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# HAPS for IAF and Ladakh Telescopes — DAC's Rs 3.60 Lakh Crore Defence and Science Push

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# HAPS for IAF and Ladakh Telescopes — DAC's Rs 3.60 Lakh Crore Defence and Science Push

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**WHY IN NEWS**

The **Defence Acquisition Council (DAC)** approved a total Rs 3.60 lakh crore package including **High-Altitude Pseudo-Satellite (HAPS)** systems for the Indian Air Force (~Rs 15,000 crore), while the **Union Budget 2026-27** simultaneously allocated funds for three new astronomical observatories at Ladakh's Hanle Dark Sky Reserve — including a 13.7-metre telescope that would be among the world's largest optical telescopes.

## HIGH-ALTITUDE PSEUDO-SATELLITES (HAPS) — INDIA'S STRATOSPHERIC ISR PLATFORMS

### What Are HAPS?

**High-Altitude Pseudo-Satellites (HAPS)** are unmanned aerial platforms — typically solar-powered airships or fixed-wing aircraft — that fly in the **stratosphere at 18–22 km altitude**, filling the capability gap between:

**Low-orbit satellites** (high cost, limited dwell time over specific areas)

**Conventional UAVs/drones** (low altitude, shorter range, more vulnerable)

| Platform Type | Altitude | Dwell Time | Cost |
|---|---|---|---|
| LEO Satellite | 400–1,200 km | Overflight (minutes/orbit) | Very High |
| HAPS | 18–22 km | **Months** (solar-powered) | Medium |
| High-altitude UAV (HALE) | 15–18 km | Weeks | Medium |
| Medium-altitude UAV (MALE) | 5–10 km | Days | Lower |
| Tactical UAV | 1–5 km | Hours | Low |

**Key capabilities of HAPS:**

**Persistent ISR:** Optical and infrared sensors that can monitor a large area (footprint: 500–800 km diameter at 20 km altitude) continuously for months

**Communications relay:** Can serve as an aerial communications hub, extending network coverage to areas without satellite or fibre connectivity

**Electronic intelligence (ELINT):** Signals intelligence at altitude without risking crewed platforms

## Why India Needs HAPS Now

**2017 Doklam standoff context:** During the 73-day face-off between Indian and Chinese troops at Doklam (Bhutan-India-China trijunction), India's surveillance of Chinese military build-up relied heavily on satellites with intermittent coverage and UAVs that were range-limited from Indian airbases. A HAPS platform stationed over the Himalayas could provide 24/7 continuous coverage.

**China's HAPS development:** China has been actively developing HAPS systems (Caihong-T4 and Qimingxing series) since 2015. A Chinese HAPS capable of monitoring India's military deployments in the Himalayas from Chinese territory would give the PLA a significant intelligence advantage.

**Other applications:**

Monitoring ceasefire lines (LoC in J&K, LAC in Ladakh)

Disaster management surveillance (floods, earthquakes)

Maritime domain awareness over the Indian Ocean

Communication support for troops in remote mountains

## India's Indigenous HAPS Development

**NAL (National Aerospace Laboratories, Bengaluru)** successfully tested a prototype HAPS in **February 2024** at the **Challakere Aeronautical Test Range, Karnataka**. Target specs for the IAF variant:

Wingspan: **30 metres**

Operating altitude: **23 km**

Power: Solar panels on upper wing surface with battery storage for night operations

Delivery: By **2027**

Industrial partners: **HAL** (manufacturing, integration) and **NewSpace Research and Technologies** (private sector partner, Bengaluru — India's leading HAPS developer).

# NEW TELESCOPES FOR LADAKH — ASTRONOMICAL INFRASTRUCTURE PUSH

## Hanle Dark Sky Reserve

The **Hanle Dark Sky Reserve** in Ladakh (established 2022) is the **world's largest high-altitude dark sky reserve**, at ~4,500 metres altitude. Low population density, minimal light pollution, exceptional atmospheric transparency, and high number of clear nights (~250–300 per year) make it ideal for optical and infrared astronomy.

## Three Facilities

### 1. National Large Solar Telescope (NLST)

**Aperture:** 2 metres (the largest solar telescope in Asia on completion)

**Location:** Merak region, near Pangong Tso

**Timeline:** 5–6 years

**Wavelengths:** Visible and near-infrared

**Purpose:** High-resolution imaging of solar features (sunspots, solar flares, magnetic field dynamics, space-weather forecasting)

**Space weather significance:** Large solar flares and coronal mass ejections (CMEs) can disrupt satellite communications, power grids, and navigation systems (GPS). India needs independent solar monitoring for early warning.

### 2. National Large Optical-Near Infrared Telescope (NLOT)

**Aperture: 13.7 metres** (segmented mirror with 90 hexagonal segments)

**Location:** Hanle, Ladakh

**Timeline:** ~1 decade

**Purpose:** Deep sky observation — exoplanet detection, stellar evolution, supernovae, dark matter/dark energy studies

**Scale context:** This would place NLOT among the world's 3–4 largest optical telescopes. The 30-metre Telescope (TMT, Mauna Kea) and the European Extremely Large Telescope (ELT, 39.3 metres, Atacama, Chile) are the largest under construction globally.

### 3. Himalayan Chandra Telescope (HCT) Upgrade

**Current:** 2.01-metre aperture (operational since 2000)

**Upgrade:** 3.7-metre segmented primary mirror

**Operator:** Indian Institute of Astrophysics (IIA), Bengaluru

**Control:** Remote-operated from CREST (Centre for Research and Education in Science and Technology), **Hosakote, Karnataka**

**Why remote operation?** At 4,500m altitude, regular human operation is physically taxing. The remote telescope model pioneered by HCT allows round-the-clock observations by scientists at lower altitude.

## Indian Astronomy Infrastructure Context

India's existing major observatories:

**Giant Metrewave Radio Telescope (GMRT):** Pune; 30 dish antennas; operated by NCRA-TIFR

**Vainu Bappu Observatory:** Kavalur, Tamil Nadu; 2.3-metre VBT

**Indian Astronomical Observatory (IAO):** Hanle, Ladakh (where HCT is located)

**AstroSat:** India's first multi-wavelength space observatory (launched 2015); observes in UV to hard X-ray

## UPSC RELEVANCE

*HAPS (altitude range, applications, NAL prototype), Doklam standoff (2017), Challakere Aeronautical Test Range (Karnataka), Hanle Dark Sky Reserve (world's largest high-altitude), NLST (2m, solar), NLOT (13.7m, segmented), HCT (IIA, remote operation, Hosakote), GMRT (Pune), AstroSat, NewSpace Research and Technologies, NAL.* **Mains GS-3:** *Defence technology indigenisation; UAV/HAPS capabilities and border surveillance; India's space weather preparedness; scientific infrastructure investment; astronomy and space exploration.*

## 📌 FACTS CORNER — KNOWLEDGEPEDIA

### HAPS (HIGH-ALTITUDE PSEUDO-SATELLITES):

Altitude: **18–22 km** (stratosphere)

Dwell time: **Months** (solar-powered)

Footprint: 500–800 km diameter area from 20 km

IAF approval: DAC granted **AoN** (Acceptance of Necessity)

Cost component: **~Rs 15,000 crore** (out of Rs 3.60 lakh crore total DAC package)

Indigenous: **NAL** prototype tested Feb 2024 at **Challakere, Karnataka**

Partners: **HAL** + **NewSpace Research and Technologies**

Target: 30m wingspan, 23 km altitude, by **2027**

### LADAKH TELESCOPES:

NLST: **2-metre solar telescope** | Merak/Pangong Tso | 5–6 years

NLOT: **13.7-metre optical-NIR** | Hanle | ~1 decade | 90 hexagonal segments

HCT upgrade: **2.01m → 3.7m** | Hanle | remote-operated from CREST, Hosakote

Location: **Hanle Dark Sky Reserve** — world's largest high-altitude DSR (~4,500m)

### KEY TELESCOPE COMPARISONS:

World's largest optical (operational): GTC (10.4m, La Palma, Spain)

ELT: 39.3m (European Southern Observatory, Atacama, Chile; under construction)

TMT: 30m (planned, delayed at Mauna Kea)

HCT: Operated by **IIA (Indian Institute of Astrophysics)**, Bengaluru

### OTHER RELEVANT FACTS:

AstroSat: India's first multi-wavelength space observatory; launched **2015** by ISRO; observes UV to hard X-ray

GMRT: Giant Metrewave Radio Telescope; Pune; 30 dishes; operated by **NCRA-TIFR**

Doklam Standoff 2017: 73-day face-off at Bhutan-India-China trijunction; HAPS would address surveillance gaps exposed

Space weather: Solar flares/CMEs can disrupt GPS, power grids, satellites; NLST provides independent monitoring capability

Sources: Drishti IAS, GKToday

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