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IAF's LCA Tejas to show flying skills at Singapore Airshow



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Successful launch of PSLV-C52 with EOS-04 Satellite



India's Polar Satellite Launch Vehicle PSLV-C52 injected Earth Observation Satellite EOS-04, into an intended sun synchronous polar orbit of 529 km altitude at 06:17 hours IST on February 14, 2022 from Satish Dhawan Space Centre, SHAR, Sriharikota. PSLV lifted off at 05:59 hours IST from the first launch pad at SHAR. This was the 80th launch vehicle mission from SDSC SHAR, Sriharikota; 54th flight of PSLV; and the 23rd flight of PSLV in XL configuration (6 strap-on motors). The satellite EOS-04 is realised at U R Rao Satellite Centre, Bengaluru. It is a Radar Imaging Satellite designed to provide high quality images under all weather conditions for applications such as Agriculture, Forestry & Plantations, Soil Moisture & Hydrology and Flood mapping. Weighing about 1710 kg, it generates 2280 W power and has a mission life of 10 years. The vehicle also placed two small satellites a student satellite (INSPIRESat-1) from Indian Institute of Space Science & Technology (IIST) in association with Laboratory of Atmospheric & Space Physics at University of Colorado, Boulder and a technology demonstrator satellite (INS-2TD) from ISRO, which is a precursor to India-Bhutan Joint Satellite (INS-2B). Co-passenger satellites were successfully separated from the PSLV in a predetermined sequence. ISRO Chairman Shri S Somanath congratulated team ISRO for the precision with which the mission was accomplished.

Source: <https://www.isro.gov.in/>

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CURRENT AFFAIRS

Successful post mission disposal of INSAT-4B Satellite

As a part of India's continual efforts towards preservation of the long-term sustainability of outer space, INSAT-4B has undergone post mission disposal (PMD) at the end of its life, followed by decommissioning on 24 January 2022, to comply with the UN and the Inter Agency Space Debris Coordination Committee (IADC) recommended space debris mitigation guidelines. INSAT-4B is the 21st Indian GEO satellite to undergo post-mission disposal, the required propellant for such re-orbiting was included in the initial fuel budget as a part of standard practice followed in ISRO's GEO mission planning. The finally achieved orbit is about 340 km above GEO altitude in perfect compliance with IADC guidelines for space debris mitigation of GEO objects. The successful post-mission disposal of INSAT-4B through meticulous planning and flawless execution marks yet another endeavour by ISRO to ensure the safety and sustainability of outer space operations.

<https://www.ISRO.gov.in/>

India flight tests Rafale-Marine for INS Vikrant

The marine version of the French-made Rafale fighter jet has been successfully flighttested at a shore-based facility in Goa where conditions similar to that on the indigenously developed aircraft carrier INS Vikrant were simulated, a top diplomat said. The Rafale-M is pitted against the U.S.-made Super Hornet — both of which are being evaluated for a possible purchase by the Indian Navy for deployment on the 44,000-tonne INS Vikrant that is undergoing trials in the Arabian Sea and the Bay of Bengal for likely commissioning in August. "Tests were done to check its [Rafale-Marine's] take-off [capability] from the deck of your [India's] carrier and it has done very well," French Ambassador to India Emmanuel Lenain told journalists on February 1 evening in Kolkata in a free-wheeling conversation. India's new aircraft carrier has been designed as a ski-jump launch ship, different from many other such carriers, which use a catapult launch for their jets. The aircraft selected by the Indian Navy consequently must be capable of taking off in this fashion, carrying all weapon systems and full fuel load. The Rafale-M jet was tested for 12 days last month at Goa's INS Hansa facility using a 283 metre mock ski-jump facility, Mr. Lenain said. The ski-jump ramp uses what naval experts call short take-off but arrested recovery (STOBAR) technology. Boeing's Super Hornet or F/A-18 jet, which is also being offered to India, is expected to undergo similar tests at INS Hansa next month. The suppliers have made modifications to both Rafale-M and Super Hornet to make them suitable for the Indian order, defence sources said. The Navy was looking for an aircraft that is capable of delivering nuclear loads, air-to-air and air-to-ground missiles, and precision-guided bombs, they said. The Navy wants to initially purchase 26 jets for its aircraft carrier, though it had issued in 2017 a Request for Information (RFI) for 57 multirole aircraft capable of being launched from carriers. The RFI was issued as the Navy will be phasing out the MiG-29Ks, currently being used on INS Vikramaditya — a modified Kiev class carrier — in 2034. A file picture of a Rafale fighter jet. | Photo Credit: K. Murali Kumar 11 Ambassador Lenain pointed out that Indian Air Force was already using Rafale fighter jets and "was very satisfied with the aircraft". Since the IAF has Rafale jets, a Naval order would build on commonality, he said. "We have already supplied 35 Rafales in the last order and will complete it by sending the 36th before the deadline in April," he said. India had in 2016 placed the order for the jets with Dassault in a fly-away condition.



<https://www.thehindu.com/news/national/india-flight-tests-rafale-marine-for-ins-vikrant/article38364438.ece>

Chandrayaan-3 targeted this year; corrections in progress, hardware realisation almost done

The Indian Space Research Organisation (ISRO), which has a packed year ahead of it, has made considerable progress on its third moon mission — Chandrayaan-3. With many related hardware and their special tests having been successfully completed, the team is moving closer to integrated testing. ISRO Chairman S Somanath told TOI: “Chandrayaan-3 has been going through a series of reviews, improvements, and strengthening. Some of these are based on the issues we’ve seen earlier. But the issues we’ve learnt so far may not be the only ones. The questions are many and we need to foresee a lot of them, which may further require corrections. The hardware is under realisation too.” While Somanath is expected to conduct a formal review of the project later this month, minister of state, department of space, Jitendra Singh, has said that based on the learnings from Chandrayaan-2 and suggestions made by the national-level experts, the realisation of Chandrayaan-3 is in progress. “The launch is scheduled for August 2022,” he added. According to more than one scientist associated with the project, testing and fabrication of the lander and other systems that will be part of Chandrayaan-3 is ongoing at various ISRO centres while design changes have been nearly finalised. ISRO conceived Chandrayaan-3 after it failed to soft-land Vikram (lander) on the lunar surface while it still has a fully operational orbiter of Chandrayaan-2 going around Moon. While the mission was initially planned for late 2020 or 2021, the department of space (DoS), owing to Covid-19, had said earlier this year that the launch is being targeted for 2022. “...Because we need a specific launch window, we need to work towards a deadline, failing which it will have to move to next year. But the top management is very clear that all steps in the process will be complete before we actually launch the mission,” a source said. In his New Year message on January 3, then ISRO chairman K Sivan had said: “Chandrayaan-3 design changes incorporating and testing has seen huge progress. The mission could be launched by the middle of the year.” As reported first by TOI, Chandrayaan-3 will see major design changes compared to the previous mission, key among which is the decision to drop the fifth engine, which was added last minute on Vikram (Chandrayaan-2’s lander). The lander for this mission will have only four engines, while the overseeing committee has also suggested a minor modification on the legs on the lander, inclusion of the laser doppler velocimeter (LDV) for better measurement of speed during landing, among other things. The modifications being proposed on Chandrayaan-3 — which were indicators of shortcomings in Chandrayaan-2 — also include changes in software and algorithms, strengthening of the legs and better power and communication systems. That the Union Budget 2022-23 among other things has listed one mission of GSLV-Mk3 is also seen as reasons for optimism so far as Chandrayaan-3 is concerned.

<https://timesofindia.indiatimes.com/india/chandrayaan-3-targeted-this-year-corrections-in-progresshardware-realisation-almost-done/articleshow/89322779.cms>

Indian Air Force’s biggest war drill to be held at Pokhran

The Indian Air Force’s biggest war exercise Vayushakti-2022 will be held at Pokhran field firing range on March 5. Around 140 planes including 100 fighter planes will take part in the drill. Earlier, the exercise was scheduled to be held on February 10. President Ramnath Kovind, PM Narendra Modi, Defence Minister Rajnath Singh, chief of three armies and other dignitaries are expected to witness IAF’s grand demonstration of capability. For the purpose, a meeting of Air Force Station, Jaisalmer station commander group captain Amardeep Singh Pannu and district collector was organised at the Air Force Station. Pannu sought cooperation of the administration. Officials reviewed the supply of drinking water, power supply, housing arrangements, road repair works at Air Force range and Air Force Station, Jaisalmer, repairing of the main road in Chandan range, its cleanliness and beautification, cleaning of the city, security and traffic arrangements, medical arrangements, internet, etc. District collector Pratibha Singh assured to extend all cooperation for Vayushakti-2022 and assured that the expected information will be sent on time so that high level arrangements can be made. Officers from the Air Force and administration attended the meeting. According to Army official sources, IAF has started the preparations in Chandhan range for the fire power demonstration. Many fighter planes are passing over Jaisalmer and practising hitting the targets. According to the sources, many kinds of missiles will be used in this war exercise. Rafale planes will also be used and the MICA missile fitted to it will be a special attraction. Moreover, Sukhoi-30, Mkl, MiG29, LCA Tejas, Mirage 2000, MiG-21 Bison, hawk and jaguar will be part of the exercise. Apache, Chinook and Dhruv helicopters will take part in night operations and will hit targets. This war exercise is held once in

three years. Many types of operations will take place in this exercise including defensive counter air, offensive counter air, counter air strike, suppress enemy air defence and target of opportunity. Female pilots are also taking part in this exercise. They will fly MiG-21 Bison fighter planes. Till now, 10 women fighter pilots have confirmed participation and three more are expected to join the exercise.

<https://timesofindia.indiatimes.com/city/jaipur/iafs-biggest-war-drill-to-be-held-at-pokhran/articleshow/89356682.cms>

IAF's LCA Tejas to show flying skills at Singapore Airshow

"The single jet performance will bring impressive stunts and manoeuvres to Singapore's skies," the airshow organisers, Experia, said on February 7. Singapore: The Indian Air Force's Light Combat Aircraft (LCA) Tejas will be showcasing its flying skills at the Singapore Airshow 2022 being held from February 15 to 18. "The single jet performance will bring impressive stunts and manoeuvres to Singapore's skies," the airshow organisers, Experia, said on February 7. "The airshow will have eight flying displays and flypasts from four air forces and two commercial companies," it said. The Tejas aircraft had also participated in the Dubai Airshow in November last year. Tejas, manufactured by State-run aerospace giant Hindustan Aeronautics Limited, is a single engine and highly agile multi-role supersonic fighter aircraft capable of operating in high-threat air environments. 3 The aircraft is a potent platform for air combat and offensive air support missions while reconnaissance and anti-ship operations are its secondary roles. Apart from the IAF LCA, the U.S. military, the Indonesian Aerobatic Team and the Singapore Air Force will put up airshows, the organisers said. Nearly 600 companies will participate as well. Last seen at the 2018 Singapore Airshow, Indonesia's Jupiter Aerobatic Team, also known as "The Jupiters", will thrill the audiences with their six-plane formations and precision flying. Returning with two performances this year, the Republic of Singapore Air Force will feature an F-16C fighter jet displaying solo aerobatics and a pair of AH-64D Apache attack helicopters. The United States Marine Corps' F-35B Lightning II, the world's first short-takeoff, vertical landing stealth fighter, will also be featured at the airshow along with the United States Air Force's B-52 Stratofortress in a fly-by. "An integral part of the Singapore Airshow, the flying displays are testament to the strong bilateral ties that Singapore has with the participating Air Forces, and brings together attendees from all across the world to interact at this biennial event," said Experia. Commercial plane watchers can also expect to see demo fly overs by Airbus' A350-1000 and Boeing's wide-bodied B777-9, it said. Members of the public will be able to catch these spectacular display performances via livestream. Experia Managing Director Leck Chet Lam said, "We are excited to present the much anticipated flying displays at this year's Singapore Airshow, a key highlight that brings the global aerospace and aviation industry together for this biennial event. "These stellar performances by our partners and exhibitors are testament to the recovery of the aerospace and aviation industry and we hope they will uplift spirits," he said.



<https://www.thehindu.com/news/international/iafs-lca-tejas-to-show-flying-skills-at-singaporeairshow/article38391631.ece>

PSLV-C52/ EOS-03 mission successful; ISRO places three satellites in orbits

The Indian Space Research Organisation opened its 2022 account with the successful launch of radar imaging satellite EOS-04 and two others onboard PSLV-C52. The launch comes nearly six months after the failed GSLV-F10/EOS-03 mission. According to ISRO, the cryogenic upper stage ignition did not happen due to a technical anomaly during the GSLV-F10/EOS-03 launch on August 12, 2021. At 5.59am, PSLV-C52 lifted off from the first launch pad at Satish Dhawan Space Centre in Sriharikota with three satellites, including its primary payload EOS-04 radar imaging satellite. Around 17 minutes after lift-off, EOS-04 satellite was placed in a sun synchronous orbit. A minute later, the rocket injected the two other satellites — INS-2TD and Inspiresat-1. Around four minutes later – that is 22 minutes after lift-off — the fourth stage was passivated to remove remaining propellants, with mixed oxides of nitrogen (MON) passivation followed by mono methyl hydrazine (MMH) passivation, two propellants that power PSLV's upper stage. The passivation lasted for 10 minutes. Passivation is the removal of any leftover fuel in the rocket to prevent the explosion of rocket upper stages. The upper stage either performs an idle burn or vent the remaining propellants. PSLV C52 takes off from Sriharikota. 25 The mission was PSLV's 54th flight and 23rd mission using PSLV-XL configuration with six PSOM-XLs. Congratulating the team, ISRO chairman S Somanath said, "The primary satellite, EOS-04, has been put in a very precise orbit by PSLV-C52. Co-passenger satellites INS-2TD and INSPIRESat-1 have also been placed in the right orbits. This spacecraft is going to be one of the biggest assets to serve the country. We will be back again with another launch of PSLV very soon." Satellite director Srikanth said, "Let me first congratulate the PSLV team on precise inject of EOS-04. The launch has rejuvenated ISRO team once again. The most awaited spacecraft, EOS-04, is an earth observation mission, all weather, day and night imaging SAR mission with indigenously developed state-of-the-art technology SAR and will serve the country in the sectors of agriculture, soil moisture, disaster management, disaster assessment, carbon inventory, forest and plantation management and many more sectors." "The health of EOS-04 is perfectly fine after separation. I am happy to share that the solar panels are deployed autonomously and started generating the designed power.... In a couple of days after calibration and braking for outgassing, the satellite will be ready to deliver the glimpse of images. The services will be an integral part of many governmental services. EOS-04 has taken a small step in the nation's dream of opening the space sector with the industry participation in the form of build to print and also assemble and test. We have fairly succeeded in our effort." Satellites EOS-04, a radar imaging satellite with a mission life of 10 years, is designed to provide high quality images under all weather conditions for applications like agriculture, forestry and plantations, flood mapping, soil moisture and hydrology. Collecting earth observation data in Cband, it complements/supplements the data from Resourcesat, Cartosat series and RISAT-2B series. INS-2TD is a technology demonstrator from ISRO with a mission life of six months, which is a precursor to the India-Bhutan joint satellite (INS-2B). Having a thermal imaging camera as its payload, the satellite benefits from the assessment of land surface temperature, water surface temperature of wetlands/lakes, delineation of vegetation (crops and forest) and thermal inertia (day/night). Inspiresat-1 is a student satellite with a mission life of one year developed by Indian Institute of Space Science and Technology (IIST), in association with University of Colorado in the US. Other contributions are NTU, Singapore and NCU, Taiwan. Two scientific payloads improve the understanding of ionosphere dynamics and the sun's orbital heating processes.

<https://timesofindia.indiatimes.com/india/pslv-c52-eos-03-mission-successful-ISRO-places-three-satellites-in-orbits/articleshow/89554668.cms>

DRDO's multi-level strategic ability placed India among top nations, says DRDO D-G

Director-General of Defence Research Development Organisation, Hyderabad, Tessy Thomas said that the DRDO's efforts positioned the nation among the top few countries in the world with multilevel strategic capability. These include the Agni series, anti-ballistic missile programmes, underwater weapon systems, main battle tanks, multi-range radar systems, electronic warfare, fighter aircraft, Light Combat Aircraft and its variants, and airborne early warning and control systems. Ms. Thomas was addressing a virtual meeting of fourth edition of SRM University- Research Day, in which she appreciated the efforts of SRM AP in entering into new areas of research and encouraged the scholars to contribute to the country's growth by developing indigenous technologies. The Research Day was an excellent

opportunity for the faculty members, research scholars and students of SRM University-AP to exchange and exhibit their ideas on research, she said. Pro Vice Chancellor, SRM University, D. Narayana Rao said that India needed to gradually move from a net consumer of knowledge to a net producer of knowledge as the country emerged as one of the world's largest economies. "The SRM University-AP provides faculty members and research scholars the required support to carry out research in new domains of knowledge," Mr. Narayana Rao said. During the next 25 years, the faculty members and research scholars of SRM AP would pursue significant and outstanding research in the areas of water resources and management, blue economy, self-diagnostic medical devices, new-age medicine, hydrogen as a potential replacement of fossil fuels and many more branches of scientific knowledge, he said. Vice-Chancellor V.S. Rao recollected the interaction he had with Ms. Thomas in BITS Hyderabad, and invited her to visit the SRM University-AP campus to converse with the students. During interaction with students and faculty members, Ms. Thomas elaborated how industrial and academic collaborations facilitated the development of indigenous technologies. Among the 285 submissions from students and from the faculty community of SRM AP on various thematic areas, selected papers were awarded gold and silver medals.

<https://www.thehindu.com/news/national/andhra-pradesh/drds-multi-level-strategic-ability-placed-indiaamong-top-nations-says-drdo-d-g/article65065548.ece>

IAF to deploy LCA Tejas at multilateral air exercise in U.K.

In a first, Indian Air Force (IAF) will deploy the indigenous Light Combat Aircraft (LCA) Tejas for multilateral air exercise 'Cobra Warrior' at Waddington, U.K., which will also see the participation of Air Forces of Belgium, Saudi Arabia, Sweden and the U.S., defence officials said. The exercise is scheduled from March 6 to 27. "Five Tejas aircraft will fly to the U.K. IAF C-17 aircraft will provide the necessary transport support for induction and de-induction," the IAF said in a statement. "IAF LCA will participate in the exercise along with fighter aircraft of the U.K. and other leading Air Forces." Greater exposure This edition the U.K. was to host the exercise, so instead of a bilateral exercise, they invited us to join the multilateral format which would give us greater exposure, a defence official said. The exercise is aimed at providing operational exposure and to share best practices amongst the participating Air Forces, thereby enhancing combat capability and forging bonds of friendship, the IAF said. "This will be a platform for LCA Tejas to demonstrate its manoeuvrability and operational capability," it stated. The IAF would be fielding the LCA in Final Operational Clearance (FOC) configuration for the exercise, it has been learnt. The IAF has two squadrons of the LCA and has placed order for 83 LCA-Mk1A which are more capable than the IOC and FOC variants in service. Air exercise Indradhanush between India and the U.K. began in 2013 and the fifth edition was held at Air Force Station Hindan in February 2020.

<https://www.thehindu.com/news/national/iaf-to-deploy-lca-tejas-at-multilateral-air-exercise-inuk/article65077018.ece>

First Sea sortie of fifth Scorpene Submarine 'VAGIR'

The fifth submarine of Project 75, Yard 11879, Indian Navy's Kalvari class commenced her sea trials on 01 Feb 22. The submarine was launched in Nov 2020 from the Kanhoji Angre Wet Basin of Mazagon Dock Shipbuilders Limited (MDL). The submarine would be named Vagir, after commissioning. Despite the COVID pandemic, MDL has 'Delivered' two submarines of the Project – 75 in the year 2021 and the commencement of sea trials of the fifth submarine is a significant milestone. The submarine will now undergo intense trials of all its systems at sea, including propulsion systems, weapons and sensors. The submarine is scheduled for delivery to the Indian Navy in the year 2022 after completion of these trials.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1794765>

IIST has a role in ISRO's first launch of the year

The Indian Space Research Organisation's (ISRO) first launch of the year, scheduled for a Valentine's Day lift-off from Sriharikota, will be a thrilling moment for the Indian Institute of Space Science and Technology (IIST) at Valiamala here. The Polar Satellite Launch Vehicle C-52 (PSLV C-52/EOS-04) mission will have on board three satellites, and one of them is a small student satellite weighing just 8.1 kg. INSPIRESat-1, as the cubesat is named, is a joint effort by the IIST, the Laboratory of Atmospheric Science and Physics (LASP) at the University of Colorado Boulder, US, the Nanyang Technological University (NTU), Singapore, and the National Central University (NCU), Taiwan. INSPIRE - short for the International Space Program in Research and Education which kicked off in 2017 - envisions a constellation of earth and space weather observation satellites. The main payload Aboard the PSLV C-52, INSPIRESat-1 will be one of two 'co-passengers' sharing space with the main payload, the 1,710-kg radar imaging satellite EOS-04. The other small satellite is the 17.5 kg INS-TD, a technology demonstrator from ISRO. The Indian space agency has scheduled the launch for 5.59 a.m. from the first launch pad of the Satish Dhawan Space Centre, Sriharikota. IIST contribution To be placed in a low earth orbit, INSPIRESat-1 has a mission life of one year. It consists of two scientific payloads designed to improve our knowledge of ionosphere dynamics and the sun's coronal heating processes, according to ISRO and IIST. Design and development of the onboard computer and the electrical power supply for the satellite were carried out by the IIST team. The satellite was ready last year, but the COVID-19 pandemic which played havoc with the ISRO launch calendar delayed its launch. Although it bears the serial number '1,' INSPIRESat-1 is in reality the third satellite in the constellation to be launched, but it will be the first by ISRO. INSPIRESat-2 and 5 were launched by SpaceX. Benefiting students The INSPIRE programme has been a rewarding experience both for the students and faculty of IIST, the institute's registrar Y.V.N. Krishna Murthy said. Not only has it given the students insights into spacecraft design and development, but it has also equipped them for handling collaborative projects, he said. The PSLV C-52/EOS-04 mission will mark the 54th flight of the PSLV, often dubbed the 'reliable workhorse' of ISRO. It aims to place the main payload, the EOS-04 satellite, in a sun synchronous orbit. This satellite will have a mission life of 10 years.

<https://www.thehindu.com/news/national/kerala/iist-has-a-role-in-ISROs-first-launch-of-the-year/article38418892.ece>

India finally taking some steps to leverage AI for military applications

India is now finally taking some steps towards ensuring effective use of artificial intelligence (AI) in fighting conflicts, which is fast becoming a critical operational necessity that may well decide the outcome of wars in the future. Top officials say the defence establishment, ranging from the Army, Navy and IAF to DRDO labs, is increasingly focusing on AI to enable faster decision-making and shortening the sensor-to shooter loop, AI-powered surveillance and weapon systems. But it's early days yet. India should get cracking on "a national mission-mode action plan" to effectively leverage AI and ML (machine learning) for military applications, with concrete participation from the IT industry and academia, the officials said. China, of course, is leagues ahead with its long-standing focus on "informatized" and "intelligentized" warfare. "AI, ML, lethal autonomous weapon systems (LAWS), robotics and cyberwarfare have been major thrust areas for the People's Liberation Army...It has taken huge strides in them," a senior officer said. The Indian defence establishment, on its part, now has a Defence Artificial Intelligence Council (DAIC) led by the defence minister to provide overall guidance and support. Defence minister Rajnath Singh, incidentally, had earlier declared that "25 defence-specific AI products" will be developed by 2024. A Defence AI Project Agency (DAIPA) has also been created under the secretary (defence production), with Rs 100 crore earmarked annually for AI-enabled projects. Individual services are also cranking up their own efforts. The Navy, for instance, has 30 ongoing AI projects encompassing autonomous systems, maritime domain awareness, perimeter security, decision-making, predictive inventory maintenance and management. Apart from setting up an "AI core group", the Navy is also creating an AI centre of excellence at INS Valsura in Jamnagar, which already has a modern lab on AI and Big Data analysis. The Army, too, has several schemes underway on contemporary and emerging AI technologies. Apart from

civil industry partnerships, an AI centre of excellence has been established at the Military College for Telecommunication Engineering in Mhow. Application-oriented research in AI is also being conducted at two dedicated DRDO labs, Centre for Artificial Intelligence and Robotics (CAIR) and DRDO Young Scientist Laboratory (DYSL)-AI, both at Bengaluru. Moreover, all DRDO system labs have started AI technology groups to introduce AI features in all products. But with countries like the US and China galloping towards AI-driven warfare, there is widespread acceptance that much more needs to be done on this “disruptive technology” front to boost the combat capability and survivability of Indian forces. “The Israel-Hamas conflict last year firmly underscored the power of AI,” said Army chief General M M Naravane, at a seminar recently. “Improved situational awareness, fusion of sensors, faster decision-making, use of autonomous weapons, and integration of AI into every facet of warfare, will necessitate changes to war fighting doctrines, organisations and structures, training methodology and leadership. For militaries across the world as well as for us, this remains an ongoing challenge, and a work in progress,” he added.

<https://timesofindia.indiatimes.com/india/india-finally-taking-some-steps-to-leverage-ai-for-militaryapplications/articleshow/89559262.cms>

Hyderabad based ATL plays key role in ISRO's successful PSLV launch

ATL has been associated with ISRO for manufacturing various electronics and mechanical sub-systems Hyderabad: Indian Space Research Organisation (ISRO)'s latest Polar Satellite Launch Vehicle (PSLV C-52) successful mission into space once again saw a critical role played by the city-based Ananth Technologies Limited (ATL) in carrying out the ‘sub-assemblies of various flight systems, integration, and checkouts’. “This PSLV C-52 mission has also been unique for its different stages harnessed, integrated, tested and qualified by us. We have been a long-term partner with the ISRO's Vikram Sarabhai Space Centre (VSSC) and taking guidance from its engineers”, said founder, chairman & managing director of ATL Subba Rao Pavuluri. The company's Thiruvananthapuram unit has worked on various stages of the rocket like fabrication, assembly, testing, avionics packages such as on-board computers, control electronics, telemetry, power systems etc., while the Bengaluru manufacturing unit has contributed to the satellite mission through many other key avionics systems, he explained. The ISRO's PSLV C-52 carrying three satellites successfully lifting off from the first launch-pad Satish Dhawan Space Centre at Sriharikota in Andhra Pradesh, February 14, 2022. | Photo Credit: B. Jothi Ramalingam 15 Headquartered in the city, the ATL has been involved with the ISRO missions for the last three decades associated with manufacturing of various electronics and mechanical sub-systems for launch vehicles, satellites, spacecraft payloads, and ground systems. “We are thankful for the ISRO in reposing trust in us all these years. We have also been providing geo-spatial data and services for developmental projects in the country. Plus, manufacturing critical aerospace sub-systems for the strategic sector such as avionics packages, sensors, communication systems, sophisticated flight systems and the likes,” informed Dr. Subba Rao. The CMD also highlighted ATL has provided to ISRO ‘zero-defect manufacturing support’ to around 69 launch vehicles and 89 spacecraft so far. The firm has recently formed a joint venture with the United States (U.S.) based Saturn Satellite Networks (SSN), for building advanced small-to-medium-sized satellites specifically be suitable to be launched on-board India's PSLV and SSLV – Small Satellite Launch Vehicle, he said. ATL has also entered into agreements with reputed aerospace and space companies of Europe, the U.S., and Russia for specialized manufacturing services, said Dr. Subba Rao and observed that government opening the space sector for ‘enhanced participation’ of private industries in all areas would help in the resolve for self-reliance under the ‘Atmanirbhar Bharat’.

<https://www.thehindu.com/news/national/telangana/hyderabad-based-atl-plays-key-role-in-ISROs-successfulpslv-launch/article65048368.ece>

TECHNOLOGY

New technology to repair Aerospace components

Key facts

- The new technology will completely repair and restore high-value components like turbine blades, moulds, and other aerospace components requiring minimal human intervention.
- This technology will leap-frog the repair and restoration industry to the next level.
- It will also help in nucleation of cutting-edge laser manufacturing ecosystem for Atmanirbhar Bharat.
- It has been developed with support from department of science & technology led “Advanced Manufacturing Technology Programme”.

How is the new technology significant? The development of new technology is significant because, existing repair techniques in India like thermal spraying and welding are ad hoc. They do not provide accuracy and precision. These techniques are manual. The quality of repair depends on skill set of the person.

Who has developed the new technology? The new technology has been developed by Professor Ramesh Kumar Singh, from Mechanical Engineering Department of IIT Bombay.

How this technology works?

- The new technology uses a laser for excellent process control. It is completely autonomous and have minimal to zero human intervention.
- With the help of new technology, defective component will be scanned autonomously for damage detection using a laser scanner.
- Deposition path will be determined on the basis of certain algorithms.
- Laser-directed energy deposition (LDED) technique will be used for depositing the material, followed by finishing and automated inspection of restored product.
- Process parameters will be obtained from physics-based models for inducing favourable residual stress. This makes way for development of a science enabled technology’ solutions which are not available to restore high-value components.

Robotic Restoration System: It comprises of a robotic restoration system and has been designed to function autonomously for all key activities like damage detection, scanning path planning, deposition, finishing, and inspection.

<https://www.gktoday.in/>

Key landing test will push reusable vehicle RLV-TD closer to Orbital Re-Entry mission

ISRO, which has been making quiet progress on the reusable launch vehicle technology demonstrator (RLV-TD) is looking to carry out a key landing Experiment — RLVLEX — in the next few months that will push it closer to an orbital re-entry experiment (ORE). The planned landing experiment will be carried out in Challakere in Chitradurga district, some 220km from Bengaluru. ISRO chairman S Somanath, while confirming that the agency has planned the RLV-LEX this year, said: “...We will be demonstrating one of the critical technologies — the approach and autonomous landing on a runway. This will happen in Challakere. We are preparing for the test and systems are being readied. We will soon make an announcement.” In the LEX, the vehicle will be carried using a helicopter to an altitude of about 3km to 5 km

and released at a distance of approximately 4km to 5km ahead of the runway with a horizontal velocity. As per ISRO, after the release, the RLV glides, navigates towards the runway and carries out a conventional autonomous landing with a landing gear. S Unnikrishnan Nair, director, Vikram Sarabhai Space Centre (VSSC), said: "We are planning for the test in the next three to four months, the hardware is nearly ready. The RLV will be released from the helicopter under controlled conditions. It will have various control systems, including its own navigation and guidance control systems and aerodynamics sensors etc. This experiment will simulate the last 800m to 1km of the actual orbital mission." Pointing out how landing is among the most complex activities in any mission, Nair said the RLV-LEX would take the technology demonstration one step closer to the planned ORE. "Once we successfully complete this mission and we have validated the software, landing gear and get data on how the aerodynamics sensors worked to manoeuvre the aircraft and bring it back to the intended spot on the runway and other critical technologies, we will be ready for the orbital reentry experiment. For this the RLV will be scaled up," Nair said. As per ISRO, in ORE, a wing body called Orbital Re-entry vehicle (ORV) will be taken to an orbit by an ascent vehicle derived from the existing GSLV and PSLV stages and stay in orbit for a stipulated period, re-enter and land in a runway autonomously with a landing gear. "Before the RLV-LEX we'd done the RLV-TD HEX-01 (hypersonic experiment) mission in which we successfully validated autonomous navigation, guidance & control, reusable thermal protection system and re-entry mission management. Once LEX is done, we'll need to integrate both for the ORE," Nair said. Carried out on May 23, 2016, the RLV-TD HEX was a 770-second suborbital flight and designed to land on sea. The experimental mission saw the HS9 solid rocket booster carrying RLVTD to a height of about 65km from where the vehicle began its descent followed by atmospheric re-entry at around Mach 5 (five times the speed of sound). ISRO, which has been working on this technology for more than a decade, decided to develop it primarily to address the cost and time issues. "The cost of access to space is the major deterrent in space exploration and space utilisation. A reusable launch vehicle is the unanimous solution to achieve low cost, reliable and on-demand space access," ISRO has said. However, mastering this technology will provide multiple other benefits, including in development of different types of launch vehicles, space transportation and so on. While the ORE will be a major milestone, the RLV-TD is only a technology demonstrator and the development of an actual re-usable launch vehicle will take more time.



<https://timesofindia.indiatimes.com/home/science/key-landing-test-will-push-reusable-vehicle-rlv-td-closeto-orbital-re-entry-mission/articleshow/89596282.cms>

BUSINESS

ISRO since 1975 launched 129 Indian and 342 foreign satellites

The Indian Space Research Organisation (ISRO) has, since 1975, launched a total of 129 satellites of Indian origin and 342 foreign satellites of 36 countries, of which 39 satellites are commercial satellites and rest nano satellites, the Parliament was informed. "India has a total of 53 operational satellites in space providing various identified services to the nation. Total 21 of these are communication satellites, eight are navigation satellites, 21 are Earth observation satellites and three are science satellites," Union Minister of State for Space, Dr Jitendra Singh told the Rajya Sabha in written replies to two different questions. From 2016-2017 to 2021-2022, a total of 285 customer satellites from 29 foreign countries were successfully launched on-board PSLV on a commercial basis. The number of foreign satellites

launched year-wise are 122 in 2016-2017, 57 in 2017-2018, 32 in 2018 -2019, 50 in 2019-2020, and 23 in 2020-2021, he said. The satellite enabled data and services are being used for the benefit of various sectors of the country. These include television broadcasting, Direct-to-Home, ATM, mobile communication, tele-education, tele-medicine and advisories on weather, pest infestation, agro-meteorology, and potential fishing zones. Satellite data is also used for crop production estimation, crop intensification, and agricultural drought assessment, wasteland inventory, identifying ground water prospect zones, inland aquaculture suitability and disaster risk reduction, he said. The ISRO has plans to launch more satellites to further enhance operational applications and cater to the needs of emerging applications and user requirements in the country, the Minister added. Many of the applications have been effectively adopted by stakeholder departments for operational use. A few of such applications include: potential fishing zone forecast and ocean state forecast by the Indian National Centre for Ocean Information Services under the Ministry of Earth Sciences, crop acreage and production forecasting and national agricultural drought assessment and monitoring system by the Mahalanobis National Crop Forecast Centre of the Ministry of Agriculture and Farmers Welfare), biennial forest cover assessment by the Forest Survey of India under the Ministry of Environment, Forest, and Climate Change, irrigation infrastructure assessment by the Central Water Commission under the Ministry of Jal Shakti, weather forecasting by the India Meteorological Department under the Ministry of Earth Science, ground water prospect and suitable recharge locations' mapping for the Ministry of Jal Shakti, and integrated watershed management programme and MGNREGS by the Ministry of Rural Development. The Minister also informed that the number of spacecrafts launched by space centres in the country from 2016-2017 to 2021-2022 till date, year-wise are: 2016-2017 (135), 2017- 2018 (67), 2018-2019 (40), 2019-2020 (56), 2020-2021 (30) and 2021-2022 (till date) 1. Of these, the spacecraft launched by the country for domestic use, year-wise are 13, 10, 8, 6, 7 and 1, respectively. The country-wise breakup of number of foreign satellites launched during 2016-17 to 2021-22, the Minister said, was: Algeria (3), Australia (1), Austria (1), Belgium (3), Brazil (1), Canada (5), Chile (1), Colombia (1), Czech Republic (1), Finland (3), France (2), Germany (2), Indonesia (1), Israel (2), Italy (4), Japan (2), Kazakhstan (1), Latvia (1), Lithuania (7), Luxembourg (1), Malaysia (1), The Netherlands (2), Republic Of Korea (5), Slovakia (1), Spain (2), Switzerland (2), the UAE (1), the UK (6), and the US (222).

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Indian Army to get BDL-manufactured Konkurs-M anti-tank guided missiles from Hyderabad company

The Indian Army will get Konkurs-M, anti-tank guided missiles, manufactured by Bharat Dynamics Limited (BDL), Hyderabad. BDL and the Indian Army signed a contract worth Rs 3,131.82 crore for manufacture and supply of the missiles. Konkurs-M is a second generation, mechanized infantry anti-tank guided missile, to destroy armored vehicles equipped with explosive reactive armour. The missile can be launched either from BMP-II tank or from ground launcher. It has a range between 75 to 4,000 metre with a flight time of 19 seconds. The contract, which was signed in New Delhi today, will be executed in three years. "The order book position of BDL stands at Rs 11,400 crore net including the Konkurs-M contract signed today," BDL said in a statement. CMD, BDL Commodore Siddharth Mishra (Retd) said Konkurs -M were being manufactured by BDL under license agreement with a Russian OEM (Original Equipment Manufacturer). "The missile has been indigenized up to maximum extent. BDL is also offering Konkurs- M missiles for export to friendly foreign countries," he said. BDL has augmented its manufacturing capacity to meet the domestic as well as overseas demand for Konkurs M. As a part of its global outreach, BDL is also offering Man Portable AntiTank Guided Missiles, Nag, Milan-2T and Amogha, in addition to Konkurs -M, for exports. "BDL is laying a lot of thrust on indigenization of its products manufactured under Transfer of Technology with foreign OEMs. The Atmanirbharat mission initiated by the Government of India has given momentum to the indigenization efforts of the Company. The Company is also strengthening its in-house R & D capabilities to take up product innovation in order to mitigate Indian armed forces' product dependency on foreign countries," BDL said.

<https://timesofindia.indiatimes.com/city/hyderabad/indian-army-to-get-bdl-manufactured-konkurs-m-antitank-guided-missiles-from-hyderabad-company/articleshow/89302527.cms>

Make in India in Defence Sector

Many significant projects including 155mm Artillery Gun System 'Dhanus', Light Combat Aircraft 'Tejas', 'Akash' Surface to Air Missile system, INS Kalvari, INS Khanderi, INS Chennai, Anti-Submarine Warfare Corvette (ASWC), Arjun Armoured Repair and Recovery Vehicle, Bridge Laying Tank, Bi-Modular Charge System (BMCS) for 155mm Ammunition, Medium Bullet Proof Vehicle (MBPV), Lakshya Parachute for Pilotless Target Aircraft, Thermal Imaging Sight Mark-II for T-72 tank, Offshore Surveillance Ship, Water Jet Fast Attack Craft, Inshore Patrol Vessel, Offshore Patrol Vessel, Fast Interceptor Boat, Landing Craft Utility, 25T Tugs, etc. have been produced in the country under 'Make in India' initiative of the Government in last few years. The Government has taken several policy initiatives in past few years under 'Make in India' program and brought reforms to encourage indigenous design, development and manufacture of defence equipment in the country, thereby reducing dependence on imports continuously. These initiatives, inter-alia, include according priority to procurement of capital items from domestic sources under Defence Acquisition Procedure (DAP)-2020; Notification of two 'Positive Indigenisation Lists' of total 209 items of Services and one 'Positive Indigenisation List' of total 2851 items of Defence Public Sector Undertakings (DPSUs), for which there would be an embargo on the import beyond the timelines indicated against them; Simplification of Industrial licensing process with longer validity period; Liberalisation of Foreign Direct Investment (FDI) policy allowing 74% FDI under automatic route; Simplification of Make Procedure; Launch of Innovations for Defence Excellence (iDEX) scheme involving startups & Micro, Small and Medium Enterprises (MSMEs); Implementation of Public Procurement (Preference to Make in India), Order 2017; Launch of an indigenisation portal namely SRIJAN to facilitate indigenisation by Indian Industry including MSMEs; Reforms in Offset policy with thrust on attracting investment and Transfer of Technology for Defence manufacturing by assigning higher multipliers; Establishment of two Defence Industrial Corridors one each in Uttar Pradesh and Tamil Nadu. The Government, in the last three years i.e. from 2018-19 to 2020-21 and current year till December 2021, has accorded Acceptance of Necessity (AoN) to 150 proposals worth Rs 2,47,515 crore approximately, under various categories of Capital procurement which promote domestic manufacturing as per DAP-2020. This information was given by Raksha Rajya Mantri Shri Ajay Bhatt in a written reply to Shri MV Shreyams Kumar in Rajya Sabha on February 07, 2022.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1796164>

The BrahMos deal and India's defence exports

The story so far: On January 28, Philippines signed a \$374.96 million deal with BrahMos Aerospace Pvt. Ltd. for the supply of shore based anti-ship variant of the BrahMos supersonic cruise missile. This is the first export order for the missile which is a joint product between India and Russia and also the biggest defence export contract of the country. This adds impetus to the efforts to boost defence exports and meet the ambitious target set by the Government to achieve a manufacturing turnover of \$25 billion or Rs.1,75,000 crore including exports of Rs.35,000 crore in aerospace and defence goods and services by 2025. What is the BrahMos missile system? The Philippines contract includes delivery of three BrahMos missile batteries, training for operators and maintainers as well as the necessary Integrated Logistics Support (ILS) package. The coastal defence regiment of the Philippine Marines, which is under the Navy, will be the primary employer of the missile system. BrahMos is a joint venture between India's Defence Research and Development Organisation (DRDO) and Russia's NPO Mashinostroyeniya. The missile derives its name from the Brahmaputra and Moskva rivers. Beginning with an anti-ship missile, several variants have since been developed and it is now capable of being launched from land, sea, sub-sea and air against surface and sea-based targets and has constantly been improved and upgraded. The missile has been long inducted by the Indian armed forces and the Army recently deployed BrahMos along the Line of Actual Control (LAC) in Arunachal Pradesh. The range of the BrahMos was originally limited to 290 kms as per obligations of the Missile Technology Control Regime (MTCR) of which Russia was a signatory. Following India's entry into the club in June 2016, plans were announced to extend the range initially to 450 kms and subsequently to 600 kms. BrahMos with extended range upto 450 kms has been tested several times since. Which other countries are in discussion for the BrahMos missiles? In addition to the deal signed last week by Philippines, there is another long pending deal under discussion for BrahMos missiles for the Philippines Army which

could see progress in the near future, officials said. The procurement for Philippines Army (PA) is included in the Horizon 3 Modernisation programme of Philippines (Year 2023-2027), diplomatic sources had stated. The BrahMos supersonic cruise missile with increased indigenous content testfired from the Integrated Test Range, Odisha. | Photo Credit: - 8 While the first export order for BrahMos took a long time, the next order is likely to be concluded soon with negotiations with Indonesia and Thailand in advanced stages. There is reportedly interest for BrahMos from countries in West Asia as well. Philippines is also looking at several other military procurements from India and South East Asia as the region has emerged as a major focus area for India's defence exports. For instance, Hindustan Aeronautics Limited (HAL) has received interest from Philippines Coast Guard for procurement of seven Dhruv Advanced Light Helicopters and eight Dornier Do-228 aircraft under the \$100mn Line of Credit (LoC) extended by India. Progress on this has been delayed due to the pandemic situation, officials said. Kanpur based company MKU has supplied Bullet Proof Jackets (BPJ) to Philippines in the past and is now in the race for bigger contracts for BPJs and helmets. In addition, maritime domain and ship building is another potential area for Indian companies in the Philippines. What is the status of defence exports? From 2016-17 to 2018-19, the country's defence exports have increased from Rs.1,521 crore to Rs.10,745 crore, a staggering 700% growth. The value of exports of defence items including major items in Financial Year 2014-15 and 2020-21 was Rs.1,940.64 crore and Rs.8,434.84 crore respectively. As per data given by the Government, defence exports for 2020-21 stood at Rs.8434.84 crore and the export target for financial year 2021-22 was Rs.10,000 crore. There have been a series of measures announced to incentivise and promote domestic defence manufacturing as well as efforts to boost exports which include simplified defence industrial licensing, relaxation of export controls and grant of No Objection Certificates (NOC), extending Line of Credit (LoC) to foreign countries to import defence products and empowering Defence Attaches in Indian missions abroad to promote defence exports. The draft 'Defence Production & Export Promotion Policy (DPEPP) 2020' is expected to be finalised soon. In December 2020, the Cabinet Committee on Security (CCS) approved the export of indigenous Akash Surface to Air (SAM) missile systems which several countries in South East Asia and West Asia have expressed interest in. To provide faster approvals for export of major defence platforms, a committee comprising of the Defence Minister, External Affairs Minister and National Security Advisor was set up. The Defence Ministry had said in December 2020, that "This Committee would authorise subsequent exports of major indigenous platforms to various countries. The Committee would also explore various available options including the Government-to-Government route." In the last few years, India has put out a range of military hardware on sale which includes various missile systems, Light Combat Aircraft (LCA), helicopters, warship and patrol vessels, artillery guns, tanks, radars, military vehicles, electronic warfare systems in addition to other weapons systems.

<https://www.thehindu.com/news/national/the-brahmos-deal-and-indias-defence-exports/article38395523.ece>

ISRO-NASA building new generation US\$1 billion satellite: Ex-ISRO Chairman Kiran Kumar

Hyderabad: Indian Space Research Organisation (ISRO) and the National Aeronautics and Space Administration (NASA) are jointly building a US\$ 1 billion satellite with latest large reflectors, high antenna and others, for clear data transmission. "It is a unique mission where both agencies will be involved in mission design, instruments, payloads and the launch vehicle with the US agency pitching in most funds", said former ISRO chairman A. S. Kiran Kumar. The eagerly awaited 'Human Space Mission Programme' got delayed due to the pandemic and this project will give a big filip to the country's development as a large number of science & technology platforms are working on it, he said, during a virtual presentation on 'Space Technology Development and Use: An Indian Approach' organised by the Administrative Staff College of India (ASCI). Indian space programme has always sought collaborative efforts and is running about 50 satellites tracking weather, communication, strategic issues, etc., and this number has to be doubled with the help of the private sector for enhancing capacities. "Space laws and policies have to be modified as globally it is the private entities leading the innovation," he said. The Government has initiated 'New Space India Ltd' to own the launch vehicles and space assets of ISRO and Tata Sky has signed up to make use of capacities in the upcoming satellite 'GSAT-24' to be launched by Arianespace. 'IN-Space' is another entity to regulate space activities and facilitate offering public facilities and expertise to start ups and 40 proposals were received, said Dr. Kumar, also

the Vikaram Sarabhai professor at ISRO. Tracing the growth of space programme under the 'visionary leadership' of Dr. Sarabhai, he said the objective has always been make "innovative use of accessible technology for addressing societal problems and build what is not available". ISRO has been able to have a trailblazing run because of "freedom to take decisions and a robust review system". It began with 'sounding rockets' borrowed from developed nations to be launched from Thumba (Kerala) from a dilapidated church building to 'SITE' experiment where common man could be reached in remote places through satellite television and so on which helped trigger the "telecom, broadcasting and meteorology services revolution". "DTH - Director to Home TV is a follow up of SITE and with help of indigenous INSAT series, we are able to forecast a cyclone four days in advance saving lives, helping fishermen reach their fishing spots directly even while guiding them about weather in their mother tongue. 'GAGAN' – Geoaugmented navigation is for planning and precision landing of planes and used by railways for real time monitoring," he explained. Satellite data is helping in mapping of landmass, agriculture planning, water resources identification, disaster management and recently in tracking the COVID virus spread. 'Chandrayan' series was another landmark project as presence of water in moon was first identified. Future projects are in dealing with space debris threat and mining of the asteroids for precious metals as 12,000 each year pass close to earth, apart from space travel. ASCI faculty Valli Manickam and DG Nirmalya Bagchi, also spoke.

<https://www.thehindu.com/news/national/telangana/ISRO-nasa-building-new-generation-us1-billionssatellite-ex-ISRO-chairman-kiran-kumar/article65076962.ece>

APPOINTMENTS

G A Srinivasa Murthy appointed director of Defence Research and Development Laboratory

G A Srinivasa Murthy has been appointed director of Defence Research and Development Laboratory (DRDL) of the Defence Research and Development Organisation (DRDO) in Hyderabad. Consequent to superannuation of Dr Dashrath Ram, G A Srinivasa Murthy, a scientist and programme director of Advanced Naval Systems Programme was appointed as director of DRDL, a premier laboratory of Dr APJ Abdul Kalam Missile Complex. Srinivasa Murthy completed his BE in Electronics and Communication Engineering from Andhra University in 1986 and pursued his ME in Digital Systems from Osmania University in Hyderabad. He joined DRDL in 1987 and made significant contributions in the area of structural dynamics, ground resonance testing, electrical integration and checkout for various projects of the missile complex. His leadership provided necessary thrust to the design, development and production of advanced missile systems and technologies. He is renowned for his contributions towards the Advanced Naval Systems Programme (ANSP).



<https://timesofindia.indiatimes.com/city/hyderabad/g-a-srinivasa-murthy-appointed-director-of-defenceresearch-and-development-laboratory/articleshow/89274739.cms>

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