launch of GISAT-1, a day before its actual launch, owing to technical reasons.

The ISRO did not share any detail about the technical reasons, or the glitch, and its rectification since then. It is also not known when the satellite with a very good camera would be launched.

Then came the Covid-19 lockdown within and outside India that had its cascading impact on ISRO's core plans like the realisation of SSLV, launch of GISAT-1, delay in the first test-flight of the rocket as part of Gaganyaan -- India's human space flight mission.

Meanwhile, two positive developments happened for ISRO -- securing an Indian patent for its liquid cooling and heating garment (LCHG) suitable for space applications and for its method of manufacturing highland lunar soil simulant or simply lunar/moon soil.

On May 16, Union Finance Minister Nirmala Sitharaman announced that the Indian private sector will be a co-traveller in India's space-sector journey and a level-playing field will be provided for them in satellites, launches, and space-based services.

She also said that a predictable policy and regulatory environment will be provided to the private players.

The future projects for planetary exploration, outer space travel and others are to be opened up for the private sector, and there will be a liberal geo-spatial data policy for providing remote-sensing data to tech-entrepreneurs subject to various checks.

On June 24, the Union Cabinet decided to set up IN-SPACe, making ISRO to focus on research and development (R&D) of new technologies, exploration missions, and human spaceflight programme.

The IN-SPACe would provide a level playing field for private companies to use Indian space infrastructure.

As a part of the rejig, DoS' commercial arm New Space India Limited (NSIL) will endeavour to re-orient space activities from a 'supply driven' model to 'demand driven' model, thereby ensuring optimum utilisation of the country's space assets.

"The best is to establish an independent regulator -- Space Regulatory Authority of India (SRAI) -- which will create a level-playing field for many of the emerging players," Narayan Prasad, Chief Operating Officer, satsearch, told IANS.

Establishing an independent regulator could allow a systematic review and reforms on a continuous basis rather than one-off announcements, Prasad said.

As per current scheme of things, IN-SPACe will have its own directorates for technical, legal, safety and security, monitoring as well as activities promotion for assessing the private sector's needs and coordination of the activities.

IN-SPACe would have a board and representatives from industry, academia and the government, Sivan said.

"Initially, IN-SPACe will be manned by people from the existing space setup. Later, people from outside will be taken in. It will have its funds from the budgetary allocations for the DoS. The new body may not need big financial allocations," Sivan remarked.

Meanwhile, ISRO restarted its satellite launch operations on November 7 by putting into orbit the Earth Observation Satellite EOS-1, formerly RISAT-2BR2, and nine other foreign satellites in a text book style, using the Polar Satellite Launch Vehicle (PSLV-C49).

With this launch, ISRO put into orbit a total of 328 foreign satellites, all for a fee.

On December 17, ISRO orbited India's 42nd communication satellite-CMS-01 (formerly named GSAT-12R) with its PSLV-C50 rocket.

While that was the last space mission for India in 2020, Sivan told IANS that the first quarter of 2021 will see Indian space agency's cash till ringing with the commercial launch of Brazilian satellite Amazonia as well as three Indian satellites.

"End of February or early March 2021, we will be sending our rocket Polar Satellite Launch Vehicle-C51 (PSLV-C51). The primary payload will be the Brazilian satellite called Amazonia an earth observation satellite," Sivan said.

"The PSLV-C51 mission will be a very special mission not only for ISRO but also for India as the rocket will be carrying the earth observation satellite Anand made by an Indian startup called Pixxel (Incorporated as Syzygy Space Technologies Pvt Ltd)," he added.

The PSLV-C51 will also carry a communication satellite - Satisat - built by the students of city-based Space Kidz India and another satellite - Unisat - built by a consortium of three Indian universities.

According to Sivan, Team ISRO has a busy schedule ahead for the launch of Aditya L1 satellite, third moon mission Chandrayaan-3, Gaganyaaan - India's human space mission, and realisation of small rocket Small Satellite Launch Vehicle (SSLV).

He also said the SSLV will carry EOS-02 (Earth Observation Satellite), and Geosynchronous Satellite Launch Vehicle-F10 (GSLV) carrying EOS-3.

The other Indian satellites that are ready for launch are GISAT and Microsat-2A.

Other developments

\* International Maritime Organisation (IMO) has recognised NavIC as a component of the World-Wide Radio Navigation System (WWRNS).

\* Hindustan Aeronautics Limited delivered the biggest cryogenic propellant tank (C32 LH2) for ISRO's Geosynchronous Satellite Launch Vehicle-Mk III (GSLV).

\* India's 700 kg cartography satellite Cartosat-2F and Russia's 450 kg Kanopus-V satellite had a near miss in the outer space on November 27.

\* ISRO opts for generic name for remote sensing and communication satellites.

\* An US court ordered Antrix Corporation to pay \$1.2 billion as damages to Bengaluru-based Devas Multimedia.

\* India's human space mission Gaganyaan to be delayed.

\* Chandrayaan-2 completes a year of orbiting the moon.

\* 100th birth anniversary of Indian rocket scientist Satish Dhawan celebrated.

\* ISRO got the patent for 'Made in India Moon Soil'.

\* Bharti Global and the UK government-led satellite communications company OneWeb launched 36 satellites with a Russian rocket Soyuz.

<http://www.daijiworld.com/news/newsDisplay.aspx?newsID=783776>



Tue, 22 Dec 2020

## Depth-dependent valence stratification in a lithium-rich layered cathode

By Liu Jia

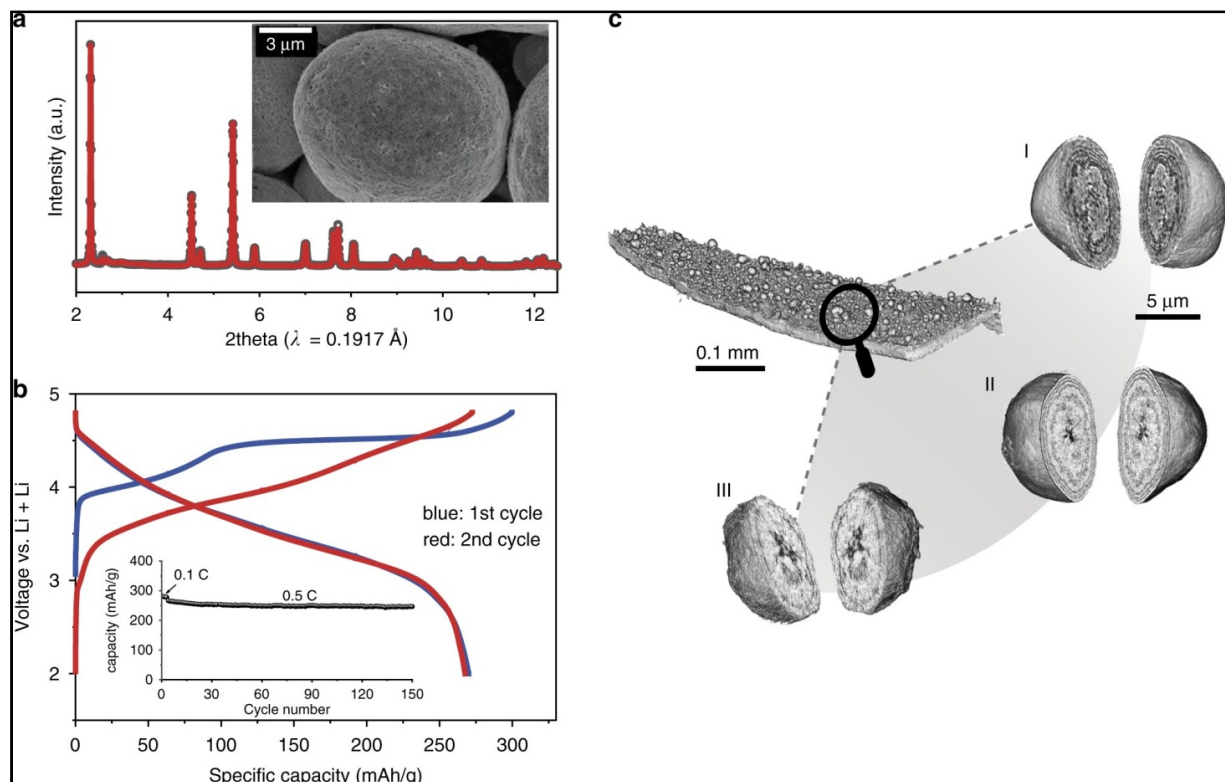
A team of scientists from the Beijing Synchrotron Radiation Facility at the Institute of High Energy Physics of the Chinese Academy of Sciences, the Stanford Synchrotron Radiation Light Source at SLAC and Brookhaven National Laboratory used synchrotron-based nano-resolution spectro-tomography to study a typical lithium-rich nickel-manganese-cobalt (LirNMC) material (i.e.,  $\text{Li}_{1.2}\text{Ni}_{0.13}\text{Mn}_{0.54}\text{Co}_{0.13}\text{O}_2$ ) to visualize its multi-layer morphology and the chemical and spatial dependence of oxygen redox behavior.

This study, published in *Nature Communications*, reveals that the oxygen redox induces the depth-dependent transition metal valence stratification in LirNMC.

As a high-efficiency energy storage device, the Li-ion battery is widely used in electronic devices and electric vehicles. The research community has devoted great effort to improving electrochemical performance.

The LirNMC layered cathode is one of the promising candidates for the Li-ion battery because of its higher energy density. However, it suffers from voltage decay upon cycling. To overcome this problem, it is necessary to understand the mechanism for this voltage fade.

In this study, the team used nano-resolution spectro-tomography to study the LirNMC material at the particle level in three dimensions. This allowed visualization of the material's unique multi-layer morphology with homogeneous composition, and the charge-induced depth dependence of the transition metal valence distribution.



**a** Structural characterization of LirNMC cathode material by XRD and Rietveld refinement. The inset graph shows the SEM image of LirNMC particles. **b** Charge-discharge profile and electrochemical cycling data of LirNMC | Li metal half-cell. **c** Three-dimensional rendering of the composite electrode and magnified views of a few arbitrarily selected LirNMC cathodes particles (panels I, II, and III). The mesoscale core/multi-shell separation is clear visible in all the particles. From: Depth-dependent valence stratification driven by oxygen redox in lithium-rich layered oxide

The soft X-ray resonant inelastic X-ray scattering (RIXS) and super partial fluorescence yield (sPFY) results clearly showed features of oxygen redox in the charged sample (4.8 V in the first cycle). Although oxygen activity can increase the capacity of the cathode, it will generate oxygen vacancy around the transition metal cations and decrease their valences. This is why the transition metal valence of LirNMC has a very different depth profile from that of conventional NM in the charged state.

This study highlights the importance of material engineering at the particle level and a depth-dependent compositional engineering strategy, which could be a viable way to solve the voltage fade problem in LirNMC cathodes.

**More information:** Jin Zhang et al. Depth-dependent valence stratification driven by oxygen redox in lithium-rich layered oxide, *Nature Communications* (2020). DOI: [10.1038/s41467-020-20198-w](https://doi.org/10.1038/s41467-020-20198-w)

**Journal information:** *Nature Communications*  
<https://phys.org/news/2020-12-depth-dependent-valence-stratification-lithium-rich-layered.html>

## Researchers invent method to 'sketch' quantum devices with focused electrons

It has long been a dream to invent new materials from the "top down" choosing which atoms go where to engineer properties of interest. A technique created by researchers out of the Department of Physics and Astronomy enables them to "sketch" patterns of electrons into a programmable quantum material—lanthanum aluminate/strontium titanate or "LAO/STO". Using this approach, they can create quantum devices and with feature sizes comparable to the spacing between electrons, and even "sketch" artificial lattices for electrons to traverse, with extremely high precision.

To develop this capability, the researchers repurposed an electron beam lithography instrument, which is ordinarily used to create nanostructures by exposing a resist that hardens into a mask, enabling layers of material to be subsequently added or removed. Instead of operating the instrument at its usual value of 20,000 Volts, the researchers dialed it down to only a few hundred volts, where the electrons could not penetrate the surface of their oxide material, and instead—without any resist—catalyze a surface reaction that renders the LAO surface positively charged, and the LAO/STO interface locally conductive. The electron beam is 10,000 times faster at writing compared with atomic-force microscope-based lithography, without losing spatial resolution or ability to be reprogrammed. In addition, the authors showed that this technique can program the LAO/STO interface when integrated with other 2-D layers such as graphene.

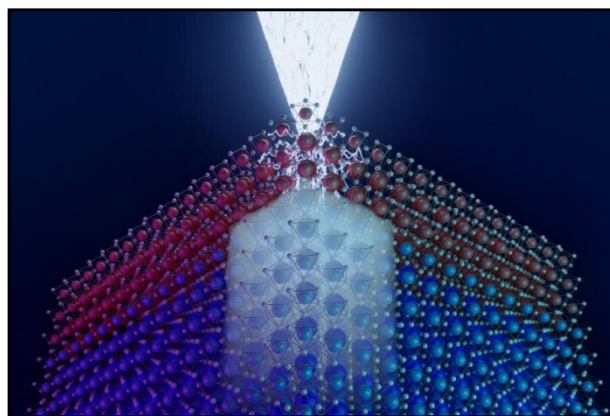


Illustration of an electron-beam "sketching" a quantum dot at the LaAlO<sub>3</sub>/SrTiO<sub>3</sub> interface. Credit: Muqing Yu

The team is led by Jeremy Levy, a Distinguished Professor of Condensed Matter Physics and director of the Pittsburgh Quantum Institute, describe the method in the paper, "Nanoscale control of LaAlO<sub>3</sub>/SrTiO<sub>3</sub> metal-insulator transition using ultra-low-voltage electron-beam lithography." The paper was published in *Applied Physics Letters* on Dec. 21.

Dengyu Yang, a graduate student who developed the technique and is lead author on the paper, compared it to "imaging a sketch on a canvas with a pen."

"In this case, the canvas is LAO/STO and the "pen" is a beam of electrons. This powerful ability allows us to participate with more complex structures and expand the device from one dimension to two dimensions," she said.

Yang and Levy said the discovery could have implications in the fields of quantum transport and quantum simulation.

"We are very interested in using this technique to programmatically create new families of two-dimensional electronic materials based on arrays of artificial atoms written using this technique. Our group recently published a paper in *Science Advances* demonstrating the idea of quantum simulation in one-dimensional devices, using the AFM method. This new EBL-based technique will enable us to perform quantum simulation in two dimensions," said Levy.

In addition to Yang and Levy, Pitt collaborators on the paper include research professor Patrick Irvin and graduate students Shan Hao, Qing Guo, Muqing Yu, Yang Hu, Assistant Professor Jun Chen from the Swanson School of Engineering. Additional affiliations include the Department of



Materials Science and Engineering at University of Wisconsin-Madison and Pittsburgh Quantum Institute.

**More information:** Nanoscale control of LaAlO<sub>3</sub>/SrTiO<sub>3</sub> metal-insulator transition using ultra-low-voltage electron-beam lithography, *Applied Physics Letters* (2020).

**Journal information:** [Applied Physics Letters](#) , [Science Advances](#)  
<https://phys.org/news/2020-12-method-quantum-devices-focused-electrons.html>

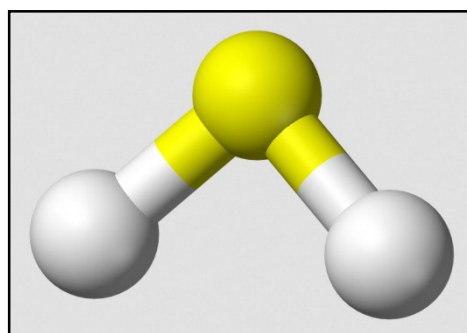


Tue, 22 Dec 2020

## High pressure causes hydrogen variants to collapse

Hydrogen exists as a gaseous compound of two hydrogen atoms (H<sub>2</sub>). Under normal laboratory conditions, H<sub>2</sub> occurs in the variants "ortho hydrogen" and "para hydrogen." Until now, it has been unclear how these variants behave under very high pressure. Researchers at the University of Bayreuth have now found the answer. Both ortho- and para-hydrogen become unstable under high pressure and cease to exist as distinguishable states. The research results presented in *Nature Communications* extend our physical understanding of fundamental quantum mechanical processes.

The two states of molecular hydrogen, ortho and para hydrogen, are known in research as spin isomers. They have the same chemical structure, but differ in the way the nuclei of the "twin atoms" connected in an H<sub>2</sub> molecule relate to each other in terms of their angular momentum. This results in different physical properties of the spin isomers, for example differences in electrical and thermal conductivity. The question of whether spin isomers coexist under very high pressures is of great interest for planetary research and also for the fundamentals of quantum mechanics. Gas giants such as Jupiter contain large amounts of gaseous hydrogen. In these planets, the H<sub>2</sub> molecules are subjected to compressive pressure many hundreds of times higher than that found in the Earth's atmosphere.



Ball-and-stick model of hydrogen sulfide.  
Credit: public domain

"If the two spin isomers were distributed uniformly in gas giants, important conclusions about the magnetic fields of these planets and their stability could be derived. However, in our study we have now succeeded for the first time in demonstrating that ortho- and para-hydrogen are destabilized by extremely high compression pressure. Their respective characteristic properties are lost at around 70 gigapascals. This evidence can significantly expand our understanding of quantum mechanical processes," says first author and physicist Dr. Thomas Meier from the University of Bayreuth.

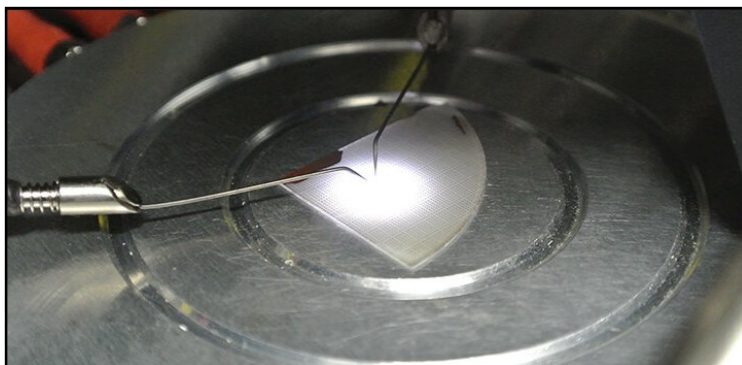
**More information:** Thomas Meier et al. Nuclear spin coupling crossover in dense molecular hydrogen, *Nature Communications* (2020). DOI: [10.1038/s41467-020-19927-y](https://doi.org/10.1038/s41467-020-19927-y)

**Journal information:** [Nature Communications](#)  
<https://phys.org/news/2020-12-high-pressure-hydrogen-variants-collapse.html>

## Optoelectronic devices that emit warm and cool white light

The advantages of light-emitting diodes (LEDs), such as their tiny size, low cost and excellent power efficiency, mean they are found everywhere in modern life. A KAUST team has recently developed a way of producing a white-light LED that overcomes some critical challenges.

Blinking away on almost every modern electronic device, LEDs transmit messages in their own distinct shade of red, green or blue. The coloration of an LED comes from a semiconductor inside that emits over a narrow spectrum of optical wavelengths. The inability of LEDs to emit across a wider spectrum restricts their use in lighting applications—



emitting a wider spectrum is necessary to generate white light—or for displays that require a wide palette of different colors.

Monolithic LEDs emit a natural-white light without using phosphors.  
Credit: KAUST

One approach to fabricate white-light LEDs is to combine devices of different materials, where each material emits a different color. The emission of red, blue and green from the different materials can be combined to create white light, but this increases the complexity and cost of manufacture of LEDs. Alternatively, a single semiconductor can be used by mixing in a phosphor that absorbs some of the light emitted by the semiconductor and then re-emits it as a different color. However, phosphor degrades over time, limiting the useful lifetime of these devices.

Daisuke Iida and Kazuhiro Ohkawa's team have devised a way to build phosphor-free monolithic white-light LEDs using the semiconductor indium gallium nitride.

The emission color of indium gallium nitride depends on the relative content of the indium and gallium atoms. For example, gallium nitride emits ultraviolet light, but adding indium shifts the emission across the visible spectrum and into the infrared. The emission can be controlled further by sandwiching very thin layers of indium gallium nitride with one composition between two layers of different composition, creating so-called quantum wells.

"What is unique about our devices is that we use material defects, or V-pit structures, to enhance the injection of a current into the semiconductor," says Iida. The LEDs designed by the KAUST team included both blue-light emitting quantum wells with a 20 percent indium content and 34 percent indium red quantum wells. Combined, this monolithic LED emits light across the entire visible spectrum. By controlling the current passing through the device, the team could change the emission from a warm white to a natural white and through to a cool white.

"The next step is to improve the emission efficacy of the red emission component," says Iida. "The red emission is a key factor of the high color-rendering LEDs with the natural white emission."

**More information:** Daisuke Iida et al. High-color-rendering-index phosphor-free InGaN-based white light-emitting diodes by carrier injection enhancement via V-pits, *Applied Physics Letters* (2020). DOI: [10.1063/5.0026017](https://doi.org/10.1063/5.0026017)

**Journal information:** [Applied Physics Letters](https://phys.org/news/2020-12-optoelectronic-devices-emit-cool-white.html)  
<https://phys.org/news/2020-12-optoelectronic-devices-emit-cool-white.html>

## Researchers unveil the origin of Oobleck waves

"Oobleck" is a strange fluid made of equal parts of cornstarch and water. It flows like milk when gently stirred, but turns rock-solid when impacted at high speed. This fascinating phenomenon, known as shear-thickening, results in spectacular demonstrations like running on a pool of Oobleck without submerging into it, as long as the runner doesn't stop.

Researchers from Aix-Marseille University in France have now studied the regular and prominent surface waves that form when a Oobleck flows down an inclined slope (see Figure 1). Similar waves can be observed on gutters and windows on rainy days. However, the scientists noted qualitative differences with water waves; waves in Oobleck grow and saturate much faster. In order to unveil the origin of Oobleck waves, they conducted careful experiments with a mixture of cornstarch and water down an inclined plane.



Credit: CC0 Public Domain

The researchers measured the onset of wave appearance and their speed using controlled perturbation of the flow and laser detection to estimate the fluid film thickness. These experiments revealed that for concentrated Oobleck, the onset of destabilization is different for destabilization in a Newtonian fluid such as water. This surprising observation led the team to look for a scenario to explain their formation. Their results are presented in a paper published on December 18 in *Communication Physics*. In this article, they conclude that for Oobleck, waves do not arise from the effect of inertia, as for water, but from Oobleck's specific flowing properties.

Under impact, as shown by recent studies, Oobleck suddenly changes from liquid to solid because of the activation of frictional contacts between the starch particles. When flowing down a slope, this proliferation of frictional contacts leads to a very curious behavior: The flow velocity of the suspension decreased when the imposed stress increased—like stepping on the gas pedal causing a car to decelerate. Researchers have shown that this effect couples to the flow free surface and can spontaneously generate a regular wave pattern.

The proposed mechanism is generic. These findings could thus provide new grounds to understand other flow instabilities observed in various configurations, particularly in industrial processes facing problematic flow instabilities when conveying Oobleck-like materials such as concrete, chocolate or vinyl materials.

**More information:** Baptiste Darbois Texier et al. Surface-wave instability without inertia in shear-thickening suspensions, *Communications Physics* (2020). DOI: [10.1038/s42005-020-00500-4](https://doi.org/10.1038/s42005-020-00500-4)

**Journal information:** [Communications Physics](https://phys.org/news/2020-12-unveil-oobleck.html)  
<https://phys.org/news/2020-12-unveil-oobleck.html>

## Study finds how Covid-19 hastens stroke risk

*A recent study led by researchers from University of California- Los Angeles Health Sciences (UCLA) determined the running fluid spiked with a Covid-19-like protein through a 3D-printed model to explain how the virus increases the risk of stroke*

Los Angeles (California) [US]: A recent study led by researchers from University of California- Los Angeles Health Sciences (UCLA) determined the running fluid spiked with a Covid-19-like protein through a 3D-printed model to explain how the virus increases the risk of stroke.

Covid-19 was initially identified as a disease with severe respiratory symptoms, but a little is known about how it increases the risk of stroke.

To enhance the findings, UCLA researchers used a 3D-printed silicone model of blood vessels in the brain to mimic the forces generated by blood pushing through an artery that is abnormally narrowed, a condition called intracranial atherosclerosis. They showed that as those forces act on the cells lining the artery, and increase the production of a molecule called angiotensin-converting enzyme 2, or ACE2, which the coronavirus uses to enter cells on the surface of blood vessels.



Covid-19 was initially identified as a disease with severe respiratory symptoms, but a little is known about how it increases the risk of stroke.(Unsplash)

Dr Jason Hinman, an assistant professor of neurology at the David Geffen School of Medicine at UCLA and the study's senior author claimed that the flow directly influences ACE2 expression. In addition to Hinman, the study's authors are neurologists at the Geffen School of Medicine and scientists from UC San Francisco and the Veterans Health Administration. The paper was published (PDF) in Stroke.

UCLA researchers created the model using data from CT scans of blood vessels in a human brain. They then lined the inner surfaces of the models with endothelial cells, the type of cells that line human blood vessels. The models enabled the researchers to mimic the same forces that would act on real blood vessels during a Covid-19 infection.

To confirm whether coronavirus bobbing along in the bloodstream could latch onto the ACE2 on the endothelial cells in the brain, researchers produced imitation 'viruses' fatty molecules studded with the spike proteins that coronavirus uses to bind to ACE2. Previous research indicated that the coronavirus binds to endothelial cells in other organs, but it was unknown whether that was also happening in the brain.

After creating the new model, researchers confirmed the particles did indeed interact with the cells lining the blood vessel, mostly in the regions of the brain with higher levels of ACE2.

"This finding could explain the increased incidence of strokes seen in Covid-19 infections," Hinman said.

Another discovery shows that when the scientists analyzed which genes were turned on in the endothelial cells after the coronavirus spike proteins bound to them, they found that the genes that were activated were a specific set of immune-response genes that are found in brain blood vessel cells, but not in endothelial cells from other organs of the body.



“There’s a unique brain endothelial response to the virus that may be helpful in identifying patients who have a higher risk for stroke,” Hinman said.

The researchers intend to conduct follow-up studies using a live coronavirus in the 3D-printed blood vessel model, which would further confirm the results of the current study and clarify which Covid-19 patients may have a higher risk for stroke.

*(This story has been published from a wire agency feed without modifications to the text.)*

<https://www.hindustantimes.com/health/study-finds-how-covid-19-hastens-stroke-risk/story-3IkoZGXPoJI2dter98KSiO.html>



Tue, 22 Dec 2020

## New research: Coronavirus spike protein imaged in its natural state

*Scientists have made detailed images of the coronavirus' spikes in their natural state- while they are still attached to the virus, and without using chemical fixatives that might distort their shape*

New Delhi: Coronaviruses including SARS-CoV-2, which causes Covid-19, get their name from the “corona” or crown shape created by the protein “spikes” on their surface. These spike proteins bind with human proteins to initiate the process of infection. These spikes have been extensively studied during the pandemic. Now, scientists have made detailed images of those spikes in their natural state — while they are still attached to the virus, and without using chemical fixatives that might distort their shape.

Their method, which combines cryogenic electron microscopy (cryo-EM) and computation, is described in a study in the Quarterly Reviews of Biophysics Discovery. The researchers said the method should produce quicker and more realistic snapshots of the infection apparatus in various strains of coronavirus — a critical step in designing therapeutic drugs and vaccines.



“The advantage of doing it this way is that when you purify a spike protein and study it in isolation, you lose important biological context: How does it look in an intact virus particle? It could possibly have a different structure there,” senior author Wah Chiu, a professor at the US Department of Energy’s SLAC National Accelerator Laboratory and Stanford University, said in a statement from SLAC.

The research team looked at a much milder coronavirus strain called NL63, which causes common cold symptoms and is responsible for about 10% of human respiratory disease each year. It’s thought to attach to the same receptors on the surfaces of human cells as SARS-CoV-2 does.

The team also identified places where sugar molecules attach to the spike protein, a process that plays an important role in the virus’s life cycle and in its ability to evade the immune system.

<https://indianexpress.com/article/explained/new-research-coronavirus-spike-protein-imaged-in-its-natural-state-7113396/>



