MISSION X PRESENTS

# X TECH

## WEEKLY SCIENCE & TECHNOLOGY COMPILATION

30 JUNE – 6 JULY 2026

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# KAIST's One-Second Bleeding-Stop Spray

GS PAPER III · BIOTECHNOLOGY & HEALTH TECH

## NEWS IN BRIEF

- KAIST (Korea Advanced Institute of Science & Technology) developed AGCL — a sprayable hemostatic powder that forms a gel on contact with blood.
- Seals wounds in about **one second** via ionic gelation — blood's own calcium ions trigger the powder to harden, no glue or adhesive involved.
- Works on deep, irregular wounds where gauze or pressure dressings fail; absorbs over **7 times** its own weight in blood.
- Stable for up to **2 years** even in humid, high-heat conditions — built with battlefield trauma care in mind, with an active-duty Army Major on the research team.

### 🔗 STATIC CONNECT — BLOOD CLOTTING & COAGULATION CASCADE

NCERT Class XI Biology – "Body Fluids & Circulation." Revise the normal clotting pathway: platelet plug formation → release of clotting factors → fibrinogen converted to fibrin (needs $Ca^{2+}$ ions) → fibrin mesh seals the wound. AGCL mimics the body's own calcium-triggered step, so this news item is best revised alongside the static physiology of haemostasis, not as an isolated fact.

### ⚡ UNIQUE FACT

The gel isn't a chemical adhesive — it hardens purely through "ionic gelation," triggered by calcium ions already present in blood, not by any added glue.

### ⚠ EXAM TRAP

Don't confuse this with existing hemostatic *dressings/patches* (like chitosan bandages) already in use — AGCL is a sprayable powder, not a physical dressing. A subtle prelims distractor on delivery mechanism.

# India's First Placenta-on-Chip

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## NEWS IN BRIEF

- ICMR-National Institute for Research on Women's Health (ICMR-NIRWoH, Mumbai) and **IIT Bombay** built India's first indigenous placenta-on-chip.
- A microfluidic device recreating key functions of the human placenta — the organ transferring oxygen and nutrients from mother to foetus.
- Designed to be simple and scalable, unlike global models needing complex perfusion equipment — easing adoption across Indian labs.
- Enables study of pregnancy complications (gestational diabetes, pre-eclampsia, foetal growth restriction) and drug-crossing behaviour, cutting reliance on animal models.

🔗 **STATIC CONNECT — HUMAN REPRODUCTIVE SYSTEM**

NCERT Class XII Biology – "Human Reproduction." Revise the placenta's static function: a temporary, disc-shaped organ formed after implantation, acting as the interface for exchange of oxygen, nutrients and waste between mother and foetus, and doubling as an endocrine gland (hCG, oestrogen, progesterone). The chip is simply a lab model of this static structure, so link the two while revising.

⚡ **UNIQUE FACT**

ICMR-NIRWoH was earlier known as **ICMR-NIRRCH** — a recent institutional rebrand to "National Institute for Research on Women's Health" worth noting as a standalone prelims fact.

⚠ **EXAM TRAP**

Don't lump this under the broad "organ-on-chip" category (liver/lung/kidney chips also exist) — UPSC often tests whether a specific application belongs correctly to a general technology class. This is a research/diagnostic model, not a treatment.

# Vikram-1 — India's First Private Orbital Rocket

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## NEWS IN BRIEF

- Skyroot Aerospace announced a launch window of **July 12 – August 4, 2026** for Vikram-1, India's first privately developed orbital-class rocket.
- Mission named **"Aagaman"** (Sanskrit for "Arrival"); launching from SDSC-SHAR, Sriharikota.
- Seven-storey, all-carbon composite rocket with 3D-printed engines; targets a 450 km, 60° inclination Low Earth Orbit.
- Can carry small satellites up to 350 kg; follows Vikram-S (2022) — India's first private rocket to reach space, but only suborbital.
- Enabled by **IN-SPACe** and ISRO infrastructure under Skyroot's "Cab to Space" commercial model.

🔗 **STATIC CONNECT — BASICS OF ROCKETRY & INDIA'S SPACE PROGRAMME**

NCERT/Standard Static – Launch vehicle staging (why rockets are multi-stage), types of orbit (LEO, GTO, Sun-synchronous), and India's private space policy architecture: IN-SPACe (2020) as the single-window regulator, NSIL as the commercial arm of ISRO, versus ISRO as the R&D body. Vikram-1 is a live example of this static institutional framework in action.

⚡ **UNIQUE FACT**

Vikram-1 was publicly unveiled by **PM Modi in November 2025** at Skyroot's "Infinity" campus — months before this maiden flight, an unusual sequence for a rocket's first launch.

⚠ **EXAM TRAP**

Don't mix up **Vikram-S** (2022, suborbital, already successful) with **Vikram-1** (2026, orbital, first attempt) — a classic "firsts" trap. Also distinguish Skyroot from **Agnikul Cosmos**, India's other private launch startup known for its 3D-printed semi-cryogenic engine.

# Starfall — SpaceX's Secret Reentry Capsule

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## NEWS IN BRIEF

- SpaceX launched **Starfall**, a secretive uncrewed reentry capsule, on a demo mission on **23 June 2026** aboard a Falcon 9.
- Built for two roles: in-space microgravity manufacturing (pharma, semiconductors, protein crystals) and rapid point-to-point cargo delivery through space.
- Disk-shaped capsule (3.1 m diameter, 2,100 kg) carrying up to 1,000 kg payload; recovers via parachute splashdown in the Pacific Ocean.
- Launches on Falcon 9 or Starship; has no full propulsion system — only cold-gas thrusters for attitude control.
- Extends ideas tested on the ISS toward a "self-sustaining in-space manufacturing economy."

### 🔗 STATIC CONNECT — REUSABILITY & REENTRY TECHNOLOGY

Standard Static – Why reentry is hard: atmospheric friction generates extreme heat, requiring heat shields/ablative material and precise deceleration (parachutes or retro-thrusters), the same static principle behind ISRO's own Reusable Launch Vehicle (RLV-TD) and Gaganyaan crew module recovery. Use Starfall as a comparative international example when revising India's own reentry/recovery tech.

### ⚡ UNIQUE FACT

SpaceX handled the launch with national-security-style secrecy — cutting its webcast minutes after liftoff, unusual for a company known for open Starlink-style broadcasts.

### ⚠ EXAM TRAP

Don't confuse **Starfall** (reentry/cargo capsule) with **Starship** (SpaceX's giant reusable heavy-lift rocket) or **Starlink** (satellite internet constellation) — three distinct "Star-" programmes is a favourite prelims mix-up.

# Ariane 6 — Europe's Heavy-Lift Workhorse

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## NEWS IN BRIEF

- Ariane 6 (ESA / ArianeGroup) continued its 2026 campaign, flying its third Amazon Leo satellite mission (**VA269**) on 17 June 2026 with upgraded P160C boosters.
- Restored Europe's **independent access to space** after Ariane 5's 2023 retirement and the loss of Russian Soyuz launches from French Guiana post-2022.
- Two configurations: **A62** (2 boosters, government/science missions) and **A64** (4 boosters, heavy commercial payloads).
- New P160C boosters (1 m longer) add over 2 tonnes of LEO capacity, letting this flight carry a record 36 Amazon Leo satellites.
- Over 30 flights already booked, including 18 for Amazon's Leo constellation — Europe targeting up to 8 launches in 2026.

### 🔗 STATIC CONNECT – INTERNATIONAL SPACE ORGANISATIONS

Standard Static – ESA is a 22-member intergovernmental body (static fact: headquartered in Paris, launches from French Guiana, distinct from any single EU institution). Compare with NASA (USA), Roscosmos (Russia), CNSA (China) and ISRO (India) on the static table of "major space agencies, HQ, and founding year" that UPSC likes to test via matching-type questions.

### ⚡ UNIQUE FACT

Ariane 6's restartable **Vinci** upper-stage engine lets a single rocket deploy multiple satellites into separate orbits on one flight — the same capability that let Ariane 5 dominate the dual-GEO-satellite launch market for decades.

### ⚠ EXAM TRAP

A common trap: assuming Ariane 6 is reusable like Falcon 9 — it is **not**; its ~40% cost cut over Ariane 5 comes from design simplification, not reusability. Also distinguish **ESA** (intergovernmental agency) from **ArianeGroup** (manufacturer) and **Arianespace** (launch operator).