Drishti Satellite Opto-SAR Technology: How Drishti Satellite Opto-SAR Technology is Transforming Space Imaging

May 4, 2026 • vajiramandravi.com

Drishti Satellite Latest News

- Indian space start-up **GalaxEye** launched its **first satellite *'Drishti'*** aboard a SpaceX Falcon 9 rocket from Vandenberg Space Force Base, California, as one of 45 payloads on the CAS500-2 mission.
- Founded by IIT Madras alumni, GalaxEye has created the **world's first satellite** capable of capturing optical and radar images simultaneously of the same location — a technological first in space imaging.

Space Imaging

- Space imaging refers to the collection of visual and electromagnetic data from space, used to map celestial bodies, track cosmic phenomena, and monitor Earth's environment.
- This technology translates data from across the electromagnetic spectrum into high-resolution imagery.

Key Technologies

- **Optical Sensors**: Capture visible light to produce detailed, high-resolution photographs of Earth and deep-space objects.
- **Synthetic Aperture Radar (SAR):** Emits microwave pulses to map terrain. Because it doesn't rely on sunlight, it can image through clouds, smoke, and total darkness.
- **Infrared and Thermal Imaging**: Detects heat signatures, which is essential for studying star formation in deep space and monitoring wildfires or climate patterns on Earth.
- **Hyperspectral Imaging**: Breaks down light into hundreds of narrow bands, allowing scientists to identify the exact chemical composition of minerals, vegetation, and gases.
- **AI and Cloud Computing**: Modern space systems utilize artificial intelligence directly on orbit to process petabytes of imagery instantly, enabling real-time change detection and analysis.

Limitations of Existing Imaging Technologies

- Space imaging satellites currently use one of two technologies:
    - **Optical/Multi-spectral Imaging** — Works like a normal camera, producing clear, intuitive, and easy-to-understand images.

        - However, it is ineffective during cloudy weather or night time — a significant limitation for tropical countries like India where cloud cover is frequent and unpredictable.
    - **Synthetic Aperture Radar (SAR)** — Uses radar signals that can penetrate clouds and capture images continuously regardless of weather or lighting conditions.
        - However, SAR images are not intuitive — like X-ray images, they require trained experts to interpret the data, limiting their usability for general users.

The Gap — Why Fusion is Needed but Difficult

- Users currently need data from multiple satellites — optical data for clarity and SAR data for continuity and all-weather availability.
- While superimposing these two datasets often works, it has serious limitations.
- The two satellites are not watching the same place at the same time, and the angles at which they observe Earth can be very different — making accurate data fusion a persistent challenge.

What Makes Drishti Unique — The Opto-SAR Technology

- Drishti is the **world's first satellite** equipped with both optical and SAR sensors operating simultaneously to capture images of the same location at the same time.
- GalaxEye calls this proprietary innovation "**Opto-SAR technology**."

The Core Technological Challenge — and How It Was Solved

- SAR and optical sensors are designed differently and look at Earth at different angles.
- If placed side by side without synchronisation, the optical sensor might be capturing Bengaluru while the SAR sensor is simultaneously capturing Dubai.
- GalaxEye developed a **proprietary technology stack** that synchronises the functionalities of both sensors, enabling them to look at the exact same location at the same time.
- Hence, it eliminates the need for users to manually align datasets from two different satellites.

The AI Dimension

- When optical sensors are unable to capture images due to clouds, Drishti uses Artificial Intelligence to regenerate optical-like images from SAR data — further bridging the gap between clarity and all-weather reliability.

Why This Problem is Particularly Indian

- Most traditional satellite companies are based in Western countries where weather is relatively more predictable and skies are cleaner.
- They do not face the same intensity of cloud cover challenges that countries like India — located in the tropics — routinely experience.
- GalaxEye is therefore solving a problem specific to India and the developing world — making space imagery available all the time and understandable to all kinds of users.

Applications of Drishti

- The data produced by Drishti has both civilian and military applications including:
    - agriculture monitoring,
    - disaster management,
    - urban planning,
    - infrastructure monitoring,
    - border surveillance, and
    - defence intelligence.

India’s Growing Space Start-up Ecosystem

- GalaxEye is part of a rapidly emerging wave of Indian private space companies making significant technological contributions.
- Other notable start-ups include:
    - **Agnikul Cosmos** (IIT Madras) — which built the world’s first 3D-printed rocket engine, Skyroot — which tested India’s first privately built rocket, and
    - **Pixxel, Dhruva Space, and Bellatrix** — demonstrating impressive innovations in satellite technologies.
- This ecosystem has been significantly enabled by **India’s Space Policy 2023**, which opened end-to-end space activities to private players.

Source: IE
