



Covering the Period from  
(01 November 2023 to 31 November 2023)



← President Of India, Smt Droupadi Murmu Graced An International Conference Cum Exhibition On 'Aerospace & Aviation In 2047'

DRDO carries out successful flight trial of Autonomous Flying Wing Technology Demonstrator, an indigenous high-speed flying-wing UAV →



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## Eminent Indian Aeronautical and Aerospace Personalities in India

Series:11

## Group Capt. Suranjan Das



Indian Air Force (IAF) took wings in the post-Independence era, Group Captain Suranjan Das became synonymous with any bomber, fighter and trainer incorporated by the IAF between 1950 until his unfortunate death in 1970. He was one of the first two experimental test pilots of the IAF. Born in Calcutta in 1920, Das graduated in physics from St Xavier's College. His father, Sudhi Ranjan Das was the fifth Chief Justice of India. Though his journey with the air force began in North America, Das trained in Canada as part of the 19<sup>th</sup> course of the IAF in 1943. He was commissioned into service upon his return to India in June 1945. According to Anchit Gupta, IAF chronicler and investor: “He (Suranjan Das) earned his operational spurs with the 8 Squadron.” Das' central contribution to the IAF was in the process leading to the acquisition of fighters especially in flight-testing. He took the maiden sortie of the HF-24 Marut, India's first indigenously-developed fighter for which he was awarded the Ati Vishisht Seva Medal (AVSM).

## **Testing, analysing and assessing multiple aircraft**

In 1958, Das was appointed the commanding officer at the Aircraft and Armament Testing Unit (A&ATU) at Kanpur, the main testing centre of the IAF. Here, he played a central role in the incorporation of the Folland Gnat — a subsonic fighter aircraft. “Beyond the tests, dad also intently followed flight design concepts, and this allowed him to make pivotal contributions through the course of different aircraft incorporation programmes,” Suranjan Das was also the first Indian to fly a fighter at the Farnborough Airshow — the Gnat itself,” he added. However, even before 1958, Das had started to play a pivotal role in aircraft incorporation in India. Deputed to Hindustan Aeronautics Limited (HAL) in 1951, Das played an integral role in the experimental testing of the HT-2. “Das flew the machine to its limits to ensure that it was safe enough for trainees to fly and even had to bail out from the HT-2 when it did not recover from a spin during the trials, joining the caterpillar club,” wrote Gupta. In 1961, Das was appointed Chief Test Pilot at HAL. Today the road from HAL to Old Madras Road in Bengaluru is named after him. Further, through his time at the IAF, Das also played a pivotal role in the acquisition of multiple aircraft like the Canberra, the Hunter and the Mystere. Specifically, Suranjan Das was the first test-flyer on all evaluations for these aircraft, added Gupta.

## **HF-24 Marut & golden time for Indian aviation**

Das’ time at HAL coincided with the development of the HF-24 Marut, India’s first domestically-made fighter bomber. “That was a golden era for Indian aviation — when the HF-24 Marut and HJT-16 Kiran were designed and manufactured,” said Sudipto son of Suranjan Das. With the HF-24 Marut, Das flew its maiden sortie on 17 June, 1961. The Marut was an integral fulcrum of the IAF during the 1971 liberation war. “Dad wasn’t supposed to test the HF-24. However, there were technical glitches which prevented the earlier test pilot from conducting the sortie. The IAF then drafted him for it and, as we know, the rest is history,” said Sudipto. Das also took the first test flight of the HJT-16 Kiran, a trainer aircraft, on 4 September, 1964.

A month before his 50<sup>th</sup> birthday, Suranjan Das lost his life during a test flight of the Marut. “The canopy unlatched during take-off and prevented the aircraft from gathering sufficient speed, crashing shortly after,” wrote Gupta. He was conferred the Padma Vibhushan posthumously. “That remains a very stressful period in my life, I was just preparing for IIT entrance exams then,” said Sudipto. Despite the tragic crash, Group Captain Das’ service and legend remain revered in the air force and the larger community. In his honour, the best trainee at the IAF Test Pilot School is awarded the Suranjan Das Trophy.

**Source:** <https://theprint.in/>

## CURRENT AFFAIRS

### **ISRO Robotics Challenge-URSC 2024 (IRoC-U2024): Inviting Indian students to join Space exploration**

After the successful landing of Chandrayaan-3 Vikram on the lunar surface and the exploration of the southern pole of the moon, ISRO is gearing up for future robotic exploration missions to the Moon and other celestial bodies. ISRO is committed to creating unique opportunities for academia & industry to participate in the technology developmental activities commensurate with organisational objectives. In line with this vision, U R Rao Satellite Centre (URSC)/ISRO solicits from the youth of India, innovative ideas and designs of robotic rovers for future missions through the conduct of a space robotics challenge with an objective to provide development opportunities in space robotics to the participating entities and to leverage the creative thinking among the youth of our Nation for ISRO interplanetary missions.

To provide the opportunity for the students in the area of space robotics, "ISRO Robotics Challenge-URSC 2024 (IRoC-U 2024)" is organised with a tagline of "Let's build a space robot". The challenge consists of an engineering project where the Institutional teams build robots to compete in an extra-terrestrial-inspired arena, performing tasks based on the real-life challenges faced by space robotics. This is an invitation for the student community for the design and realisation of a 'Wheeled/Legged Rover' encompassing the development of complete hardware and software. The solutions provided by the students in IRoC-U 2024 have a greater chance of getting incorporated into ISRO's future interplanetary robotics missions.

#### **Objectives of the Challenge**

- To provide a standardised platform for exploring the area of space robotics.
- To develop a deeper understanding of space robotics and its applications among the student community. It enhances their communication, collaboration, inquiry, problem-solving and flexibility skills which will benefit them in their academic and professional lives.
- To co-develop (students and ISRO) future technologies needed in the area of space robotics.

#### **Outcome for Student Community**

- Identify, formulate, and solve complex engineering problems by applying principles of mathematics, science and engineering.
- Apply engineering design to produce solutions that meet specified needs.
- Communicate effectively.
- Collaborate with a team, provide inclusive leadership, establish goals, plan tasks, and meet objectives.
- Formulate and conduct appropriate experiments, analyse and interpret test and analytical data and use engineering judgment to draw conclusions.

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

### **DRDO holds XVIII International Workshop on High Energy and Special Materials**

The Defence Research and Development Organisation's (DRDO) High Energy Material Research Laboratory (HEMRL), Pune is organizing the XVIII International Workshop on High Energy and Special Materials (HEMS-2023) in association with Tomsk State University & Federal Research & Production Centre, Russia on 2<sup>nd</sup> & 3<sup>rd</sup> November 2023 at Dr APJ Abdul Kalam DRDO Golden Jubilee Auditorium, Pashan, Pune. The workshop was inaugurated by Dr Samir V Kamat, Secretary Department of Defence R&D and Chairman DRDO. HEMRL is organizing this international workshop for the first time in India, which provides a platform to the scientists, technocrats and researchers to share knowledge, experience and technological advancements made in recent past. About 250 delegates from countries like Russia, Germany, France, India etc., are attending the workshop. Various DRDO and ISRO laboratories, academic institutes and industries are participating in the workshop. HEMS-2023 is being held to discuss, deliberate and share new developments in recent past in High Energy Materials and

allied technologies. The theme of this workshop is 'Emerging Trends in High Energy and Special Materials'. The workshop is aimed at strengthening the collaboration of scientists and researchers across the globe on the development of new articles based on High energy and special materials. Focused areas for deliberations and discussions at the workshop are synthesis, characterization & evaluation of new energetic materials for various applications, insensitive & green HEMs, advanced high explosive formulations and devices, advanced pyrotechnics, nano materials for HEMs application, demilitarization, waste management, environmental studies and disposal technologies for HEMs, advances in special materials and allied technologies. The International Workshop on HEMs was started in the year 2004 and thereafter regularly organized by Russia with International Collaborators like Politecnico di Milano, Italy; Airbus Safran Launchers (Ariane Group) and Universite Lyon 1, France; JAXA, Japan.

**Source:** <https://www.drdo.gov.in/>

### **IAF Fighter Squadron Converts from MiG-21 to Su-30 MKI**

The Number 4 Squadron (Oorials) of the Indian Air Force (IAF) based at Air Force Station Uttarlai (Barmer) is converting from the MiG-21 to the Su-30 MKI, marking a watershed moment in the history of the squadron which was operating the MiG-21 since 1966. The MiG-21 was the first supersonic fighter in service of the IAF and was inducted in 1963. It has participated in all major conflicts since then. This change signifies the unwavering commitment of the Indian Air Force to modernise and at the same time protect the skies of the nation. The formal induction of the new aircraft was marked by a ceremony at Air Force Station Uttarlai on 30 October 23. The ceremony featured a combined flypast by the MiG-21 and Su-30 MKI, which marked the last MiG-21 sortie for the squadron. The ceremony was witnessed by the various military and civilian dignitaries in attendance. The conversion of this squadron to Su-30 MKI implies that the IAF now operates only two squadrons of the MiG-21. The IAF remains committed to phasing out the MiG-21 aircraft by the year 2025.

**Source:** <https://pib.gov.in/PressReleasePage.aspx?PRID=1973505>

### **India successfully test-fires 'Pralay' missile off Odisha coast**

The missile was launched from the APJ Abdul Kalam Island, Balasore, Odisha: India successfully test-fired its surface-to-surface short-range ballistic missile (SRBM) 'Pralay' from the Abdul Kalam Island off the Odisha coast, a Defence official said. The missile has been developed by the Defence Research and Development Organisation (DRDO). The missile, launched around 9.50 am, met all its mission objectives, the official said. A battery of tracking instruments monitored its trajectory along the coastline, he said. 'Pralay' is a 350-500 km short-range, surface-to-surface missile with a payload capacity of 500-1,000 kg, the official said. 'Pralay' has been developed for deployment along the Line of Actual Control (LAC) and Line of Control (LoC), he added.

**Source:** <https://www.deccanherald.com/india/india-successfully-test-fires-pralay-missile-off-odisha-coast-2760145>

### **Getting to the high table on space affairs**

In September this year, India became the first country to land near the lunar south pole. This feat came close on the heels of India signing the Artemis Accords in June 2023 — a US-led initiative that seeks to land the first woman and the first person of colour on the moon. This initiative will also drive lunar exploration and commercial mining of planetary resources. While the Chandrayaan-3 landing has shown India as a potential key player in an emerging lunar economy, its signing of the Artemis Accords highlighted India's desire to be a part of the global lunar space ecosystem which is likely to shape up as the next frontier of geopolitics. The India-US space partnership is not new. It matured in the mid-2000s. For instance, with the establishment of the US-India Civil Space Joint Working Group in June 2005 alongside



the announcement of the historic nuclear deal, the partnership acquired a firm footing. This working group provided ISRO a path to collaborate with NASA on Chandrayaan-1 in 2008 as it carried the latter's mini-synthetic aperture radar (SAR) and the moon mineralogy mapper (M3) to lunar orbit. This equipment helped Chandrayaan-1 to detect the presence of water on the moon. That mission cemented the India-US lunar partnership, laying the ground for future collaborations. More recently, the Initiative on Critical and Emerging Technologies (iCET) signed between India and the US calls for Indian participation in human spaceflight missions and in Commercial Lunar Payload Services (CLPS) project. Other initiatives like the Innovations for Defence Excellence (IDEX) and the India-US Defence Acceleration Ecosystem (INDUS-X) has given a boost to private sector engagement in the Indian lunar space sector. However, the Artemis Accords could set a new benchmark in India-US space ties. Introduced in 2020, the Artemis Accords are rooted in the Outer Space Treaty of 1967 and is a 'non-binding' multilateral arrangement for civil space exploration and peaceful uses of the Moon, Mars and other astronomical bodies. Initially, eight states became signatories to the accord — Australia, Canada, Italy, Japan, Luxembourg, the United Arab Emirates and the United Kingdom. After much deliberation, India decided to sign on the dotted line to become the 27th member of the lunar alliance. In fact, India's signing of the Artemis Accords on June 21 demonstrated India's intention of engaging in 'sustainable and transparent space activity.' It also demonstrated India's commitment to a multipolar world order in consonance with the Outer Space Treaty and the Moon Treaty. India's entry into the grouping is farsighted, given that it has struggled to be a part of different multilateral (technology denial) clubs such as the Missile Technology Control Regime (MTCR) and the Wassenaar Agreement, and still continues to be kept out of the Nuclear Suppliers' Group (NSG) due to Chinese machinations. With the Artemis Accords, India aspires to be "inside the tent" and at the diplomatic high table when it comes to space affairs. Such aspirations are also timely as India has announced two mega space missions: to set up an Indian Space Station by 2035 and to place the first Indian on the Moon by 2040. This is besides numerous other space missions being worked out by ISRO, such as the Venus Orbiter Mission and the Mars Lander Mission. However, despite these positive outcomes, India will need to address principal issues to emerge as a major player in the space domain and an important ally in space for the United States. While the success of Chandrayaan-3 has given impetus to India's space ambitions, structural constraints continue to hamper India's space ambitions and may potentially affect India-US space collaboration in the wake of the Artemis Accords. Concerns remain over providing an amicable regulatory environment for public-private partnerships to emerge in the space sector. India will also have to navigate the complex International Traffic in Arms Regulations (ITAR) on the US domestic side. ITAR includes a set of export control regulations that protect US security interests in different sectors, including space. The United States Munitions List (USML) designates 21 categories, articles and data as sensitive — considering them "defence items". Within the space domain, export of communication, remote sensing, navigation and multi-mission satellites as well as ground stations for telemetry, spacecrafts, launchers and propellants will come under the scanner. Getting US congressional consent will be necessary for technology transfers as well. Addressing these steps will enable India's further rise as a space power while giving a boost to India-US partnerships in the sector. Perhaps most importantly, the Artemis Accords complement the agreement in the Indo-Pacific where the US and India, along with other like-minded signatories, are looking to enhance transparency, promote peaceful intentions, register space objects and share scientific data to improve the safety and predictability of the space environment.

**Source:** <https://www.deccanherald.com/opinion/getting-to-the-high-table-on-space-affairs-2754618>

### **NASA ready to work with ISRO to help India build space station**

The National Aeronautics and Space Administration (NASA) chief Bill Nelson said the joint Indo-USA NISER satellite would be "one of the great observatories" to look at the changes happening on the Earth, besides noting that the USA was willing to collaborate with India on building an Indian Space Station. Nelson, who will be in Bengaluru said he would not only be interacting with the ISRO officials but also meet the lone Indian astronomer Rakesh Sharma, whom the NASA Administrator – himself an astronomer - met for the first time in April 1991. "Rakesh and I hit off immediately. We have not met after that, but we spoke over the phone," he recalled at a media interaction here. Nelson met Union Science and Technology Minister Jitendra Singh to take forward the discussions on space cooperation as outlined by

Prime Minister Narendra Modi and President Joe Biden in their joint statement earlier this year. NASA and ISRO have formed a joint working group on the human space flight programme. The two countries are also exploring cooperation in radiation impact studies, micro meteorite and orbital debris shield studies. There are also discussions with prominent US industries like Boeing, Blue Origin and Voyager on specific items of cooperation and also to explore joint collaborations with Indian commercial entities, says a government official. Asked whether the US will collaborate with India on the 'Bharatiya Antariksha Station' (Indian Space Station) project, Nelson said the US would be ready to collaborate with India in building the space station if it so desires. NASA plans to deorbit the International Space Station by 2031 and take the space observatory to a graveyard in the southern Pacific. "We expect to have a commercial space station by that time. I think India wants to have a space station. If India wants us to collaborate with them, of course, we will be available. But that's up to India," said Nelson, who was an astronaut and flew with the crew of the 24th Space Shuttle flight onboard 'Columbia' in 1986. Last month Prime Minister Modi asked ISRO to establish a 'Bharatiya Antariksha Station' (Indian Space Station) by 2035 and send the first Indian to the Moon five years later. Nelson said the USA would help train an Indian astronaut for a trip to the International Space Station in late 2024, but the astronaut will be selected by the ISRO. On the NISER satellite that will be launched in the first quarter of 2024, the NASA chief said it would be one of the great observatories and four-five such observatories in combination with 25 other spacecraft looking at the earth would be able to determine what is happening on the earth's surface and with the climate. Costing \$ 1.5 billion, the NASA-ISRO Synthetic Aperture Radar (NISER) is one of the most expensive payloads in space research, which was conceptualised more than 15 years ago when New Delhi and Washington decided to enter into a strategic partnership following the historic nuclear deal.

**Source:**<https://www.deccanherald.com/science/space/nasa-ready-to-work-with-isro-to-help-india-build-space-station-2788016>

## **A disturbing thought as MiG-21 flies into the sunset**

There must have been mixed feelings among those who watched the swansong sortie of the MiG-21 fighter jet on October 31 at the Uttarlai Air Force Station in Barmer in Rajasthan. It was joined in flight by a Su-30MKI fighter to mark the conversion of the Mig-21 Bison Squadron based at Uttarlai since 1966 into one of Su-30MKIs. Only two MiG-21 squadrons now remain in the Indian Air Force (IAF)'s fleet, and once they are phased out by 2025, a remarkable era in the history of the IAF will come to an end. While the MiG-21 retreats, there are pressing questions about India's air defence prowess. The IAF currently has less than 30 operational fighter squadrons of a sanctioned strength of 42 squadrons. With the MiG-21s gone, the fleet would be dangerously stretched at a time when there are major aerial threats on the eastern and western borders. When the IAF acquired the supersonic MiG-21 from the former Soviet Union in 1963, nobody knew just how valuable it would prove to be over the next 60 years. The delivery of its second-generation interceptor variant had hardly started in 1964 when it found itself in the thick of battle in the India-Pakistan conflict of 1965. The MiG-21's extraordinary dog-fighting ability made it the backbone of the IAF in the 1971 Bangladesh Liberation War, and the Kargil War with Pakistan in 1999. With the Soviets granting India the licence to manufacture the MiG-21 in the subcontinent, the Hindustan Aeronautics Ltd (HAL) set up new plants at Nashik, Koraput, and Hyderabad for making airframes, engines, and avionics respectively. Soon several versions of the MiG-21 rolled out of these facilities. In the following decades, HAL built most of the 875 MiG-21s inducted into the IAF. This helped it hold sway over more modern aircraft like the Dassault Mirage 2000s and MiG-29s that joined the IAF fleet in subsequent years. In fact, age has been just a number for this ageing aerial warhorse as its numerous variants continued to hold their own even against fourth-generation jet fighters. That said, the most versatile of the series, the Mig-21Bis fleet perhaps dominated the IAF's fighter fleet for a year too many and — like all fighting machines — should have been phased out of service by more modern avatars. Yet, several factors, borne more out of necessity than tactical reasons, forced the IAF to make do and mend, flying the MiG-21 in various roles like ground attack, bombing, reconnaissance and providing cover for bombers. Such ad hocism also had much to do with the adamant refusal of the MiG-21's vaunted successor, the Light Combat Aircraft (LCA), to leave the drawing board, defying deadlines. With the pressing need to arrest a dwindling fleet, the IAF faced the Hobson's choice of upgrading and continuing with its MiG-21 Bis fleet

indefinitely, switching the fighter from its primary role of a short-range interceptor to that of a ground attack aircraft. Sadly, airbrushing the performance parameters of an aircraft like the MiG-21, primarily designed for high-speed interceptions, was never going to work — this was reflected in the unacceptably large number of crashes involving the fighter. Like all aircraft, the MiG-21 has its idiosyncrasies. For instance, its high take-off and landing speeds — more than a jet airliner's — meant the pilot had to think ahead of it, leaving little or no reaction time in an emergency. Moreover, bailing out from a MiG-21 is perilous compared to other fighter jets with an unacceptably high risk of spinal injury which often made pilots unwilling to eject. The crashes, of course, also had much to do with the way rookie pilots, used to obsolete basic trainers, leapfrogged technology to fly this frontline fighter. In fact, it is doubtful if the absence of an advanced jet trainer was so starkly demonstrated by any other major air force in the world. Small wonder the sobriquet 'Flying Coffins' was plastered on the MiG-21s through most of their service life. Talk about giving a dog a bad name and hanging him. For in the hands of a good pilot, the MiG-21's extreme manoeuvrability made it a feared fighter, especially in WVR (Within Visual Range) combat. It is too soon to forget how, in 2019, a MiG-21 Bison flown by Wing Commander Abhinandan Varthaman of the Srinagar-based No 51 squadron shot down an F-16 of the Pakistan Air Force. The MiG-21 is a classic that has outlived all its contemporaries and has had several avatars since it first sported the IAF roundels. Much like what happened to the legendary German Messerschmitt EE-109 of the 1940s, however, the fine handling qualities of the initial Mig-21 versions were curiously missing in the later models that had to be upgraded. Indian planners shouldn't have licence-built this magnificent flying machine without any strategic planning. The lack of planning and timely action can also be seen in the gaps in our squadron strength. Phasing out jets and replacing them or even inducting new ones is a decades-long process. The induction of the indigenously-built LCA Tejas, along with some off-the-shelf and licence-built foreign platforms like the Dassault Rafale, may address the issue in the short term. But this will not be enough for the IAF to have even 35 fighter squadrons by 2030 — surely a disturbing thought for defence planners as they watch the MiG-21 fly into the sunset.

**Source:**<https://www.deccanherald.com/opinion/indian-air-force-mig21-defence-lca-tejas-disturbing-thought-2763527>

### **Aditya-L1's SUIT captures full-disk images of the Sun in near ultraviolet wavelengths**

The Solar Ultraviolet Imaging Telescope (SUIT) instrument on board the Aditya-L1 spacecraft has successfully captured the first full-disk images of the Sun in the 200-400 nm wavelength range. SUIT captures images of the Sun's photosphere and chromosphere in this wavelength range using various scientific filters. SUIT payload was powered ON. Following a successful pre-commissioning phase, the telescope captured its first light science images on December 6, 2023. These unprecedented images, taken using eleven different filters (as shown in Table 1), include the first-ever full-disk representations of the Sun in wavelengths ranging from 200 to 400 nm, excluding Ca II h. The full disk images of the Sun in the Ca II h wavelength has been studied from other observatories. Among the notable features revealed are sunspots, plage, and quiet Sun regions, as marked in the Mg II h image, providing scientists with pioneering insights into the intricate details of the Sun's photosphere and chromosphere. SUIT observations will help scientists study the dynamic coupling of the magnetized solar atmosphere and assist them in placing tight constraints on the effects of solar radiation on Earth's climate. The development of SUIT involved a collaborative effort under the leadership of the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune. This collaboration included ISRO, the Manipal Academy of Higher Education (MAHE), the Centre for Excellence in Space Science Indian (CESSI) at IISER-Kolkata, the Indian Institute of Astrophysics Bengaluru, the Udaipur Solar Observatory (USO-PRL), and Tezpur University Assam.

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

**DRDO carries out successful flight trial of Autonomous Flying Wing Technology Demonstrator, an indigenous high-speed flying-wing UAV**

Defence Research and Development Organisation (DRDO) has successfully carried out a flight trial of Autonomous Flying Wing Technology Demonstrator, an indigenous high-speed flying-wing Unmanned Aerial Vehicle (UAV) from the Aeronautical Test Range, Chitradurga in Karnataka. The successful flying demonstration of this autonomous stealth UAV is a testimony to maturity in the technology readiness levels in the country. With this flight in the tailless configuration, India has joined the elite club of countries DRDO's Aeronautical Development Establishment. The maiden flight of this aircraft was demonstrated in July 2022, followed by six flight trials in various developmental configurations using two in-house manufactured prototypes. These flight-tests led to achievements in development of robust aerodynamic and control system; integrated real-time and hardware-in-loop simulation, and state-of-the-art Ground Control Station. The team had optimised the avionic systems, integration and flight operations towards the successful seventh flight in final configuration. The aircraft prototype, with a complex arrowhead wing platform, is designed and manufactured with light-weight carbon prepreg composite material developed indigenously. Also, the composite structure, impregnated with fibre interrogators for health monitoring, is a showcase of 'Aatmanirbharta' in the aerospace technology. The autonomous landing of this high-speed UAV, without the need for ground radars/infrastructure/pilot, showcased a unique capability demonstration, allowing take-off and landing from any runway with surveyed coordinates. This was possible using onboard sensor data fusion with indigenous satellite-based augmentation using GPS Aided GEO Augmented Navigation (GAGAN) receivers to improve the accuracy and integrity of GPS navigation. Raksha Mantri Shri Rajnath Singh has complimented DRDO, Armed Forces and the Industry for the successful flight trial of the system. He stated that the successful development of such critical technologies indigenously will further strengthen the Armed Forces. Secretary Department of Defence R&D and Chairman DRDO Dr Samir V Kamat also congratulated the DRDO and the teams associated with this successful flight trial.



**Source:**<https://pib.gov.in/PressReleasePage.aspx?PRID=1986788>

## **NASA Administrator Visits ISRO Headquarters, Inspects NISAR**

NASA Administrator Bill Nelson met the Indian Space Research Organisation (ISRO) chairman and Department of Space (DoS) Secretary S Somanath at the ISRO headquarters here. At a meeting organised at Antariksh Bhavan, Nelson and Somanath, along with the first Indian cosmonaut Wg Cdr Rakesh Sharma (Retd.), interacted with the ISRO/DoS community. Somanath noted the long-standing collaboration between the two space agencies – from the launch of the first sounding rocket from India to the discovery of hydroxyl molecules on the Moon by the payloads on board Chandrayaan-1 to the upcoming low earth orbit observatory NISAR (NASA ISRO Synthetic Aperture Radar). Nelson congratulated ISRO on Chandrayaan-3 which made India the first nation to reach the south pole of the Moon. He said NASA is looking forward to receiving the data from NISAR. ISRO said “potential opportunities for continued cooperation” beyond NISAR, in programmes like India’s human spaceflight mission Gaganyaan and enhanced interactions among scientific, academic and industrial communities were discussed. Senior members from ISRO, DoS, NASA and the US Consulate, Chennai, participated in the meeting. Earlier in the day, the NASA administrator and the ISRO Chairman visited the U R Rao Satellite Centre (URSC) and had a look at the NISAR satellite which is undergoing its final integration and testing activities, with the participation of engineers from ISRO and NASA/Jet Propulsion Laboratory (JPL). Nelson also interacted with the NASA/JPL engineers who are working at URSC on the satellite.

**Source:**<https://www.deccanherald.com/india/karnataka/bengaluru/nasa-administrator-visits-isroheadquarters-inspects-nisar-2791781>



## **INS Sumedha - Mission Deployed at Antsiranana, Madagascar**

As part of Indian Navy's Long Range Mission Based Deployment, Indian Naval Ship Sumedha is undertaking port call at Antsiranana, Madagascar from 04 to 06 December 2023. The visit is aimed at reinforcing Indian Navy's commitment to enhance Maritime Security, building bridges of friendship and strengthening maritime co-operation with Madagascar. India and Madagascar have traditionally enjoyed warm and friendly relations, sharing common ethos of democracy, secularism and development. The deployment also highlights warm and cordial relation of India with Eastern African countries. During her stay, INS Sumedha will engage in professional interactions, cross training for exchange of best practices and interaction with Malagasy Navy personnel. The visit aims to enhance interoperability towards capacity building between the two friendly navies in Indian Ocean Region in line with the Prime Minister's vision of Security And Growth for All in Region (SAGAR). The ship is also scheduled to undertake Maritime Partnership Exercise (MPX) with Malagasy Navy upon departure on 06 December 2023, wherein, various facets of maritime operations such as communication drills, tactical manoeuvres and flying operations are planned. INS Sumedha is third of the indigenously constructed Naval Offshore Patrol Vessel (NOPV) of Saryu class deployed for multiple roles independently and in support of Fleet Operations. She is part of the Indian Navy's Eastern Fleet based at Visakhapatnam and functions under the operational command of the Flag Officer Commanding-in-Chief, Eastern Naval Command. The ship is equipped with several weapon systems, sensors, state of art navigation and communication systems/Electronic Warfare suite. Sumedha has undertaken various Fleet support operations, coastal and offshore patrolling, ocean surveillance, Non-combatant Evacuation Operations and HADR missions. The ship also has the distinction for being the maiden Indian Naval Ship to participate in Exercise Bright Star (a Multinational exercise held biennially in Egypt) from 06 to 15 September 2023 and India-EU Joint Naval exercise 24 to 26 October 2023.

**Source:**<https://pib.gov.in/PressReleasePage.aspx?PRID=1982360>

## **Successful Training Launch of Short-Range Ballistic Missile 'Agni-1'**

Training launch of Short-Range Ballistic Missile 'Agni-1' was carried out successfully from APJ Abdul Kalam Island, Odisha on December 07, 2023. Agni-1 is a proven very high precision missile system. The user training launch, carried out under the aegis of the Strategic Forces Command, successfully validated all operational and technical parameters.

**Source:**<https://pib.gov.in/PressReleasePage.aspx?PRID=1983750>

## **ISRO to Develop ECLSS for Gaganyaan after Failing to Get it from Other Countries: S Somanath**

Indian Space Research Organisation (ISRO) chairman S Somanath said the space agency has decided to indigenously develop the environmental control and life support system (ECLSS) for the upcoming human space flight mission Gaganyaan, after it failed to get it from other countries. Science & Technology News The Gaganyaan project envisages a demonstration of ISRO's human spaceflight capability by launching a human crew to an orbit of 400 km and bringing them safely back to earth by landing in Indian sea waters. It is expected to be launched in 2025. "We have no experience in developing an environmental control life support system. We were only designing rockets and satellites. We thought that this knowledge would come from other nations, but unfortunately after so much discussion, nobody is willing to give it to us," Somanath said. He was addressing the 5th edition of Manohar Parrikar Vidnyan Mahotsav 2023 at Dona Paula, an event organised by Goa's Science, Environment and Technology Department. Somanath said that ISRO has now decided to indigenously develop the ECLSS. "We are going to develop it in India using the knowledge we have and using the industries that we have," he said. Speaking about the challenges before the Gaganyaan programme, he said India has been into knowledge building design capability development over the last so many years and the pinnacle of this is going to be the Indian human space flight programme. "When we send humans to space through our Gaganyaan programme, I think the amount of skill and confidence that we need to have has to be higher than what we currently have," he said. Somanath said that the confidence-building process is happening all across

ISRO today with the support of national laboratories. The first part of the Gaganyaan programme is the rocket. “The rockets are always bound to fail; whenever it is ready for launch our tension and heartbeats go up because even if the rocket is built very safely having all the processes followed, something can still go wrong,” he said. “And if it goes wrong, then there is nobody who is able to correct it or adjust it. Thousands of elements should work without any flaw to make a launch happen,” he said. Somanath said that there is always a risk of failure. “When you have a failure possibility, then you must have protection against it in human space flight. This is a core of human space flight that we should not put the risk of having the astronaut lost due to the failure in the rocket,” he said. “So it calls for intelligence in the rocket. This is what we are working on today,” he said. The people in the new generation understand what intelligence is and how to create intelligence in machinery by sensors, data processing, artificial intelligence to create signals of various natures and then come to a conclusion that the rocket is going to fly safely or it is going to fail, he added. Somanath said the decision in case of failure has to be taken in less than a fraction of a second. “Then you have to tell the rocket that you are going to fail now and you better abort even before failure happens. This is a challenge of working on intelligence in the rocket and we are working on such technologies today, looking at the data which is available in measurements and then making a synthesis of it,” he said. Somanath said that ISRO was developing many new technologies to handle human space flight.

**Source:**<https://www.deccanherald.com/science/isro-to-develop-eclss-for-gaganyaan-after-failing-to-get-itfrom-other-countries-s-somanath-2809063>

## TECHNOLOGY

### Re-entry of Cryogenic Upper Stage of LVM3 M4

The cryogenic upper stage of the LVM3 M4 launch vehicle made an uncontrolled re-entry into the Earth’s atmosphere, around 14:42 IST today. The probable impact point was predicted over the North Pacific Ocean. The final ground track did not pass over India. This rocket body (NORAD id 57321) was part of the vehicle that successfully injected the Chandrayaan-3 spacecraft into the intended orbit of 133 km x 35823 km with a 21.3° inclination on July 14, 2023. The re-entry of the rocket body took place within 124 days of its launch. The post-mission orbital lifetime of the LVM3 M4 Cryogenic upper Stage is, thus, fully compliant with the “25-year rule” for LEO (Low Earth Orbit) objects as recommended by the Inter-Agency Space Debris Coordination Committee (IADC). Post Chandrayaan-3 injection, the upper stage had also undergone “passivation” to remove all residual propellant and energy sources to minimise the risks of accidental explosions as per the space debris mitigation guidelines prescribed by the United Nations and IADC. Passivation and Post-mission disposal of this rocket body in adherence to the internationally accepted guidelines once again reaffirms India’s commitment to preserve the long-term sustainability of outer space activities.



**Inauguration of Capacity Building Programme on “Geospatial Technologies and Applications” by Hon’ble MoS, DOS Dr. Jitendra Singh**

ISRO / Department of Space has launched a Capacity Building Programme on “Geospatial Technologies and Applications” in tandem with objectives of National Geospatial Policy - 2022. First phase of the capacity building programme on “Geo-spatial Technologies and Applications” has been inaugurated by Hon’ble Minister of State, Department of Space, Government of India, Dr. Jitendra Singh in the presence of Secretary, Department of Space Sri S. Somanath, Chairman, Capacity Building Commission Sri Adil Zainulbhai and other senior dignitaries. 58 Participants from 29 Ministries and Departments of Government of India and various State Governments are undergoing this one-week programme at RRSC – North, NRSC at New Delhi & NE-SAC, Shillong.

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

### **Indian Navy’s Indigenous Guided Missile Hits ‘Bulls Eye’ in Maiden Brahmos Firing**

In a notable achievement, the Indian Navy’s latest indigenous guided missile destroyer scored ‘Bulls Eye’ in its maiden Brahmos firing at sea. The successful test marks the first-ever test-firing of an extended-range Brahmos missile before a ship’s commissioning, as reported by news agency ANI. #WATCH | Imphal (Yard 12706), Indian Navy’s latest indigenous guided missile destroyer, scored ‘Bulls Eye’ in her maiden Brahmos firing at sea. First ever test-firing of Extended Range Brahmos missile before a ship’s commissioning underscores Indian Navy’s unwavering focus on... [pic.twitter.com/hdXFGXS7se](https://pic.twitter.com/hdXFGXS7se) — ANI (@ANI) November 22, 2023 the Indian Navy and the Defence Research and Development Organisation (DRDO) successfully conducted Guided Flight Trials of the first indigenously developed Naval Anti-Ship Missile. Launched from a Seaking 42B helicopter, this missile milestone marks a significant step in the direction of attaining self-reliance in niche missile technology, showcasing advancements in seeker and guidance technologies. “#IndianNavy in association with @DRDO\_India successfully undertook Guided Flight Trials of #1st indigenously developed Naval #AntiShipMissile frm Seaking 42B helo on #21Nov 23. A significant step towards achieving self-reliance in niche missile tech, incl seeker & guidance tech,” a post by the Indian Navy stated. After the maiden flight test, Defence Minister Rajnath Singh extended congratulations to DRDO, the Indian Navy, and associated teams, acknowledging India’s achievement in the indigenous design and development of missile systems. Dr G Satheesh Reddy, then the Chairman of DRDO, praised the project team’s efforts, commending the Indian Navy and Naval Flight Test Squadron for their support. He emphasised that the new system would enhance the offensive capability of the Indian Navy, news agency ANI reported. The missile’s advanced guidance system incorporates state-of-the-art navigation and integrated avionics, showcasing India’s prowess in developing cutting-edge missile technologies. The successful trial reaffirms the Indian Navy’s commitment to indigenisation and strengthens the country’s position in missile technology development.

**Source:** <https://news.abplive.com/india-at-2047/Indian-navy-indigenous-guided-missile-imphal-hits-bullseye-maiden-brahmos-firing-1644394>

### **Aditya-L1’s ASPEX instrument begins its measurements**

The Aditya Solar wind Particle Experiment (ASPEX) payload onboard India’s Aditya-L1 satellite has commenced its operations and is performing normally. ASPEX comprises two cutting-edge instruments – the Solar wind Ion Spectrometer (SWIS) and STEPS (SupraThermal and Energetic Particle Spectrometer). The STEPS instrument was operational on September 10, 2023. The SWIS instrument was activated on November 2, 2023, and has exhibited optimal performance. SWIS, utilizing two sensor units with a remarkable 360° field of view each, operates in planes perpendicular to one another. The instrument has successfully measured solar wind ions, primarily protons and alpha particles. A sample energy histogram acquired from one of the sensors over two days in November 2023 illustrates variations in proton (H+) and alpha particle (doubly ionized helium, He2+) counts. These variations were recorded with nominal integration time, providing a comprehensive snapshot of solar wind behaviour. The directional capabilities of SWIS enable precise measurements of solar wind protons and alphas, contributing significantly to addressing longstanding questions about solar wind properties, underlying processes, and their impact on Earth. The change in the proton and alpha particle number ratio, as observed by SWIS, holds the potential to provide indirect information about the arrival of Coronal



Mass Ejections (CMEs) at the Sun-Earth Lagrange Point L1. Enhanced alpha-to-proton ratio is often regarded as one of the sensitive markers of the passage of interplanetary coronal mass ejections (ICMEs) at the L1 and hence considered crucial for space weather studies. As researchers delve deeper into the collected data, the international scientific community eagerly awaits the wealth of knowledge that Aditya-L1's ASPEX is set to unveil about the enigmatic solar wind and its implications for our planet.

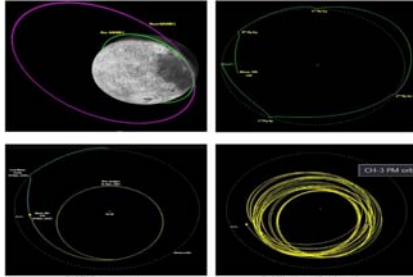
**Source:**<https://www.isro.gov.in/>

## **Returns to home Earth: Chandrayaan-3 Propulsion Module moved from Lunar orbit to Earth's orbit**

In another unique experiment, like the hop experiment on the Vikram Lander, the Propulsion Module (PM) of Chandrayaan-3 was moved from an orbit around Moon to an orbit around Earth. The primary objective of Chandrayaan-3 mission was to demonstrate soft landing near to lunar south polar region and perform experiments using the instruments on Vikram and Pragyaan. The spacecraft was launched on July 14, 2023 on-board LVM3-M4 vehicle from SDSC, SHAR. On August 23<sup>rd</sup> Vikram Lander made its historic touch down on Moon and subsequently Pragyaan rover was deployed. The scientific instruments in Lander and Rover were operated continuously for 1 lunar day as per the defined mission life. The mission objectives of Chandrayaan-3 have been completely met. With regard to Propulsion Module, the main objective was to ferry the Lander module from GTO to the final lunar polar circular orbit and separate the Lander. Subsequent to separation, Spectro-polarimetry of HAbitable Planet Earth (SHAPE) payload in the PM was also operated. The initial plan was to operate this payload for about three months during the mission life of PM. The precise orbit injection by LVM3 and optimal earth / lunar burn maneuvers, resulted in the availability of over 100 kg of fuel in the PM after over one month of operations in the lunar orbit. It was decided to use the available fuel in the PM to derive additional information for future lunar missions and demonstrate the mission operation strategies for a sample return mission. In order to continue SHAPE payload for Earth observation, it was decided to re-orbit the PM to a suitable Earth orbit. This mission plan was worked out considering the collision avoidance such as preventing the PM from crashing on to the Moon's surface or entering into the Earth's GEO belt at 36000 km and orbits below that. Considering the estimated fuel availability and the safety to GEO spacecrafts, the optimal Earth return trajectory was designed for October 2023 month. First maneuver was performed on October 9, 2023 to raise apolune altitude to 5112 km from 150 km thus, increasing the period of orbit from 2.1 hrs to 7.2 hrs. Later, considering the estimate of available propellant, the second maneuver plan was revised to target an Earth orbit of 1.8 lakhs x 3.8 lakhs km. The Trans-Earth injection (TEI) maneuver was performed on October 13, 2023. In the post-TEI maneuver realized orbit, propulsion module made four Moon fly-bys before departing Moon SOI on November 10. Currently, propulsion module is orbiting Earth and crossed its first perigee on November 22<sup>nd</sup> with an altitude of 1.54 lakhs km. The orbit period is nearly 13 days with 27 deg inclination. The perigee and apogee altitude vary during its trajectory and the predicted minimum perigee altitude is 1.15 lakhs km. Hence as per current orbit prediction, there is no threats of close approach with any operational Earth orbiting satellites. As per plan, SHAPE payload is being operated whenever Earth is in its field of view. Also, a special operation of the SHAPE payload was carried out on October 28, 2023 during a lunar Eclipse. The Shape payload operations will continue further. UR Rao Satellite Centre/ISRO's flight dynamics team has developed an analysis tool from first principles for this operation which is being validated through the return maneuvers carried out for the Chandrayaan-3 PM. Following are the main outcome from the return maneuvers carried out on CH3 PM related to future missions:

- Planning and execution of trajectory and maneuvers to return from Moon to Earth.
- Development of a software module to plan such a maneuver and its preliminary validation.
- Planning and execution of a gravity assisted flyby across a planets/ celestial body.
- Avoiding uncontrolled crashing of the PM on the Moon's surface at the end of life of PM thus meeting the requirements of no debris creation.





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

## BUSINESS

### India should become World's Innovation Hub: Former DRDO Chief

Dr G Satheesh Reddy, the former Chairman of India's Defence Research and Development Organisation (DRDO) and Scientific Advisor to the Defence Minister, emphasized the need for India to become the world's innovation hub. He delivered the 21st convocation address at NITK, Surathkal, where he encouraged the youth to develop state-of-the-art products that are both high quality and cost-effective for the world. Dr Satheesh Reddy stated that innovation and technology are crucial for India to achieve a top position globally. Dr Satheesh Reddy highlighted India's self-reliance in missile technology, with a wide range of missiles in its arsenal. He said India has achieved self-reliance in radars, aircraft, guns, communication systems, submarines, surface-to-surface missiles, anti-tank missiles, and many other varieties of indigenously developed missiles. Dr Satheesh Reddy said the 'Make in India' initiative launched by the government has created opportunities for the private sector to participate in manufacturing equipment in various sectors, including defence. He noted that many young entrepreneurs and startups have emerged in the country, driven by a globally competitive mindset. During the previous fiscal year, the Ministry of Defence exported equipment, arms, and ammunition worth Rs 16,000 crore, reflecting the world's confidence in India's defence technology, he said. He recollected that India's ability was tested during the Covid19 pandemic when the country was tasked with manufacturing 30,000 ventilators within a short 3 timeframe. CSIR-NIIST Director Dr C Anandharamakrishnan stressed the need for scientific intervention to address issues related to health, food, the energy sector, and climate change in the country. "We need to work on energy, water and food security. To achieve Amrit Kaal by 2047, we need to work together and plan for the next 24 years," he said. NITK Director Prof. B Ravi mentioned that work on a lecture hall complex (D), an Olympic-sized swimming pool, and an elevated Sky track to connect both sides of the campus are currently in progress. Additionally, NITK's testing and consultancy services exceeded Rs five crore within a year, compared to less than Rs 3 crore in the previous fiscal year. NITK's student placement continues to be strong, with over 1500 students out of 1730 students securing placements at an average CTC of nearly Rs 16 lakh.

Source:<https://www.deccanherald.com/india/india-should-become-worlds-innovation-hub-former-drdochief-2757258>

### HAL and Airbus Sign Contract for Establishing Civil MRO Facility for A-320 Family at Nashik

HAL and Airbus Sign Contract for Establishing Civil MRO Facility for A-320 Family at Nashik Bengaluru/New Delhi, November 9, 2023: HAL and Airbus have signed a contract for establishing MRO facilities for A-320 family of

aircraft during a function in New Delhi today. This collaboration with the largest European aircraft manufacturing company will strengthen Make-in-India mission by achieving self-reliance in the aircraft Maintenance, Repair and Overhaul (MRO) industry in India. HAL intends to establish an integrated MRO services in India and seeks to provide the commercial airlines a one stop MRO solution. Under the collaboration, Airbus will supply the A320 family tool package and offer specialised consulting services to HAL to establish MRO facility for A-320 family of aircraft. The partnership between HAL and Airbus will support the growing demand for MRO services in the country and expand the commercial fleet, especially the A320 family of aircraft. “HAL wants to establish an integrated MRO hub in the country and provide Airlines with an effective MRO solution. This step by HAL is also aligned to civil-military convergence and Make-in-India mission of Govt. of India,” said Saket Chaturvedi, CEO (MiG Complex), HAL. Rémi Maillard, President & Managing Director, Airbus India and South Asia emphasized that Airbus is committed to grow the aviation ecosystem in India and development of a strong MRO infrastructure is a key element of this ecosystem. The facility once established will be one of its kind in India. HAL and Airbus collaboration envisages substantial reduction in lead-time, improved turnaround time and reduction in MRO costs, thereby increasing availability of the fleet for flight operations. The MRO facility for the A-320 aircraft family would be established and ready for aircraft induction by November 2024 with required DGCA approval. In future, this Nashik facility will also be available for the entire Asian region after obtaining EASA approval in partnership with Airbus.

PM Visits HAL Facilities, Appreciates HAL Capabilities Prime Minister Shri Narendra Modi visited Hindustan Aeronautics Limited (HAL) today in Bengaluru after his maiden sortie on LCA Tejas twin seater aircraft in Bengaluru. Prime Minister Shri Narendra Modi became the first Prime Minister of the country who took a sortie in Tejas - an indigenously designed and developed aircraft. Prime Minister had a look at production facilities of LCA Tejas aircraft in Bengaluru and was briefed about the technology intensive work being done at HAL towards realising the vision of Aatmanirbhar Bharat. He was apprised about the initiatives being taken by HAL towards ramping capacities and capabilities by HAL. Prime Minister visited the LCA Tejas Final Assembly and discussed capabilities of the aircraft. He was briefed about the capabilities of Tejas - a lightweight, all weather multi-role aircraft. Tejas has been operationally deployed with the Indian Air Force and will be the mainstay of IAF fighter fleet in years to come. The aircraft is capable of undertaking offensive air support role as well as ground attack roles and is quite superior to its contemporaries. Prime Minister walked through the production line of LCA Tejas and interacted with the Engineers on the various features of the Aircraft. It was explained that the aircraft is presently powered by GE 404 engine which will get upgraded to GE 414 Engine for LCA Mk II which will be manufactured in India with 80% Transfer of Technology arrangement with GE Engines for which the MOU has been signed with GE Engines. This will be the first time that an engine of this class will be produced in India with 80% Transfer of technology. This transfer of technology is likely to bridge the technology gap that exists currently in the aero engine domain of the country. Prime Minister was briefed about the capacity investments being done by HAL to produce LCA Tejas aircraft in greater numbers. HAL has established two production lines of LCA Tejas at Bengaluru, which can produce up to 16 aircraft per year. Further, an additional production line is being established at HAL, Nasik to take the production rate beyond 24 aircraft from 2024-25 onwards. HAL is planning to advance the deliveries of current and future order of LCA Tejas to its customers. Prime Minister discussed the extent of indigenisation efforts of LCA Tejas. HAL had displayed various indigenously developed and produced systems including the Digital flight control computer (DFCC) and Open architecture computer (OAC) with the support of DRDO, DPSU's and Private industry along with HAL. It was further explained that Flight controls, Fuel systems, Hydraulics, Air-conditioning, Mission and display systems have also been indigenised. Prime Minister was informed that HAL is striving to take the indigenious content of the aircraft beyond 70% in the next 3-4 years under the indigenization drive as part of Aatmanirbhar Bharat vision and take India towards self-reliance into defence and aerospace. Prime Minister appreciated the capabilities of indigenously developed LCA Tejas aircraft and production facilities available at HAL. Prime Minister was also briefed about the progress on LCA MK1A programme. The production of fighter aircraft against 83 Mk1A order concurrent with its design and development is under progress at HAL. Mk1A variant will be a more lethal aircraft with capabilities such as AESA Radar, BVR Missile capability, EW suite, advance avionics, and maintenance improvements. The deliveries of MK1A aircraft are planned from Feb 2024 onwards to IAF. Various indigenious helicopters such as Light Combat Helicopter (LCH) Prachand, Advanced Light Helicopter-WSI Rudra and Light Utility Helicopters were also showcased to the Prime Minister. HAL briefed the Prime

Minister on the combat and performance capabilities of Prachand with emphasis on the high altitude employability in Leh/ Ladakh and eastern Himalayan sectors. It was informed that the helicopter can fly upto 6 km altitude. He was also briefed that the LCH has already been deployed with the Army and IAF and there is an additional requirement from the defense forces for 156 Prachand helicopters for enhancing the defense preparedness of the nation and its efforts toward Aatmanirbharta. The electronic warfare system, armament and troop-carrying capability of Rudra (ALH Mk IV) helicopter was also showcased. Prime Minister was briefed on the slew capability of gun to the target as demanded by the pilots, and he was briefed how the same is achieved either through the electro optical pod or pilot helmet mounted sighting system. CMD (Additional Charge), HAL Shri C.B. Ananthkrishnan was present during the Prime Minister's visit. He thanked the Prime Minister for his continuous support and encouragement. He said that the Prime Minister's visit has motivated HAL to work towards fulfilling the Aatmanirbhar goals in the Aerospace & Defence domain.



Source: [hal-india.co.in](http://hal-india.co.in)

## Tejas LCA to be exported? India eyes deal with Nigeria, others

Despite a set back in its first endeavour, India is in talks with at least three nations – Nigeria being the latest – for exporting the home-grown combat aircraft Tejas LCA Mk-1, top officials of the Hindustan Aeronautics Limited said here. While discussions with the African nation are at an early stage, the Bengaluru-based state-owned aviation major already held talks with Egypt and Argentina, with officials from the Latin American country visiting the HAL facilities earlier this year. “We are in talks with Nigeria on Tejas-LCA, but it is early days. This is apart from our discussions with Egypt and Argentina that witnessed a change in the government recently,” C B Ananthkrishnan, HAL chairman-cum-managing director told journalists here on the sidelines of a HAL conference on avionics. The plan is to sell 15 aircraft to Argentina and 20 to Egypt to start with. Other countries that evinced interest in Tejas LCA jet are USA, Australia, Indonesia and Philippines. Tejas LCA is a single-engine multi-role fighter aircraft capable of operating in high-threat air environments to carry out missions on air defence, reconnaissance and strike roles. Earlier, HAL had submitted a proposal to Malaysia's Ministry of Defence to supply 18 Tejas LCA responding to a global tender floated by the Royal Malaysian Air Force. But the Indian company, despite being shortlisted as one of two final contenders, lost the deal to South Korean FA-50 made by Korean Aerospace Industries. Ananthkrishna said HAL would also be looking at exporting avionics like mission computers, navigational systems and display systems because of its growing market as indigenous products could be customised for platforms used for foreign countries. “Avionics are crucial to upgrade military aircraft. Globally the market is growing at a compound annual growth rate of 8% to touch 70 billion by 2030,” he said. Platforms like Dhruv advanced Lightweight helicopter and LCA Tejas were offered to foreign customers because of their superior avionics, he added. Inaugurating the conference, Gen Anil Chauhan, Chief of the Defence Staff said India's challenges must be resolved with Indian solutions as the Russian-Ukraine war affected the operational efficiency of the armed forces around the world and exposed the vulnerability of global supply chains.

Source: <https://www.deccanherald.com/india/tejas-lca-to-be-exported-india-eyes-deal-with-nigeria-others-2801489>

## **First Ship of Survey Vessel (Large) Sandhayak Delivered to Indian Navy**

Sandhayak (Yard 3025), the first of four Survey Vessel (Large) ships, being built at Garden Reach Shipbuilders & Engineers (GRSE), Kolkata, was delivered to the Indian Navy on 04 Dec 23. The Contract for four Survey Vessel (Large) was signed on 30 Oct 18. The SVL ships are designed and built to the rules of Indian Register of Shipping Classification society by M/s Garden Reach Shipbuilders & Engineers (GRSE), Kolkata. The primary role of the ship would be full scale coastal and deep-water Hydrographic Survey of Port/ Harbour approaches and determination of navigational channels/ routes. Zone of operation includes maritime limits upto EEZ/ extended continental shelf. The ships will also collect oceanographic and geophysical data for defence and civil applications. In their secondary role, ships will provide limited defence and function as Hospital ship during war/ emergencies. With a displacement of about 3400 tons and an overall length of 110 meters, Sandhayak is fitted with state of the art hydrographic equipment such as Data Acquisition and Processing System, Autonomous Underwater Vehicle, Remotely Operated Vehicle, DGPS Long range positioning systems, Digital side scan sonar etc. Powered by two Diesel Engines, the ship is capable of achieving speeds in excess of 18 knots. The Keel for ship was laid on 12 Mar 19 and the ship was launched on 05 Dec 21. The ship has undergone a comprehensive schedule of trials in harbour and at sea, leading up to its delivery to Indian Navy on 04 Dec 23. Sandhayak has an indigenous content of over 80% by cost. The delivery of Sandhayak is an affirmation of the impetus being given by the Government of India and the Indian Navy towards 'Aatma Nirbhar Bharat'. The induction of Sandhayak, despite COVID and other Geo Political challenges during its construction, is a tribute to the collaborative efforts of large number of stake holders, MSMEs and Indian Industry in enhancing the maritime prowess of the Nation in the Indian Ocean Region.

Source:<https://pib.gov.in/PressReleasePage.aspx?PRID=1982348>

### EVENTS

## **President Of India, Smt Droupadi Murmu Graced An International Conference Cum Exhibition On 'Aerospace & Aviation In 2047'**

President of India, Smt Droupadi Murmu graced an International Conference cum Exhibition on 'Aerospace & Aviation in 2047', organised by the Aeronautical Society of India to commemorate its 75th Anniversary, in New Delhi today (November 18, 2023). Speaking on the occasion, the President said that from its humble beginnings in 1948 till today, the Aeronautical Society of India has worked tirelessly to ensure that not only the aeronautics as a knowledge-system grows by leaps and bounds, but it also impacts life of every citizen in a substantial manner. She appreciated all for their outstanding contribution to the advancement and dissemination of the knowledge of aeronautical sciences and aircraft engineering that has made the aeronautical profession as one of the most sought-after and glamorous careers. The President said that aviation is a remarkable feat of human ingenuity that brings the imaginative power to reality with seamless fusion of technology. Aerospace and aviation are simultaneously humbling and almost superhuman activities that afford us the vast global connection of the planet we inhabit and exploration of space and beyond. The President said that as we celebrate the journey of the Aeronautical Society of India, we cannot help but marvel at the achievements and breakthroughs our nation has made in the fields of aviation and aerospace, space technology, missile technology and aircraft technology. Whether it is the feat of successful completion of the Mars mission or showcasing the end-to-end capability in safe landing and roving near the Moon's South Pole – a place considered beyond human endeavour, India has proved that it has the willpower, potential, and capacity to accomplish what it sets out to achieve. The highest standards of quality, cost-effectiveness and punctuality have been the hallmarks of all of our projects. The President said that though we have made long strides, there also remain many challenges. The aerospace sector has been undergoing a transformative phase by bracing up for speed and runway-independent technologies for defence purposes, air mobility and transportation. There is also the demanding task of cultivating human resources well-versed and ready to tackle these issues in right earnest. At the same time, there is also a need



for upskilling and reskilling of the current workforce. The President said that the decarbonization of aero-propulsion is an onerous task we will have to undertake because climate change and global warming are threatening the very existence of humans. She stated that the development of sustainable jet fuels is one of the much-needed steps to decarbonize the economy but it is hardest to achieve because traditional fuels are of very high density. Finding non-fossil sustainable resources which could replace these traditional fuels should be the priority objective because we are approaching a climate tipping point. To reduce our carbon footprint, we need to rapidly adopt new propulsion technologies at a large scale, such as electric, hydrogen, and hybrid. She expressed confidence this Conference would provide valuable solutions to many of the challenges.



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

## **Defence Secretary Inaugurates New Design and Test Facility for Aero Engine Research & Development**

The Defence Secretary, Mr. Giridhar Aramane inaugurated a new design and test facility at HAL's Aero Engine Research and Development Centre (AERDC) in Bengaluru today. Hailing the important work being done by HAL, Mr. Aramane said, "HAL has received applause at the highest levels and the government trusts your capability to deliver and make the country self-reliant. Manufacturing sector is the future of our country and in the coming decades, HAL should focus on mastering technologies for all types of aircraft. Think ahead as the entire paradigm of warfare is changing." Thrusting on the role of unmanned aircraft in the future warfare, he encouraged HAL to collaborate with other private companies to develop new platforms. "HAL is the largest DPSU in India and I want it to become the top ten companies in the world," he added. He had a look at the manufacturing range of various engines and test beds. He also paid a visit to HAL's Aerospace Division. Mr. C.B. Ananthakrishnan, CMD (Addl. Charge), HAL said, "The development of this facility marks a key milestone in HAL's growth trajectory. It is a testimony of HAL's commitment towards achieving *Aatmanirbharta* in aero-engine design and development." The new facility spanning over 10,000 sq. meters has been established under the modernisation plan. Dr. D.K. Sunil, Director (Engg, R&D) outlined the design perspectives of HAL's R&D initiatives. The AERDC is currently involved in the design and development of several new engines including two strategic engines — Hindustan Turbo Fan Engine (HTFE) - 25 for powering trainers, UAV's, twin engine small fighter aircraft or regional jets and Hindustan Turbo Shaft Engine (HTSE) - 1200 for powering light and medium weight helicopters (3.5 to 6.5 tonnes in single/ twin engine configuration). The new state-of-the-art facility houses special machines, advanced setups leveraging on computational tools, in-house fabrication facility and two test beds for testing HTFE-25 and one testbed each for testing HTSE-1200 and upcoming JV engine for IMRH to be co-developed by Safran, France and HAL. In addition, the newly developed facility has setups for testing Air producer of Jaguar, Gas Turbine Starter Unit (GTSU) -110 M2 and 127E of LCA, Auxiliary Power Units of IMRH and AMCA, Gas Turbine Electrical Generator (GTEG) -60 for An-32 aircraft. Setups to carry out various critical tests for engine components and LRUs have also been established within the new facility. The Centre, established in the 1960s, holds the unique distinction of being the only design house that has developed test beds for engines of both Western and Russian origin. The Centre has successfully developed & certified PTAE-7 engine, the first indigenous turbojet engine of India powering Lakshya (Unmanned Aircraft), Gas Turbine Electrical Generator GTEG-60 for starting An-32 aircraft, Air starter ATS 37 & Air producer for starting Adour-Mk 804E/811 on

Jaguar Aircraft and Shakti engine for powering ALH to support Ad804/811 engine of Jaguar aircraft. Senior officials from HAL, IAF, GTRE, ADA, NAL, CEMILAC and ADE were present on the occasion.



HAL team for being an important cog in the process of strengthening the aviation capability of the nation. Today's Avionics Expo underscores HAL's commitment towards Atmanirbharta. Immediate beneficiary of such an initiative will be the Armed Forces. The two-day Expo will provide a platform for networking between Avionics Industry and the Services, understanding the requirements of the services, and evolving solutions that fit our terrain, climate and operational requirements. In a data-driven battlefield of tomorrow, avionics systems have to be capable of collecting, processing and disseminating information in real time for the decision makers", he added. CDS also walked through the expo and evinced keen interest in the avionics products displayed on the occasion. The presence of CDS inspires the entire Aerospace fraternity, said Mr. C.B. Ananthkrishnan, CMD (Additional Charge), HAL. "We have achieved self-reliance in most of the avionics systems such as mission computers, navigation systems, communication systems, weapon systems and display systems. Avionics is the fastest growing market with high margin potential. Given the design and certification challenges of avionics systems at the global level, it is high time for Indian Industries to take up Avionics System R&D and manufacturing on a war footing", he said. Dr. D.K. Sunil, Director (Engineering and R&D), proposed a vote of thanks and urged participants to make good use of panel discussions that feature experts from the Indian Armed forces, HAL, partner organisations, academia and live demonstrations of avionics products and systems. The two-day event brings together leading figures from the military, scientific community, developers and industries to explore cutting-edge advancements in avionics.



Source: <https://hal-india.co.in/>

## **From Submarines to Fighter Jets: Big-ticket Defence Deals on Agenda as Modi set to Host Macron on R-Day**

With Prime Minister Narendra Modi set to host French President Emmanuel Macron a few weeks later, New Delhi and Paris may finalise deals on India procuring 26 Rafale Marine combat aircraft from France as well as on the construction of three submarines in India with the transfer of technology from France. The two sides are also expected to adopt a roadmap for defence-industrial cooperation. New Delhi and Paris are keen to step up defence cooperation through partnership in the design, development, testing and manufacture of advanced defence technologies and platforms and expand joint production of military hardware in India with technology transferred from France, including for third countries in the Indo-Pacific and beyond. Macron will visit New Delhi to be the chief guest at India's 75th Republic Day ceremony on January 26. He will have meetings with Modi and President Droupadi Murmu apart from witnessing the military parade on the Kartavya Path. 12 The meeting between Modi and Macron may see progress on the big-ticket defence deals, including the procurement of 26 Rafale-M fighter jets from Dassault Aviation of France for the Indian Navy. A

source in New Delhi told DH that the negotiation for an intergovernmental agreement for India to procure 22 single-seat and four dual-seat marine combat aircraft from Dassault Aviation of France had gained momentum over the past few months. A day before Modi attended the Bastille Day parade in Paris on July 14 on an invitation from Macron, the Defence Acquisition Council (DAC) of the Government of India granted the grant of Acceptance of Necessity (AoN) for the procurement of the 26 Rafale Marine aircraft for the Indian Navy from the Dassault Aviation of France, along with associated ancillary equipment, weapons, simulator, spares, documentation, crew training and logistic support. The Rafale M fighter jets are being procured primarily for the INS Vikrant, the Indian Navy's first indigenous aircraft carrier, which was commissioned on September 2, 2022. Some of the aircraft are also likely to be deployed on the INS Vikramaditya – the other carrier of the Indian Navy. The proposed intergovernmental agreement was on the agenda of discussion when Modi and Macron met in Paris, but a deal could not be clinched then. It was also discussed when Macron and Modi met in New Delhi on September 10 on the sideline of the 18th G20 summit. Eric Trappier, the Chief Executive Officer of Dassault Aviation, visited New Delhi on October 9 and 10 and met top officials of the Government of India. In response to a Letter of Request for the acquisition of the 26 Rafale M aircraft from India, France recently sent a Letter of Acceptance, with the pricing and other details offered by it. The final deal will be clinched after the negotiation between New Delhi and Paris over pricing concludes. India had earlier purchased 36 Rafale fighter jets for the Indian Air Force under an intergovernmental agreement inked with France in September 2016. Macron's forthcoming visit to New Delhi and his meeting with Modi may also see the two sides making progress on the proposed deal between Mazagon Dock Shipbuilders Limited of India and the Naval Group of France for the construction of three additional submarines – as a follow-up to the construction of six Kalvari-class – an export derivative of the Scorpène-class of France – diesel-electric submarines for the Indian Navy under New Delhi's acquisition programme 'Project 75'.

Source: <https://www.deccanherald.com/india/india-france-defence-deals-on-agenda-as-modi-set-to-host-macron-on-republic-day-2830760>

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