



E-NEWS

EVERY MONTH FROM THE AERONAUTICAL SOCIETY OF INDIA

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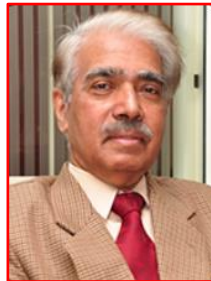


Covering the period from 01 June 2024 to 30 June 2024

Eminent Indian Aeronautical and Aerospace Personalities in India

Series: 17

Dr. C G KRISHNADAS NAIR, President, SIATI



President, The Aeronautical Society of India (1995-1997)

Dr. C G Krishnadas Nair, Former Chairman Hindustan Aeronautics Ltd, was born on 17th of August 1941, is a Padmasri Awardee for outstanding contributions in Engineering Science and Technology at large and Aerospace domain in particular. He holds a Ph.D in the field of Mechanical Engineering from the University of Sask, Canada. He is an accomplished Chief Executive, winner of Scope Award for excellence in Public Sector Management and Gold Trophy for the Best Chief Executive awarded by Shri Atal Bihari Vajpayee, then Prime Minister. He started his career as an Assistant Professor at Karnataka Regional Engineering College, Suratkal, and served as General Manager of several Engineering Divisions of HAL and became the MD & Chairman of HAL. He is credited for the transformation of HAL from a cost plus to a globally competitive aerospace industry and growth through R&D diversification and developing reliable and cost-effective supply chain partners. He led HAL's Design & Development and production of Advanced Light Helicopter (Dhruv) and the Light Combat Aircraft (Tejas). After retirement from HAL, he served as the first Vice Chancellor of the newly sanctioned Mahaveer Academy of Technology and Science University at Raipur, Chhattisgarh. He served as a full-term member of the Scientific Advisory Committee to the Cabinet of India (1999-2003) and as AICTE-INAE Distinguished Visiting Professor at IIT Chennai. On invitation from Government of Kerala, he served as the MD of Cochin International Airport and Chairman of Cochin International Airport Services Ltd from 2008 to 2011 and was the architect for its modernization and growth. He served as Chancellor of the Jain University (Deemed-to-be- University), Bangalore from 2011 to 2021, during which he founded the International Institute for Aerospace and Management as part of the Jain University with participation of Aerospace Industries and National Research Organisations. He was also appointed by President of India as Chairman Board of Governing Council, National Institute of Technology, Calicut and served from 2011-2014. After demitting the Office of Chancellor, he is serving as Sardar Vallabhai Patel National Professor and Advisor to Jain University. He is the Founder - President Society of Indian Aerospace Technologies & Industries, **President of the Aeronautical Society of India (1995-1997)**, President- Indian Institute of Metals (1998-1999), Founder - President of Society for Professional Ethics and Management. He is a recipient of several Awards for Science & Technology,

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Management and Social work. These include distinguished alumnus of IIT-Madras, Birla Gold Medal (1988), National Aeronautical Prize (1990), Vasvik Research Award (1992), Shri Omprakash Bhasin Award for Space & Aerospace (1996), Indira Gandhi Priyadarshini Award (1997), Swadeshi Sasthra Puraskara (2000), Dr. Ambedkar Bharat Shree Award (2001) for Social Service, National Metallurgist Award (2003). He is also recipient of the "Lifetime Achievement Award" from Indian National Academy of Engineering (INAE) (2007) and "Lifetime Achievement Award" from Indian Institute of Metals 2017. He has published as on date 264 Technical and Research Papers in National and International Journals and 25 books covering subjects ranging from Engineering, Management, Ethics and Religious Harmony and Social Reforms to convey that education should add values in life and Science and Technology to make the Industries in the Nation globally competitive.

President AeSI

The Space Society of Mechanical Engineers (SSME) awarded "Honorary Lifetime Membership" to Dr. G Satheesh Reddy, President of The Aeronautical Society of India.

June 06, 2024 - Dr. D K Singh, Associate Director, Space Applications Centre of Indian Space Research Organisation (SAC) accompanied by Shri Neeraj Mathur, President, the SPACE Society of Mechanical Engineers (SSME) felicitated the dignitaries Dr G Satheesh Reddy, President, The Aeronautical Society of India and Dr S Somanath, Chairman ISRO. The Honorary Lifetime Membership was presented to Dr. G Satheesh Reddy at Space Applications Centre (SAC), a unit of the Indian Research Space Organisation in Ahmedabad by the Space Society of Mechanical Engineers (SSME) in the presence of Dr S Somanath, Chairman, ISRO and Dr D K Singh, Associate Director, Space Applications Centre of Indian Space Research Organisation for his outstanding and invaluable contributions to Aerospace and Defence Technologies. The Space Society of Mechanical Engineers (SSME) was founded on April 6, 1988, at the Space Applications Centre.



Dr G Satheesh Reddy felicitated by SSME

AeSI Ahmedabad Branch

Inauguration of The Aeronautical Society of India (AeSI) Ahmedabad



Dr G Satheesh Reddy delivered a Presidential Address

June 06, 2024 - The Aeronautical Society of India (AeSI) inaugurated its Ahmedabad Branch at the Space Applications Centre, ISRO Ahmedabad. The event marks a significant milestone in advancing aeronautical sciences and fostering collaboration among professionals in the aerospace sector. Shri Siddharth Kumar from AeSI, Head Quarters, New Delhi introduced the Society and its mission, emphasizing the role of the new branch in Ahmedabad in contributing to the National Aerospace objectives, highlighting the importance of AeSI in promoting Aeronautical Research and innovation in India.

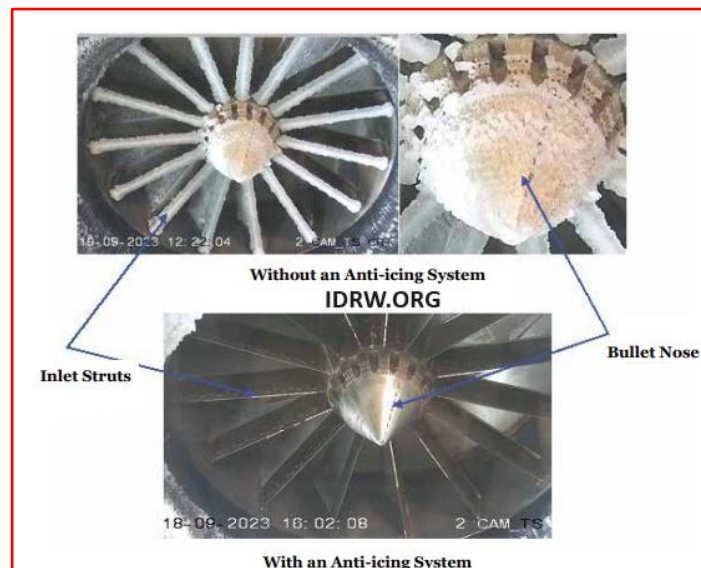
Dr G Satheesh Reddy, Former Scientific Advisor to Raksha Mantri and President of AeSI, delivered the Presidential Address, focusing on Defence Technologies for India's National Security. His insightful talk highlighted the critical role of

advanced technologies in strengthening India's defense capabilities. He emphasised on the technological developments done in the field of Defence towards achieving the goal of Atmanirbhar Bharat. Dr S Somanath, Secretary, Department of Space, and Chairman, ISRO, who is also the President-Elect of AeSI, gave the keynote address. He said that AeSI can be the enabler for development of aeronautics in the western part of India and Ahmedabad is going to be the hub of aeronautics. The establishment of the AeSI Ahmedabad branch is expected to foster greater engagement and collaboration among aerospace professionals in the region, furthering the goals of technological advancement and innovation in the aeronautical field. With this new Ahmedabad Branch, now the AeSI have 19 Branches.

DRDO

GTRE Develops Indigenous Anti-Icing Technology for Aero Engines

June 11, 2024 - Icing remains a critical safety concern for aircraft, especially when flying through clouds containing supercooled liquid water droplets. Two primary types of anti-icing systems exist: electrical and hot air-based. Electrical systems use electricity to heat the icing surfaces, while hot air-based systems utilize pressurized hot air from the engine compressor to prevent ice formation. In India, anti-icing technology of our own for aero engines was previously unavailable. Addressing this gap, the Gas Turbine Research Establishment (GTRE) in Bengaluru launched a technology development project aimed at designing and developing indigenous anti-icing technology for aero engines. Under this initiative, GTRE has successfully developed a methodology and capability to design a hot air anti-icing system applicable to both manned and unmanned platforms. Ice typically accumulates on the engine inlet casing's struts and bullet noses, as these components are exposed to ambient icing conditions.



GTRE has designed heating configurations to prevent icing on these critical components. For the first time in India, two test pieces of the engine inlet casing have been produced using a combination of conventional and additive manufacturing techniques in a relatively short duration. To maximize the benefits of icing tunnel tests, four different anti-icing designs have been incorporated into a single test hardware. The design methodology was validated using test data from icing wind tunnel tests conducted at M/s CIRA in Italy. The test hardware developed by GTRE demonstrated successful anti-icing capability under simulated icing cloud conditions, meeting all certification requirements. The expertise developed extends to conducting numerical studies to compute icing characteristics, such as water

catch efficiency (catch coefficient), crucial for aero-engine or aircraft development programs. This technology holds promise for both military and civil aviation applications in the future. GTRE's breakthrough in indigenous anti-icing technology represents a significant advancement in aviation safety.

Source: <https://idrw.org/gtre-makes-breakthrough-in-indigenous-anti-icing-technology-for-aero-engine>



DRDO showcased Indian weapons at EuroSatory Defence exhibition, France

June 18, 2024 - Indian Defence Sector firms from both public and private sector participated in the EUROSATORY 2024 defence show in France that included Indian private sector companies like Bharat Forge, Honeywell, Nibe Defence among other small, medium and large enterprises with Govt. PSUs like Bharat Electronics Ltd, DRDO showcasing major defence technologies and products. The exhibition showcased Indian products from DRDO, a few products included Airborne Early warning and control system, LCA Tejas, Astra beyond visual range missiles, the highly successful Akash air defence system, Arjun main battle tank, the wheeled Armoured Platform along with the Varunastra heavy weight torpedo. One of the prime attractions from the India was the “Pinaka multi-barrel rocket launcher system” which is being exported by India. Eurosatory-2024 was held in Paris, France which is one of the largest defence shows in Europe.

Source: <https://timesofindia.indiatimes.com/india/drdo-indian-firms-showcase-made-in-india-weapons-tech-at-paris-defence-show/articleshow/111085928.cms>

High Speed Expendable Aerial Target ‘ABHYAS’ successfully completes developmental trials

June 27, 2024 - Defence Research and Development Organisation (DRDO) has successfully completed six consecutive developmental trials of High Speed Expendable Aerial Target (HEAT) ‘ABHYAS’ with improved booster configuration from the Integrated Test Range (ITR), Chandipur, Odisha. ABHYAS has successfully completed 10 developmental trials demonstrating the reliability of the system.

The trials were carried out with improved Radar Cross Section, Visual and Infrared augmentation systems. During the trials, various mission objectives covering safe release of booster, launcher clearance, and endurance performance were successfully validated. Two launches were conducted back-to-back within a gap of 30 minutes, demonstrating the ease of operation with minimum logistics.

ABHYAS has been designed by DRDO’s Aeronautical Development Establishment (ADE), Bengaluru, and developed through Production Agencies - Hindustan Aeronautics Limited (HAL), Larsen & Toubro which offers a realistic threat scenario for weapon systems practice. This indigenous system is designed for autonomous flying with the help of an auto pilot, a laptop-based Ground Control System for aircraft integration, pre-flight checks, and autonomous flight. It also has a feature to record data during flight for post-flight analysis. The booster has been designed by Advanced Systems Laboratory and the navigation system by Research Centre Imarat.

Source: <https://pib.gov.in/PressReleasePage.aspx?PRID=2029196>

Defence Research Development Organisation (DRDO) plans India's first underwater-launched UAV (ULUAV), awards contract to Pune startup Sagar Defence

June 12, 2024 - To boost India’s underwater military capabilities, DRDO has decided to develop a first of its kind underwater launched unmanned aerial vehicle (ULUAVs) after selecting Sagar Defence Engineering Pvt Ltd out of the 17 firms through a competitive building process. DRDO would be assisting Sagar Defence, which earlier had developed a maritime spotter drone for the Indian Navy, in ULUAV technology development. This agreement with M/s Sagar Defence was signed in the presence of DRDL director Dr G A S Murthy and Indian Navy officials. A ULUAV has the capability to be deployed quickly, safely and autonomously from a moving submarine which will have high endurance and long range, giving it a huge surprise element advantage. This will enable discrete surveillance missions, allowing submarines to monitor potential threats without revealing their presence. Only a few countries in the world possess ULUAVs but they are not highly advanced, however, DRDO has entrusted the startup Sagar Defence to develop a



ULUAV that will have a longer endurance, a higher maritime and underwater domain awareness which will be used for data gathering.

Source: <https://timesofindia.indiatimes.com/india/drdo-plans-indias-first-underwater-launched-uav-awards-contract-to-pune-startup-sagar-defence/articleshow/110919999.cms>

DRDO Partnering up with Startups to Develop AI Authentication Tool

June 16, 2024 - India's defense and law enforcement agencies are embracing technological revolution, partnering with woman-led startup M/s Ingenious Research Solutions Pvt Ltd. to make use of its AI authentication tool called 'Divya Drishti' which is learning to help in enhancing security measures. The development was announced by the Defence Ministry and it showcases exciting collaboration between Defence Research and Development Organisation (DRDO) with emerging tech innovators. It is learned the AI tool was developed with the technical guidance of the Centre for Artificial Intelligence & Robotics (CAIR). 'Divya Drishti' comes with dual approach of authentication. It combines facial recognition with gait analysis that also utilizes physiological parameters such as skeletal structure. The integration is learned to improve the accuracy of identifying individuals, hence, reducing the likelihood of false positives and identity fraud. The advancement is crucial in India with respect to defense and law enforcement as well as corporate and public infrastructure security.

Source: <https://government.economictimes.indiatimes.com/news/defence/drdo-unveils-the-power-of-divya-drishti-woman-led-startup-develops-ai-tool-for-a-personal-identification/111031347>

ISRO

"PraVaHa": ISRO develops CFD software for aerodynamic design and analysis

May 30, 2024 - The Computational Fluid Dynamics (CFD) software "Parallel RANS Solver for Aerospace Vehicle Aero-thermo-dynamic Analysis" (PraVaHa) is developed in Vikram Sarabhai Space Centre to simulate external and internal flows on launch vehicles, winged & non winged re-entry vehicles. Initial aerodynamic design studies for launch vehicles demand evaluation of a large number of configurations. Any aerospace vehicle while moving through the earth's atmosphere during 'launch' or 're-entry' is subjected to severe aerodynamic and aerothermal loads in terms of external pressure and heat flux. Understanding the 'airflow' around aircraft, rocket bodies, or Crew Module [CM] during earth re-entry is essential to design the shape, structure, and Thermal Protection System [TPS] requirements for these bodies, the unsteady part of aerodynamics contributes to serious flow issues around such rocket bodies and creates significant acoustic noise during the mission. Computational Fluid Dynamics [CFD] is one such tool to predict the aerodynamic and aerothermal loads which solve numerically the equations of conservation of mass, momentum, and energy along with the equation of state.

CFD is mature enough in terms of its accurate prediction capability for complex aerodynamic flows, as well as faster simulation turnaround time on High-Performance Computing Clusters which makes it handy for the design and characterization of many initial designs so that a few optimum configurations can be selected for detailed evaluation. PraVaHa has been used extensively in the Gaganyaan program for aerodynamic analysis of human-rated launch vehicles, viz, HLVM3, Crew Escape System [CES], and Crew Module [CM] which is designed to make use of CPU as well as GPU architecture of available and upcoming supercomputing facilities. The software framework is quite flexible & secure enough to have collaborative development with academic institutes and government labs.



The PraVaHa code is operational to simulate airflow for Perfect Gas & Real Gas conditions. Validations of the code are underway for simulating the effect of chemical reactions that occur during air dissociation upon 'earth re-entry' and 'combustion' as in scramjet vehicles.

PraVaHa soon will replace most of the CFD simulations for aero characterization, which is currently being carried out using commercial software. This indigenous software is going to help academia and other institutions, engaged in the design of missiles/aircraft/rockets, to find solutions to complex aerodynamic problems. By making this product available to larger sections of society, ISRO aspires to lend a helping hand, to move forward in achieving the stated goal of Atmanirbhar India.

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

ISRO completes its RLV technology demonstrations through LEX trio

June 23, 2024 - The Indian Space Research Organisation (ISRO) has proudly achieved a third consecutive success in the Reusable Launch Vehicle (RLV) Landing EXperiment (LEX). The third and final test in the series of LEX (03) at the Aeronautical Test Range (ATR) in Chitradurga, Karnataka.



Reusable Launch Vehicle (RLV) Landing EXperiment (LEX)

Following the success of the RLV LEX-01 and LEX-02 missions, RLV LEX-03 re-demonstrated the autonomous landing capability of the RLV under more challenging release conditions. From a release point 4.5 km away from the runway, Pushpak autonomously executed cross-range correction manoeuvres, approached the runway and performed a precise horizontal landing at the runway centreline. Due to this vehicle's low lift-to-drag ratio aerodynamic configuration, the landing velocity exceeded 320 kmph,

compared to 260 kmph for a commercial aircraft and 280 kmph for a typical fighter aircraft. After touchdown, the vehicle velocity was reduced to nearly 100 kmph using its brake parachute.

This mission simulated the approach and landing interface and high-speed landing conditions for a vehicle returning from space, reaffirming ISRO's expertise in acquiring the most critical technologies required for the development of a Reusable Launch Vehicle (RLV). Through this mission, the advanced guidance algorithm catering to longitudinal and lateral plane error corrections, the RLV-LEX-03 mission reused the winged body and flight systems as such without any modification, from the LEX-02 mission, demonstrating the robustness of ISRO's capability of design to reuse flight systems for multiple missions.

The mission, led by VSSC, was a collaborative effort involving multiple ISRO centres SAC, ISTRAC, SDSC-SHAR and IISU, with significant support from the Indian Air Force (IAF), Aeronautical Development Establishment (ADE), Aerial Delivery Research and Development Establishment (ADRDE), Regional Centre for Military Airworthiness (RCMA) under Centre for Military Airworthiness and Certification (CEMILAC), National Aerospace Laboratories (NAL), Indian Institute of Technology, Kanpur, Indian aerospace industrial partners, Indian Oil Corporation of India and Airport Authority of India. Shri. J Muthupandian is the Mission Director and Shri. B Karthik is the Vehicle Director for this successful mission. To watch the video please click https://www.isro.gov.in/media_isro/video/rlv_lex_03.mp4.

Source: https://www.isro.gov.in/ISRO_Completes_RLV_Technology_Demonstrations_RLV-LEX3.html



ISRO Handholding Start-ups: Towards a Vibrant Space Ecosystem

June 01, 2024 - Following the sectoral reforms the Indian Space arena is witnessing a rapid growth of start-ups and private firms. ISRO, towards facilitating a vibrant space ecosystem in India, has been extending its technical support and sharing its expertise. Its support for a recent suborbital mission Agnibaan SOrTeD, conducted by M/s Agnikul Cosmos, an Indian start-up showcases the willingness of the organisation to support and nurture private startups in India's space sector. For the Agnibaan mission, SDSC-SHAR/ISRO supported in selection of suitable site for suborbital flight and assisted in setting up the Launchpad and Control Centre. A robust network for seamless data and communication between the launch pad, the Control Centre, and ISRO Control Centre was facilitated. SHAR developed comprehensive safety plans and procedures to ensure all operations are conducted safely and efficiently. They coordinated launch clearances and NOTAM (NOTice To Air Missions) for all launch attempts and provided extensive range systems, including tracking, timing, real-time data processing, and master control operations. Additionally, SHAR supplied historical wind data for flight planning and real-time atmospheric data for launch commit criteria, alongside crucial logistics support for system realization and launch campaigns.

VSSC/ISRO provided its expertise and facilitated 15-second hot testing of the semi-cryogenic engine. They conducted acoustic tests for the launch vehicle's inter-tank structure at CSIR-NAL's state-of-the-art acoustic testing facility. The mission design underwent thorough verification and validation by VSSC. VSSC provided a comprehensive end-to-end Flight Termination System, including pyro charges, batteries, telecommand decoders, and tracking transponders, ensuring the mission's range safety. It extended on-site support for assembly, integration, wiring, and last-minute pyro operations during the launch campaign, pre-countdown, and countdown phases. ISTRAC/ISRO provided telemetry and tracking support for this launch, through a Memorandum of Understanding with the start-up. ISTRAC supported the launch campaign from its two ground stations at Shriharikota, offering integration, testing, and real-time tracking. They developed and deployed Vehicle Data Acquisition software to filter real-time data flow to the control center and display systems. On the day of launch, ISTRAC's ground station network provided real-time support, confirming the successful launch. ISRO's extensive and multifaceted support for such missions undertaken by Indian start-ups underscores the collaborative framework made available to startups in the Indian space sector. ISRO assures its support, invites and encourages non-governmental entities to engage themselves in the space sector, paving the way for a vibrant space ecosystem in the country.

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

New HAL facilities to support ISRO's LVM3 programme



Dr S Somanath visited the new HAL facility

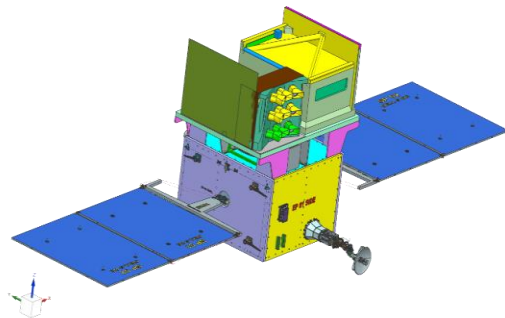
June 06, 2024 - ISRO Chairman S Somanath paid a visit to the new HAL facility in Bengaluru. In a capability upgrade which will meet the growing production needs of ISRO, The Hindustan Aeronautics Limited (HAL) opened a manufacturing facility at its aerospace division in Bengaluru. The new facility will facilitate a propellant tank production unit and CNC machining facility which will specifically cater to the production of India's heaviest rocket, the Launch Vehicle Mark-3 (LVM3). While ISRO has an annual requirement of six LVM3 launches, HAL's new facilities would address this gap and enable HAL to manufacture critical components to support the production of six LVM3s per year. The propellant tank production facility will specialise in the manufacturing of high-performance

fuel and oxidiser tanks, critical components for the LVM3 i.e. 4 m in diameter and up to 15 m in length. The CNC machining facility houses advanced computer numerical control machines for handling high-precision fabrication of 4.5 m-class rings and propellant tank domes of the launch vehicle.

Source: <https://www.deccanherald.com/india/new-hal-facilities-to-support-isro-s-lvm3-programme-3054494>

TRISHNA Mission: Advancing High-Resolution Thermal Imaging

June 05, 2024 - The TRISHNA (Thermal Infra-Red Imaging Satellite for High-resolution Natural Resource Assessment) mission, a collaborative endeavor between ISRO and CNES (Centre National D'Etudes Spatiales), is engineered to deliver high spatial and high temporal resolution monitoring of Earth's surface temperature, emissivity, biophysical and radiation variables for surface energy budgeting at regional to global scale. This mission addresses critical water and food security challenges, focusing on the impacts of human-induced climate change and efficient water resource management through evapotranspiration monitoring. TRISHNA's primary objectives include detailed monitoring of the energy and water budgets of the continental biosphere for quantifying terrestrial water stress and water use and high-resolution observation of water quality and dynamics in coastal and inland waters. In addition, as secondary objectives, the TRISHNA mission will also help in a comprehensive assessment of urban heat islands, detection of thermal anomalies linked to volcanic activity and geothermal resources, and precise monitoring of snow-melt runoff and glacier dynamics. The mission will also provide valuable data on aerosol optical depth, atmospheric water vapor, and cloud cover.



CAD view of the Trishna Satellite

TRISHNA satellite is equipped with two primary payloads. The Thermal Infra-Red (TIR) payload, provided by CNES, features a four-channel long-wave infrared imaging sensor capable of high-resolution surface temperature and emissivity mapping. The Visible - Near Infra-Red - Short Wave Infra-Red (VNIR-SWIR) payload, developed by ISRO, includes seven spectral bands designed for detailed mapping of surface reflectance of VSWIR bands for generating important biophysical and radiation budget variables. The variables retrieved from the combination of payload data would help in solving surface energy

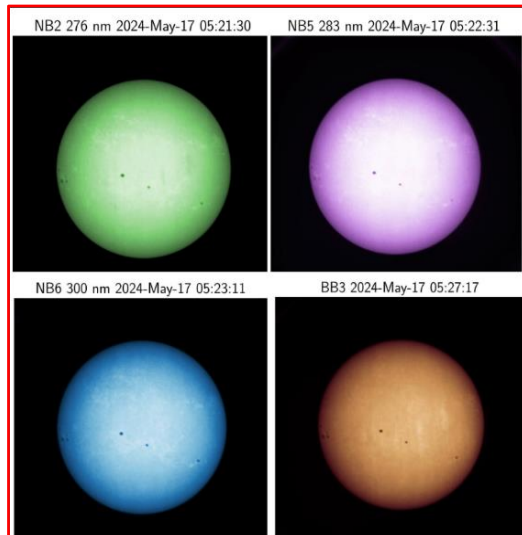
balance to estimate surface heat fluxes. The satellite will operate in a sun-synchronous orbit at an altitude of 761 km, with a local time of 12:30 PM at the equator. This orbit will provide a spatial resolution of 57 meters for land and coastal areas and 1 km for oceanic and polar regions. The mission is designed for a 5-year operational life. TRISHNA mission is expected to signify a substantial advancement in remote sensing technology, addressing critical water and food security issues and providing essential data to help bring out sustainable solutions for policy/decision makers.

Source: https://www.isro.gov.in/TRISHNA_Mission.html

Aditya-L1's Solar Ultra Violet Imaging Telescope (SUIT) Capture Solar Fury

June 10, 2024 - The Active region AR13664 on the Sun, during its passage during the week of May 8 – 15, 2024, erupted several X-class and M-class flares, which were associated with Coronal Mass Ejections (CMEs) during May 8 and 9. These produced a major geomagnetic storm on May 11, 2024. Two of the remote sensing payloads on board Aditya-L1 (SoLEXS and HEL1OS) captured these events during May 8-9, 2024 while the two in-situ payloads (ASPEX and MAG) captured this event during May 10-11, 2024

during its passage through L1. These observations were subsequently reported by ISRO, along with the observations made by the Chandrayaan-2 spacecraft, XPoSat as well as by USO-PRL ground-based facility.



Various Wavelength Sunspots captured by Aditya - L1

During those series of eruptive events, two remote sensing instruments onboard Aditya-L1, viz. the Solar Ultra Violet Imaging Telescope (SUIT) and the Visible Emission Line Coronagraph (VELC) were in baking and calibration modes respectively and couldn't observe the event during May 10-11. Both SUIT and VELC doors were opened on May 14 after the completion of the indented operations.

Aditya L1, is ISRO's coronagraph spacecraft that is located at Lagrange Point 1 (1.5 million km) which was sent by India to study the sun Earth. Lagrange Point (also known as Liberation Point) is an area where the gravitational forces of two massive celestial bodies cancel out each other's gravitational force. This means that Aditya L1 is at a point where Earth and Sun's gravities cancel each other out giving the satellite a stable orbit. The data collected by Aditya L-1 will significantly enhance our understanding of solar phenomena. The images and observations will aid in studying solar flares, energy distribution, and long-term solar variations. The success of Aditya L-1's observations during the solar storm highlights the potential for global collaboration in space research. The data gathered will

benefit scientists worldwide in understanding and predicting space weather. Sunspots and the bright areas around them, seen in various wavelengths on May 17, 2024 by India's Aditya-L1 solar probe. Detailed observations by these payloads (SUIT & VELC) are available here: <https://shorturl.at/l13ZH>

Source: https://www.isro.gov.in/Aditya_L1_SUIT_VELC_Capture_SolarFury.html

GSAT-N2: Enhancing India's Broadband Infrastructure

June 14, 2024 - GSAT-N2 (GSAT-20) is a Ka-band High throughput communication satellite of NewSpace India Limited (NSIL), a Government of India company under the Department of Space and the commercial arm of ISRO. GSAT-N2 is the 2nd Demand Driven satellite of NSIL which is set to enhance broadband services and in-flight connectivity (IFC) across the Indian region. This satellite, featuring multiple spot beams and wideband Ka x Ka transponders, aims to support a large subscriber base with small user terminals, significantly boosting system throughput through its multi-beam architecture which allows frequency reuse.

GSAT-N2, with a lift-off mass of 4700 kg, has a mission life of 14 years. The satellite is equipped with 32 user beams, comprising 8 narrow spot beams over the Northeast region and 24 wide spot beams over the rest of India. These 32 beams will be supported by hub stations located within mainland India. The Ka-Band HTS communication payload provides a throughput of approximately 48 Gbps. The payload consists of three parabolic 2.5-meter deployable reflectors with multiple feeds generating 32 spot beams over the Indian region using a single feed per beam configuration. The GSAT-N2 spacecraft structure is based on the standard Carbon Fiber Reinforced Polymer (CFRP)-based I4K bus. GSAT-N2 is compatible with all major launch vehicles. The thermal control configuration includes both active elements, such as heat pipes

and heaters, and passive elements, like multi-layer insulation (MLI) blankets, optical solar reflectors (OSR), thermal paints, and coatings, as used in earlier missions.

The propulsion system of GSAT-N2 is configured with a unified bi-propellant chemical propulsion system employing MON3 as oxidizer and Monomethylhydrazine (mono-methyl hydrazine, MMH) i.e. a highly toxic, volatile hydrazine derivative with the chemical formula CH_6N_2 as fuel. GSAT-N2's power system is a single fully regulated 70V bus, consisting of solar panels for power generation, Li-Ion batteries for energy storage and peak load support, and power electronics for power conditioning and distribution. The electrical power system is designed to meet a power requirement of approximately 6 kW

Source: <https://www.isro.gov.in/GSATN2EnhancingIndiaBroadbandInfrastructure.html>

IN-SPACE launches Pre-Incubation Entrepreneurship Programme

June 18, 2024 - The Indian National Space Promotion and Authorisation Centre (IN-SPACE) announced the launch of its Pre-Incubation Entrepreneurship (PIE) development programme, an ambitious initiative aimed at nurturing the next generation of space technology startups in India. The programme will be held for 21 months which will provide comprehensive support to aspiring space entrepreneurs, guiding them through the key stages of ideation, innovation and prototype development. The participants will also have access to mentorship from experts across academia, research institutes, incubators and the Space industry. The PIE programme will provide the space sector's young entrepreneurs with a launchpad, equipping them not only with technical expertise but also with the business acumen needed to navigate the complexities of the Space Sector. For more information about the programme, please visit <https://shorturl.at/se8rS>

Source: <https://timesofindia.indiatimes.com/city/bengaluru/in-space-launches-pre-incubation-program-for-space-entrepreneurs/articleshow/111069914.cms>

LVM3 M3 Upper Stage Re-enters Atmosphere: Mission Debrief



The final ground trace of LVM3 M3 Cryogenic Upper Stage before atmospheric re-entry and the probable impact Point

June 14, 2024 - the cryogenic upper stage of the LVM3 M3/OneWeb-2 India mission re-entered the Earth's atmosphere. The nearly 3-ton rocket body (NORAD ID 56082) was left in an orbit of 450 km altitude after injecting 36 OneWeb satellites on March 26, 2023. The upper stage was passivated by depleting excess fuel as per the standard practice to minimise any potential risk for an accidental break-up. The re-entry was estimated to occur within a window from 14:35 UTC to 15:05 UTC, the most probable impact being at 14:55 UTC in the Indian Ocean. Only certain elements like gas bottles, nozzle, and tanks which comprise materials of very high melting points were expected to survive the aerothermal heating

during the re-entry for this rocket body. The object was tracked by the Multi-object Tracking Radar (MOTR) of ISRO at Sriharikota over the orbits before the atmospheric re-entry, the tracking data was utilised in the re-entry prediction process. The re-entry of this object was continuously monitored by ISRO's facility, ISRO System for Safe and Sustainable Space Operations Management (IS4OM), ISTRAC at Bengaluru. The LVM3-M3 rocket body was disposed of through natural orbital decay within 2 years of the orbital injection.



Therefore, it complied with international guidelines such as UN space debris mitigation guidelines. The LVM3-M3 rocket stage also complied with the directives of India's Debris Free Space Missions (DFSM) initiative which requires the space objects operating in the Low Earth Orbital region to be in orbit for less than 5 years after the end of the mission. DFSM was announced by Chairman ISRO/Secretary of DOS on April 16, 2024, during the opening plenary of the 42nd Inter-Agency Space Debris Coordination (IADC) Committee meeting in Bengaluru, India. ISRO steadfastly pursues all efforts to meet the objectives of this initiative as all Indian space actors, both governmental and non-governmental, are expected to conform to the guidelines outlined in DFSM by the year 2030.

Source: https://www.isro.gov.in/LVM3_M3UpperStageRe_entersAtmosphere.html

NewSpace India Limited (NSIL) and Space Machines Company announce the signing of historic Launch Service Agreement for next Optimus spacecraft onboard Small Satellite Launch Vehicle (SSLV).

June 26, 2024 - NewSpace India Limited (NSIL), a Govt. of India company under the Department of Space and the commercial arm of the Indian Space Research Organisation (ISRO) and Space Machines Company, an Australian-Indian in-space servicing firm, have signed a landmark Dedicated Launch Service Agreement. This pioneering collaboration sets the stage for the launch of Space Machines Company's second Optimus spacecraft weighing 450kg, the largest Australian-designed and built spacecraft so far. Slated for a Dedicated launch on-board NSIL/ISRO's Small Satellite Launch Vehicle (SSLV) in 2026, this mission will mark a defining moment for both nations in the area of space collaboration. This mission, named Space MAITRI मैत्री (Mission for Australia-India's Technology, Research and Innovation), marks a significant milestone in the strategic partnership between Australia and India in the space domain, fostering closer ties between commercial, institutional, and governmental space organisations from both nations. By focusing on debris management and sustainability, the mission aligns with the core values and objectives of both countries, promoting responsible space operations and mitigating the growing threat of space debris.

Source: https://www.nsilindia.co.in/sites/default/files/NSIL%20and%20SMC_SSLV%20%281%29.pdf

Institutions

IIT Madras & NASA Researchers study Multidrug-Resistant Pathogens on the International Space Station

June 11, 2024 - Researchers from the Indian Institute of Technology-Madras and NASA's Jet Propulsion Laboratory (JPL) are studying multidrug-resistant pathogens on the International Space Station (ISS), which could open doors to take effective preventative measures for astronauts as insights into the persistence and succession patterns of the bacterium in space which can be used for making strategies for managing microbial contamination in closed environments like spacecraft for the health of astronauts and hospitals. A study of the microbial landscape on the ISS is crucial to the health of astronauts who are deeply influenced by micro-organisms on board the station which has limited access to medical facilities. The researchers studied enhancement in multidrug resistant pathogens, focusing on *Enterobacter bugandensis* - a nosocomial pathogen (originated in a hospital) and 13 strains of the bacterium were isolated from the ISS. The team mapped the prevalence and distribution of the bacterium over time to shed light on its colonisation pattern in space. The ISS-isolated strains were also mutated, becoming genetically and functionally distinct under stress compared to their earth counterparts which also coexisted with other organisms and helped those organisms survive.

Source: <https://theprint.in/science/iit-madras-nasa-jointly-study-multidrug-resistant-pathogens-on-international-space-station/2126266/>



Manav Rachna University installs GNSS receiver in collaboration with ISRO

June 17, 2024 - Manav Rachna University (MRU) has installed a Global Navigation Satellite System (GNSS) receiver on its campus. The installation was done in collaboration with the National Atmospheric Research Laboratory (NARL) of the Indian Space Research Organisation (ISRO). The installation of the GNSS receiver at the university is part of the NARL north-south chain of receivers used for studies on weather, climate, space weather, and planetary ionospheres, which features a GNSS receiver, antenna, 30M RF cable, laptop, and iron mast at the Manav Rachna campus. GNSS benefits includes, Multi-parametric data collection across various atmospheric and space parameters, enhancing research capabilities, benefiting student projects and learning opportunities, particularly for the Electronics & Communication Engineering (ECE), Computer Science Engineering (CSE) departments, Atmospheric sciences and related fields which also helps the students to gain hands-on experience with cutting-edge technology and real-time data analysis.

Source: <https://news.careers360.com/manav-rachna-university-installs-gnss-receiver-in-collaboration-isro>

Defence PSUs

HAL receives Request for 156 Light Combat Helicopters from IAF

June 17, 2024 - In a bid to push self reliance in the defence sector, Hindustan Aeronautics (HAL) announced that the Defence Ministry has issued a RFP for 156 Light Combat Helicopters. Out of the 156 Light Combat Helicopter (LCH) requested by the Defence Ministry, 90 are being procured for the Indian Army (IA) while the remaining 66 are for the Indian Air Force (IAF). The LCH, also known as Prachand, having similarities with the Advanced Light Helicopter Dhruv has a number of stealth features, armoured protection systems, night attack capability and crash-worthy landing gear for better survivability. The LCH is equipped with requisite agility, manoeuvrability, extended range, high altitude performance and all-weather combat capability to perform a range of roles including combat search and rescue (CSAR), destruction of enemy air defence (DEAD) and counter-insurgency (CI) operations. The helicopter can also be deployed in high-altitude bunker-busting operations, supporting ground forces.

Source: <https://economictimes.indiatimes.com/news/defence/defence-ministry-issues-request-for-proposal-for-procurement-of-156-light-combat-helicopters/articleshow/111060293.cms>

BEL Signs MoU with Armoured Vehicles Nigam (AVNL)

28 June, 2024 - Bharat Electronics (BEL), has signed a contract valued at Rs.3,172 crore with Armoured Vehicles Nigam (AVNL) at AVNL Headquarters in Chennai. The project entails the supply and installation of an advanced, indigenously designed and developed Sighting and Fire Control System (FCS) for the upgrade of BMP (Boyevaya Mashina Pekhoty) 2/2K Tanks of the Indian Army, along with a comprehensive Engineering Support Package. Additionally, BEL has secured other orders valued at Rs.481 crore following the last disclosure on 22 May 2024 which comprises of Doppler Weather Radar, Classroom jammers, spares and services etc. With these, BEL has received accumulated orders totalling Rs.4,803 crore in the current financial year.

Source: https://www.business-standard.com/markets/capital-market-news/bharat-electronics-secures-orders-worth-rs-3-653-cr-124062801027_1.html

Private Sector

Agnikul, Indian Startup 3D Prints Rocket Engine in Just 72 Hours



3D printed Single Piece Rocket Engine

June 12, 2024 - A rocket featuring the world's first rocket engine 3D printed as a single piece blasted off from India's east coast. Startup Agnikul fabricated the engine in just 72 hours and hopes the approach could open the door to "on-demand" rocket launches for operators of small satellites. What sets Agnikul apart is that its engine is printed in one go, rather than as multiple components that have to then be stitched together, which significantly speeds up manufacturing time. The company carried out its first suborbital launch powered by the engine. A single-stage rocket lifted off from the Indian Space Research Organisation's Satish Dhawan Space Center on Sriharikota island in Andhra Pradesh, reaching an altitude of 6.5 kilometers before splashing down into the ocean. The launch acted as a technology demonstrator to test out all of the key subsystems necessary for an orbital launch. Those included the flight computer, avionics, guidance, and navigation systems, as well as the launchpad itself, which was purpose-built for the mission. The team hit its target of 6 kilonewtons of thrust and was able to successfully carry out a wind-biasing maneuver, in which the rockets trajectory is adjusted midflight to account for the affects of wind. Besides validating the technology, SPM says they gained valuable experience in both manufacturing processes and launch operations.

Source: <https://www.cnbctv18.com/india/science/how-india-first-3d-printed-rocket-was-built-in-72-hours-19420467.htm>

AZAD Engineering develops advanced turbo engines for GTRE

May 23, 2024 - Complex and highly engineered precision forged and machined components manufacturer AZAD Engineering Ltd has bagged a contract from the Gas Turbine Research Establishment (GTRE), an R&D organisation under the Defence Research and Development Organisation (DRDO) and the Union Defence Ministry, to build advanced turbo engines for India's Defence programmes. The Hyderabad-based company has been chosen as GTRE's sole industry partner to bring this advanced design to reality. The long-term contract involves the complete manufacturing and assembly of an advanced gas turbine engine, crucial for Defence applications. The advanced gas turbine engine is designed with a single-spool turbojet setup, incorporating components such as a four-stage axial flow compressor, an annular combustor, a single-stage axial flow uncooled turbine and a fixed exit area nozzle. The company also comes at a time when India has consistently showcased its ability to create top-notch engine designs with cutting-edge indigenous technology which would be all done in its facilities in Hyderabad.

Source: <https://timesofindia.indiatimes.com/business/india-business/azad-engineering-bags-order-from-grtre-drdo-to-build-advanced-turbo-engines-for-indias-defence-programmes/articleshow/110369704.cms>

Garuda Aerospace inaugurates first Drone showroom in Chennai

June 04, 2024 - Drone manufacturer Garuda Aerospace Pvt Ltd has inaugurated its first exclusive drone showroom in Chennai as it plans to sell 50,000 agricultural and consumer drones in the upcoming years. The company, has served over 750 clients, 350 finished projects and 50 designed works across the country. The company has received the Directorate General of Civil Aviation's approval for the manufacturing of



small and medium drones along with pilot training. The revolutionary showroom offers a one-stop shop for all drone enthusiasts and professionals. Consumers and visitors can explore a wide range of drones on display and available for direct purchase, a major leap forward for the drone market. These drones cater to various applications including FPV (First Person View), videography, surveillance, agriculture, inspections, flying for passion, creating an immersive experience for customers.

Source: <https://www.ndtvprofit.com/business/garuda-aerospace-inaugurates-first-drone-showroom-in-chennai>

ISRO and Wipro 3D partner for 3D-printed Rocket Engine

June 01, 2024 – ISRO, Indian Space Research Organisation (ISRO) and Wipro 3D have successfully manufactured a 3D-printed rocket engine, the PS4, set to power the fourth stage of the Polar Satellite Launch Vehicle (PSLV). The PSLV is an expendable launch system designed to place earth observation and scientific satellites into precise orbits enabling multiple applications like remote sensing, oceanography, cartography, mineral mapping, disaster warning, etc. The PS4 engine, traditionally manufactured through conventional machining and welding, underwent a revolutionary redesign using additive manufacturing technology. The technology also offers superior precision, minimal resource utilisation and significant reductions in material wastage and production time. Wipro 3D and ISRO adopted Design for Additive Manufacturing (DfAM) and Laser Powder Bed Fusion (LPBF) technology to consolidate the multiple and diversified PS4 engine components into a single unified production unit, enhancing production efficiency and structural integrity. The 3D-printed PS4 engine boasts integrated complex cooling channels, embodying a commitment to sustainability and efficiency. Rigorous testing at ISRO Propulsion Complex in Mahendragiri confirmed its exceptional performance, meeting all design safety and efficiency standards.

Source: <https://www.businesstoday.in/technology/news/story/isro-and-wipro-3d-partner-for-space-exploration-with-3d-printed-rocket-engine-431694-2024-06-01>

Pixxel to develop miniaturised multi-payload satellites for IAF

June 26, 2024 - Space data company and spacecraft manufacturer Pixxel headquartered in Bengaluru, India and the USA who are backed up by one of the top Tech Giant companies Google, signed an iDEX (innovations for Defence Excellence) contract with the Ministry of Defence to develop miniaturised multi-payload satellites for the Indian Air Force, in New Delhi. The contract is the 350th under iDEX, initiating its efforts to develop small satellites of up to 150 kg for Electro-Optical, Infrared, Synthetic Aperture Radar, and Hyperspectral purposes. The company was awarded the first-ever iDEX Prime (Space) Satellite Grant, under the Mission DefSpace Challenge and is also set to launch six commercial-grade hyperspectral satellites, called Fireflies, this year which is designed to detect, monitor, predict important global phenomena across agriculture, oil, gas, mining, environment, and other sectors in up to 50x richer detail.

Source: <https://www.deccanherald.com/india/pixxel-to-develop-miniaturised-multi-payload-satellites-for-iaf-3080536>

SkyFi partners with GalaxEye Space to revolutionise multi-sensor Earth imaging

June 25, 2024 - GalaxEye Space, a space-tech startup, has announced a strategic partnership with SkyFi, that simplifies access to Earth observation imagery and provides powerful analytics tools. This collaboration signifies a major advancement in the industry, coming well ahead of GalaxEye's first satellite launch and promising to enhance the accessibility and quality of high-resolution, multi-sensor data for a deeper understanding of Earth's dynamic landscapes.



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The space startup's innovative technology equips satellites with both Synthetic Aperture Radar (SAR) and Electro-Optical/Multispectral Imaging (MSI) capabilities. This dual approach allows for the simultaneous collection of diverse data sets, providing valuable insights regardless of weather conditions. The maiden satellite will feature a 2-meter resolution. The simultaneous SAR and Optical imaging will provide useful information to end-users, allowing us to meet and exceed our customers' expectations with even more detailed and frequent observations of the Earth.

Source: https://www.financialexpress.com/business/defence-skyfi-partners-with-galaxeye-space-to-revolutionise-multi-sensor-earth-imaging-3534320/#google_vignette

Events

CSIR – National Aerospace Laboratories Commemorated the Centenary of Dr Sitaram Rao Valluri

June 25, 2024 - Dr Sitaram Rao Valluri, The Second Director of National Aerospace Laboratories, a CSIR – Laboratory at Bengaluru, left an indelible mark during his nearly two decades tenure (19 years) (1965-1984) as Director. He created strong foundation for sustained Research and Development efforts aiding all nationally important Aerospace projects be it Civil or for Defence. Grateful fraternity of Aerospace Scientists paid rich tributes to the glorious leadership of Dr S R Valluri on 25th June 2024 as a part of this centenary birth celebrations at NAL.

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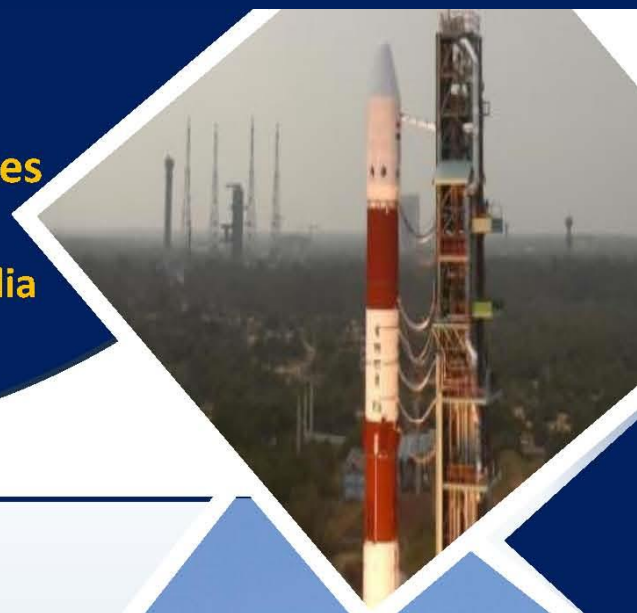
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