



The 33rd UN/IAF Workshop: "Space Economy Opportunities for Emerging Nations: Advancing Socio-Economic Resilience through Space Technologies and Applications" in Antalya, Türkiye

“Leveraging International Cooperation to Build Space Capability: Thailand’s Experience with the THEOS program”

4th October 2026

Paripat Pairat, GISTDA, Thailand

Contact: paripat@gistda.or.th , paripat.per@gmail.com

Geo-Informatics and Space Technology Development Agency (Public Organization), Ministry of Higher Education, Science, Research and Innovation

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About GISTDA

The Geo-Informatics and Space Technology Development Agency or, in brief, GISTDA, is a Thai space agency and space research organization. It is responsible for remote sensing and technology development satellites.

Under the Ministry of Higher Education, Science, Research and Innovation (MHESI)

Headquartered in Bangkok, with a national satellite Assembly, Integration & Test facility in Chonburi

HQ: Chaeng Watthana Government Complex, Bangkok | Space Krenovation Park (satellite AIT center): Sriracha District, Chonburi



HQ @ Government Complex



AIT building

Space Krenovation Park (SKP)

อุทยานรังสรรค์นวัตกรรมอวกาศ





Rationale

Thailand's Earth Observation System (THEOS) program shows how international cooperation can evolve from **satellite procurement to national capability building**.

Through successive partnerships, Thailand has moved from operating foreign-built satellites to gaining hands-on experience in **satellite design, integration, testing, software development, local manufacturing and engineering training**. THEOS-3 represents the next step, with greater Thai participation in satellite development and a growing role for domestic companies and facilities.

This experience raises an important question for emerging space nations: **How can international cooperation deliver not only a satellite, but also the people, knowledge, industry and infrastructure needed to build the next one?**

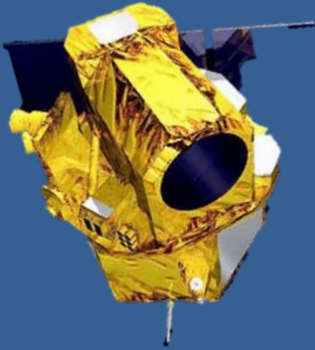
Thailand's experience suggests that cooperation can be used as a **capacity-building tool**—where each partnership contributes to the next stage of national capability and, ultimately, to a broader domestic space ecosystem.

Objectives

The session aims to:

- Examine how GISTDA has used successive international partnerships (Airbus, SSTL and others) as deliberate vehicles for technology transfer and local industry growth, not merely as procurement relationships
- Surface concrete mechanisms — local sourcing quotas, joint engineering teams, training pipelines, ground-segment co-development — that other space-emerging nations could adapt

THEOS (THAICHOTE)



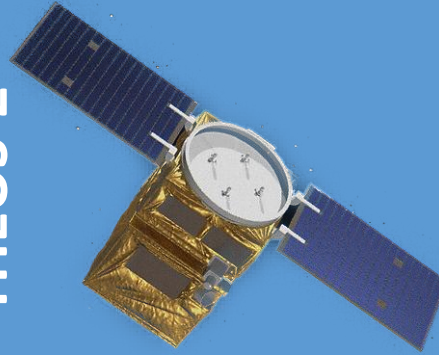
Launch date : Oct 1st, 2008
Yasny, Russia

Payload : 2 m resolution
panchromatic imager,
15 m resolution multispectral
imager

Mass : ~718 kg

Orbit : ~822 km
Sun Synchronous

THEOS-2



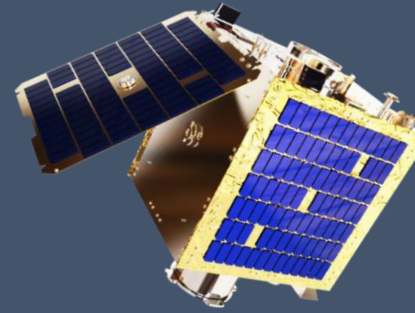
Launch date : Oct 9th, 2023
French Guiana, France

Payload : 0.5 m resolution
panchromatic imager,
2 m resolution multispectral imager

Mass : ~425 kg

Orbit : ~621 km
Sun Synchronous

THEOS-2A



Launch date : 2026 (Launch failed)
Sriharikota, India

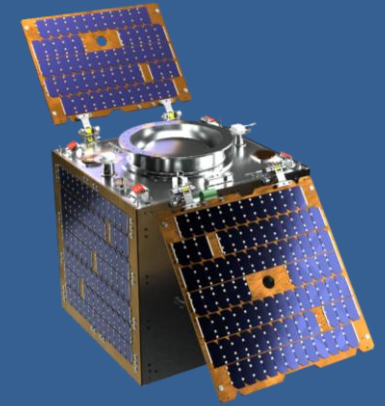
Payload : 1.18 m resolution RGB
Secondary Payload : AIS and ADS-
B Receiver

Third Payload : GISTDA self
development module

Mass : ~100 kg

Orbit : ~500 km
Sun Synchronous

THEOS -3



*Under development
2023 - 2029*

Launch date : 2029

Payload : VNIR and SWIR
Camera

Secondary Payload : AIS Receiver

Mass : ~130 kg

Orbit : ~500 km
Sun Synchronous



International Program & Capacity Building

Never going alone

- Every generation of Thailand's satellite programme — and the constellation now being planned — has relied on structured partnership with a more experienced space agency or company
- Capability builds step-by-step: THEOS-1 → THEOS-2 → THEOS-2A → THEOS-3, echoing the international literature's “space technology ladder” — climbed unevenly, not in one leap

How the transfer actually happens

- Satellite engineering knowledge transfers best through co-located, hands-on work, not document handover — GISTDA's KHTT (Knowledge and Hands-on Training Transfer) model splits training between the partner's facility and GISTDA's own AIT facility
- The next slides walk through what each partnership actually delivered, satellite by satellite

Capacity building, in numbers

- Training progression: EADS Astrium, France (2008) →
- Surrey, UK Customer Engineer (CE-A) training (2019) →
- CE-A to CE-B know-how transfer at Space Krenovation Park, Thailand (2022) → School Satellite (2023)
- Local content share: 10% on THEOS-2A → 50% target on THEOS-3, across five newly Thai-built subsystems — structure, power distribution module, solar panel, flight software, communication system
- Infrastructure: GISTDA's own National Assembly, Integration & Test (AIT) facility — now developing THEOS-3



Historical: THEOS-1 — France

Astrium, France (2008)

- Thailand's first Earth-observation satellite — fully foreign-built
- Launched on a Russian Dnepr rocket from Yasny

What this partnership gave GISTDA

- A first, ground-level exposure to satellite programme management, ground-segment operations, and mission planning — the starting rung of the ladder
- No local build or design content at this stage — the foundation laid here was operating experience, not development experience



THEOS-1 (2008)
Engineering training at
EADS Astrium, Toulouse,
France

THEOS-2 — Airbus Defence and Space, France

THEOS-2 Airbus Defence and Space, France

- Built by Airbus Defence and Space
- Launched by Arianespace's Vega rocket from Kourou, French Guiana, with ESA/CNES coordination

What this partnership gave GISTDA

- Exposure to a modern, Very higher-resolution EO satellite platform and a European launch-campaign process
- Satellite build stayed with Airbus, but GISTDA engineers trained in France (~6 months, ground systems) and in Thailand at handover



THEOS-2 Captures Images of the Disaster: Massive
Flash Flood and Mudslide in the Himalayas



KHTT: THEOS-2A — Surrey Satellite Technology Ltd (SSTL), UK

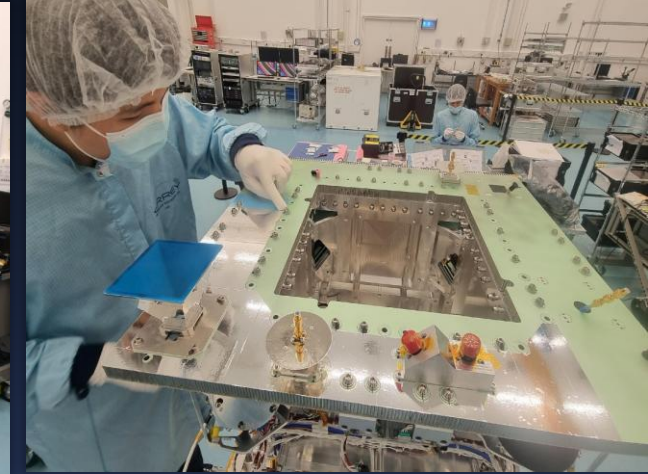


Surrey Satellite Technology Ltd (SSTL), UK (2019-2021)

Where the knowledge transfer happened (2026)

- A 2-year, 22-GISTDA-engineer training programme, split between SSTL's Guildford (UK) facility and GISTDA's own AIT facility in Thailand — covering satellite design, manufacture, integration and test, plus in-country supply-chain development
- Thai engineers went on to develop their own experimental payloads (a custom sun sensor, Raspberry Pi-based systems) — the origin of GISTDA's KHTT approach
- Launched on India's PSLV-C62 from Satish Dhawan Space Centre; the launch itself was not successful

THEOS-2A is where GISTDA stopped being only an operator and became a co-developer — the direct reason THEOS-3 can be substantially Thai-built.



Sun sensor can made in Thailand made



First Phase

Second Phase



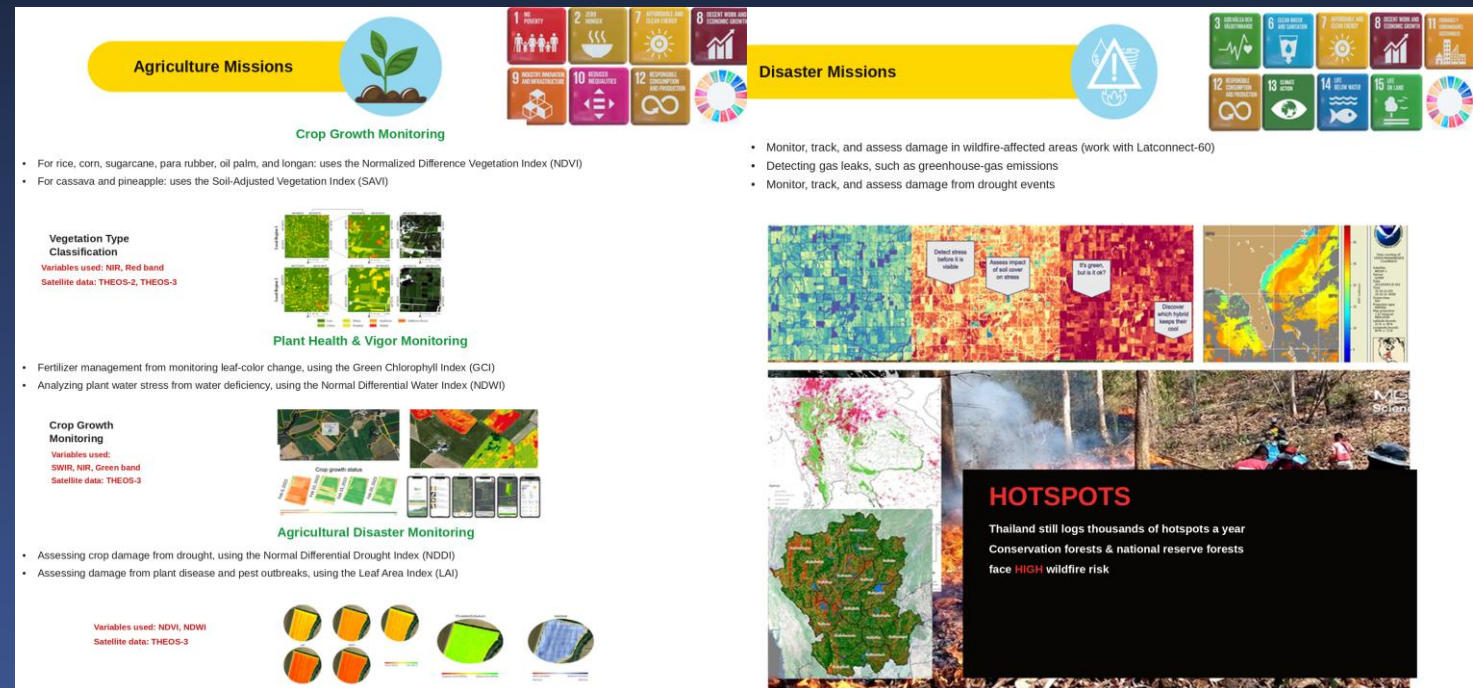
THEOS-3: Building Capability, Not Just a Satellite

THEOS-3 is based on the THEOS-2A platform and represents the next step in Thailand's capability development.

Four objectives

1. **Build Thai Satellite Heritage** — Create a sustainable national capability for future satellite development.
2. **Develop Local Industry** — Increase participation of Thai SMEs and suppliers in satellite development.
3. **Build Applications** — Provide EO data for agriculture, disaster monitoring and climate-related applications.
4. **Build People** — Transfer knowledge and skills to train at least 1,000 future satellite engineers.

The shift: From technology transfer → to capability retention and local participation.



- Knowledge Transfer and Knowledge Management (KM): Facilitating knowledge sharing among team engineers by archiving key documents in the data repository.

- AOCs flight-software co-development for THEOS-3, kicked off May 2026
- Weekly joint design/requirements reviews are ongoing, building toward Flight Software
- An earlier 2025 phase covered requirements definition and design-review support ahead of Critical Design Review





Co-Development: THEOS-3 — Training With Hardware

In-Space Missions Ltd, Hampshire, UK

- THEOS-3 Flatsat co-development, Around 2 Years project: 4-time X 2-week workshop in Thailand, UK, Total 4 Time 8 Week
- Including a joint AOCS design review at ISM's UK facility (Jul2025 and April 2026)
- Hands-on Acceptance Test training on real flight-like hardware: Electrical Power distribution module, RF, OBC and FSW, AOCS Hardware





Test Facility & Growing GISTDA's Own Trainers

Space Krenovation Park — Sriracha, Chonburi: Infrastructure Readiness

- GISTDA's National Satellite Assembly, Integration & Test (AIT) Center — supports development, build, assembly and test for small satellites (10–500 kg) under the THEOS-2/THEOS-3 programmes
- Class 100 / Class 100,000 cleanrooms, vibration test equipment, thermal cycling and thermal-vacuum chambers, and mass-property measurement systems
- Also open to Thai and ASEAN private-sector and academic users — GISTDA's own facility doubling as regional infrastructure

Know-How Transfer and Training: CE-A to CE-B

- Engineers trained abroad (Customer Engineer, CE-A) don't just bring knowledge home — they train the next generation of GISTDA engineers (CE-B) domestically, at this facility
- This in-country cascade is what turns one training trip into a repeatable, multiplying source of capability, rather than a one-off transfer



Pictures Courtesy of SCRC, NTU



Parallel project THEOS-3 — CubeSat

Still receiving, still learning

- Propulsion is sourced from an international partner — GISTDA trains alongside procurement rather than developing the subsystem in-house
- For some components GISTDA is still the customer, not yet the co-developer — but even a purchase comes with training, not just delivery

THEOS-3 is not one partnership but many, running in parallel, at different stages of the same climb — some subsystems co-developed hands-on, some still bought in with training attached. That mix, honestly shown, is what “helping hand” cooperation looks like in practice.

CubeSat cooperation with a Asian partner

- Joint environmental testing — hands-on hardware qualification, not just a design review

Reaching students directly

- Lecture-based outreach — GISTDA staff teaching satellite-engineering fundamentals directly in classrooms and public courses

Why this closes the loop

- The same “helping hand” GISTDA received from Astrium, Airbus, SSTL, NGC and ISM is what GISTDA is now trying to extend domestically, to its own next generation of engineers

International cooperation and domestic outreach are the same strategy, aimed in two directions — one absorbs capability from outside, the other builds the pipeline that will use it.



GISTDA’s 3rd School Satellite Competition (Sep2026) trained students from 107 teams in real satellite engineering, including designing and testing CubeSat experiment payloads. The winning team, **TIDAS from King Mongkut’s University of Technology Thonburi**, developed an **AI/GNSS payload** designed to support **tsunami detection and early warning**. GISTDA engineers will continue developing the payload with the students for integration into a **6U CubeSat**, with assembly and testing in Thailand expected to begin around **mid-2027**, before its eventual space mission.



Become the Constellation: 18 Satellites

From single satellites to a national constellation

- Thailand's plans to develop 18 Earth-observation satellites domestically within six years. The program aims to strengthen Thailand's data sovereignty, space capabilities, national security, disaster monitoring, agriculture, and environmental management, while also developing the domestic space industry
- Eighteen satellites is not a headcount target — it's a roadmap for which subsystem GISTDA brings in-house next, and international partnership is what makes each step possible.***





On going Projects: Thailand Spaceport

Site still under study

- A 2025–2026 feasibility study (GISTDA with KPMG) favors Koh Juwang–Koh Chan, Chonburi — lowest cost (~376M baht), and the only site of three studied with a positive economic (not just financial) return
- A separate March 2026 Japan–Thailand effort is studying a different site in the Rayong/Chonburi Eastern Economic Corridor (Utapao/Sattahip) for combined horizontal/vertical launch
- The two studies haven't converged on one location yet

A real commitment still taking shape — GISTDA's next international partnership is site selection away, not signed yet.

Last update: Thailand ran its first private rocket launch test on 11 August 2026 in Lopburi — GISTDA, the Defence Technology Institute, the Royal Thai Army, and private company Equatorial Space (Thailand) jointly tested a hybrid-propulsion rocket (3.96 m, 32.3 kg, target 4 km altitude) under a new "Spaceport Regulatory Sandbox," aimed at proving out the whole launch ecosystem (coordination, safety, airspace, permitting), not just the rocket. The launch didn't fly — two glitches were fixed on-site, but it was ultimately aborted for safety: the launch-pad lifting motor was underpowered and the pad structure needs a redesign review. Framed as a valuable "real classroom" test.





On going Projects: Artemis With NASA

International Cooperate project

- Thailand signed the Artemis Accords in December 2024, with GISTDA representing the country — a framework agreement, not a specific joint mission
- It formally opens the door to future NASA cooperation; no concrete joint project has been announced under it yet

A real commitment, not yet a finished one — GISTDA's next frontier for international partnership, alongside THEOS-3.

Artemis Program update, GISTDA Facebook, posted 18 Aug 2026):

Thailand's approved role concept: **"Thailand's Advanced Lunar Life Support & Well-being Systems,"** spanning two frameworks — **(1) Moon Base Capabilities** and **(2) Lunar Science and Technology Payload**. For the initial phase, **3 pilot projects** were approved:

- A plant transport/cultivation experiment system for lunar research
- A **spectrometer-on-chip** to detect water on the Moon
- **A CubeSat to study space-environment conditions during exploration missions**

Status: GISTDA is in ongoing, positive negotiations with NASA, with a formal binding agreement expected to be signed soon to officially kick off joint activities.



From left to right, Thailand's Minister of Higher Education, Science, Research and Innovation Supamas Isarabhakdi, Executive Director of GISTDA Pakorn Apaphant, U.S. Ambassador to Thailand Robert Godec, and Pol. Gen. Suwat Jangyodsuk, Chairman of GISTDA, pose for a photo after the signing of the Artemis Accords at a signing ceremony in Bangkok, Thailand on Monday, Dec. 16, 2024.

Credit: U.S. State Department



Summary

What This Partnership Model Shows

- Partnerships shift from vendor–customer to co-developer once local engineers take real ownership of design decisions — the arc from THEOS-1 (fully foreign-built) to today's joint engineering with NGC and ISM.
- THEOS-3's local-content share is tracking above its 10% target — evidence that deliberate technology-transfer planning, not procurement alone, drives measurable capability growth.
- Thailand's regional role (APRSAF, ASEAN) turns bilateral satellite partnerships into a platform Thailand can extend to its neighbors, not only receive from partners.

Benefit

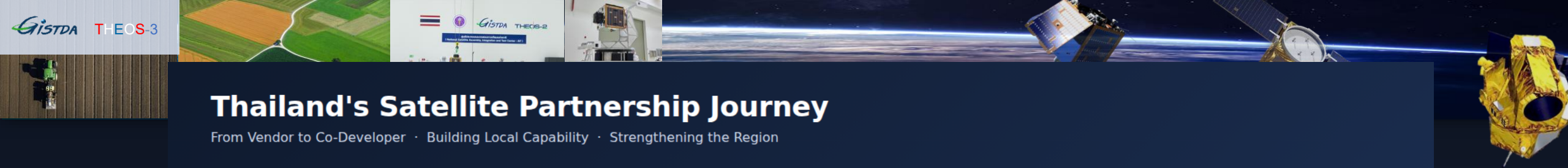
- **Partner of Partner** — access to a partner's own network of specialists and suppliers, not just the partner itself.
- **Real work experience, beyond theory** — hard skills built through live design reviews and real hardware work, not classroom instruction alone.
- **Soft skills from international work** — disciplined meeting process, a serious professional work culture, and rigorous commitment/agreement procedures, learned only by working internationally.

Constrain

- **Export License** — approval is a long process with a timeline that is hard to estimate or plan around.
- **Time Shift** — time-zone differences slow down joint reviews and day-to-day coordination.
- **Skill Gap** — partners and GISTDA engineers do not always start from the same technical baseline.
- **Language** — differences in technical terms, essential vocabulary, and synonyms can cause miscommunication even in fluent English exchanges.

Outcomes

- **A reusable framework** — cooperation levers that convert a satellite purchase into a domestic ecosystem: local-content targets, embedded training, shared test facilities, regional data-sharing follow-on.
- **Risk, shared honestly** — the THEOS-2A launch setback, treated honestly as a resilience case study that informs how future agreements might share launch and schedule risk.



Thailand's Satellite Partnership Journey

From Vendor to Co-Developer · Building Local Capability · Strengthening the Region



Partnerships Build Capability for a Sustainable Space Future



What This Partnership Model Shows

1

From vendor-customer to co-developer

Partnerships shift once local engineers take **real ownership of design decisions** — the arc from THEOS-1 (fully foreign-built) to today's joint engineering with NGC and ISM.

2

Local-content target exceeded

THEOS-3's local-content share is tracking **above its 10% target** — evidence that deliberate technology-transfer planning, not procurement alone, drives measurable capability growth.

3

Regional role, bigger impact

Thailand's regional role (APRSAP, ASEAN) turns bilateral satellite partnerships into a **platform** **Thailand can extend to its neighbors**, not only receive from partners.



Benefit



Partner of Partner

Access to a partner's own network of specialists and suppliers, not just the partner itself.



Real work experience, beyond theory

Hard skills built through live design reviews and real hardware work, not classroom instruction alone.



Soft skills from international work

Disciplined meeting process, a serious professional work culture, and rigorous commitment/agreement procedures, learned only by working internationally.



Constrain



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Outcomes

1

A reusable framework

Cooperation levers that convert a satellite purchase into a domestic ecosystem: local-content targets, embedded training, shared test facilities, regional data-sharing follow-on.

2

Risk, shared honestly

The THEOS-2A launch setback, treated honestly as a resilience case study that informs how future agreements might share launch and schedule risk.



Q&A