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Latest Brahmos Missile Test was conducted using Made in India sub-systems

BrahMos, the world's fastest anti-ship cruise missile, has achieved yet another significant milestone! The supersonic cruise missile was on May 22 tested successfully with a number of critical sub-systems that were made using Indian raw materials. The successful test was carried out at around 12:00 hours from an Integrated Test Range (ITR). Sources told Financial Express Online that the BrahMos missile, which was tested from a Mobile Autonomous Launcher, followed its trajectory with “pin-point” accuracy and achieved all the mission objectives. The critical sub-subsystems that were made from Indian raw materials include components like fuel management system and non-metallic airframe components. Till now these were provided by Russia. According to Mr Sudhir Mishra, CEO and MD of BrahMos Aerospace, with the successful launch these critical ‘Make in India’ sub-systems of the missile are ready to form an integral part of the weapons system. This new achievement not only marks a big ‘Make in India’ success story, but also helps in substantially reducing the cost of the missile system. The successful test of BrahMos comes after achievement, in which the missile was tested for life extension to 15 years. BrahMos is the first Indian missile whose life has been extended from 10 years to 15 years. Life extension of the missile system is yet another step that helps in reducing the cost of BrahMos. Recently, the missile was successfully tested with an indigenous seeker as well. BrahMos is a missile that has been jointly developed by India and Russia. The formidable missile system has already generated export interest from several countries. The missile has already been inducted into the Indian Army and the Indian Navy. BrahMos became the first heavy missile system in the world to be integrated successfully on a Sukhoi-30 MKI frontline fighter jet of the Indian Air Force (IAF). The missile can be fired from land, from ships (both vertical and inclined configuration), under-water, and from air. BrahMos initially had a range of 300-km, but after India became a part of the Missile Technology Control Regime (MTCR), the range was extended to 450-km, and an extended range missile was tested in early 2017. Now, BrahMos Aerospace is working to extend the missile's range to 800-km as well. BrahMos, a two-stage missile, can attain a cruise speed of 2.8 Mach and can carry a conventional warhead of almost 300 kg.



Source: <http://defencenews.in/>

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ISRO's big scheme to send small rockets into space

India's space agency aims to create a consortium of companies to build and market a small rocket to launch low-weight satellites at lesser cost and within shorter durations, as it seeks to tap into burgeoning global demand for such services. Led by Antrix Corp — the commercial arm of the Indian Space Research Organisation — the consortium will include engineering major Larsen & Toubro, Godrej Aerospace and Hindustan Aeronautics Ltd. The combine will help ISRO build a small rocket capable of carrying 500 kilogram satellites into the lower earth orbit. "Antrix is working on a model to involve industry from the beginning. Our aim is that one or two rockets will be launched by ISRO, the industry should then make the rockets and launch satellites," said Dr K Sivan, chairman of ISRO in an interview with ET. He said ISRO has approached these companies and that "they are all interested". "The price of a satellite launch on this small rocket is expected to be less than one-fifth of the current launch costs," Dr Sivan added. The first development flight or launch of the rocket will be by 2019. By involving companies such as L&T, Godrej and HAL, in the initial stages the space agency expects to improve the manufacturing process and bring down the cost of the rocket. Typically, ISRO takes around 45 days to assemble its workhorse the Polar Satellite Launch Vehicle (PSLV). The smaller rocket, to be powered by a solid booster, is expected to be ready for launch in three days. It is being designed to place low-weight satellites in the low earth orbit of around 500 kilometres.

Source: <https://economictimes.indiatimes.com/>

Institutes want Govt to play bigger role in funding tech research: Nasscom study

As many as 92% of India's technology institutes want the Union government to play a bigger role to encourage research and innovation, and enhance industry-academia collaboration to boost innovation, according to a joint study by Nasscom. The study, which featured interviews with representatives of 75 prominent technology institutes across the country and industry representatives, found that the overwhelming view was that while the government played an active role in making technology products commercially viable it should offer more aids to students for pursuing research. The interviewees highlighted that the government should have well-implemented policies to remove disconnect between the industry and academia. Large technology services and startups in the country have sharpened their focus on developing technology products that solve everyday problems. Industry lobby Nasscom said in this year's strategic review that in 2017 India had the third largest startup ecosystem with more than 5,000 startups, and that the startups with direct consumer connect attracted more funding. In 2016 and 2017, 39% institutions received more than Rs 5 crore in research funds. Nonetheless, the study named adequate funds and proper guidance as the two top needs for successful academic research. In two major technology institutes, funding dropped while the number of projects increased. IIT Kharagpur saw the number of sponsored projects increase 75 in 2016-17, but its funding dropped Rs 9 crore even as 27 more funding agencies came in. At NIT Tiruchirappalli, the number of projects went down by just one but funding fell Rs 11 crore. Nearly four in five representatives of institutes said that a greater industry-academia convergence would encourage entrepreneurship. The study said "78% of the universities agree that industry-academia convergence will lead to a better entrepreneurship ecosystem". India has seen a growth in patents filed by an increasing number of institutions, as 70% institutes surveyed had filed one or more patents. While IIT Delhi has filed more than 600 patents till date, IIT Madras filed 126 patents in 2016-17 alone.

Source: <https://economictimes.indiatimes.com>

India's Light Combat Aircraft Fires Beyond Visual Range Missile

The Indian Air Force's (IAF) Tejas Light Combat Aircraft (LCA) has successfully test fired the I-Derby beyond-visual-range (BVR) air-to-air missile at test range off the coast of Goa on April 27, the Indian Ministry of Defense (MoD) said in a statement. The missile was fired "to expand the firing envelope as well as to demonstrate safe operation of the aircraft during missile plume ingestion into the aircraft engine under worst case scenarios," the statement reads. According to the MoD, the successful test the missile is "one of the major objectives of Final Operational Clearance (FOC) of LCA Tejas." The I-Derby BVR missile has been test fired previously and constitutes the Tejas LCA's main air-to-air weapon system. It is fired from missile rail launchers fitted underneath the LCA's wings. The missile, manufactured by Israeli defense contractor Rafael Advanced Defense Systems, is fitted with a fire-and-forget guidance system and has an estimated range of over 50 kilometers. It can reach an estimated top speed of Mach 4. The IAF has also expressed interest in equipping the LCA with an extended-range variant of the I-Derby capable of hitting targets at up

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to a 100 kilometers distance. During the recently concluded Gaganshakti-2018 air combat exercise — with 1,100 aircraft and 15,000 military personnel the IAF's largest aerial combat drill ever — Tejas LCA participating in the drill also flew armed with the Derby BVR missile, although no test firing occurred. The Tejas LCA is a supersonic, single-seat, single-engine multirole light fighter aircraft that has been under development since 1983 by the Aeronautical Development Agency in cooperation with India's state-owned Hindustan Aeronautics Limited (HAL). In February, the Tejas LCA for the first time conducted a hot refueling trial another step toward FOC. HAL is also working on an improved variant, the Mark-IA featuring numerous upgrades including an advanced active electronically scanned array (AESA) radar system, a new electronic warfare sensor suite, and an externally refuelling capability. The Tejas LCA currently in service with the IAF are all initial operational configuration aircraft or in other words, they meet the service's minimum operational requirements. The IAF has listed several technical deficiencies found on the Tejas LCA Mark-I variant in 2017, which purportedly will be addressed in later versions of the aircraft. "The Indian Air Force (IAF) issued a tender to HAL in December 2017 for the procurement of 83 Tejas Light Combat Aircraft including 73 single-engine Tejas LCA Mark-IA and 10 tandem two-seat LCA trainer aircraft," I wrote in February. "The IAF plans to induct a total of 123 Tejas Mark-IA, next to 40 Mark-I Tejas LCAs." FOC clearance for the Tejas LCA by the Indian Aeronautical Development Agency is expected in the coming months.

Source: <https://thediplomat.com/>

All tests on heaviest satellite Gsat-11 to be over by May 17: ISRO chief

Indian Space Research Organisation (ISRO) is currently doing a series of tests on its heaviest communication satellite Gsat-11 weighing over 5.7 tonne after recalling the same from the European spaceport to look for any "potential anomaly". Talking to TOI, ISRO chairman Dr K Sivan said, "We are currently doing tests on Gsat-11 at our Bengaluru's ISRO Satellite Centre (ISAC). All tests, including test on its electrical circuits, are going to be over by May 17." He said, "If we find no anomaly, then we'll proceed further and start discussions with officials of Arianespace for the next launch date. They have their own busy schedule and we have to start talks to fix a date for our satellite launch." ISRO postponed the launch of Gsat-11 initially planned on May 25 from the European spaceport as it did not want to take chances with its heaviest satellite especially after the signal failure episode with Gsat-6A. Communication satellite Gsat-6A, which was successfully launched from Sriharikota on March 29, got out of control during the third orbit-raising manoeuvre in space when the signal with the satellite got abruptly snapped because of suspected power failure. The space agency since then has been trying to restore the communication link with Gsat-6A though it knows its exact location through the satellite-tracking system. High-throughput satellite Gsat-11, which carries 40 transponders in Ku-band and Ka-band frequencies, is capable of "providing high bandwidth connectivity" with up to 14 gigabit per second (GBPS) data transfer speed. The heavy-duty satellite is so massive that each solar panel is over four metres long, equivalent to the size of a room. The satellite will usher in high-speed internet connectivity, especially in rural India. The chairman said, "ISRO is simultaneously working on its next communication satellite Gsat-29. Its launch is due in June or July." Gsat-29, which carries Ka x Ku multi-beam and optical communication payloads for the first time, will be launched by second developmental flight of ISRO's 'fat boy' GSLV-MkIII. The satellite mission targets for village resource centres in rural areas to bridge the digital divide.

Source: <https://timesofindia.indiatimes.com/>

HAL offers 40 more Sukhois at one-third of Rafale's cost

With the Sukhoi-30MKI fighter — the backbone of the air force fleet — nearing the end of its production run, its manufacturer, Hindustan Aeronautics Ltd (HAL), is taking up a case to build 40 more. If the defence ministry accepts HAL's proposal, the inventory of the Russian fighter would be enhanced from the planned 272 to 312. With HAL offering to price the additional Su-30s at just Rs 4.25 billion, the fighter will be barely one-third the cost of the Rafale. According to a Business Standard analysis, the Indian Air Force (IAF) is paying Rs 11.25 billion per Rafale, excluding the price of weapons and logistics. HAL Chairman Mr T Suvarna Raju said: "We will offer a very competitive price. Since 2010, we have been delivering the Su-30 at Rs 4.25 billion. We can deliver another three squadrons at that same price." So, the IAF will pay Rs 170 billion for 40 additional Su-30s. However, that would involve buying the fighters in ready-to-assemble kits from Russia and putting them together in Nashik. "HAL has already absorbed the technology for building and supporting the Su-30s. Now, the aim is to build those three new squadrons as quickly, and as cheaply, as possible," said Raju. Rationalising the proposal for 40 additional Su-30s, Mr Raju said they were needed to carry the BrahMos air-launched cruise missile (ALCM). "We are required to modify 40-odd Su-30s to carry the BrahMos ALCM. Instead of upgrading older fighters, with a shorter residual lifespan, it would be better to build three more squadrons of Sukhois

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with the capability to carry BrahMos missiles,” said Mr Raju. The air-launched version of the BrahMos has been downsized to 8 metres and 2,560 kgs. Even so, mounting it on a Su-30 requires reinforcing the aircraft’s underbelly and installing a heavy-duty mounting station. After years of development, the BrahMos was successfully test-fired from a Su-30 in November. Ministry sources indicate a proposal to build more Su-30s would be considered positively, given the shortfall of IAF fighter squadrons. HAL is currently building the last 23 Su-30s of the 272 it was mandated to build. The IAF’s first 50 Su-30s were built in Russia. Even as HAL Nashik builds the last Su-30s on order, HAL and Sukhoi have negotiated the upgrade of the Sukhoi fleet. HAL officials said they wanted to be the lead agency, but Sukhoi has indicated it wanted a 50 per cent share in this lucrative contract to upgrade the fighter’s avionics, including radar, glass cockpit displays, electronic warfare systems, warning systems and jammers. “The IAF has already frozen its upgrade requirements. We are now waiting for the commercial proposal from Russia,” said Mr Raju. HAL estimates an avionics upgrade for the Su-30 would cost upwards of Rs 1 billion per aircraft, placing the cost of upgrading 312 fighters at Rs 312 billion. Officials said the upgrade would have two distinct parts. In Phase I, Sukhoi would take over some IAF Su-30s and use them as prototypes to install and certify new-generation avionics and weapons upgrades. HAL would install those upgrades in the entire fleet. Phase II, which would involve India-specific enhancements, would be designed and developed by HAL and also incorporated on to the fighter by HAL.

Source: <http://www.business-standard.com/>

Bangalore to Lose Next Generation Fighter Plane Project

The Aeronautical Development Agency, which had conceived and designed the Light Combat Aircraft (LCA) Tejas, has set the ball rolling for building the next generation defence aircraft, the Advanced Medium Combat Aircraft (AMCA), by extending an invitation to private players in Coimbatore to build a technology demonstrator. The proposal is not only the first time an indigenous military aircraft programme is seeing the involvement of private players, but it is also the first time a defence plane development project is proposed to be executed outside Bangalore. The project — to be implemented in Sulur in Coimbatore district which may house the permanent base of the Tejas squadron — marks Tamil Nadu’s first major defence aircraft project.

Fifth Generation Aircraft May Replace Tejas

Talking about the fifth generation aircraft that may eventually replace Tejas, ADA programme director Mr Girish Deodhar said: “We’ve only invited an Expression of Interest and received application from a few industries. It’d be too early to reveal names or numbers as the project is in a preliminary phase and final clearance is awaited.” The agency, created for the design and development of Tejas, has become relevant with the AMCA project and defence sources said the involvement of private players is in line with the Centre’s ‘Make In India’ programme and it could help with the project’s timelines. “There’s a proposal to implement the project in Sulur and the decision is based on the fact that Bengaluru has no space for technology development. The HAL airport already has too much testing. We looked at Chitradurga but it was not feasible because there was a problem with the approach part of the field. Since Sulur has an airfield, it looks good,” Mr Deodhar said. According to ADA, private players will be required to manufacture, assemble and equip two fighter aircraft and for the first time the industry will be involved from the stage of developing a process plan, design and fabricate parts, manufacture both metallic and composite parts, prepare sub-assembly jigs, create sub-assemblies and transport them to the identified Flight Test Facility.

Source: <http://www.indiandefensenews.in/>

AeSI holds technical meet in Hyderabad

The Aeronautical Society of India (AeSI) organised a Technical Meet and Aerospace Luminary Lecture, which saw nearly 400 eminent scientists, engineers, industrialists and professionals from the sector here. Dr VK Saraswat, Member NITI Aayog, said: “Miniaturisation will be the key in all the futuristic vehicles. We need to pursue cutting-edge research in hypersonics, propulsion, stealth and many niche technological areas. We need to embed cyber security in aircrafts for communication, transmission and data storage.” Dr G Satheesh Reddy, Director General, Missiles and Strategic Systems and the Chairman of AeSI, Mr Ajit Kumar, Vice Chief of Naval Staff, Mr Satya Gautam, Head Data Science and Artificial Intelligence, Credit Ms Vidya and Mr Vinay Kumar, Co-founder and CEO of Invenzone, were present.

Source: <https://telanganatoday.com>

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IAF to send Sukhoi to Australia for multilateral drill

Moving a step towards consolidating the Quad, the Indian Air Force is set to send its Su-30MKI fighter jets to Australia for its maiden participation in the multilateral air Exercise Pitch Black 2018. At least four to five front-line combat aircraft and one C-17 transporter will fly to Australia in July for the three-week-long air exercise between July 27 and August 17. This will be India's maiden participation in the biggest air combat training programme in the southern hemisphere involving several other air forces, sources told DH. In 2015, India and Australia had agreed on the IAF's participation in the multilateral war game. Following a bilateral meeting between the then defence minister Mr Manohar Parrikar and his Australian counterpart Mr Kevin Andrews, the two sides gave a public statement on India's presence at Pitch Black 2016. The IAF, however, couldn't make it because of certain operational issues. In January this year, Australian Defence Industry Minister Mr Christopher Pyne confirmed India's participation at Pitch Black 2018 while giving a lecture at the National Defence College in Delhi. Taking place once in every two years since 2006, the drill began with Singapore, Thailand, the UK and the US and grew to include France and Malaysia in 2008. New Zealand participated for the first time in 2010, followed by Indonesia in 2012. The United Arab Emirates also took part in 2014, followed by Canada, Germany and Netherlands in 2016. The manoeuvres — practised largely in vast stretches of northern Australia — is to learn more about offensive counter air and defensive counter air combat in a simulated environment. India-Australia strategic relations are slowly on the rise. The two navies began their annual maritime exercise in 2015 and a second edition took place in 2017. New Delhi, however, didn't permit Canberra to be part of the Malabar multilateral naval exercise involving the US and Japanese Navy. India's decision earned a rare praise from China. India, Japan, Australia and the US are believed to have formed a Quad to tackle a rising China in the Indo-Pacific region. But only sketchy official details on the Quad are available from any of these nations.

Source: <http://www.defencenews.in/>

India, US, Japan all set for Malabar Naval Exercise with China in the Crosshairs

Indian warships are now steaming towards the Western Pacific to take part in the top-notch Malabar naval exercise with the US and Japan off Guam, with the three countries keen to further bolster "interoperability" in the Indo-Pacific amidst China's continuing aggressive moves in the region. India will be fielding its stealth frigate INS Sahyadri, missile corvette INS Kamorta and fleet tanker INS Shakti as well as P-8I long-range maritime patrol aircraft for the Malabar exercise from June 6 to 15. Interestingly, the three warships held India's first naval exercise with Vietnam last week while being on operational deployment to South East Asia and North West Pacific. The US will be fielding its over 100,000-tonne USS Ronald Reagan, a nuclear-powered super-carrier with its full complement of F/A-18 fighters, early-warning and electronic warfare aircraft, and other frontline assets including a nuclear attack submarine and P-8A patrol aircraft for the Malabar exercise. Japan, in turn, will participate with one of its two 27,000-tonne helicopter carriers, a Soryu-class submarine and Kawasaki P-1 maritime aircraft. "The exercise's focus will be on anti-submarine warfare, though other kinds of maneuvers ranging from surface warfare to VBSS (visit, board, search and seizure) and maritime interdiction operations will also be held," said a senior officer. With the three countries remaining suspicious about China's growing military capabilities and increasing assertive behavior in the entire Asia Pacific region, especially in the contentious South China Sea, they have repeatedly stressed the need for all to respect freedom of navigation and right of passage in international waters as well as unimpeded commerce and access to resources. Though Australia has also been keen on joining the trilateral Malabar for some years, India does not want to needle a prickly China, which sees any multi-lateral naval grouping in the region as a security axis seeking to contain it. China, for instance, had lodged a strong protest against the Malabar exercise in the Bay of Bengal in 2007 when it had been expanded to include Australia and Singapore as well. Navy chief Mr Admiral Sunil Lanba also ruled out imparting any "military dimension" to the emerging quadrilateral with US, Japan and Australia. "There are dependencies of other nations involved. Australia's dependencies on China for economic benefits, the uncertainty of America when push comes to shove. We are not going down the route (military dimension). There are other avenues," he said. At a time when China is making regular naval forays into the Indian Ocean Region (IOR), the Indian Navy has adopted several measures to ensure security in the region from the Persian Gulf to Malacca Strait, with warships spread across choke points on round-the-clock patrols for any operational eventuality. "No one is going to come and hold your hand," said Mr Admiral Lanba.

Source: <http://www.defencenews.in/>

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Jaguars - \$1.5-bn upgrade with AESA Radars, Engines, DARIN III to make it a cutting edge Fighter

Jaguar strike aircraft number JM 255, parked in a Hindustan Aeronautics (HAL) hangar in Bengaluru, is superficially similar to the other 600-odd fighters in the Indian Air Force (IAF) fleet. In fact, it is unique in IAF history as the first Indian fighter to be integrated with an AESA — or active electronically scanned array — radar. The upgrade is said to modernise and extend the life of the strike aircraft by more than a decade. HAL Chairman Mr T. SuvarnaRaju said an Indian fighter flying with an AESA radar is in itself a landmark. The AESA radar — imported from Israel — enables the fighter to track multiple targets; communicate in multiple frequencies through high bandwidth apart from offering high accuracy and resolution, an official said. A set of Jaguars procured in 1983 is being upgraded from level DARIN I to DARIN III. DARIN, or Display Attack Ranging Inertial Navigation, stands for features that add teeth to these planes during combat. Of the 50-odd planes assigned for upgrade, three variants are getting refurbished in terms of a new fire control radar, engine & flight instrument system, a GPS-based inertial navigation system, a digital video recording system, a smart multi-function display and a radio altimeter with a 20,000 feet range. HAL's Mission & Combat System Research & Design Centre has carried out the upgrade of software, hardware, electrical and mechanical elements. The aircraft can get back to work for the IAF after the upgrades are tested and certified to be combat-worthy.

Source: <http://defencenews.in/>

BrahMos successfully test-fired for 2nd consecutive day

The BrahMos supersonic cruise missile was successfully test-fired from an integrated test range in Odisha's coastal Balasore district for the second consecutive day today, validating its strike capability, the defence ministry said. The missile was launched from a mobile autonomous launcher at 11.45 hours and it successfully flew in its pre-set trajectory "fulfilling its mission objectives," the ministry said. "Through this launch the critical indigenous components including fuel management system and other non-metallic airframe components have qualified to form part of the missile," Chief Executive Officer and Managing Director of BrahMos Mr Sudhir Mishra said. BrahMos is a joint venture between India's DRDO and NPO Mashinostroyeniya (NPOM) of Russia. It has a maximum speed of Mach 2.8 to 3, and it is believed to be the one of the world's fastest cruise missiles currently in operational use. It was successfully test-fired yesterday from the integrated test range as part of service life extension programme. The life extension trial of BrahMos was conducted from a static inclined launcher, proving the efficacy and longevity of the system. During today's launch, the major sub-systems manufactured indigenously under the 'Make in India' initiative were tested, defence sources said. BrahMos has emerged as the ultimate weapon of choice in modern warfare with its unmatched speed and precision, they said. DRDO Chairman Dr S Christopher congratulated the team involved in successful flight test, calling it a major milestone in the indigenisation of the BrahMos system. The scientific advisor to the Defence Minister and DG (Missiles & Strategic Systems) Dr G Satheesh Reddy congratulated the scientists for successfully developing the multiple sections of BrahMos and proving them in the mission. The defence ministry said the missile has established itself as a major force multiplier in modern-day complex battlefields with its "impeccable" land-attack and anti-ship capabilities.

Source: <http://defencenews.in/>

Indian Navy commissions fourth Mk-IV LCU

The Indian navy has commissioned its fourth Landing Craft Utility (LCU) Mk-IV, IN LCU L54, in a ceremony at Port Blair on South Andaman Island. The ceremony took place and was led by Indian Navy Chief of Materiel, Vice Admiral Mr GS Pabby. A total of 8 vessels in the class are planned to be built for the Indian Navy. The commissioning of the third ship in the class took place in April 2018. The amphibious ships are designed by India's Garden Reach Shipbuilders and Engineers and can be deployed for multi-role activities like beaching operations, humanitarian and disaster relief operations and evacuation from distant islands. They displace 830 tons and are capable of transporting Arjun main battle tanks, T72 and other armored vehicles. The ships are fitted with an integrated bridge system (IBS) and an integrated platform management system (IPMS) and feature the indigenous CRN 91 gun with a stabilized optronic pedestal for patrolling tasks. LCU ships are capable of carrying up to 160 troops.

Source: <http://defencenews.in/>

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TECHNOLOGY

NASA launches InSight spacecraft on \$1B Mars mission to peek below surface

VANDENBERG AIR FORCE BASE, Calif. — With the orange flames of its engine lighting up the foggy sky for miles around, a car-sized Mars lander rocketed into space early in a first-of-its-kind launch from California on a mission to probe beneath the surface of the Red Planet. The nearly \$1 billion Mars InSight probe blasted off shortly after 4 a.m. local time, roaring south down the coast to the delight of crowds gathered on beaches and church parking lots to watch in the pre-dawn darkness. The lander's two-year mission aims to understand what makes the Red Planet like Earth and help advance the search for new homes for our species. "It's unbelievable. It's literally unbelievable. I just stand here in awe," said InSight principal investigator Bruce Banerdt a few minutes before launch. Banerdt has been shepherding the project for nearly a decade, through construction and a scrubbed 2016 launch due to an equipment failure. Scientists had to wait two years until Mars and the Earth aligned again so the probe could start its approximately 200-day journey. This was NASA's first interplanetary launch from the West Coast, a decision made in large part because Vandenberg's launch pads are less busy than the ones at Cape Canaveral's Kennedy Space Center in Florida. InSight's main mission is to check for quakes beneath Mars' surface, which will help us learn how our solar system was created and lay the groundwork for similar exploration of potentially habitable planets elsewhere in the universe. Although Earth and Mars are generally formed of the same material, scientists want to know why the two planets ended up different. In addition to science experiments, the lander also carries two tiny silicon wafers engraved with the names of 2.4 million people who signed up via a public awareness campaign. InSight is expected to reach Mars around Thanksgiving of this year, hitting the thin Martian atmosphere at about 13,200 mph, and then slowing down through friction, a parachute, and then right before reaching the surface, with thrusters. Even if the probe reaches Mars, there's no guarantee of success: Missions to the Red Planet have just a 40% success rate, NASA said. "The scary part is when we get to Mars," said Mr Tom Hoffman, the InSight project manager for NASA's Jet Propulsion Laboratory. "You never know what Mars is going to throw at you." Federal taxpayers have provided about \$813 million for the lander, with another \$180 million from Germany and France. JPL also funded an additional \$18.5 million to test two shoebox-sized "cubesats" that can act like cellphone towers, relaying information from the lander back to Earth. Those cubesats use inexpensive off-the-shelf technology and will help monitor the lander's descent. If all goes well, this will be the first time cubesats have been used anywhere but in Earth orbit and could lay the groundwork for their use in other space exploration as humans expand our search of the stars. By early 2019, scientists hope InSight's instruments will be reporting back everything from how often the planet quakes to how warm the soil is, thanks to a probe designed to burrow nearly 20 feet below ground. That probe will be "picked" off the top of the lander by a robotic arm, the first time one has been used on another planet. Color cameras will photograph the area around the lander, which was built to withstand temperatures as low as minus-148 degrees below zero. Because Mars is geologically more stable than Earth, its interior may hold answers that have been erased here at home.

Source: <https://www.usatoday.com>

'DRDO Is Taking New Challenges in AI And Robotics That Will Act As Force Multipliers'

The Defence Research & Development Organisation (DRDO) is an apogee among institutions under the government's Department of Defence Research and Development. It has since 1958, been indigenously developing military technology, weapons and equipment for the Indian Armed Forces. It has received both bouquets for India's home-grown missiles technology (Agni-V, NAG and the long-range LRSAM), rocket systems (Pinaka) and platforms – and brickbats for time and cost overruns. BW Businessworld's Mr Manish Kumar Jha catches up with DRDO Chairman and Secretary, Department of Defence R&D, S. Christopher, for an exclusive interview.

Next generation technology is going to influence warfare in the future. Please tell us about these new developments

War is serious business, as it tends to drain the economy, development and social fabric of any nation involved. Future wars would be short, swift, accurate and gain an upper hand during bargaining. That brings us to the importance of technology in futuristic wars affecting military doctrine and strategy. New dimensions of threat are posing radically new questions, demanding fundamentally new answers, buttressed by unconventional mindsets and integration of methods that facilitate both. The DRDO has identified specific technologies for low level of readiness and high strategic value, where scientific investigations are urgently required in laboratories, through modeling and simulation. In the future, Artificial Intelligence (AI), cyber elements, smart materials, smart ammunition, Soldier as a System, Military

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Robotics and Unmanned Systems, Network Centric, surveillance, long-range accurate weapons and systems, mobile launch pads and stealth technology will incapacitate the enemy, even before a full-scale war begins. They would also play a pivotal role in safeguarding our own assets. The aim would be to create an effect, without sending a soldier to a hostile land. Joint initiatives are on between the DRDO and academia at various Centres of Excellence for multi-institutional collaborative and directed research under technology verticals, like Directed Energy Technologies, Secure System and Cognition, Unmanned Systems and Robotics Technologies, Quantum Computing, Photonics, Plasmonics and Smart and Intelligent materials. These areas have been identified based on the requirements of future defence systems and where further scientific investigations are required to enhance indigenous capabilities.

The DRDO has earmarked Rs 18,000 crore for research and development (R&D) in the current year? Is it enough for your ongoing and next generation research?

Research and Development is a continuous process which also involves creating infrastructure for strategic projects apart from the cost involved in R&D. Investment in R&D is vital for the Make in India initiative. The Rs 18,000 crore allocated in this financial year will set things rolling, of which nearly 25 per cent - 30 per cent will go into newer projects, such as stealth technology for unmanned combat aerial vehicle (UCAV) and next generation critical technologies for Advanced Medium Combat Aircraft (AMCA), Next Gen integrated EW system, indigenous technology for cruise missile etc. We have a proposal to develop BrahMos next generation missiles. Funds have never hindered progress.

Where do we stand in the landscape of global research now when the Defence Production Policy 2018 envisions India as a global leader, especially in AI?

Modernisation of our Armed Forces is an on-going process and information technology plays a very crucial role in the process. In this context, keeping the roles of Artificial Intelligence, Robotics, and Drones as vital, the DRDO has carried out a number of Army-specific projects. The Artillery Command Control and Communication System (ACCCS) called Project 'Shakti', developed in the 1990's, has the third generation version that is now being deployed. The DRDO's Centre for AI and Robotics (CAIR) has developed robots for various kinds of inspection for aerospace manufacturing and nuclear reactor maintenance. Another DRDO laboratory Aeronautical Development Establishment, Bengaluru has developed the 'Nishant' and 'Rustom' variants of the UAVs for defence applications. A high performance computing facility is being set up in Hyderabad. Through these initiatives, the DRDO hopes to deliver critical AI and robotics technologies required for network-centric warfare capability and superiority of information of our Armed Forces. The DRDO is taking new challenges in AI and robotics that would act as force multipliers for our Armed Forces. We can confidently say that we are on par with many developed nations of the world and are catching up with the most advanced ones.

What is the objective of the proposed Innovation for Defence Excellence (iDEX)?

The iDEX has been recently launched by the Prime Minister at DefExpo 2018, Chennai.

The main objective of iDEX is to develop an ecosystem to foster innovation and technology development in defence and aerospace by involving industries including MSMEs, startups, individual innovators, R&D institutes and academia and provide them grants or funding and other support for R&D. The iDEX will enable funding, guidance, handholding, users' engagement and facilitation.

The DRDO is slated to show cutting-edge technological platform and benchmark for UCAV Ghatak and SWiFT. Could you elaborate ?

Unmanned Combat Air Vehicles (UCAV) are envisaged for complex missions where several types of aircraft and ground and Naval Forces may be present. The UCAV (Project GHATAK) around modified KAVERI dry engine and stealth technology is being taken up on a fast track. The objective of SWiFT (Stealth wing Flying Testbed) is to develop a flying wing test bed to demonstrate capabilities and technologies for future UCAV. Do you foresee substantial R&D by private players?

The Government of India is in the process of bringing out a new Defence Production Policy 2018 which encourages participation of private industries in R&D and production. It also encourages MSMEs, which may utilise DRDO test facilities.

Source: <http://businessworld.in/>

ISRO set to develop smart propellants for reusable launches

Indian Space Research Organisation (ISRO) is planning to develop world class propulsion technology to ensure cost effective re-usable, recoverable, re-startable and reliable space launches, said ISRO chairman Dr K Sivan in his video message for the annual National Conference on Emerging Trends in Aerospace Technologies – 'ASET' 2018 on future

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of propulsion at Liquid Propulsion Systems Centre (LPSC) Valiyamala here. Now, the latest in propulsion including electric, hybrid, cryogenic and nuclear power propulsion system is being developed indigenously at LPSC, Dr Sivan said. The attempt is to control the engine thrust to explore all landing modes including vertical and soft landing of launch vehicles, so that it can be reused, he said. Inaugurating the two-day conference being organised by Aeronautical Society of India (AeSI) Thiruvananthapuram chapter, eminent propulsion expert and LPSC founder director Dr AE Muthunayagam said the conference coincides with the 30th anniversary of LPSC. "India's space programme since its humble beginning at Thumba here has matured with world class capabilities. LPSC, since its inception in 1987, has overcome challenges to develop liquid, cryogenic and electric propellants," he said. VSSC director Dr S Somnath pointed out that ISRO will emerge as the torch-bearer of human space flight and interplanetary missions with the latest in propulsion technology which will be cost-effective and environment friendly. "Use of light materials and simplifying the technology to ensure soft landing, recovery and reuse of the launch vehicle, thereby ensuring the safety of the crew will be the focus and the future of space travel," he said. LPSC director Mr V Narayanan said LPSC over the years had developed many variants in solid, liquid and cryogenic propellants including the advanced C25 cryogenic upper stage engine. Now, LPSC is developing the 800 Newton liquid main engine propellant for Chandrayaan-2 Moon mission slated for launch in October, he said. AeSI chairman Dr G Ayyappan also pointed out that advanced propulsion systems are developed for space launches that are recoverable, reusable and reliable. ISRO Inertial Systems Unit (IISU) director D Sam Dayal Dev, ISRO Propulsion Complex (IPRC) director Mr S Pandian, and Indian Institute of Space Science and Technology (IIST) director Dr BN Suresh were also among the speakers at the event. India's space system is focused on developing smart propellants which will be equipped with artificial intelligence based sensors, they said. Seven invited lectures by eminent scientists, 50 oral presentations and aerospace technology expo formed part of the conference.

Source: <https://timesofindia.indiatimes.com/>

India gears up for AI-driven wars

To prepare the Army, the Navy and the Air Force for next-generation warfare

In an ambitious defence project, the government has started work on incorporating artificial intelligence (AI) to enhance the operational preparedness of the armed forces in a significant way, which would include equipping them with unmanned tanks, vessels, aerial vehicles and robotic weaponry. The move, part of a broader policy initiative to prepare the Army, Navy and the Air Force for next-generation warfare, comes amid rising Chinese investments in AI — an area of computer science devoted to creating intelligent machines — for its military.

Task force at work

Mr Ajay Kumar, Secretary, Defence Production, said the government had decided to introduce AI in all the three Forces as it would be a "big area" considering the requirements of future warfare. He said a high-powered task force headed by Tata Sons chairman Mr N. Chandrasekaran was finalising the specifics and framework of the project, which would be implemented in a "partnership model" between the armed forces and the private sector. "This [AI] is where the future is going to be. We need to prepare ourselves for the next-generation warfare which will be more and more technology-driven, more and more automated and robotised," he said.

Boosting capabilities

Like many other world powers, India had also started work on the application of AI to boost the capabilities of its armed forces, Mr. Kumar said, adding that unmanned aerial vehicles, naval vessels, tanks and automatic robotic rifles as weapon systems would have an extensive use in future wars. Military sources said the application of AI in border surveillance could significantly ease the pressure on armed forces personnel guarding the sensitive frontiers with China and Pakistan. China has been pouring billions of dollars into AI research and machine learning. The U.S., Britain, France and the European Union are also investing significantly in AI. The U.S. has been carrying out successful operations targeting terrorist hideouts in Afghanistan and Northwest Pakistan using drones which operate with the help of artificial intelligence. Mr. Kumar said the recommendations of the task force were likely to come in by June and then the government would take the project forward. The state-run Defence Research and Development Organisation (DRDO) would be a major player in the project, he said.

Source: <http://www.thehindu.com/>

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ISRO to rope in industry majors for mini-PSLV project

Indian Space Research Organisation (ISRO) will rope in private companies or consortiums for its mini-PSLV project aimed at tapping the small satellite launch market. ISRO chairman Dr K Sivan told TOI that the first such rocket is likely to be tested by the middle of next year. The project – first reported by TOI – involves assembling a small rocket in three days, at a lower cost. It takes 30 to 40 days to put together a normal PSLV, which is 44m tall and 2.8m in diameter. Dr Sivan said, “ISRO will initially build one or two mini rockets. Thereafter, private companies will be given the contract to build them. Antrix (ISRO’s commercial arm) is working on the business model.” The consortium of companies that will be given the task to build the mini rocket may include industry majors like Larsen & Toubro (L&T) and Godrej A PSLV costs around Rs150 crore, while a mini-PSLV can be made with one-tenth the money. The rocket will weigh one-third that of a normal PSLV which weighs 300 tonnes. The mini version will have a payload capacity of less than 700 kg, compared to a normal PSLV’s capacity to carry more than 1,750kg to a sun-synchronous polar orbit of 600km altitude. India’s satellites in such near-earth orbits are used for earth imaging, weather tracking and reconnaissance. The concept of the mini-rocket came from brainstorming sessions where ISRO scientists felt they need not spend on a normal PSLV when they have to launch smaller satellites, especially when there is a commercial demand for launching small satellites that weigh a few hundred kilos and Nano satellites that weigh less than 10kg. “Such small vehicles will be capable of launching multiple nano satellites,” Dr Sivan said in an earlier interaction with TOI. So far ISRO has been accommodating foreign satellites in its launch vehicles only as secondary passengers. The demand for smaller satellites and the short turnaround time for the mini-PSLV present ISRO with a commercial opportunity.

Source: <https://timesofindia.indiatimes.com/>

ISRO looking for industries to participate in launch of rockets

ISRO said it was looking at participation of a consortium of industries in the space agency’s plan to launch 12 to 18 rockets each year. “ISRO wants the industries to come forward and develop the finished product from raw material to processing, integration, testing and launching of rocket from Sriharikota, in our plan to launch 12 to 18 rockets each year,” said Mr S Pandian, director of Indian Space Research Organisation Propulsion complex at Mahendragiri near Kanyakumari. Speaking at the seventh edition of three-day SUBCON-2018 organised by the district industries association, he said space technology has to be taken to the unreachable in terms of remote-sensing, education, tele-medicine, defence and communication. Stating that the country is looking for transponders to cope with the demand, he said the number of TV channels on air was inadequate to meet the requirements of a family in modern times. “The goal of ISRO is to reach out to the unreachable,” Mr Pandian said.

Source: <https://timesofindia.indiatimes.com/>

Mahindra and Boeing team up to make F/A-18 fighters in India

India’s Mahindra Defense Systems, or MDS, a subsidiary of automaker Mahindra & Mahindra, has signed a deal with U.S. aircraft maker Boeing to build F/A-18 Super Hornet fighter jets in India. Hindustan Aeronautics will also participate. This is Mahindra’s first foray into offensive weaponry. Up to now it has made noncombat defense equipment, such as armored vehicles and radar systems. Representatives from the three companies unveiled the deal in April at the Defexpo India trade show in the southern city of Chennai. Details on when and where production will start, how many planes will be built and the cost of the project were not disclosed. A joint statement by the partners said they will manufacture the fighter locally for the Indian armed forces. The companies will also cooperate on research and development, the statement said. Mr A Mahindra insider said that the deal is based on a memorandum, and that details are yet to be worked out, but that the company will initially supply the fighter to the Indian military and may export in the future. Prime Minister Mr Narendra Modi and Defence Minister Ms Nirmala Sitharaman also expressed a desire to export homegrown weapons during the event. The statement did not specify the roles of the companies in the project, but a Mahindra executive said Boeing will license the technology for the F/A-18, HAL will be the main assembler of the plane and MDS will make components. The executive said the company’s experience in manufacturing aircraft parts and exporting in the civil aviation market will come in handy. At the trade show, MDS also announced it will work with ShinMaywa Industries to make components for the Japanese company’s US-2 amphibious rescue aircraft. MDS, established in 2012, had sales of 3.46 billion rupees (\$51.3 million) and a net profit of 126 million rupees on a parent-

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only basis in the year ended March 2017. The company has three defense-related subsidiaries, including a joint venture with Telephonics of the U.S., Mahindra Telephonics Integrated Systems, in which it has a 51% stake. Mahindra Telephonics' sales reached 200 million rupees in the year ended March 2017. Mahindra & Mahindra, which fully owns MDS, is primarily an automaker. It was India's No. 3 manufacturer of passenger cars and its second-largest commercial vehicle maker in the year ended March. The company also has a big slice of the SUV market and those skills help MDS in making armored vehicles. Experts say the success of the tie-up depends how many planes the Ministry of Defense decides to buy. The ministry determines the equipment needs of the armed forces. Annual spending on weapons and other defense equipment has fallen in recent years, according to documents released by a defense committee in the Indian parliament. The hardware budget has fallen since the fiscal year through March 2015, when it peaked at 736.5 billion rupees. As part of its push to foster the defense industry, the Modi government in 2014 raised the cap on foreign investment in the defense sector to 49% from 26%. Despite the policy change, foreign direct investment, which promotes technology transfers, has been flat. A senior Mahindra official hinted that the government is to blame for the vague partnership plans with Boeing. In an apparent show of frustration, the official said in an interview with the Nikkei Asian Review during Defexpo that more orders from the ministry would boost foreign investment, not the other way around. Considering that the air force is a more active buyer of weapons, in both total budget terms and in the number of direct orders to foreign companies, than India's other military branches, the MDS partnership with Boeing seems sensible. But if it wants a vibrant defense industry, Modi's government must devise a transparent and consistent national strategy explaining how it plans to promote domestic production. The government has cited procurement of defense equipment as an important part of bilateral diplomacy on many occasions. At the same time, it has tried to prioritize technology development through the Defense Ministry's Defense Research and Development Organization.

Source: <http://www.defencenews.in/>

ISRO urges industry to take up rocket launch

Dr S Pandian, Director, ISRO Propulsion Complex, Mahendragiri, hinted that the Indian Space Research Organisation is looking for some kind of industry consortium to take up rocket launch and move to greater heights. Urging industry participants to leverage their strength and partner with ISRO in this mission, he said: "the ISRO is targeting to launch 12-18 rockets (vehicles) every year from the next year. These vehicles will carry different satellites to meet the requirements of the common man. We have conceived lots of programme, want the industry to come forward and develop from raw material to processing, integration, testing and launching of the vehicle from Sriharikota. We want the rockets to be launched by the industry by 2020," Dr Pandian said, speaking at the 7th edition of SUBCON 2018 — a three-day event organised by Codissia Intec Technology Centre. Pandian also invited the MSMEs in this region to consider taking up ISRO's work package. "We have more than 500-600 work packages. Such packages are being outsourced at present. We will support by imparting training. All that we seek is expertise in electronics, mechanical integration, precision, reliability and quality," he said. Mr R Paneerselvam, Principal Director, MSME Technology Development Centre, Agra, said that the Ministry's focus is shifting to micro enterprises and big initiatives to give greater impetus to the MSME units is under way.

Source: <http://defencenews.in/>

L&T to set up Rs 500-cr facility to make Rocket Motors for ISRO and Space Air Frames for Brahmos

Larsen and Toubro (L&T) is all set to expand its defence component manufacturing facility in the district and set up an exclusive factory on its Malumichampatti campus at a cost of Rs 500 crore to manufacture rocket motors for the Indian Space Research Organisation (ISRO). Mr J D Patil, director, defence, L&T, said the factory would be ready within this financial year. "We have produced motors for Akash, which is an all-weather medium range surface-to-air missile system indigenously developed in India. Now, we plan to set up this factory to exclusively manufacture for ISRO. Their rocket motors are different from Akash, as the diameter is 2.8m and 3.2m and are massive. We will produce at least 10-12 sets a year which equals to nearly 50 sections of the motors," he said.

According to Mr Patil, the industry and the ecosystem here were good enough to produce precision equipment. "Earlier, we were only able to produce at our facility at Powai near Pune that was set up in 1940. Slowly, that entire unit will be shifted to Coimbatore. Even various orders from Baroda facility will be shifted to the district. We are going to take the number of factories to five here," he said. Patil said they would manufacture various components of satellites such as heat shields and other components that form the basic structural part of a satellite. "Currently, we are manufacturing these components in Baroda and we will shift all this to Coimbatore," he added. L&T would also produce

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space air frames for Brahmos Missile. Dr S Christopher, chairman, Defence Research and Development Organisation (DRDO) said they were working on unmanned aircraft project and various other missile programmes. About their association with ISRO, he said they were working together on a project named Kautilya. "We are also using the profit from the Brahmos programme to run an extended range programme," he said. About their production, he said, they had so far catered to the requirements of Air Force. "Army also has further requirement of Akash, however in 0.5 version. DRDO has already taken up the development. All these will be taken up from 2021 onwards. This product will have orders in another 3-4 years. The facility at Coimbatore will support us," Dr Christopher said. After the central government's Make in India drive to 'Indianise' all products, he said, the growth had gone up in the past 50 years by 60%. "Micro, Small and Medium Enterprises (MSMEs) are localised facilities and not integrated facilities. Corridors will help various individual MSMEs with their special expertise. Defence wants precision products and quality is very important. They can help in producing small fabrications and various components that can be integrated. Also, the government needs to invest to set up integrated defence manufacturing facilities," Dr Christopher said.

Source: <http://defencenews.in/>

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