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Current Affairs - 24 December 2025

WHAT IS THE AKASH-NG MISSILE SYSTEM?



The Defence Research and Development Organisation (DRDO) has successfully completed the User Evaluation Trials of the Next Generation Akash missile (Akash-NG) system recently.

- Akash Next Generation (Akash-NG) is a state-of-the-art **Surface-to-Air Missile (SAM)** defence system.
- It was **developed** by the **Defence Research and Development Organisation (DRDO)** and **produced** by **Bharat Dynamics Limited (BDL)**.
- It is designed to protect vulnerable areas and points from air attacks.
- It **succeeds** the **original Akash missile system**, which has been **operational** with the Indian Air Force since 2014 and the Army since 2015.

Features:

- The next-generation variant is **lighter**.
- It consists of several advanced features, including an **indigenous Radio Frequency (RF) seeker**, **dual-pulse solid rocket motor**, and **fully homegrown radars and Command, Control, and Communication (C2) systems**.
- These features enable the system to detect and engage high-speed, low-altitude, and long-range high-altitude targets with high precision.
- It is designed to **engage multiple targets simultaneously**, with a **range** of up to **30 km** and an **altitude** of **18 km**.
- It has the ability to **engage up to 10 targets** simultaneously, with a firing rate of one missile every 10 seconds.
- The system can also be **deployed in various configurations**, including **mobile and fixed installations**.



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WHAT IS ARTIFICIALLY INTELLIGENT LAB ASSISTANT (AILA)?



- It is an AI agent which can independently run complex scientific experiments, analyse results, and make decisions in real time.
- It was developed by IIT Delhi researchers in collaboration with scientists from Denmark and Germany.
- Unlike earlier AI tools that mainly helped with writing or data analysis, AILA works directly with laboratory instruments.
- It can operate real scientific equipment, particularly the Atomic Force Microscope (AFM), one of the most delicate and complex instruments used to study materials at the nano scale.
- When AILA is instructed to perform an experiment, it writes the necessary code, operates the scientific instrument, collects data, and analyses the results on its own.
- The entire scientific workflow, data generation, processing, and interpretation, is automated through AILA.
- It performs experiments much like a trained scientist.

DIRECTED ENERGY WEAPONS SYSTEM



- It uses concentrated energy from electromagnetic or particle technology, rather than kinetic energy.
- It uses high-powered lasers to inflict damage on targets.
- It uses directed energy to heat up and destroy or damage the target.
- Capabilities of Directed Energy Weapons:
 - **Precision and Low Collateral Damage:** It can target specific weak spots of enemy systems, motors, electronics, or wings, minimising collateral damage.
 - **Rapid Response:** It engages with targets at the speed of light, eliminating fast-moving threats in real time.



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- **Cost and Logistics:** It has a low operational cost, only requiring a continuous supply of electricity to work indefinitely.
- **Counter-Drone and Stealth Technology:** It is uniquely positioned to tackle swarm drones while ensuring there are no sounds or explosions, giving them stealth capabilities.
- **Applications Directed Energy Weapons:**
 - It has diverse **military applications**, offering rapid and precision strikes against threats such as **unmanned aerial vehicles (UAVs)**, missiles and small vehicles and can be used in all war fighting environments.

SHAKTI SCHOLARS YOUNG RESEARCH FELLOWSHIP



SHAKTI
SCHOLARS
YOUNG
RESEARCH
FELLOWSHIP

- It is a six-month program aimed at supporting emerging scholars in **researching women's issues in India**.
- **Objectives of SHAKTI Scholars Young Research Fellowship:**
 - Encourage research on **women's issues** from a **multidisciplinary perspective**.
 - Promote academic and policy-oriented studies that contribute to gender equality, safety and empowerment.
 - **Provide opportunities** for young scholars to **engage in meaningful research** that can support the Commission's mandate.
- **Duration:** 6 months
- **Research areas:** Women's safety and dignity, gender-based violence, legal rights and access to justice, cyber safety, implementation of the Prevention of Sexual Harassment (POSH) framework ETC.
- It is an initiative of **National Commission for Women**.
- **Eligibility for SHAKTI Scholars Young Research Fellowship:**
 - **Academic:** Must hold at least a graduate degree; preference is given to those completed or pursuing Masters, M.Phil., or Ph.D. in relevant fields.



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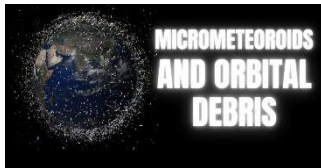


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- **Nationality & Age:** The fellowship is **open to Indian citizens** aged between **21 and 30 years** who hold at least a **graduation degree** from a recognised institution.
- **Financial Support:** Selected candidates will receive a research **grant of Rs 1 lakh** to undertake a **six-month study**.

MICROMETEORIODS AND ORBITAL DEBRIS



- Micrometeoroids are typically **extremely small**, with sizes **ranging** from a few micrometres (a millionth of a meter) to up to about two millimetres.
- **Origin:** Most of them originate from **collisions between asteroids** in the Asteroid belt (between Mars and Jupiter) with a small portion coming from comets.
- **Speed:** They travel at **extremely high velocities**.
- **Distribution:** They exist **everywhere in space**, but due to the Earth's gravity pull their distribution is slightly higher near our planet.
- The micrometeoroids in Earth's orbital environment are **effectively uncountable** and they deliver billions of impacts to orbiting space crafts annually.

About Orbital debris:

- They are also called **space debris, space junk or space trash**.
- They consist of **human-made objects in the Earth's orbit** which no longer serves any useful purpose.
- **Origin:** All orbital debris originated primarily from **exploded rocket stages**, satellites, accidental collisions and **intentional anti-satellite weapon tests**.
- The typical average speed of orbital **debris is about 10 km/s**.
- Orbital debris is mostly concentrated in a "shell" **around the Earth in Low earth Orbit (LEO)** ranging from **about 200 km up to 2,000 km altitude**.



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LVM3-M6: ISRO'S HEAVIEST LAUNCH

- The Launch Vehicle Mark-3 (LMV3) is a **three-stage** launch vehicle weighing about 640 tonnes and standing 43.5 metres tall.
- Developed over decades, it represents the peak of India's launch vehicle engineering.

ISRO's Push to Optimise LVM3 Engines

- ISRO is upgrading the LVM3 to meet human-rating requirements for **Gaganyaan** and to increase lift capacity for modules of the proposed **Bharatiya Antariksh Station**.
- This involves adding redundancies for safety and boosting overall performance.
- **More Thrust from the Cryogenic Upper Stage**
 - ISRO is enhancing the cryogenic upper stage, which provides nearly 50% of the velocity needed for geosynchronous missions.
 - The current C25 stage carries 28,000 kg of propellant and produces 20 tonnes of thrust.
 - The planned C32 stage will carry 32,000 kg of fuel, increasing thrust to 22 tonnes, enabling heavier payloads.
- **Switch to a Semi-Cryogenic Second Stage**
 - The agency is considering replacing the liquid-propellant second stage with a semi-cryogenic engine using refined kerosene and liquid oxygen.
 - This change would lower costs, improve efficiency, and raise LEO payload capacity from ~8,000 kg to ~10,000 kg, a configuration likely for space-station module launches.
- **Bootstrap Reignition for Multi-Orbit Missions**
 - To support missions deploying satellites into multiple orbits, ISRO is developing bootstrap reignition for cryogenic engines.
 - This allows the upper stage to restart without external gases (like helium), reducing system mass and increasing payload capability—especially valuable for LEO constellation missions.



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Significance of LVM3-M6 Mission

- The LVM3-M6 / BlueBird Block-2 mission is a dedicated commercial launch using ISRO's LVM3 rocket to deploy the BlueBird Block-2 communication satellite of AST SpaceMobile.
 - It represents the sixth operational flight of the LVM3 launch vehicle.
 - This is ISRO's third commercial mission with the LVM-3, after launching OneWeb satellites in 2022–23.
 - With alternatives like SpaceX's Falcon-9 and European Space Agency's Ariane-6 available, the launch is a chance for ISRO to prove it can deliver heavy launches at lower cost.
 - **Expanding the LVM-3's Role**
 - Originally designed for geosynchronous missions (~36,000 km), the LVM-3 has now proven versatile in low Earth orbit (LEO) deployments.
 - This marks the third LEO mission for the vehicle, reflecting its evolution from the earlier GSLV-Mk3.
 - **Operational Readiness and Turnaround Time**
 - The launch follows the CMS-03 mission on November 2, making it the shortest gap between two LVM-3 launches.
 - It tests ISRO's ability to assemble and execute heavy missions rapidly, a key metric for commercial reliability.
 - **Record-Breaking Payload**
 - At 6,100 kg, the BlueBird payload is ISRO's heaviest satellite ever placed into orbit, surpassing the cumulative OneWeb payloads (~5,700 kg) to LEO and the 4,410 kg CMS-03 sent to geosynchronous transfer orbit last month.
 - **Strategic Momentum**
 - This is the second year since 2023 that ISRO flies two LVM-3 missions in a single year, underscoring growing cadence, capability, and confidence in India's heavy-lift launch ecosystem.
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INDIA'S LARGEST CIRCULAR STONE LABYRINTH



- It was discovered in the **Boramani grasslands of Solapur, Maharashtra.**
- It is formed from **small stone blocks.**
- The **rings guide movement inward** toward a **tightly coiled spiral at the center**, creating a design that reflects both precision and symbolic intent.
- This structure is linked to **Indo-Roman trade during the Satavahana dynasty period.**
- The presence of soil accumulation between the stone rings shows that this structure has remained untouched for several centuries.
- Its design resembles **classical labyrinth forms found in Mediterranean cultures, including motifs seen on Roman-era coins**, while also incorporating a central spiral associated in India with the **concept of the Chakravayuh.**
 - The Chakravayūha is a **complex military formation** described in the Hindu epic **Mahabharata, designed to encircle and overwhelm enemies** through multiple defensive layers.
- Before this discovery, the largest known circular labyrinth in India had 11 circuits, making the Solapur example unprecedented in terms of circular complexity.
- Although there is a larger square labyrinth in Gedimedu in Tamil Nadu, this newly documented site is the largest circular stone labyrinth identified in the country to date.

Mazes vs. Labyrinths:

- Labyrinths and mazes are not the same; however both are patterns for a path from the entrance to the centre.
- Though the terms are often used interchangeably, they mean different things.
- **Mazes are a kind of puzzle with multiple paths and decision points, and sometimes high walls.**



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- Labyrinths, by contrast, are **unicursal**: a single path twisting and turning through several concentric circles or circuits to arrive at a central goal, **without walls** or other obstructions to visibility.
 - There are **no "wrong turns" in a labyrinth**.
 - Labyrinths and/or labyrinth carvings in rock and stone date back more than 4,000 years.
 - There are labyrinths etched in Roman mosaics, in caves, cliffs, and tombs, on stone floors of medieval churches, and cut into turf.

INSV KAUNDINYA



**INSV
KAUNDINYA**

- It is a **stitched ship** which is inspired by a fifth-century vessel shown in **Ajanta cave paintings**.
 - It is named after the **legendary mariner Kaundinya**, who is believed to have sailed from India to Southeast Asia **in ancient times**.
- It has been **built using traditional stitching techniques** instead of metal nails. Artisans from Kerala used coconut fibre, coir rope, wooden joinery, natural resins and cotton sails.
- It is a joint initiative of the **Indian Navy, Ministry of Culture, and Hodi Innovations**.
- It features **symbolic motifs** like
 - **Gandabherunda** (mythical two-headed eagle) **symbol of the Kadamba dynasty and the Sun**
 - The bow **carries a Simha Yali**
 - **Harappan-style stone anchor on the deck**
- **Significance**: INSV Kaundinya showcases India's ancient maritime traditions. It reflects India's historic role in trade, **cultural exchange, and modern maritime diplomacy**.

Who was Kaundinya?

- He is a legendary **Indian mariner** who sailed to Southeast Asia about 2,000 years ago.
- He married Queen Soma and founded the **Funan kingdom**.



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MUKUNDRA HILLS TIGER RESERVE (MHTR)



- The Mukundara Hills Tiger Reserve, also known as the **Darrah Wildlife Sanctuary**, is spread across 4 districts – Bundi, Kota, Jhalawar & Chittorgarh in **Rajasthan**.
 - It is situated in a valley formed by two parallel mountains, viz. **Mukundra and Gargola**.
 - It encompasses the area of **Mukundra National Park, Darrah Sanctuary, Jawahar Sagar Sanctuary**, and **part of Chambal Sanctuary** (from Garadia Mahadev to Jawahar Sagar Dam), forming its core/critical tiger habitat.
 - It is strategically located **between Ranthambore and Madhya Pradesh's Kuno National Park**, making it a **vital corridor for tiger movement**.
 - This tiger reserve was **once a hunting preserve** belonging to the **Maharaja of Kota**.
 - **River:** It is located on the **eastern bank of the Chambal River** and is drained by its tributaries.
 - **Vegetation:** **Dry Deciduous Forest**
 - **Flora:** **Kala Dhok, or Kaladhi, is the predominant species**, along with **Khair, Ber, Kakan, Raunj, etc.**
 - **Fauna:**
 - The important fauna includes **Leopard, Sloth bear, Nilgai, Chinkara, Spotted Deer, Small Indian Civet, Toddy Cat, Jackal, Hyena, Jungle Cat, Common Langur, etc.**
 - The common reptiles and amphibians are **Pythons, Rat Snake, Buff-striped keelbacks, Green keelback, crocodiles, Gharial, Otter, and Turtles.**
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