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# समाचार पत्रों से चयित अंश Newspapers Clippings

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## Defence News

# Defence Strategic : National/International



Press Information Bureau  
Government of India

Ministry of Defence

*Wed, 21 Sep 2022 7:24PM*

### **Curtain Raiser: Launch of Two Diving Support Vessels at Hindustan Shipyard Ltd, Vizag on 22 Sep 2022**

Two Diving Support Vessels (Nistar & Nipun) being built by Hindustan Shipyard Ltd, Vishakapatnam for the Indian Navy, are scheduled to be launched on 22 Sep 22. Admiral R Hari Kumar, Chief of the Naval Staff, will be the Chief Guest at the launching ceremony. The vessels will be launched by Mrs Kala Hari Kumar, President Navy Wellness and Welfare Association (NWWA), who would also be performing the traditional honour and naming them. The Diving Support Vessels (DSVs) are first of the kind, ships indigenously designed and built at HSL for the Indian Navy. The vessels are 118.4 metres long, 22.8 metres at the broadest point and will have a displacement of 9,350 tons.

These ships would be deployed for deep sea diving operations. Additionally, with Deep Submergence Rescue Vehicle (DSRV) embarked, the DSVs are designed to undertake submarine rescue operations, in case requirement exists.

Furthermore, these ships will be capable of sustained patrolling, conducting Search & Rescue operations and carrying out Helicopter Operations at high seas. With approximately 80 % indigenous content, the DSV project has generated considerable local employment opportunities and has also promoted indigenisation which in turn will aid in boosting India's economy.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1861273>



**Press Information Bureau  
Government of India**

**Ministry of Defence**

*Wed, 21 Sep 2022 4:37PM*

## **Ministry of Defence Signs MoU with Bank of Baroda and HDFC Bank to Expand the Reach of SPARSH Initiative**

The Defence Accounts Department signed a Memorandum of Understanding (MoU) today with Bank of Baroda and HDFC Bank, to onboard them as Service Centres under the System for Pension Administration (Raksha) (SPARSH) initiative, across more than 14,000 branches throughout India. The MoU was signed in the presence of Defence Secretary Dr. Ajay Kumar, Financial Adviser (Defence Services) Smt. Rasika Chaube and Controller General of Defence Accounts (CGDA), Shri Avinash Dikshit, by Shri Sham Dev, Controller of Defence Accounts (CDA) Pensions, PCDA (Pensions) Prayagraj and senior executives of Bank of Baroda and HDFC bank.

Defence Secretary Dr Ajay Kumar said that the objective is to bring 17 Lakh pensioners out of the total 32 lakh defence pensioners on SPARSH by the end of September, 2022 and the remaining pensioners will be brought to SPARSH at the earliest. He said that the average time in pension settlement has come down significantly to about 16 days. The MoU will onboard more than 7900 branches of Bank of Baroda and 6300 branches of HDFC Bank as Service Centres to provide last mile connectivity to pensioners, especially those who live in remote areas of the country and those who do not have the means or technical wherewithal to logon to SPARSH. For these pensioners, the Service Centers will become an interface for SPARSH and provide an effective medium for pensioners to perform profile update requests, register grievances and seek redressal, digital annual identification, pensioner data verification or also simply fetch detailed information regarding their monthly pension.

These centres would further augment the existing network of more than 161 DAD offices and nearly 800 Service Centres provided by State Bank of India and Punjab National Bank branches, and 14 branches of the Kotak Mahindra Bank. More than 4.5 lakh Village Level Entrepreneurs (VLEs) will also assist Defence Pensioners, as part of the Common Service Centres (CSC) network. The access to these service centers would be provided free of cost to the pensioners, with nominal service charges being borne by the Department. Providing impetus to Digital India initiative, SPARSH has grown exponentially with more than Rs 11,600 Crores disbursed in the Financial Year 2021-22, from just about Rs 57 crores in FY 2020-21. The total number of pensioners onboard SPARSH has crossed over one million mark with 11 lakh beneficiaries, which is about 33% of the total defence pensioners in India.

SPARSH is a web-based system for processing the pension claims and crediting the pension directly into the bank accounts of defence pensioners without any external intermediary. It has been designed to give Defence Pensioners a transparent view of their pension account, through an online portal (<https://sparsh.defencepension.gov.in/>) which captures and maintains a complete history of events and entitlements of the pensioner – right from the date of commencement of pension to the date of cessation of pension due to the last eligible beneficiary. This system is

administered by the Defence Accounts Department through the Principal Controller of Defence Accounts (Pensions), Prayagraj and caters to all the three Services and allied organization. The system on roll-out is initially catering to the new retirees and subsequently is being extended to cover the existing defence pensioners.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1861173>



बुधवार, 21 सितंबर 2022

## देश के दुश्मनों की उड़ेगी नींद, 'प्रोजेक्ट चीता' के तहत अपग्रेड होकर Heron Drones बनेंगे और घातक

IAF Israeli Heron Drones: दुश्मन के खतरों से निपटने के लिए भारतीय सेना को लगातार मजबूत किया जा रहा है. मेक इन इंडिया के तहत आधुनिक हथियार से लेकर मिसाइल और ड्रॉन्स उपलब्ध कराए जा रहे हैं. इस बीच भारतीय वायुसेना का 'प्रोजेक्ट चीता' जल्द ही शुरू होने की उम्मीद है. इंडियन एयर फोर्स (Indian Air Force) अब मेक इन इंडिया के तहत अपने 'प्रोजेक्ट चीता' को आगे बढ़ाने की योजना बना रही है. इस प्रोजेक्ट के तहत देश के रक्षा निर्माता इजरायली 'हेरोन ड्रॉन्स' (Heron Drones) को मारक क्षमताओं से लैस करेंगे. प्रोजेक्ट चीता (Project Cheetah) के तहत हेरोन ड्रॉन्स को अपग्रेड किया जाना है. इस ड्रॉन्स को इजरायल की मदद से दुश्मन के खिलाफ जंग लड़ने के लायक बनाया जाएगा.

### आधुनिक मिसाइलों से लैस करने की योजना

प्रोजेक्ट चीता के तहत भारतीय रक्षा कंपनियां इन इजरायली हेरोन ड्रॉन्स को आधुनिक मिसाइलों से लैस करेंगी. इसमें लेजर गाइडेड बम, एंटी टैंक गाइडेड मिसाइलें भी लगाई जाएंगी. इसके साथ ही कई सर्विलांस उपकरणों की मदद से इसकी क्षमताओं को और बेहतर बनाया जाएगा. हेरोन ड्रॉन में कई प्रकार के सेंसर्स और कैमरा पहले से ही लगे हैं. इसे अपग्रेड किए जाने के बाद ये दुश्मनों की नींद और हराम करने में सक्षम होंगे.

### हेरोन ड्रॉन्स की क्या है खासियत?

- हेरोन ड्रॉन्स रडार सिस्टम (Radar System), थर्मोग्राफिक कैमरा के साथ एयरबॉर्न सर्विलांस विजिबल लाइट से लैस
- हेरोन ड्रॉन्स 250 किलो तक वजन लेकर उड़ने में सक्षम
- ड्रॉन्स अपने बेस से उड़ान भरकर खुद ही मिशन खत्म करके बेस पर लौटता है
- कैमरे और सेंसर्स किसी बाज की नजर की तरह काम करते हैं
- हवा में 52 घंटे तक उड़ान भर सकता है.
- हेरोन ड्रॉन्स (Heron Drones) किसी भी मौसम में उड़ान भरने में सक्षम

## हेरोन ड्रॉन्स से दुश्मन पर पैनी नजर

पड़ोसी देश चीन (China) के साथ चल रहे बॉर्डर विवाद को देखते हुए पिछले साल भारत सरकार ने इजरायल से ये ड्रोन लिए हैं। इनमें लगे आधुनिक कैमरे, सेंसर और रडार सिस्टम दुश्मन की हर गतिविधियों पर पैनी नजर रखते हैं। ड्रॉन्स की तैनाती लद्दाख सेक्टर में की गई थी। प्रोजेक्ट चीता (Project Cheetah) के तहत इसे अपग्रेड करने के बाद हेरोन ड्रॉन्स (Heron Drones) के जरिए भारतीय सैन्य बलों को दुश्मन के ठिकानों के बारे में सटीक और खुफिया सूचना मिल सकेगी ताकि उन्हें मुंहतोड़ जवाब दिया जा सके।

<https://www.abplive.com/news/india/defence-news-indian-defense-manufacturers-will-upgrade-indian-air-force-israeli-heron-drones-under-project-cheetah-2220571>



Wed, 21 Sep 2022

## Indian Army plans to Change Old Customs and Traditions

A lot of changes are expected to be made to several customs and traditions being followed in the Indian Army as it plans to shed its colonial past. Soon names of regiments, buildings, roads, uniform, ceremonies which are dating back to pre-Independence times. The focus will be on changing the old and following new customs. The first change that has been reported is that the Indian Army Day Parade is moving out of New Delhi. Next year it will take place in Southern Command on January 15. It is on this day the first commander in chief of the Indian Army after Independence was appointed.

On Wednesday (Sept 21, 2022) an internal discussion of the Army's Adjutant General (AG) Lt General C Bansi Ponnappa was scheduled to review the old regulations, policies as well as prevailing practices. However, this meeting has not taken place so far, said sources. Sources have also clarified that the circulation of the agenda note does not mean that all these changes will be made without discussing with all the stakeholders. "If it is decided to make changes, the first impact will be on the ranks the officers and the soldiers hold. They will have to shed them with immediate effect. So what ranks will they be holding? Changing the names of the regiments will impact the soldiers and it will have an impact on their morale, creating more chaos," said a senior veteran.

The discussions will also be on changing the call signs the aviators use.

### What does the agenda note say?

The note for the review meeting which is floating on the social platforms says: "it's time to move away from archaic and ineffective practices". Changes to be made in the Army Uniform too have been suggested. What does this mean? Does it mean that there are plans to change the uniforms and accoutrements? What is not clear is if the lanyard will be there or removed? (It is the cord around the shoulder).

### **Change in the name of the Units?**

There are plans to review the current name of units which were named by the British – like the Gorkha Regiment, Punjab, Rajput, Dogra and Assam or Sikh regiment.

In 2021, while addressing the Combined Commanders Conference which took place in Gujarat's Kevadia, Prime Minister Narendra Modi had focused on the indigenisation customs, procedures and doctrines of the Indian armed forces.

During that address he had also advised the three service chiefs to “rid themselves of legacy systems and practices that have outlived their utility and relevance”. On the agenda that is expected to be reviewed by the AG also has establishments, institutes of the colonial past, units, roads, parks, buildings and more which are named after the British Commanders like Sir Herbert Kitchener and Claude Auchinleck. The units of the Army which fought in the two World Wars are also expected to be reviewed as well to restrict the regimental reunion and events should be restricted to the Army. During the meeting when it takes place, the army officials will also touch upon the pre-Independence theatre honours or battle honours. These were awarded by the British to ensure there was no dissent by the Indian states.

### **What does this mean?**

It means, if the decision is made that several army units who have battle honours to mark the Anglo-Gorkha wars, Anglo-Maratha wars and Anglo-Sikh wars, will then have to give it up. Affiliation with Commonwealth War Graves Commission, granting Honorary Commission, Beating the Retreat are all expected to be reviewed. The system of appointing ‘Colonel of Regiment’, military funerals are all on the agenda.

### **Amrit Kaal**

These changes when they are made will be in line with the Prime Minister's 'Amrit Kaal'. This phrase is used to define the period between 75<sup>th</sup> Independence and 100<sup>th</sup> year of the country's Independence in 2047.

[https://www.financialexpress.com/defence/indian-army-plans-to-change-old-customs-and-traditions/2681620/lite/?utm\\_source=defence\\_landing\\_page&utm\\_medium=article\\_listing\\_wid&utm\\_campaign=Tags](https://www.financialexpress.com/defence/indian-army-plans-to-change-old-customs-and-traditions/2681620/lite/?utm_source=defence_landing_page&utm_medium=article_listing_wid&utm_campaign=Tags)

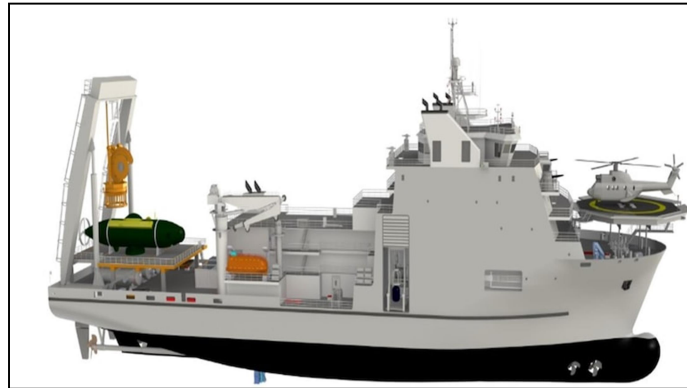


*Wed, 21 Sep 2022*

## **2 Diving Support Vessels of Indian Navy All Set to be Launched in Visakhapatnam**

The Indian Navy is all set to get two Diving Support Vessels (DSVs) on Thursday, indigenously built by Hindustan Shipyard Ltd, Visakhapatnam. Admiral R Hari Kumar, Chief of the Naval Staff, will be the chief guest at the launching ceremony. The vessels will be launched by Kala Hari Kumar, President of the Navy Welfare and Wellness Association (NWWA), who will also

perform the traditional honour. The first of its kind indigenously designed vessels are 118.4 metres long, 22.8 metres at the broadest point and will have a displacement of 9,350 tons.



*These vessels will be deployed for deep sea diving operations.*

These ships would be deployed for deep sea diving operations. Additionally, with Deep Submergence Rescue Vehicle (DSRV) embarked, the DSVs are designed to undertake submarine rescue operations, in case a requirement exists. Furthermore, these ships will be capable of sustained patrolling, conducting search and rescue operations and carrying out helicopter operations at the high seas. With approximately 80 per cent indigenous content, the DSV project has generated considerable local employment opportunities and has also promoted indigenisation which in turn, will aid in boosting India's economy. The contract for the construction of the two vessels was signed with the Hindustan Shipyard Limited (HSL) in 2018 to the tune of Rs 2,392.94 crore.

<https://www.indiatoday.in/india/story/diving-support-vessels-indian-navy-launch-visakhapatnam-2003145-2022-09-22>



*Tue, 20 Sep 2022*

## **Why Indian Army Activating Satellite-based Internet on Siachen Glacier is a Big Deal**

The Indian Army in a remarkable achievement activated satellite-based Internet service on the Siachen Glacier, the world's highest battlefield.

The Leh-based Fire and Fury Corps, which handles military deployment along Kargil-Leh and secures the frontier with China and Pakistan, tweeted:

#IndianArmy

“Always Through”



Satellite based internet service activated on the #SiachenGlacier at 19,061 feet, the World's Highest Battlefield, by the Siachen Signallers#SiachenWarriors@adgpi@NorthernComd\_IA@ANI pic.twitter.com/kK8xQG8aQj

— @firefurycorps\_IA (@firefurycorps) September 18, 2022

This comes on the same day that the Indian Army said it has invited the domestic defence industry to offer critical defence equipment for emergency procurement in consonance with its commitment to “fight future wars with indigenous solutions”.

Let's take a closer look:

### **Why is this a big deal?**

Because of the inherent difficulties in providing services to far-off and mountainous areas.

As per Daily Excelsior, while China has strengthened communication in remote villages in its side, India has been falling behind in some areas – though the present government has done much to catch up.

As per The Times of India, Bharat Broadband Network Limited (BBNL) is the internet service provider for the army in Siachen, located in the eastern Karakoram range in the Himalayas.

BBNL has also undertaken the BharatNet Project, which is aimed at providing satellite-based Internet connection to around 7,000 Gram Panchayats and to remote areas with no access to fibre-based internet, as per the report.

Under the project, 7,000 sites are slated to be covered by four satellite gateways having two high-throughput (HTS) satellites. Thus far, roughly 4,000 Gram Panchayats have been commissioned as part of the project, as per the report.

As per Daily Excelsior, a few private companies are providing different satellite-based internet services to the Indian Army in sensitive places in border areas like in Eastern Ladakh.

Hughes Communications India, which has tied up with ISRO for using the Indian space agency's Gsat-11 and Gsat-29 satellites and recently announced the commercial launch of India's first high-throughput satellite (HTS) broadband service, is providing sat-based connectivity to the Indian Army along the China border, including in the Galwan region, as per the report.

### **Indian Army shares links for RFPs**

The Indian Army has been focussing on many indigenous solutions to meet its various needs and recently hosted a seminar on logistics and discussed ways to make the system self-reliant.

In a series of tweets, it also shared links for getting details on Requests for Proposals (RFPs).

“In keeping with its commitment to fight the future wars with Indigenous Solutions, #IndianArmy invites Indian Defence Industry to offer critical defence equipment for Emergency Procurement. #IndianArmy #InStrideWithTheFuture,” the Army tweeted.

The process will be based on “compressed timelines, wherein the procurement window will be open to the Indian industry for six months and the industry would be expected to deliver equipment within one year of signing the contract,” it said.

Procurement cases will be based on “open tender enquiry,” it wrote on the microblogging site.

“Proposals are being fielded for Guns, Missiles, Drones, Counter Drone, Loiter Munition, Communication & Optical systems, specialist Vehicles, Engineering Equipment & Alternate Energy Resources,” it said in another tweet.

“Government is committed to create a robust, secure, speedy and ‘Aatmanirbhar’ logistics system to effectively deal with future security challenges and take the country to greater heights,” Defence Minister Rajnath Singh had said at the event.

In June, the Defence Acquisition Council cleared capital acquisition proposals of the Armed Forces amounting to ₹76,390 crore to ‘Buy (Indian)’, ‘Buy & Make (Indian)’ and ‘Buy (Indian-IDDMM)’ categories, as per Mint.

<https://www.firstpost.com/explainers/explained-why-indian-army-activating-satellite-based-internet-on-siachen-glacier-is-a-big-deal-11296221.html>

## The Statesman

*Thu, 22 Sep 2022*

### **Indian Envoy in South Africa Inaugurates BrahMos Aerospace Corporation Pavilion at Defence Expo**



Image source (ANI)

Indian High Commissioner in South Africa Jaideep Sarkar on Wednesday inaugurated the BrahMos Aerospace corporation pavilion on the inaugural day of the Africa Aerospace and the Defence Expo in Cape Town. India-Russia defence Joint Venture BrahMos Aerospace is capable of making hypersonic missiles completed its glorious 25 years since its formation in 1998. Coinciding with India's 75 years of Independence, BrahMos Aerospace has commenced the 'Silver Jubilee Year' celebrations, for 2022-2023, to mark the incredible journey of one of India's most successful, cutting-edge military partnership programmes that have produced the world's best, fastest and most powerful modern precision strike weapon BrahMos.

In the field of defence, India has longstanding and wide-ranging cooperation with Russia. India-Russia military-technical cooperation has evolved from a buyer-seller framework to one involving joint research, development and production of advanced defence technologies and systems. BrahMos Missile System as well as the licensed production in India of SU-30 aircraft and T-90 tanks are examples of such flagship cooperation. The defence cooperation between India and Russia is historically deep and built on trust. In 2021-22, there was a sustained momentum in India's traditionally close ties with Russia and other countries in the Eurasian region despite the negative impacts of the pandemic.

The special role of Russia in India's foreign policy was highlighted by the successful visit of the Russian President, Vladimir Putin, to India for the 21st India-Russia Annual Summit and the holding of the first India-Russia 2+2 Dialogue of Foreign and Defence Ministers, as well as the 20th meeting of India- Russia Inter-Governmental Commission on Military Technical Cooperation in New Delhi on 6 December 2021.

During the year, there were regular high-level exchanges between India and Russia at the Ministerial and senior official levels, including a number of virtual meetings.

Russians and Indians, both value and share values like friendship and loyalty, and this is something that unites the people of the two countries and especially the members of their permanent bureaucracies in ways that outside observers rarely ever realize.

The particularly privileged strategic partnership between the two countries has become stronger and more diversified over a period of time.

<https://www.thestatesman.com/india/indian-envoy-in-south-africa-inaugurates-brahmos-aerospace-corporation-pavilion-at-defence-expo-1503113754.html>

## ThePrint

*Thu, 22 Sep 2022*

### **Ukraine-Russia Shows Us the Future of War with High-end ATGMs, Drones. India has to Step up**

*By Lt Gen H S Panag (retd)*

Ukraine's Kharkiv counter-offensive, which began on 5 September and resulted in the recapture of 6,000 square kilometres of its territory, has led to speculation of an eventual Russian defeat. Considering Russia's immense reserves and unused combat potential, it is unlikely to suffer a

decisive military defeat but has certainly been stalemated—which is nothing short of a political defeat for a superior power. If Ukraine succeeds in recapturing Kherson, the mounting men and material losses may force Russia to negotiate a face-saving victory restricted to the Donbas region and Crimea.

There have been many instances where bigger powers have been worn down and politically defeated by prolonged guerrilla wars—Vietnam and Afghanistan being notable examples. Ukraine would be a unique example in military history because history wherein a smaller nation has defeated a much superior military power in a conventional war. Apart from the constants of national will, strategy, leadership, motivation and superior training, it is the exploitation of high-end military technology that has made the difference in favour of Ukraine.

Pitched battles and close combat, except in built-up areas, have been conspicuous by their absence. The effectiveness of tanks, aircraft, attack helicopters, and artillery as major battle-winning factors has been neutralised to a great extent. The outcome of battles is now decided by Precision-Guided Munitions (PGMs), delivered by aircraft, helicopters, drones and ground-based weapon systems backed by an effective cyber and electronic warfare proof Command, Control, Communications, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance (C4ISTAR) system. Military technology is still dominated by human-assisted artificial intelligence-enabled weapon systems. Full spectrum autonomous artificial intelligence weapon systems may still be two decades away.

In the Ukraine war, third to fifth-generation anti-tank guided missiles (ATGMs), drones, and man-portable air defence weapon systems (MANPADs) have made a major difference. I analyse the current capabilities of the Indian Armed Forces with respect to these weapon systems.

### **Anti-tank guided missiles**

The tank has dominated the battlefield for over 100 years. Its technology has kept pace with second-generation Semi-Automatic Command to Line of Sight (SACLOS) guided anti-tank weapons through composite/explosive reactive armour, electronic/kinetic countermeasures and by targeting the exposed operators who have to continuously track the target. In the Ukraine war, the balance has tilted in favour of the third to fifth-generation interference-proof 'fire and forget' top attack anti-tank missiles like the Javelin and New Generation Light Anti-Tank Weapon (NLAW). Over 1,000 Russian tanks have been destroyed. These missiles can defeat electronic and kinetic countermeasures, attack the vulnerable top of the tank and do not require continuous guidance or tracking by an exposed operator.

The Indian Army has a large inventory of approximately 6,000 second-generation anti-tank missile launchers. The infantry is equipped with Milan T2, Fagot Launcher Adapted for Milan Equipment (FLAME), Konkurs and Kornet missiles. Each BMP is equipped with a Konkurs missile launcher. T90 tanks are equipped with 9M119M missiles fired through the main gun. Barring the Apache, all attack helicopters—such as the Mi 25/35 and Rudra—are equipped with second-generation missiles. All these missiles have a theoretical kill probability of 90 per cent on static targets. However, since these require continuous tracking exposing the operator and are only capable of direct horizontal attack, which is defeated by the tank's protection system, their effectiveness under battle conditions is only 25-30 per cent. The odds favour the tank.

A limited number of third and fifth-generation fire and forget and top attack Israeli Spike ATGM launchers have been imported. Also, a limited number of Nag Missile Carriers or NAMICA—

(modified BMP2) based Nag indigenous ATGMs—have been inducted into the Reconnaissance and Support Battalions. The numbers of these state-of-the-art systems are yet insignificant to make a difference.

The Indian Army is now committed to “fight future wars with indigenous solutions” based on the policy of ‘Atmanirbharta,’ or self-reliance in defence. Many third to fifth-generation ATGMs under the Nag umbrella project are under development by the Defence Research and Development Organisation (DRDO). Prospina is the base variant land-attack fire-and-forget ATGM with ‘top attack capabilities and a range of about four kilometres. It can also be mounted on the NAMICA. Twelve NAMICAs have already been inducted.

Helina/Dhruvastra is the helicopter launched version with a range of 7-10 km. The Man Portable Anti-Tank Missile (MPATGM) for Infantry and Special Forces is undergoing field trials. The Standoff ATGM (SANT) is an upgraded version of HELINA with a range of 20 km to be used by indigenous drones. The Semi-Active Mission Homing (SAMHO) ATGM is tube-launched and will also be adapted for launch from tank guns. Indian manufacturing giant Larsen & Toubro has launched a joint venture with European multinational missile developer MBDA to create a fifth-generation ATGM.

In my view, it would take another three to five years before the indigenous third to fifth-generation ATGMs are inducted in significant numbers to make a difference. Until then, the Indian Army will have to rely upon second-generation ATGMs with effectiveness of only 25-30 per cent as compared to the third to fifth-generation ATGMs that made the difference in Ukraine.

### **Armed drones**

Apart from surveillance and reconnaissance drones, Ukraine has effectively used a variety of armed drones and loiter ammunition to destroy tanks, Infantry combat vehicles, artillery and other weapon systems. Turkey’s Bayraktar TB2 drones proved to be very effective. The limiting factor of this class of drones is the very high cost of manufacture/import. Loiter ammunition or Kamikaze drones, is the cheaper alternative. The US has supplied 700 Switchblade, 700 Phoenix Ghost and other such drones to Ukraine. The cost of a Switchblade is \$10,000, which is one-eighth the cost of a Javelin ATGM, priced at \$78,000 and a fraction of the cost of a US Reaper drone, which costs \$32 million. Even the Bayraktar TB 2 costs \$5 million. Ukraine has also fielded 6,000 cheap, commercial off-the-shelf drones like the DJI Mavic 3.

India has been using Israeli Searcher 1 and 2 drones primarily for Intelligence, Surveillance and Reconnaissance (ISR) purposes since 2000. These were followed by the Heron—a sophisticated long-range, long-endurance and high-altitude unarmed drone. Ninety Herons are currently in service with the Indian Armed Forces. The Indian Air Force (IAF) has also imported a limited number of Harop Kamikaze drones from Israel, primarily for suppression of enemy air-defence systems.

So far, India does not have the classic strategic armed drone in its arsenal, though we have initiated a project to modify part of the existing fleet of Heron Unarmed Aerial Vehicles (UAVs) into armed UAVs. There are conflicting reports about the progress of the mega \$3 billion deal to buy 30 MQ 9B Predator Sky/Sea Guardian armed drones from the US.

While there is a need for long-endurance sophisticated drones like the Predator for strategic tasks, the best bet for the Indian Army is to induct the much cheaper Kamikaze Drones or loiter ammunition in large numbers for anti-tank/equipment/personnel missions. The Indian private

sector, with its software expertise, is well geared to fulfil this requirement and has been given firm orders by the Ministry of Defence to get to work. While there is a lot of sensational and speculative reporting, so far no military-grade drones have been fielded.

For the last two decades, the DRDO has had various categories of UAVs under development. However, none have reached the field trial stage.

### **Man-portable missiles**

MANPADs have literally sent the Russian Air Force out of the skies. These shoulder-fired, man-portable missiles have been most effective against aircrafts and helicopters. Sophisticated air defence systems like the S 300/400 and Patriot/THAAD are extremely expensive and prime targets for cruise missiles. Relatively inexpensive MANPADs are difficult to detect before launch and can swarm the battlefield covering all vulnerable areas. Fourteen hundred Stinger missiles supplied by the US were the mainstay of Ukrainian air defence.

The Indian Army is equipped with state-of-the-art Russian Igla missiles and a limited number of Stinger missiles for Apache attack helicopters. However, the numbers of MANPADs are too small to make a significant difference as has happened in the Ukraine war.

It is evident that there are serious voids of third-fifth generation ATGMs, armed drones and MANPADs in the Indian Armed Forces. There is an urgent need to indigenously develop or procure these systems. For the next decade, these weapon systems will remain a battle-winning factor as has been proven in the Ukraine War.

<https://theprint.in/opinion/ukraine-russia-shows-us-the-future-of-war-with-high-end-atgms-drones-india-has-to-step-up/1137854/>

# ThePrint

*Wed, 21 Sep 2022*

## **Putin Announces Partial Mobilisation of Reservists; says Russia Fighting ‘Entire Western Military Machine’**

President Vladimir Putin on Wednesday announced a “partial mobilisation” of some 300,000 reservists with immediate effect in the wake of setbacks suffered by Russia in its conflict with Ukraine, saying the measure is necessary as his country is fighting the “entire Western military machine”.

Putin made the announcement in a televised address to the nation in which he also said that Russia will use all the means at its disposal to protect its territory, warning the West that “this is not a bluff”. He has already signed an Executive Order for the call-up to start the mobilisation immediately.

The stretched-out frontline, the constant shelling of Russian borderline areas by the Ukrainian military and attacks on liberated regions required the call-up of servicemen from the reserve, Putin said. His speech comes a day after the Lugansk and Donetsk People’s Republics, as well as Russian-controlled Kherson and Zaporozhye regions on Tuesday announced that they would hold referendums on whether to join Russia from September 23-27.

Soon after Putin's address, Russian Defence Minister Sergey Shoigu announced that 300,000 people will be called up for service during the partial mobilisation.

"Three hundred thousand reserve troops will be called up," Shoigu said during a Rossiya-24 TV broadcast.

Putin's announcement was described as a sign of "weakness" by US ambassador in Ukraine Bridget Brink. "Sham referenda and mobilisation are signs of weakness, of Russian failure," Brink tweeted.

"The United States will never recognise Russia's claim to purportedly annexed Ukrainian territory, and we will continue to stand with Ukraine for as long as it takes." British Defence Secretary Ben Wallace said Putin's decision to mobilise military reservists shows that his invasion is failing.

"He and his Defence Minister have sent tens of thousands of their own citizens to their deaths, ill equipped and badly led," he said in a statement. "No amount of threats and propaganda can hide the fact that Ukraine is winning this war, the international community are united and Russia is becoming a global pariah." In his speech, Putin accused the West of making attempts to weaken, divide and ultimately destroy Russia. "They are saying openly now that in 1991 they managed to split up the Soviet Union and now is the time to do the same to Russia, which must be divided into numerous regions that would be at deadly feud with each other," Putin said.

He accused the Ukraine government of bringing foreign mercenaries and nationalists, military units trained according to NATO standards and receiving orders from Western advisers.

"Today our armed forces are fighting on the line of contact that is over 1,000 kilometres long, fighting not only against neo-Nazi units but actually the entire military machine of the collective West," Putin said. Accusing the US-led West of resorting to nuclear blackmail, Putin said that Russia has different types of weapons as well, and some of them are more modern than the weapons NATO countries have.

"In the event of a threat to the territorial integrity of our country and to defend Russia and our people, we will certainly make use of all weapon systems available to us. This is not a bluff," he warned. "Those who are using nuclear blackmail against us should know that the wind rose can turn around." Russia will call up reservists who have already served in the army and will arrange for their training. The reservists and Donbass volunteers will be entitled to the same guarantees enjoyed by contract-enlisted servicemen. Putin said the heads of defence industry enterprises will be directly responsible for attaining the goals of increasing the production of weapons and military equipment and using additional production facilities for this purpose.

Defence Minister Shoigu disclosed that a total of 5,937 Russian troops have died during the military operation in Ukraine while fatalities on the Ukrainian side are ten times higher, with 61,207 Kiev troops killed. It's the first time that Russia announced its losses during the military operation since late March when the casualties stood at 1,351.

<https://theprint.in/world/putin-announces-partial-mobilisation-of-reservists-says-russia-fighting-entire-western-military-machine/1137207/>

## **Submarine Fleet Needs More Spare Parts to Stem Maintenance Delays**

*By Megan Eckstein*

The submarine industrial base, already strained by demand for new construction, may need to accelerate its production of spare parts to alleviate submarine maintenance woes. The vast majority of submarine maintenance availabilities run late, in part due to poor planning practices and in part because repair yards rely on a pool of replacement parts “that just doesn’t exist” after the Navy failed to sufficiently prepare for Virginia-class submarine sustainment, according to two admirals. “That upfront investment didn’t happen for Virginia-class, so we’re missing that whole sustainment tail, or a big portion of that,” Rear Adm. Scott Brown, the deputy commander of Naval Sea Systems Command for industrial operations (NAVSEA 04), said Sept. 20 at the American Society of Naval Engineers’ annual Fleet Maintenance and Modernization Symposium here.

“It’s resulting in a lot of churn, a lot of cannibalization — so we have to take things off other boats to stick them on the boat we’re trying to get out — and a lot of, frankly, frustration with the workforce on waiting for stuff that doesn’t exist,” he added. “Of course, that leads to delays.” He said the Navy asked the Center for Naval Analyses to study the connection between material delays and extended maintenance availabilities; the research organization found the lack of material on hand “is a fairly large contribution to our delays,” according to Brown. Vice Adm. Bill Galinis, the commander of NAVSEA, said Sept. 21 at the same conference that only 20% to 30% of submarine maintenance availabilities over the last decade have finished on time. The problem is worsening as the Virginia-class submarines account for a greater percentage of the undersea fleet, he said.

“We’ve seen a significant growth in the amount of man days required to complete a submarine availability, particularly a Virginia-class one, and [we’re] really trying to deep-dive and understand why that really is,” Galinis added. He pointed to a couple potential factors. For parts purchased with annual operations and maintenance funding, global supply chain issues mean it takes longer for parts to be delivered. In some cases, it’s taking up to two years, putting current and upcoming availabilities at risk. For spare parts managed through the Defense Logistics Agency or the Naval Supply Systems Command, the Navy has only funded some of these at about 40% or 50% in recent years. As a result, parts simply aren’t in the inventory when needed by the Navy’s four public shipyards.

And, Galinis added, the rotatable pool of spares is too small due to a lack of investment in the early years of the Virginia-class acquisition. The rotatable pool is made up of parts taken off a submarine by shipyard workers and later refurbished for use in the future. He added that the refurbishment process is moving too slowly, meaning parts aren’t available when needed. Galinis said the Navy may have to contract out some of that refurbishment work.

Brown told Defense News his office, which oversees the work of all four public shipyards, wants to increase the inventory of each component in the rotatable pool and also add new types of



components that have particularly blocked the service from completing maintenance availabilities on time.

Brown said he doesn't expect the problem to cost the Navy more, but the service may need to spend more quickly on spares and sustainment. "That's going to cause a push of material dollars to the left in the [five-year Future Years Defense Program] to buy early to make sure we have that stuff. But it's eventually going to equalize out, because we're going to end up buying it anyway," he said. Galinis also pointed to a lack of rigor in submarine planning and project management, which he said is exacerbating the maintenance delays. A number of pre-availability assessments and tests must take place on all submarines, aircraft carriers and surface ships to help identify the exact condition of the ship and what work is needed.

"The submarine force is probably the hardest one for us to get that done, principally because of their operational schedule and just in some cases the difficulty getting teams out to a submarine," Galinis said. But it means some planning documents aren't completed until the submarine is back in port, generating additional delays. Indeed, whereas surface ships only see about 10% so-called unplanned work, aircraft carriers have been seeing a 22% unplanned work rate and submarines are nearing 30%, the NAVSEA commander said.

Though submarine maintenance faces a slew of challenges, Galinis said aircraft carrier maintenance is improving. The four public shipyards — all of which work on submarines and two of which work on aircraft carriers — have actually seen fewer maintenance delays in recent years. In fiscal 2019, he said, the four yards totaled 1,500 delay days. In FY 22, that's down to about 1,100, a 27% decrease. Additionally, Galinis said, 13 of the last 18 aircraft carrier maintenance availabilities have finished on time or early, with the late ones largely related to carriers that conducted back-to-back deployments and skipped a maintenance period in between. "I credit that [higher on-time completion rate] to the work that the larger team has done on the planning process," he said. "The planning efforts on the carrier side are probably the most stable" compared to surface ships and submarines.

<https://www.defensenews.com/naval/2022/09/21/submarine-fleet-needs-more-spare-parts-to-stem-maintenance-delays/>

## Science & Technology News



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Ministry of Science & Technology

Wed, 21 Sep 2022 4:17PM

### **Industry can be Roped in for Increasing Funding of C V Raman International Fellowship for African Researchers: DST Secretary**

Secretary Department of Science and Technology Dr. S Chandrasekhar highlighted that India has always benefited from working with Africa, and mutually beneficial ties are win-win for growing relations not only in Science & Technology but also in the field of trade, culture, and social sciences at the roundtable discussion on C V Raman International Fellowship for African Researchers (CVRF) program with African Missions in India. “DST, along with MEA and our African friends, has been working on various capacity-building programmes like CV Raman Fellowship, training programmes, and strengthening of academic and scientific institutes. I wish that CV Raman Fellowship will be as popular as Alexander von Humboldt fellowship of Germany,” Dr. Chandrasekhar pointed out.

Department of Science and Technology (DST) and Ministry of External Affairs (MEA), Government of India (GoI), through the Federation of Indian Chambers of Commerce & Industry (FICCI), have launched the C.V. Raman Fellowship for African Researchers programme under the India-Africa Forum Summit to promote human capacity building through scientific and technological cooperation between Africa and India. The objective of this Fellowship is to provide an opportunity for African researchers to conduct collaborative research in various areas of science and technology in different Indian universities and R&D institutions under the guidance of host scientists in India. This prestigious fellowship aims to strengthen further the bond between India and African nations in science and technology.

Dr. Chandrasekhar said that the fellowship program is for people-to-people connection and for learning best practices from each other. He urged for a provision to revisit the programme so that the relationship goes a long way. He also requested FICCI, a partner of the programme to rope in the industry for additional funding. Commissioners/Ambassadors/Representatives from High Commissions/embassies of Africa in India, as well as officials from DST and FICCI, also participated in the meeting and discussed about the fellowships. Mr. Puneet Kundal, Joint Secretary, Ministry of External Affairs (MES), stressed that this was another reflection of India’s commitment towards Africa. He appealed to African Mission countries to publicise the fellowship through Universities and institutes so that more applications can be received.

Shri S K Varshney, Head International Cooperation, DST, briefed about the India-Africa Science and Technology Partnership framework and its activities and elaborated on the CVRF programme.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1861157>



**Press Information Bureau**  
**Government of India**

**Ministry of Science & Technology**

*Wed, 21 Sep 2022 3:38 PM*

## **Union Minister Dr Jitendra Singh Interacts with CEOs and Representatives of More Than 30 Prominent American Companies in Washington; The Minister Asks them to Avail of Enabling Business and Investment Milieu Created in India by PM Narendra Modi**

**CEOs and Representatives of Google, FedEx, Cyient Technologies, Nextler Innovations, Climate Compass and representatives from USG/Space, DC Government, NASA, American Think Tanks, and Federal Representatives took part in the Business Roundtable**

**ISRO and NASA are working together to launch a joint radar satellite for Earth observation named NISAR [NASA -ISRO Synthetic Aperture Radar] to collect data vital to tackling the climate crisis: Dr Jitendra Singh**

Union Minister of State (Independent Charge) Ministry of Science and Technology; Minister of State (Independent Charge) Ministry of Earth Science; MoS PMO, Ministry of Personnel, Public Grievances, Pensions, Space and Atomic Energy, Dr Jitendra Singh today interacted with CEOs and representatives of more than 30 prominent American companies at the US Chamber of Commerce headquarters in Washington and exhorted them to avail of enabling business milieu created in India by Prime Minister Narendra Modi. The Minister said, India under Modi is incentivising investments and called upon them to also engage in Joint Venture opportunities in the wake of pro-business reforms carried out by the Government over the last 8 years.

Miriam Daniel and Priscilla Baek of Google on Geospatial Data, Stafan Alexander, CEO of Nextler Innovations, Emily Beline, Senior Counsel of FedEx, Randy Liebermann, CEO of HoT Technologies, Timothy Puckorius, CEO of Earth Observation Technologies, Glenn Grab of Cyient Technologies, Kevin James, CEO of Climate Compass, Ajeeth Ibrahim of Nanorocks Space Technologies, Ravnish Luthra, CEO of ITGlobe Inc, Sanjay Singhal, CEO of Sintel Satellite Services Inc, were some of the prominent business leaders who interacted in detail with Indian Delegation led by Dr Jitendra Singh. Apart from business leaders, representatives from USG/Space, DC Government, NASA, American Think Tanks, and Federal Representatives took part in the Roundtable in areas associated with Geospatial, Space, Earth & Ocean Science, Pharma and Biotech Sectors, organised by US-India Business Council (USIBC) at U.S. Chamber

of Commerce headquarters in Washington, DC. The USIBC represents top global companies operating across the United States, India, and the Indo-Pacific.

Earlier, Dr Jitendra Singh as the head of Joint Ministerial Indian delegation, arrived at New York last evening and proceeded to Washington on the first leg of the 5-day US visit, which includes participation in Global Clean Energy Action Forum scheduled from 21<sup>st</sup> to 23<sup>rd</sup> September at Pittsburgh, Pennsylvania. He is also scheduled to interact with eminent academicians as well as Indian diaspora. Atul Keshap, President, USIBC welcomed Dr Jitendra Singh at the Business Roundtable, while Sripriya Ranganathan, Deputy Chief of Mission, Indian Embassy, Washington, D.C. set the tone for Industry Interaction. The CEOs and representatives of Geospatial, Space, Earth & Ocean Science, Pharma, Biotech and other emerging Sectors held discussions on topics like “The Commercial Opportunities for U.S.-India Space Collaboration”, “The Potential of Geospatial”, “Expansive Potential for Growth in Satcoms” and “Commercial Space: Brown, Green and Blue”

Dr Jitendra Singh told the Business Leaders that India and America have very successful cooperation in Space Science and Exploration and ISRO and NASA are working together to launch a joint radar satellite for Earth observation named NISAR [NASA -ISRO Synthetic Aperture Radar]. The NISAR mission will collect data vital to tackling the climate crisis. The Minister also informed that ISRO has been getting Deep Space Network Antenna support from NASA in its Missions such as Chandrayaan-1, Mars Orbiter Mission (MOM) and Chandrayaan-2 mission and will continue availing support for our Chandrayaan-3 mission. He said, given the space reforms in India in place, India is looking forward to engaging with private sectors for fabrication, manufacturing, and joint development of space system and infrastructure.

On the subject of Geospatial Ecosystem, Dr Jitendra Singh said in the panel discussion that the recent policy reforms provides opportunities to work with academia, industry, and other stakeholders to create a vibrant and dynamical data-driven digital economy. He said, apart from NISAR Earth observation satellite, both the sides could expand cooperation in jointly developed geo-stational data sets used for weather forecasting, ground referencing, and positioning, navigation, and timing (PNT) information. On the issue of “Earth Science and observations”, Dr Jitendra Singh informed that combined scientific and technical skills and satellite data are being used to enhance observations of the earth and use information [Indian Ocean Variability and Monsoon] most effectively for the benefit of society. The Minister said, realising the importance of Arabian Sea, Scientific Teams from India and the USA have come together to define a collaborative India-USA program called EKAMSAT, where the scientific teams will engage in joint scientific collaboration in the Open waters of the Arabian Sea using research vessels from India and USA for better prediction of Monsoons, cyclone, and severe weather systems.

Dwelling on the aspects of Clean Energy Technologies, Dr Jitendra Singh said, U.S. Department of Energy (DOE) and the Government of India [led by Ministry of Science & Technology] signed an agreement in 2021 to establish the Joint Clean Energy Research and Development Center (JCERDC) to promote clean energy innovation by teams of scientists and engineers from India and the United States in Public- Private consortia modes and identified areas of mutual interest such as - Clean Coal Technologies, Advanced Supercritical Carbon dioxide (SCO<sub>2</sub>) cycle and Carbon Capture Utilization and Storage (CCUS).

Regarding “Health Sciences & Technologies”, Dr Jitendra Singh said, there has been longstanding collaboration between India and USA in Health Sector. The scientific community

and private sector of both the nations have been working together in several programs to understand important diseases and develop new therapeutic, diagnostic and vaccine. He said, new MOU was signed last in October, 2021, which provides an umbrella MOU for expanding cooperation and partnership in the healthcare sector between the two countries.

Indian Minister said, he was happy to note that in the area of Emerging Technologies, DST and NSF (National Science Foundation) of USA launched joint projects recently in wide range of areas of common interests such as - Cobotics, Computer vision, Robotics and Automation Technologies, Artificial Intelligence and Machine Learning, Data Analytics, Sensors, and Networking and Technologies for Internet of Things & Internet of Everything. He informed that bilateral S&T collaboration range from Mega Science such as LIGO [Laser Interferometer Gravitational Observatory], TMT [Thirty Meter telescope], and Neutrino Physics to Clean Energy Technologies, Health Science, Earth and Ocean Science, Agricultural Science and recent interest in expanding our collaboration in Emerging Technologies.

Apart from giving a brief view of India's Digital Economy, Dr Jitendra Singh concluded by saying that there is huge scope in expanding cooperation in the areas of common priority such as Quantum Technology, Artificial Intelligence, Deep Ocean Exploration, Electric Vehicles, Emerging Technologies for Telecommunications and Semiconductor Research and Innovation, geospatial technology areas related to acquisition, processing, and dissemination of high-resolution geospatial data. We shall look forward to working with you and continue supporting scientific communities of both the nations to create solution for pressing world problems.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1861125>



Wed, 21 Sep 2022

## **Smartphone Cameras and Flashes could be Used to Measure Blood Oxygen Levels in the Future**

*By Sethu Pradeep*

Researchers have shown that it is possible to measure blood oxygen saturation levels down to 70 per cent using a smartphone's camera and flash module. While still in its early stages, the study opens the door to a future where users can measure their blood oxygen saturation levels with easily-accessible smartphones. The proof-of-principle study conducted by University of Washington and University of California San Diego researchers has been published in the journal npj Digital Medicine. The researchers have applied for a patent for the technology. To measure the blood oxygen levels, study participants placed their fingers over the camera and flash module of a Google Nexus 6P smartphone. With every heartbeat, fresh blood flows through the part of the finger illuminated by the flash. The camera records a video to measure how much of the light from the glass is absorbed by the blood across three channels—red, green and blue.

There have been several previous studies on using smartphones for SpO2 levels, and there are also apps that claim to do the same but the purpose of the new study was to validate these measurements across a full range of clinically relevant SpO2 values. "There were a few on the

app store early in 2020, but some were removed due to concerns about their accuracy in the mid-2020s. There may still be apps available, but none are approved for medical use, and they are mainly marketed as fitness apps, rather than health apps. These can be dangerous if users do not understand the potential inaccuracy, and thus we believe our study paves a path forward to potentially improve the accuracy in the future,” said co-lead author Jason Hoffman to indianexpress.com in an email. Hoffman is a doctoral student at the University of Washington.

While the technology and configuration has currently only been tested with one smartphone model, the researchers are optimistic that it can be used on a larger variety of phones in the future. “We haven’t tested enough phone models to validate any hardware limitations, so this is speculation, but we are optimistic that this technique would work on any modern smartphone with a camera and flash that are co-located,” said Hoffman. Also, since the researchers needed to make configuration changes to the smartphone before using it to take measurements, there is a need for the technology to be tested on different smartphones before it can see wider use.

“If we want to become the first FDA-cleared test for SpO2 on an unmodified smartphone, we’d need to perform a larger study to validate on a larger population, and then send our data to the FDA for evaluation and approval. We’d estimate this whole process would take 18-24 months after the commencement of the new study, though we don’t have concrete plans to perform this study at this time,” added Hoffman. The data collection portion of the study happened several years ago when the Nexus 6P was a current model. The researchers were spurred by the urgency of the COVID-19 pandemic but it took several years to achieve the results. After that, it took two more years for the paper to make it past the peer review process. Also, the data collection method is expensive, meaning the researchers won’t have the resources to re-collect the data with a different model unless a follow-up study is conducted.

Co-authors of the paper include Xinyi Ding, a doctoral student at Southern Methodist University; Eric Larson, associate professor at Southern Methodist University; Caiwei Tian, who completed this research as a UW undergraduate student; and Shwetak Patel, a UW professor. The research was funded by the University of Washington. This data from some of the participants were used to train a deep-learning algorithm to measure blood oxygen levels from the values. They then validated the model on the other participants. Not only did the technology accurately predict blood oxygen levels but it continued to do so when the research team brought down the blood oxygen levels of subjects by giving them a controlled mixture of nitrogen and oxygen.

<https://indianexpress.com/article/technology/science/smartphone-cameras-and-flashes-could-be-used-to-measure-blood-oxygen-levels-in-the-future-8164616/lite/>



*Wed, 21 Sep 2022*

## **3D-Printed Drones Work Like Bees to Build and Repair Structures While Flying**

The technology, which has been tested in the lab, could ultimately be used for manufacturing and building in difficult-to-access or dangerous locations such as tall buildings or help with post-

disaster relief construction, say the researchers. 3D printing is gaining momentum in the construction industry. Both on-site and in the factory, static and mobile robots print materials for use in construction projects, such as steel and concrete structures.

This new approach to 3D printing—led in its development by Imperial and Empa, the Swiss Federal Laboratories of Materials Science and Technology—uses flying robots, known as drones, that use collective building methods inspired by natural builders like bees and wasps who work together to create large, intricate structures.



*ScanDrone (left) and BuilDrone (right)*

The drones in the fleet, known collectively as Aerial Additive Manufacturing (Aerial-AM), work co-operatively from a single blueprint, adapting their techniques as they go. They are fully autonomous while flying but are monitored by a human controller who checks progress and intervenes if necessary, based on the information provided by the drones. Lead author Professor Kovac, of Imperial's Department of Aeronautics and Empa's Materials and Technology Center of Robotics said, "We've proved that drones can work autonomously and in tandem to construct and repair buildings, at least in the lab. Our solution is scalable and could help us to construct and repair building in difficult-to-reach areas in the future."

### **Printing 3D geometries**

Aerial-AM uses both a 3D printing and path-planning framework to help the drones adapt to variations in geometry of the structure as a build progresses. The fleet consists of BuilDrones, which deposit materials during flight, and quality-controlling ScanDrones that continually measure the BuilDrones' output and inform their next manufacturing steps. To test the concept, the researchers developed four bespoke cementitious mixtures for the drones to build with. Throughout the build, the drones assessed the printed geometry in real time and adapted their behavior to ensure they met the build specifications, with manufacturing accuracy of five millimeters. The proof-of-concept prints included a 2.05-meter high cylinder (72 layers) with a polyurethane-based foam material, and an 18-centimeter high cylinder (28 layers) with a custom-designed structural cementitious material. The technology offers future possibilities for building and repairing structures in tall or other hard-to-access locations. Next, the researchers will work with construction companies to validate the solutions and provide repair and manufacturing capabilities. Professor Kovac said, "We believe our fleet of drones could help reduce the costs and risks of construction in the future, compared to traditional manual methods."

<https://techxplore.com/news/2022-09-3d-printed-drones-bees.html>

## **ISRO Tests Hybrid Propulsion System**

The Indian Space Research Organisation (ISRO) said on Wednesday, September 21, 2022, that it has successfully demonstrated a hybrid propulsion system that uses a solid fuel and liquid oxidiser. The hybrid motor was tested at the ISRO Propulsion Complex (IPRC), Mahendragiri, on Tuesday evening. The hybrid system is more efficient, "greener" and safer to handle and paves the way for new propulsion technologies for future missions, the Vikram Sarabhai Space Centre (VSSC) which tested it with support from the Liquid Propulsion Systems Centre (LPSC), said. In the ground-based test, the flight equivalent 30 kN hybrid motor used Hydroxyl-terminated polybutadiene (HTPB)-based aluminised solid fuel and liquid oxygen (LOX) as the oxidiser. The test was performed for 15 seconds on a 300-mm sounding rocket motor.

Conventional HTPB-based solid propellant motors used in rockets use ammonium perchlorate as oxidiser. In rocket engines, oxidisers supply the oxygen needed for combustion. While both HTPB and LOX are green, the cryogenic LOX is safer to handle. And unlike conventional solid motors, the hybrid technology permits restarting and throttling capabilities on the motor. The use of liquids facilitates throttling and control over the flow rate of LOX, the VSSC said. The technology demonstration paves the way for hybrid propulsion-based sounding rockets and an exciting platform for vertical landing experiments for spent-stage recovery, the VSSC said. As part of perfecting the technology, ISRO will try it out on a sounding rocket launch in future.

<https://www.thehindu.com/news/national/isro-tests-hybrid-propulsion-system/article65917332.ece>



