

Bridging the Watch Gap: High Altitude Pseudo Satellites (HAPS) as India's Interim Maritime Surveillance Architecture in the Indian Ocean Region

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Introduction

Operation Sindoor laid a structural constraint in India's defence preparedness: relying on Indian-built earth observation satellites with limited revisit frequency and foreign commercial imagery prolong decision-making cycles.¹ This reveals that the pace of modern warfare has overtaken India's real-time space surveillance capabilities. Responding to these vulnerabilities promptly, the cabinet committee on security accelerated the Space-Based Surveillance phase III (SBS-3) programme, committing INR 26,968 crore to launch 52 satellites by 2029 (21 by Indian Space Research Organisation, 31 by Indian private firms).^{2,3}

Although India's surveillance architecture faces challenges across its continental borders and maritime approaches, it is in the Indian Ocean Region (IOR) that the gap between ambition and current capability is most acute and least addressed. The IOR spans approximately 70 million sq kms.⁴ It carries over 80 per cent of global seaborne oil trade, hosts growing grey-zone activity, and is subject to increasing presence of untracked and Automatic Identification Systems (AIS)-dark vessels.⁵ Given the current maritime surveillance capability, none provides constant wide-area IOR coverage. The 52-satellite constellations, once operational, address this problem, but till then, India needs to monitor this emerging contested arena. High-Altitude Pseudo Satellites (HAPS), which India is already developing, are an unmanned stratospheric platform that operates between 17 and 25 kms altitude. HAPS has the potential to emerge as an intermediary technology especially as India awaits the operationalisation of its next-generation space-based surveillance systems.

The SBS-3 Promise and Its Temporal Gap

Positioned across Low Earth Orbit (LEO) and Geostationary Orbit, the SBS-3 constellation, once completed, would transform India's surveillance architecture. 52 satellites equipped with Synthetic Aperture Radar (SAR), Artificial Intelligence (AI)-driven analytics, and reduced revisit times aim to provide persistent, all-weather maritime coverage (when fully deployed).⁶ Expedited following the operation Sindoor, the first batch of satellites is anticipated to be launched in 2026, with full deployment by the end of 2029. The operative phrase, however, is full deployment; a partial constellation would not deliver continuous coverage.

Satellites in LEO complete an orbital cycle in approximately 90 minutes⁷, with limited operational satellites, the revisit gap over specific maritime zones would be measured in hours, not minutes. To overcome these revisit constraints, India has

planned the SBS-3 constellation as a next-generation surveillance architecture, but the program has not escaped the institutional delays that have historically constrained India's launch schedules. Even under optimistic assumptions, an effective and sustained maritime coverage from SBS-3 remains a 2028-29 prospect. This is a strategic vulnerability in an increasingly contested maritime environment.

A Capable Architecture, not a Persistent One

India's existing maritime surveillance architecture rests on three pillars: the P-8I Poseidon fleet, Unmanned Aerial Vehicles squadrons, and the Information Fusion Centre for the Indian Ocean Region (IFC-IOR). Each performs its designated function well, but none provides uninterrupted, wide-range IOR coverage.⁸

Currently, the Indian Navy operates 12 P-8I Poseidon maritime patrol aircraft across squadrons at Arakkonam (INS Rajali) and Goa (INS Hansa).⁹ Equipped with APY-10 surface search radar, APS-143 OceanEye aft radar, magnetic anomaly detectors, and Bharat Electronics Limited Data Link II communications¹⁰, Boeing's P-8I Poseidon is a formidable platform. Despite its advanced sensor suite and four hours on-station for an anti-submarine warfare mission, the aircraft's effectiveness is constrained by its limited range beyond 1,200 nautical miles (\approx 2,200 kms). The Navy itself has acknowledged that a minimum of 18 aircraft is required to maintain meaningful simultaneous coverage across the Arabian Sea, Bay of Bengal, Andaman Sea, and other key chokepoints.¹¹ The planned procurement of six additional aircraft has been paused since August 2025 following a 50 per cent cost escalation and United States tariff complications.¹²

A P-8I sortie provides surveillance of a defined area for hours, but the MQ-9B SeaGuardian UAVs offer improved endurance at approximately 40 hours per sortie.¹³ However, the UAV requires forward basing, maintenance cycles, and crew rotation and cannot sustain continuous coverage. The UAV squadrons operating Heron and Searcher platforms (at Kochi, Porbandar, and UAV-based coastal-surveillance nodes at Ramanthapuram)¹⁴ operate with an altitude ceiling of 15,000 to 30,000 feet (\approx 4.6 km to 9.1 km), which is useful for near littoral surveillance, yet inadequate for sustained deep-ocean coverage across the large IOR maritime space.

India's Institutional framework for maritime domain awareness, the IFC-IOR, was established in 2018 and is based in Gurugram.¹⁵ Its architecture aggregates AIS data, partner nation inputs, and maritime intelligence through the MANTRA platform, but it carries a structural limitation.¹⁶ It is a fusion centre, not a sensor, it processes the data it receives. Sensor blind spot translates to IFC-IOR blind spots. A vessel that disables its AIS transponder in a coverage gap between P-8I sortie windows does not appear anywhere in the Indian maritime surveillance picture. This is not institutional failure but an architectural one. India's surveillance system is optimised for mission-based response rather than continuous presence, which is insufficient for today's information-driven landscape.

The Stratospheric Option: Endurance Where Satellites and Aircraft Cannot Reach

A single HAPS platform, sustained at 20 kms altitude, can provide continuous optical, infrared, and Signals Intelligence (SIGINT) coverage of a 500-km radius for weeks without rotation. An endurance ceiling that no satellite revisit cycle or patrol aircraft can approach. India does not need to look abroad for proof of concept; it is already being built domestically.

On 3 May, 2025, Defence Research and Development Organisation conducted the maiden flight trial of its Stratospheric Airship Platform from Sheopur, Madhya Pradesh, reaching an altitude of approximately 17 kms.¹⁷ Developed by the Aerial Delivery Research and Development Establishment in Agra, the platform's key stratospheric systems were successfully validated. Council of Scientific and Industrial Research - National Aerospace Laboratories is simultaneously developing a solar-powered fixed-wing HAPS variant, with a subscale demonstrator reaching (\approx) 7.6 kms and sustaining over ten hours of flight on solar power.¹⁸ A dedicated production facility is being commissioned, with a full stratospheric flight objective of 20 kms targeted for 2027.¹⁹ Airbus Zephyr S achieved 67 days of continuous stratospheric flight in Apr 2025.²⁰ Demonstrating endurance that no contemporary patrol aircraft or UAV can approach.

The operational implications for India are direct. A HAPS positioned over the Andaman Sea provides continuous optical, infrared, and SIGINT coverage of India's eastern maritime corridor for weeks without crew rotation or forward basing. The same platform repositioned over the Arabian Sea watches India's western maritime approaches without interruption. Unlike a satellite, HAPS is locally controlled, operates within India's near-space, is not subject to orbital mechanics, and is significantly harder to deny than a satellite that can be tracked, jammed, or targeted in orbit. At 20 km altitude, the line-of-sight coverage would be enough for round-the-clock sovereign coverage of India's most critical maritime corridor.

Three Institutional Decisions India Must Make Now

Despite having technology, three institutional gaps currently prevent the DRDO's HAPS from contributing to maritime domain awareness.

First, HAPS operate between 17 kms and 25 kms, a sweet spot that lies above the national airspace under Chicago Convention norms²¹ and below the Kármán line. Neither the Directorate General of Civil Aviation nor the Dynamics Spectrum Alliance²² has defined jurisdiction over this altitude band. Without this framework, HAPS operations over IOR lack legal standing even under Indian authority.

Second, the current variants of the HAPS program, be it the Stratospheric Airship Platform or CSIR-NAL's fixed-wing, are being developed for broad Intelligence

Surveillance Reconnaissance purposes.²³ Without a defined maritime surveillance mandate, neither is equipped to be integrated into India's existing maritime surveillance architecture.

Third, and perhaps most fundamental, architecture gaps, IFC-IOR was designed to aggregate inputs from existing sensors. It is not structured to receive continuous stratospheric sensor streams. Connecting HAPS-generated data directly into MANTRAS's processing architecture would upgrade it from a fusion centre to a platform capable of producing a near continuous intelligence picture across IOR's critical chokepoints.²⁴ India needs to act now, as this integration requires advanced planning. This architecture needs to be designed before HAPS reaches operational status, if the full surveillance value of the technology is to be realised.

Strategic Intent Without an Operational Bridge Is Insufficient

The Indian Maritime Doctrine 2025²⁵, the Security and Growth for All in the Region framework²⁶, and the SBS-3 programme all reflect a clear strategic intent to dominate awareness across the Indian Ocean Region; yet a gap lies in the operational timeline. The DRDO's maiden flight of the Stratospheric Airship Platform in May 2025 and CSIR-NAL's forthcoming production facility confirm that India

India possesses the foundational technology. What is missing is a policy decision: to assign the HAPS programme a specific maritime surveillance mandate, to define regulatory authority over near-space operations, and to integrate stratospheric sensor inputs into IFC-IOR's data architecture. The problem is architectural; the solution requires institutional decisions. Strategic autonomy (*Atmanirbharta* or *self-reliance*) is embedded in India's navigation doctrine; it needs to be extended to its maritime surveillance architecture, and HAPS provides the gateway. India's maritime surveillance cannot wait for satellites that have not yet been launched.

Endnotes

¹ 'Operation Sindoor: Domestic Strategic Space Assets, Foreign Commercial Satellites Used,' *Times of India*, May 2025, <https://timesofindia.indiatimes.com/india/operation-sindoor-domestic-strategic-space-assets-foreign-commercial-satellites-used/articleshow/121118997.cms>

² 'India Defence Satellites SBS-3 Surveillance,' *Business Standard*, 30 Jun 2025, https://www.business-standard.com/external-affairs-defence-security/news/india-defence-satellites-sbs3-surveillance-isro-china-pakistan-iok-125063000690_1.html

³ 'India's SBS-3 Programme,' *Raksha Anirveda*, Jul 2025, <https://raksha-anirveda.com/indias-sbs-3-programme>

⁴ Press Information Bureau, 'Indian Ocean Region,' Government of India, <https://www.pib.gov.in/newsite/PrintRelease.aspx?relid=186757®=3&lang=2>

⁵ 'How ISRO Satellites Backed IAF's Decisive Blows During Operation Sindoor,' *Bharat Shakti*, May 2025, <https://bharatshakti.in/how-isro-satellites-backed-iafs-decisive-blows-during-operation-sindoor/>

⁶ 'What is India's SBS-3 Programme and How it Strengthens Surveillance,' *WION*, 2025, <https://www.wionews.com/photos/what-is-india-s-sbs-3-programme-and-how-it-strengthens->

[surveillance-over-pakistan-1765443473735](#)

⁷ European Space Agency, 'Low Earth Orbit,' ESA, Mar 2020,

https://www.esa.int/ESA_Multimedia/Images/2020/03/Low_Earth_orbit

⁸ Press Information Bureau, 'Maritime Domain Awareness,' Government of India, PRID=1776090,

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1776090®=3&lang=2>

⁹ Government of India, Ministry of Defence. 'India–US Move on Pending Defence Pacts: Focus on P-8I Aircraft.' Press Information Bureau. Nov 2015,

<https://www.pib.gov.in/newsite/PrintRelease.aspx?relid=130417®=3&lang=2>

¹⁰ Jha, Manish Kumar. 'India–US Move on Pending Defence Pacts: Focus on P-8I Aircraft.' SPS Aviation, 7 Feb, 2026. <https://www.spsmai.com/features/?id=564&q=India-US-Move-on-Pending-Defence-Pacts-Focus-on-P-8I-Aircraft>

¹¹ 'Indian MoD Halts Procurement of Six Additional P-8I,' *IDRW*, 6 Aug 2025, <https://idrw.org/indian-mod-halts-procurement-of-six-additional-p-8i>.

¹² Ibid.

¹³ General Atomics Aeronautical Systems, 'MQ-9B SeaGuardian: Persistent Maritime Domain

Awareness,' GA-ASI, accessed 1 May 2026, <https://www.ga-asi.com/remotely-piloted-aircraft/mq-9b-seaguardian>

¹⁴ Government of India, Indian Coast Guard. 'Maritime Surveillance.' Accessed May 1, 2026.

<https://indiancoastguard.gov.in/maritime-surveillance>

¹⁵ Bikhchandani, Raghav. 'Heron, Searcher, Sea Guardian, SWITCH — the Many UAVs That Make Up India's Drone Arsenal.' *The Print*, 6 Aug, 2021. <https://theprint.in/defence/heron-searcher-sea-guardian-switch-the-many-uavs-that-make-up-indias-drone-arsenal/709670/>

¹⁶ Indian Navy, 'About Us,' Information Fusion Centre — Indian Ocean Region,

https://ifcior.indiannavy.gov.in/about_us

¹⁷ Press Information Bureau, 'Information Fusion Centre for the Indian Ocean Region,' Government of India, PRID=1557074, <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1557074>

¹⁸ 'India-US P-8I Poseidon Deal Stalled,' *Defence Security Asia*, Dec 2025,

<https://defencesecurityasia.com/en/india-us-p8i-poseidon-deal-stalled>

¹⁹ Press Information Bureau, 'DRDO Stratospheric Airship Platform Flight Trial,' Government of India, 3 May 2025, PRID=2126640, <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2126640>

²⁰ Amprius Technologies, 'Zephyr S Sets 67-Day Continuous Flight Record,' Press Release, May 2025, <https://ir.amprius.com/news-events/press-releases/detail/133>

²¹ Snehes Alex Philip, 'NAL Successfully Tests Solar-Powered 'Pseudo Satellite' UAV, Can Float in Air for Months,' *Deccan Herald*, 10 Feb, 2024, <https://www.deccanherald.com/india/nal-successfully-tests-solar-powered-pseudo-satellite-uav-can-float-in-air-for-months-2889257>

²² International Civil Aviation Organization, 'The History of ICAO and the Chicago Convention,' ICAO, accessed 1 May 2026, <https://www.icao.int/history-icao-and-chicago-convention>.

²³ 'DAC Approves HAPS for IAF: Bridging the Gap,' *Indian Defence News*, Feb 2026,

<https://www.indiandefensenews.in/2026/02/dac-approves-haps-for-iaf-bridging.html>.

²⁴ Gurpreet S. Khurana, 'Mapping IORA's Maritime Security Agenda,' *Observer Research Foundation*, 2025, <https://www.orfonline.org/expert-speak/mapping-iora-s-maritime-security-agenda>

²⁵ "Indian Maritime Doctrine 2025: An Assessment," *Institute for Defence Studies and Analyses*, 2025, <https://idsa.in/publisher/issuebrief/indian-maritime-doctrine-2025-an-assessment>.

²⁶ "Security and Growth for All in the Region (SAGAR) 2015," *IMPRI Impact and Policy Research Institute*, accessed 1 May 2026, <https://www.impriindia.com/insights/security-growth-for-all-regions-sagar/>

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