Vikram-1 Orbital Launch Vehicle

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Why in News?

Recently, Skyroot Aerospace flagged off the payload fairing of Vikram-1; this launch campaign begins soon, marking a historic milestone in India's private space sector.

- **Rocket Type –** India's first privately developed *multi-stage orbital launch vehicle*, authorised by IN-SPACe, set to pioneer private orbital satellite launches.
- **Developed by** – Skyroot Aerospace (private company).
  - Skyroot was also the 1st private company to carry out a single-stage sub-orbital flight in 2022.
- **Launch site** – Satish Dhawan Space Centre, Sriharikota.

Features

- **Multi-stage launch vehicle** – solid + liquid propulsion + cryogenic.
- **Height** – Approximately 23 metres (equivalent to a 7-storey building).
- **Honour –** The launch vehicle has been named to honour Dr Vikram Sarabhai, considered to be the father of the Indian space programme.
- **Propulsion systems** – Named after Indian scientific pioneers –
  - High thrust solid boosters for liftoff - Kalam
  - Liquid engines for orbital precision - Raman
  - Cryogenic stage - Dhawan
- **Payload capacity** – Up to 350 kg to *Low Earth Orbit*; 260 kg to *Sun-synchronous Orbit*.
- **Structure** – It is made of
  - **Carbon composite instead of metals –** Lightweight, faster assembly, cost-effective.
  - **3D-printed engines –** Indigenously developed, reduce manufacturing time and assembly easier, quicker and cheaper.
  - **Flexibility –** Dedicated and rideshare launches; custom orbital deployment.

Quick Fact

Feature	Low Earth Orbit (LEO)	Sun Synchronous Orbit (SSO)
Altitude	160–2,000 km; LEO is the broad orbital regime.	500 – 800 km; specialised orbit within LEO, critical for Earth observation satellites

Inclination	Variable (depends on mission)	Near polar, 97°–99° (98° typical)
Coverage	Small footprint; requires constellations for global coverage	Passes the same area at the same local solar time daily
Applications	Communication constellations (e.g., Starlink), ISS and general Earth observation	Remote sensing, cartography, weather and environmental monitoring
Energy Requirement	Lower; easier to reach	Higher, precise altitude + inclination needed

References

1. Indian Express | Vikram - 1
2. NDTV | Vikram - 1
3. Skyroot | Vikram - 1