Skyroot’s Vikram-1 – A New Era for India’s Private Space Sector

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Vikram-1 Latest News

- India achieved a historic milestone as Hyderabad-based Skyroot Aerospace’s Vikram-1 became the **country’s first** privately built rocket to successfully place payloads into Low Earth Orbit (LEO).
- The **Mission Aagaman** marks India’s emergence as the **third** country (after US and China) where a private company has independently demonstrated **orbital launch** capability.
- So far, all orbital rockets India has launched have been statefunded and led by the ISRO, but Skyroot Aerospace changed this, reflecting the growing maturity of India’s commercial space ecosystem following space-sector reforms.

Mission Aagaman – Key Highlights

- **Historic achievement:**

    - Vikram-1, a 22-metre, **three-stage** orbital launch vehicle, was successfully launched from Satish Dhawan Space Centre, Sriharikota.
    - The mission, titled ‘Aagaman’ (**Arrival**), validated the rocket’s ability to achieve full orbital flight.
    - India joins a select group of nations where private enterprises possess orbital launch capability.
- **Technical features:**
    - **Payload capacity**: Up to 350 kg to Low Earth Orbit (450 km).
    - **Rocket built using:** All-carbon composite structure, 3D-printed engines, high-thrust solid-fuel boosters, and indigenous propulsion systems.
    - **Successfully validated:** Propulsion; stage separation; Guidance, Navigation and Control (GNC); avionics; telemetry; and overall vehicle performance.

Payload and Technological Demonstrations

- Besides validating the launch vehicle, Vikram-1 carried several **experimental payloads**, including –
    - Technology demonstration payloads from Grahaa Space, Cosmoserve and DCubed.
    - A lab-grown diamond.
    - A miniature 18-carat gold sculpture celebrating India’s space programme.
    - A micro-art tribute to Vikram Sarabhai, Dr. A.P.J. Abdul Kalam and C.V. Raman.
    - Letters from well-wishers, including the Prime Minister.
- The rocket is also equipped with **robotic arms** capable of assisting future space-debris removal missions, highlighting India’s growing focus on sustainable space operations.

Evolution of Skyroot Aerospace

- Founded in **2018**, Skyroot emerged after the liberalisation of India’s space sector.
- It became India’s **first** unicorn in the space sector (valuation exceeding $1 billion).
- Earlier launched **Vikram-S** (2022), a suborbital mission that demonstrated launch capability but did not achieve orbit.
- Vikram-1 represents the **transition** from demonstration to operational orbital launch capability.
- **The company’s future plans:** Additional test launches; commercial launch services; and manufacturing capacity of one Vikram-1 rocket per month (12 annually).

Significance for India’s Space Programme

- **Strengthening the commercial space ecosystem:** The success demonstrates that India’s private sector can now complement ISRO in launch services, satellite deployment and commercial missions.
- **Boost to space reforms:** The mission validates policy reforms initiated after 2020, including –
    - Opening the space sector to private participation.
    - Establishment of IN-SPACe for authorisation and promotion.
    - Commercialisation through NewSpace India Limited (NSIL).
    - Growing startup ecosystem in launch vehicles, satellites and downstream applications.
- **Strategic importance:**
    - Enhances India’s self-reliance in critical space technologies.

- Strengthens India’s position in the rapidly expanding global space economy.
- Encourages innovation, entrepreneurship and high-technology manufacturing.

Challenges Before Skyroot

- While the technological achievement is significant, commercial success remains uncertain.
- **Challenges are –**
  - **Challenging global market:** The small-satellite launch market has become highly competitive. Several startups in the US, Europe, China, Japan and Australia have struggled or exited due to limited launch demand.
  - **Competition from rideshare launches:**
    - Small satellites increasingly use rideshare missions aboard larger rockets such as SpaceX’s Falcon 9, significantly reducing launch costs.
    - Dedicated launch vehicles like Vikram-1 offer orbital flexibility but often at a higher price.
  - **Competition from ISRO:** Vikram-1 will also compete with ISRO’s Small Satellite Launch Vehicle (SSLV) and the well-established Polar Satellite Launch Vehicle (PSLV).
  - **Limited domestic demand:**
    - India’s current demand for dedicated small-satellite launches remains modest.
    - To fully utilise its proposed production capacity, Skyroot must secure international commercial customers.
  - **Low-margin industry:** Launch services are capital-intensive; comparatively low-margin; and subject to increasing compliance costs, including space debris mitigation and regulatory obligations.

India’s Competitive Advantages

- Despite market challenges, India enjoys several **structural strengths** –
  - Lower manufacturing and labour costs.
  - Access to ISRO’s launch infrastructure and expertise.
  - Strong engineering talent.
  - Expanding satellite manufacturing ecosystem.
  - Government emphasis on advanced manufacturing and innovation.
- India’s emerging commercial ecosystem includes startups such as – Pixxel, Bellatrix Aerospace, and Dhruva Space.
- Together, they can build **integrated capabilities** spanning launch vehicles, satellites and downstream space services.

Big Picture

- The Skyroot factory is capable of producing 12 Vikram1 rockets every year.
- This will be an asset if there is demand for 12 Vikram1 launches every year.
- But even ISRO does not launch 12 small satellites a year today.
- In other words, Skyroot will have to find and secure **international customers**.

Way Forward

- For sustained success, Skyroot must move beyond a single successful launch by –
    - Demonstrating consistent launch reliability.
    - Reducing launch costs.
    - Expanding into higher-value segments such as satellite manufacturing, space applications and data services.
    - Leveraging India’s growing reputation as a trusted, cost-effective space partner.
- The successful launch of Vikram-1 marks a watershed moment for India’s private space industry and validates years of **policy reforms** encouraging private participation.
- For India, the mission represents another major step towards becoming a leading player in the global space economy and advancing the vision of **Atmanirbhar Bharat** in strategic technologies.

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