

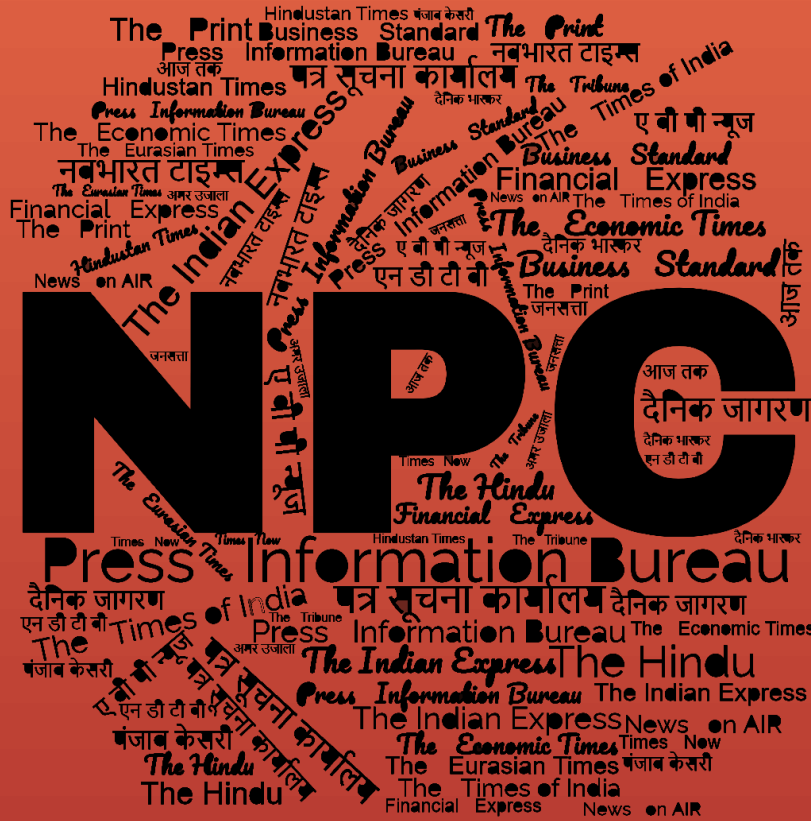
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समाचार पत्रों से चयित अंश Newspapers Clippings

डीआरडीओ समुदाय को डीआरडीओ प्रौद्योगिकियों, रक्षा प्रौद्योगिकियों, रक्षा नीतियों, अंतर्राष्ट्रीय संबंधों और विज्ञान एवं प्रौद्योगिकी की नूतन जानकारी से अवगत कराने हेतु दैनिक सेवा

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DRDO News

DRDO Technology News

**DECCAN
Chronicle**

Tue, 30 Apr 2024

DRDL Hosts Dipam-2 Meet to Foster Collaborations in Defence Technology

Over 70 micro, small and medium enterprises (MSMEs) attended the DRDL Industry Partners & Associates Meet (Dipam-2) meet at the Defence Research and Development Laboratory in Secunderabad to discuss advancements and collaborations in missile systems and defence technologies. The meet was inaugurated by DRDL director G.A. Srinivasa Murthy and scientists including, Dr B.V.N. Charyulu, Dr R. Krishanmurthy, Dr J.V.R. Sagar, Dr S. Krishna Mohan, and L. Srinivasa Rao, experts in various facets of defence technology, from propulsion systems to smart materials and artificial intelligence applications in missile design. Director Srinivasa Murthy spoke about the laboratory's vision to evolve a robust partnership with established and emerging industries.

<https://www.deccanchronicle.com/technology/in-other-news/drdl-hosts-dipam-2-meet-to-foster-collaborations-in-defence-technology-891806>

Defence News

**Defence Strategic:
National/International**



**Press Information Bureau
Government of India**

Ministry of Defence

Tue, 30 Apr 2024

Fourth General K Sundarji Memorial Lecture on 'General Sundarji's Legacy and 'Vision 2100' in the Dynamic Evolution of Warfare' Conducted at Manekshaw Centre

The 4th General Sundarji Memorial Lecture was organised by the Indian Army in Manekshaw Centre to commemorate the legacy of one of India's foremost military thinkers General K Sundarji.

The lecture was conducted under the aegis of Mechanised Infantry Centre & School (MIC&S) and Centre for Land Warfare Studies (CLAWS).

The event was attended by serving and retired officers of the three Services as well as literati and various think tanks. The lecture remembered the dynamic and visionary General K Sundarji, the 13th Chief of the Army Staff, who is also fondly called as the ‘Father of the Mechanised Infantry Regiment’.

General Manoj Pande, Chief of the Army Staff (COAS) delivered the keynote address and underscored the foresight of General Sundarji. He highlighted General Sundarji’s vision in the fields of digitisation of the battlefield, Information Warfare, technology infusion, conventional strategies and force structure, reflected in his work ‘Vision 2100’.

The COAS while underscoring the thoughts of General Sundarji on transformation, asserted that, “The Indian Army is alive to the imperative of transformation, and it is with a progressive outlook, that we intend, to not only change, but to change at a good pace too. The holistic transformation of the Indian Army, that we put into effect two years ago, is part of our efforts to give shape to a modern, agile, adaptive, technology enabled and self-reliant future ready force”.

The eminent speakers Shri NN Vohra, former Governor of J&K, shared his experiences with General Sundarji & also expressed his thoughts on ‘Need for National Security Policy’ while Lieutenant General Subrata Saha (Retired), former Deputy Chief of Army Staff and Member National Security Advisory Board (NSAB) delivered a talk on, “Modernising India’s Armed Forces: Lessons from Gen K Sundarji”. The informative talks were followed by an invigorating Question & Answer session.

General Sundarji, an accomplished soldier and a visionary is known for his deep insights & strategic foresights into future warfare and security paradigms. His contributions went far beyond his distinguished service in ‘olive greens’. The lecture was a befitting occasion to remember the former COAS.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2019167>



Press Information Bureau
Government of India

Ministry of Defence

Tue, 30 Apr 2024

Indian Coast Guard Helps Arrange a Super-specialist Medical Camp in Lakshadweep

Indian Coast Guard (ICG) in collaboration with AIIMS New Delhi and support of the Union Territory (UT) administration conducted a medical camp from 29th to 30th April, 2024 in the remote islands Kavaratti and Androth of UT Lakshadweep. The camp engaged approximately 1,500 citizens at each island and provided free of cost medicines along with expert consultation.

Dr M Srinivas, Director, AIIMS, Delhi headed the medical team which comprised of 15 specialist doctors from fields of Gynecology, Pediatrics, Neurology, Dermatology, Orthopedic and more. The medical camp focused on providing super-specialist medical coverage in the far-flung islands and help the local people through consultation with domain experts. They also delivered basic life

support (BLS) lectures to local medical professionals to enhance the standards of available medical infrastructure.

The camp was inaugurated by Dr M Srinivas in the presence of Inspector General Bhisam Sharma, Commander Coast Guard Region (West), Surgeon Commodore Diviya Gautam, VSM, Principal Director (Medical Services), CGHQ and Shri Avnish Kumar, IAS, Health Secretary, UT administration.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2019160>



Press Information Bureau
Government of India

Ministry of Defence

Tue, 30 Apr 2024

Admiral Dinesh K Tripathi PVSM, AVSM, NM Assumes Command of the Indian Navy as 26th Chief of the Naval Staff

Admiral Dinesh K Tripathi, PVSM, AVSM, NM assumed command of the Indian Navy on 30 April 2024 as the 26th Chief of the Naval Staff. He succeeds Admiral R Hari Kumar, PVSM, AVSM, VSM, ADC who retires upon superannuation, after an illustrious career in the Indian Navy.

Admiral Dinesh K Tripathi, is an alumnus of Sainik School Rewa and National Defence Academy, Khadakwasla. He was commissioned on 1st July 1985 into the Executive Branch of the Indian Navy. A Communication and Electronic Warfare specialist, he has served on frontline warships of the Navy as Signal Communication Officer and Electronic Warfare Officer and later as the Executive Officer and Principal Warfare Officer of the Guided Missile Destroyer INS Mumbai.

Adm Tripathi's Sea Commands include INS Vinash, INS Kirch and INS Trishul. During his career spanning nearly 40 years, he has held various important operational and staff appointments, which include Fleet Operations Officer of the Western Fleet at Mumbai, Director of Naval Operations, Principal Director Network Centric Operations and Principal Director Naval Plans at New Delhi. On promotion to the rank of Rear Admiral, he served as Assistant Chief of Naval Staff (Policy and Plans) at NHQ and as the Flag Officer Commanding Eastern Fleet. On promotion to the rank of Vice Admiral, he has served as Commandant of the prestigious Indian Naval Academy at Ezhimala, Kerala, Director General of Naval Operations, Chief of Personnel and Flag Officer Commanding-in-Chief Western Naval Command at Mumbai.

Adm Dinesh K Tripathi has undergone courses at Signal School, Kochi, Defence Services Staff College, Wellington, Naval Higher Command Course, Karanja and Naval Command College at the United States Naval War College, United States of America.

He was the Vice Chief of Naval Staff, prior taking over the helm as Chief of the Naval Staff on 30 April 2024.

<https://pib.gov.in/PressReleasePage.aspx?PRID=2019166>

Tue, 30 Apr 2024

Navigating the Seas of Change: Admiral Tripathi's Vision for Maritime Security and Self Defence

Ushering in a new era of leadership and strategic vision Admiral Dinesh K Tripathi, PVSM, AVSM, NM, CNS, takes the helm as the twenty-sixth Chief of the Naval Staff of the Indian Navy.

In his inaugural address, acknowledging the maritime challenges confronting the nation, Admiral Tripathi underscored the imperative for the Indian Navy to maintain operational readiness and deter potential adversities at sea. He stressed the Navy's commitment to securing the nation's maritime interests and ensuring victory in any conflict scenario.

The new chief expressed deep gratitude to his predecessors for their contributions in shaping the Indian Navy into a Combat Ready, Cohesive, Credible, and Future-Proof Force.

What will be his focus as the navy chief?

Central to Admiral Tripathi's agenda is the advancement of the Indian Navy's self-reliance and technological prowess in alignment with the nation's vision of 'AatmaNirbharBharta' and 'Viksit Bharat'. He pledged to bolster the Navy's efforts in adopting new technologies and becoming a pivotal force in the country's development journey.

Recognizing the invaluable contribution of the Navy's personnel, Admiral Tripathi in his inaugural address vowed to prioritize their upskilling and well-being. And pledged to provide the men and women of the Navy with the best training, equipment, and administrative support, ensuring a professional environment conducive to excellence.

As he assumes command, his unwavering commitment to the Navy's mission and vision instill confidence in the service members and the nation at large. Under his leadership, the Indian Navy is poised to navigate the complexities of the maritime domain with resilience, agility, and unwavering resolve.

<https://www.financialexpress.com/business/defence/navigating-the-seas-of-change-admiral-tripathis-vision-for-maritime-security-and-self-defence/3472856/>



Tue, 30 Apr 2024

Indian Air Force Holds WASP, Aims to Raise Understanding of Modern Warfare

External Affairs Minister S Jaishankar on Tuesday attended Indian Air Force's No. 3 Warfare and Aerospace Strategy Programme (WASP), wherein the programme aimed at understanding the complexities of modern warfare and aerospace strategy.

EAM Jaishankar interacted with the participants of IAF's No. 3 WASP, held on Tuesday.

The programme further aimed at exposing key elements of comprehensive national power.

The Indian Air Force shared a post on X, stating, "The Honourable Minister of External Affairs, @DrSJaishankar, interacted with the participants of IAF's No. 3 Warfare and Aerospace Strategy Programme (WASP) on 30 Apr 24. The programme aims at exposing the participants to key elements of comprehensive national power, developing critical thinking and cultivating an understanding of a "whole of government" approach."

Moreover, the course consisted of 14 officers from the IAF, two from the Indian Navy and one each from the Indian Army and Academia.

"The course consisted of fourteen officers from #IAF, two from #IndianNavy and one each from #IndianArmy and #Academia," the post read.

https://x.com/IAF_MCC/status/1785271898663993585

EAM spoke to participants on his book 'The India Way', adding that the discussion focused on current geopolitics and India's strategic choices.

"The participants benefitted immensely from an incisive and thought-provoking discussion with the honourable minister on his seminal book titled " The India Way: Strategies for an uncertain World", " the IAF said in their post.

In 2022, Jaishankar released the book 'The India Way: Strategies for an Uncertain World.' He had presented the first copy of his book to Prime Minister Narendra Modi. In 2024, Jaishankar released his second book "Why Bharat Matters."

<https://www.aninews.in/news/world/asia/indian-air-force-holds-wasp-aims-to-raise-understanding-of-modern-warfare20240430214312/>

THE ECONOMIC TIMES

Tue, 30 Apr 2024

Self-reliance Key to Deal with Future Security Challenges: Army Chief

Warfare has transcended into new domains, such as space, cyber, electromagnetic spectrum and information systems, and India must develop indigenous capabilities to deal with future security challenges, Army Chief Gen Manoj Pande said on Tuesday. The Army chief especially underlined the importance of "technology infusion" and "self-reliance" in the armed forces, saying both are distinct yet interconnected.

Gen Pande said India must develop its indigenous military capabilities as no country will share the latest, advanced and critical technology with it.

"Warfare has transcended into new domains, such as space, cyber, electromagnetic spectrum and information. Consequent to these developments, conventional force ratios, which was the measure of military strength and superiority in the past, stand blunted today," he said.

Gen Pande made the remarks at the fourth Gen K Sundarji memorial lecture.

He highlighted the need for embracing technology in order to maintain a competitive edge on the battlefield.

"The imperative of technology infusion into warfighting systems and to keep pace with technological progression, remains enduring to this day," he said.

"The impact of external dependency for critical components, supply chain disruptions and weaponisation of denial regimes came to the fore, during the (Covid-19) pandemic and also from the lessons of the ongoing Russia-Ukraine conflict," he said.

"We need to recognise that no country will share the latest, advanced and critical technology with us," he said.

The Army chief said being import dependent for critical technologies entails the risk of remaining behind in niche areas.

"The answer, therefore, lies in being self-reliant and achieving self-sufficiency in critical technologies through indigenous research and development," he said.

Gen Pande said the growing centrality of cyber domain in critical infrastructure has resulted in it emerging as a new battleground of digital confrontation.

"Information operations today have gained new dimensions," he said.

"When we talk about digitisation of the battlefield, we are witness to a manifold increase in the lethality and accuracy of kinetic instruments and increased proliferation of technologies such as artificial intelligence, quantum computing, robotics and nano-technology," he said.

The Army chief said disruptive and dual use technologies and their proliferation at unprecedented scale are transforming the character of modern wars.

"A suite of digital technologies, encompassing electronic warfare, micro-electronics, drones, precision attack systems, loiter munitions and star link terminals are challenging traditional force multipliers," he said.

"Swarming is contesting surging, surveillance and precision are scoring over fire and manoeuvre, and the light and small are prevailing over the large and heavy," he added.

Gen Pande said his force has been focusing on developing indigenous capabilities.

"The Indian Army on its part, stands committed to achieve its capability development and sustenance needs through Atmanirbharta," he said.

"Modernisation and technology infusion forms one of the five pillars of the transformation roadmap, which we had put into effect, almost two years ago," he added.

The Army chief, while underscoring the thoughts of Gen Sundarji on transformation, asserted that his force is alive to the imperative of transformation.

"It is with a progressive outlook that we intend to not only change, but to change at a good pace too. The holistic transformation of the Indian Army, that we put into effect two years ago, is part of our efforts to give shape to a modern, agile, adaptive, technology enabled and self-reliant future ready force," he said.

Gen Sundarji was the Army chief from February 1, 1986 to May 31, 1988. He is known for his deep insights and strategic foresights into future warfare and security paradigms.

<https://economictimes.indiatimes.com/news/defence/self-reliance-key-to-deal-with-future-security-challenges-army-chief/articleshow/109733381.cms>

Israel-Iran Clash Reinforces Need for Solid Air Defence

Missile defence is technically complex, and very expensive. It's virtually like firing a bullet to stop an incoming bullet. But with the sheer operational criticality of air and missile defence systems being reinforced by the tit-for-tat attacks between Israel and Iran, India needs to majorly crank up efforts to make its airspace as impregnable as possible.

India has taken some strides in the arena but much more clearly needs to be done for an effective multi-layered integrated air and missile defence shield, with an overlapping network of early-warning and tracking sensors, reliable command and control posts, land and sea-based batteries of advanced interceptor missiles.

Unlike India, Israel of course has only a small territory to defend. And it did so effectively on April 13, thwarting Iran's mass missile and kamikaze drone attack with its wide array of defence systems, from the short-range Iron Dome to long-range Arrow, as well as help from some others like the US.

India's air defence systems are geared towards protecting only some vital areas and installations. "India is simply too vast to be effectively protected from all kinds of aerial threats. But yes, apart from buying bullets, we need to invest much more in bulletproof jackets as well. Missile defence is now an overwhelming tactical necessity rather than a strategic one," a senior officer said.

For one, India needs to get cracking on operationally deploying its indigenous two-tier ballistic missile defence (BMD) system, which as per DRDO is designed to track and destroy nuclear and other ballistic missiles both inside (endo) and outside (exo) the earth's atmosphere at altitudes from 15-25 km to 80-100 km for "a higher kill probability".

After "successfully completing" a series of tests for Phase-1 of the land-based BMD system quite a while ago, the DRDO also conducted the maiden flight-trial of a sea-based interceptor missile in April last year.

The govt, however, has so far not sanctioned full-scale deployment of the BMD system at any vital location. This could be due to the exorbitant costs involved or a few technological gaps, or even strategic calculations that it may provoke Pakistan to go in for a larger nuclear arsenal and countermeasures to defeat the BMD system, as reported by TOI earlier.

IAF, of course, now has three squadrons of Russian S-400 Triumph surface-to-air missile systems, which can detect, track and destroy incoming strategic bombers, jets, spy planes, drones and even some intermediate-range ballistic missiles at a range of 380-km. They are deployed in north-west and east India to cater for both China and Pakistan.

Delivery of the remaining two S-400 squadrons, under the \$5.4 billion contract inked in 2018, has been delayed to 2025-26 due to the ongoing Russia-Ukraine war.

Parallely, India is developing its own long-range surface-to-air missile (LR-SAM) system under the ambitious Project Kusha. With an interception range of around 350-km, this air defence system should be ready by 2028-29.

Then, there is the Barak-8 medium range surface-to-air missile (MR-SAM) systems, with an over 70-km range, jointly developed with Israel. After the Navy and IAF, Army in Feb last year operationalised its first 'Abhra' MR-SAM regiment in the 33 Corps, which defends the frontier with China in Sikkim and the Siliguri Corridor.

DESI & VIDESHI SYSTEMS

INDUCTED

S-400 Triumph | 380-km range

> 3 squads deployed under ₹40,000 crore deal with Russia in Oct 2018

> Rest 2 squads delayed to 2025-26

Barak-8 MR-SAM | Over 70-km range

> Jointly developed with Israel under projects initially worth ₹30,000 crore.

> Being inducted by IAF, Navy & Army

Akash | 25-km range

> IAF inducting 15 squads of Akash-1 & 2 systems for ₹10,900 crore

> Army has 2 regiments for ₹14,180 crore. Ordered 2 more for ₹8,160 crore

Spyder | 15-km range

> Israeli low-level quick-reaction anti-aircraft missile system



> Limited units inducted by IAF & Army

Shorter Range | Older Russian Igla-1M (5-km), OSA-AK-M (10-km) Pechora missiles & upgraded L-70 anti-aircraft guns (3.5-km)

> Newer Russian shoulder-fired Igla-S (6-km) systems

> ₹7,669 crore contract in March with L&T for 61 “flights” of close-in weapon systems (derivatives of L-70 guns)

PROJECTS

Ballistic Missile Defence

> Indigenous 2-tier shield
> Phase-I (interceptor missiles with 4.5 Mach speed) for 2,000-km range enemy missiles. Not yet deployed.

> Phase-2 (interceptor missiles with 6-7 Mach speed) for 5,000-km range missiles. Under development.

LR-SAM under Project Kusha | 350-km range

> Should be ready by 2028-29.

> IAF plans 5 squadrons for ₹21,700 crore.

VSHORADS | 6-km range

> ₹1,920 crore project underway

Army and IAF have also inducted in large numbers the indigenous Akash air defence missile systems, with an interception range of 25-km, while a new-generation sleeker version is also now ready for user trials.

The armed forces also have a variety of shorter range air defence weapons. These range from the older Russian Igla-1M (5 km), OSA-AK-M (10 km) and Pechora missiles and upgraded L-70 anti-aircraft guns (3.5 km) to the newer Israeli low-level Spyder quick-reaction anti-aircraft missiles (15 km range) and Russian man-portable Igla-S (6 km) systems. DRDO is also testing the indigenous very short-range air defence system (VSHORADS) missiles, which has a range of up to 6 km.

<https://timesofindia.indiatimes.com/world/middle-east/israel-iran-clash-reinforces-need-for-solid-air-defence/articleshow/109738444.cms>

India-Indonesia Defence Industry Partnership Gets Big Boost

First ever "India-Indonesia Defence Industry Exhibition-cum-Seminar" was organised in Jakarta on 30th April 2024 by Embassy of India, Ministry of Defence, Government of India and Ministry of Defense, Republic of Indonesia which marked a keystone bilateral defence cooperation event in the series of programmes being organised during the 75th year of establishment of diplomatic ties between the two maritime neighbours.

As many 36 prominent defence companies from India participated in the event including 12 Defence Public Sector Undertakings (DPSU or SOEs) and 24 private companies, along with several Indonesian Defence State Owned Enterprises and Private Defence establishments.

Indian Ambassador to Indonesia Sandeep Chakravorty during his inaugural remarks highlighted that the Government of India is playing a crucial role in ensuring a strong, secure and self-reliant nation as India is poised to become the world's third-largest economy. He highlighted about the Innovations for Defence Excellence (iDEX) initiative, which is nurturing a vibrant defence innovation eco-system to bolster India's self-reliance in defence technologies. iDEX is bridging the gap between the military and the startup eco-system.

The participants were impressed as prominent Indian companies such as BrahMos, Larsen & Toubro, Bharat Dynamics Limited, Bharat Electronics presented their products and services. A total of 50 exhibitors showcased their state-of-art technology and innovations during the event. Top leadership of Indonesian MoD, Military, Coast Guard and defence companies participated in the Exhibition-cum-Seminar, according to a statement by the Indian Embassy in Jakarta. This high-level engagement underscores the commitment to fostering partnerships between the Indian and Indonesian defence ecosystems.

T. Natarajan, Director General (Defence Production), Government of India shed light on the the remarkable achievements of the Indian defence sector in the recent years. Indeed, Indian defence sector has come a long way with the defence exports value rising from US\$ 560 million in 2017 to achieving record exports of US\$ 2.63 billion in 2023. Needless to say, India is poised to become one of the leading defence exporters by 2030.

Major General Piek Budyakto, Director General (Defense Potential) represented Ministry of Defense, Indonesia. He praised the ever-growing ties between India-Indonesia defence relations and strong bond shared between both countries in defence and security domain.

The defence cooperation between India and Indonesia got a fillip during the visit of Narendra Modi, Prime Minister of India to Jakarta in May 2018, when India and Indonesia elevated their ties to "Comprehensive Strategic Partnership". Both countries also agreed on the "Shared Vision of India-Indonesia Maritime Cooperation in the Indo-Pacific"; thus they share a similar vision for a free, open, and inclusive Indo-Pacific region which respects ASEAN centrality. A collaborative approach to defence development is poised to strengthen their collective maritime security posture.

Furthermore, in 2024, 42nd India-Indonesia Coordinated Patrol (IND-INDO CORPAT) is scheduled to take place in May. Military Exercise "Garuda Shakti" and Navy Exercise "Samudra Shakti" are planned to take place towards the end of 2024, thereby, further strengthening the institutional bilateral mechanisms between both countries.

This India-Indonesia Defence Industry Exhibition-cum-Seminar marks a significant step forward in the strategic partnership between the two nations. By fostering closer collaboration in the defence

sector, India and Indonesia can ensure regional stability and contribute to a more secure Indo-Pacific, which is need of the hour.

<https://economictimes.indiatimes.com/news/defence/india-indonesia-defence-industry-partnership-gets-big-boost/articleshow/109726466.cms?from=mdr>

Science & Technology News

ThePrint

Tue, 30 Apr 2024

Space Debris on the Rise, ISRO Performed Record 25 Collision-avoidance Manoeuvres in 2023

The world added a total of 3,143 objects to space in 2023, a 24 percent rise from the previous year when the number stood at 2,533. The Indian Space Research Organisation (ISRO) performed 25 collision-avoidance manoeuvres (CAM) in space last year — these were some of the details ISRO released in a report last week on how it manages its satellites and space assets in the backdrop of rising space debris.

Notably, according to an ISRO graph, in 13 years, the number of CAMs has increased to 25 in 2023 from one in 2010 — a rising trend attributed to “growing congestion in outer space”.

In light of the growing concerns regarding space debris, ISRO’s chairman S. Somanath, during an Inter-Agency Debris Coordination Committee (IADC) meeting in Bengaluru on 16 April, announced that India planned to have debris-free space missions by 2030 — by both government and non-governmental organisations — to reduce space pollution.

In its report released on 26 April titled ‘The Indian Space Situational Assessment Report (ISSAR) for 2023’, ISRO highlighted the surge in space missions and the corresponding increase in space objects, a consequence of the expanding reach of space technology.

It also showed how the ISRO System for Safe and Sustainable Space Operations Management (IS4OM) team, founded in 2022, works to manoeuvre and protect India’s space assets from potential collisions.

According to the report, 25 collision-avoidance manoeuvres were performed by the organisation this year, based on a total of 3,033 close-approach alerts (within 1km) detected by ISRO.

Notably, 23 of the 25 CAMs that ISRO undertook were for its satellites in both the Low-Earth orbit and Geo-synchronous Earth orbit, while two were specific to the Chandrayaan-3 mission to avert collisions with NASA’s Lunar Reconnaissance Orbiter and Korea Aerospace Research Institute’s (KARI) Korea Pathfinder Lunar Orbiter, the report highlighted.

It also revealed that to prevent collisions, the Chandrayaan-3 launch was postponed by 4 seconds, and other missions, such as TeLEOS-2 and DS-SAR, were delayed by 1 minute each.

Collaborating with United States Space Command (USSPACECOM), ISRO received 1.38 lakh (1,37,565) close-approach alerts for Indian satellites. After conducting its analysis, ISRO

determined whether CAMs were necessary and found that none of the close approaches were critical enough to warrant a collision avoidance manoeuvre.

On certain occasions, coordination with international agencies, like SpaceX and Europe's satellite agency, EUMETSAT, was also carried out to avoid close approaches with their satellites. These close-approach alerts encompass not only satellite collisions but also natural space hazards, such as asteroids, meteoroids, and comets.

Atmospheric re-entry of space objects

For the long-term sustainability of outer space missions, ISRO and other international organisations attempt to facilitate the re-entry of objects, rockets and decommissioned space missions into the atmosphere. This process is critical for mitigating space debris.

As these objects descend through Earth's atmosphere, they are subjected to intense friction, heating up due to collisions of their surfaces with air molecules at high speed. Most objects, thus, heat up and burn away, either partially or completely, depending on their size.

On 7 March 2023, one of the biggest atmospheric re-entry missions was when ISRO controlled the Megha-tropiques-1 to safely land in the South Pacific Ocean. The Megha-tropiques-1 was launched in 2011 to study climate and weather patterns, and a total of 20 manoeuvres were required after its decommissioning to bring it back to Earth.

For other space objects like the PSLV-C56 upper stage, which is responsible for placing the payloads and satellites of a mission into their final orbits, ISRO opted for de-orbiting to avert its transformation into orbital debris. However, subjected to atmospheric drag, it naturally re-entered and disintegrated within a month.

In situations where the space objects and parts of a launch mission could not be de-orbited or brought back to Earth, ISRO ensured that they were placed in an orbit with a "relatively sparse populations" to not crowd the other orbits and interfere with existing missions.

Take the 2009 Oceansat-2 mission, for instance. Due to its age and resulting limitations, ISRO couldn't execute a de-orbiting manoeuvre. Therefore, after the mission, the satellite was disposed of in an orbit that was at a 900-km altitude above the Earth's surface.

ISRO is party to a number of international treaties that deal with sustainability in space, and best practices for dealing with space debris. It's a member of the Inter-Agency Debris Coordination Committee (IADC), the International Academy of Astronautics' space debris group, and the International Organization for Standardization (ISO) space debris working group.

In 2024, ISRO chaired the 42nd IADC meeting in Bengaluru on 16 April.

<https://theprint.in/science/space-debris-on-the-rise-isro-performed-record-25-collision-avoidance-manoevres-in-2023/2063759/>

