Philippine Space Agency

November 16, 2022

CubeSat as a Platform for Space Engineering Education and Nanosatellite R&D Collaboration with Philippine Universities

Dr. Adrian C. Salces
Supervising Science Research Specialist
Spacecraft Payload and Communications Systems Development Division

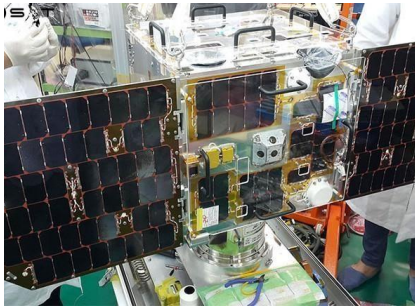
On behalf of Dr. Gay Jane P. Perez, Paul Jason Co (UP Diliman), Dr. Marc Caesar R. Talampas, Gabriel Kevin A. Mabini, Samantha R. Medrano, Dr. Izrael Zenar C. Bautista

APRSAF
ASIA-PACIFIC REGIONAL SPACE AGENCY FORUM

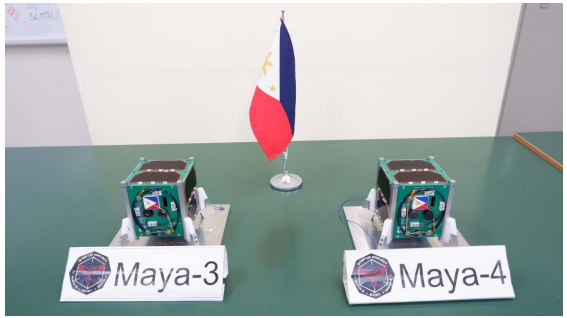
SE4AWG
SPACE EDUCATION FOR ALL WORKING GROUP

Philippine Small Satellites Built through DOST's PHL-MICROSAT & STAMINA4Space Programs

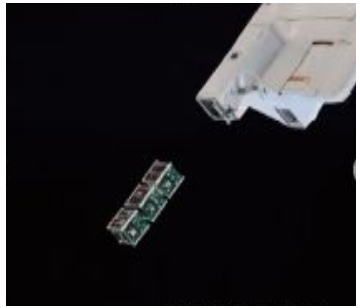
Diwata-1
(deployed from ISS 2016)



Diwata-2
(launched 2018)

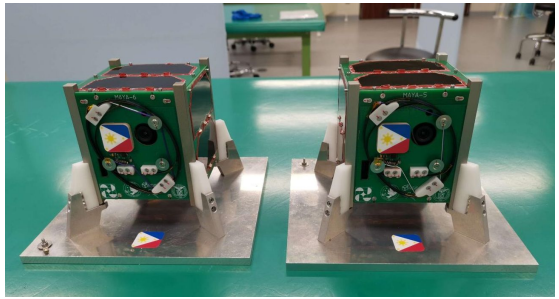


Maya-3 and Maya-4
(deployed from ISS October 2021)



Maya-1
(deployed from ISS Aug 2018)

Maya-2
(deployed from ISS March 2021)



Maya-5 and Maya-6
(for launch early 2023)
Image credit: STEP-UP Project

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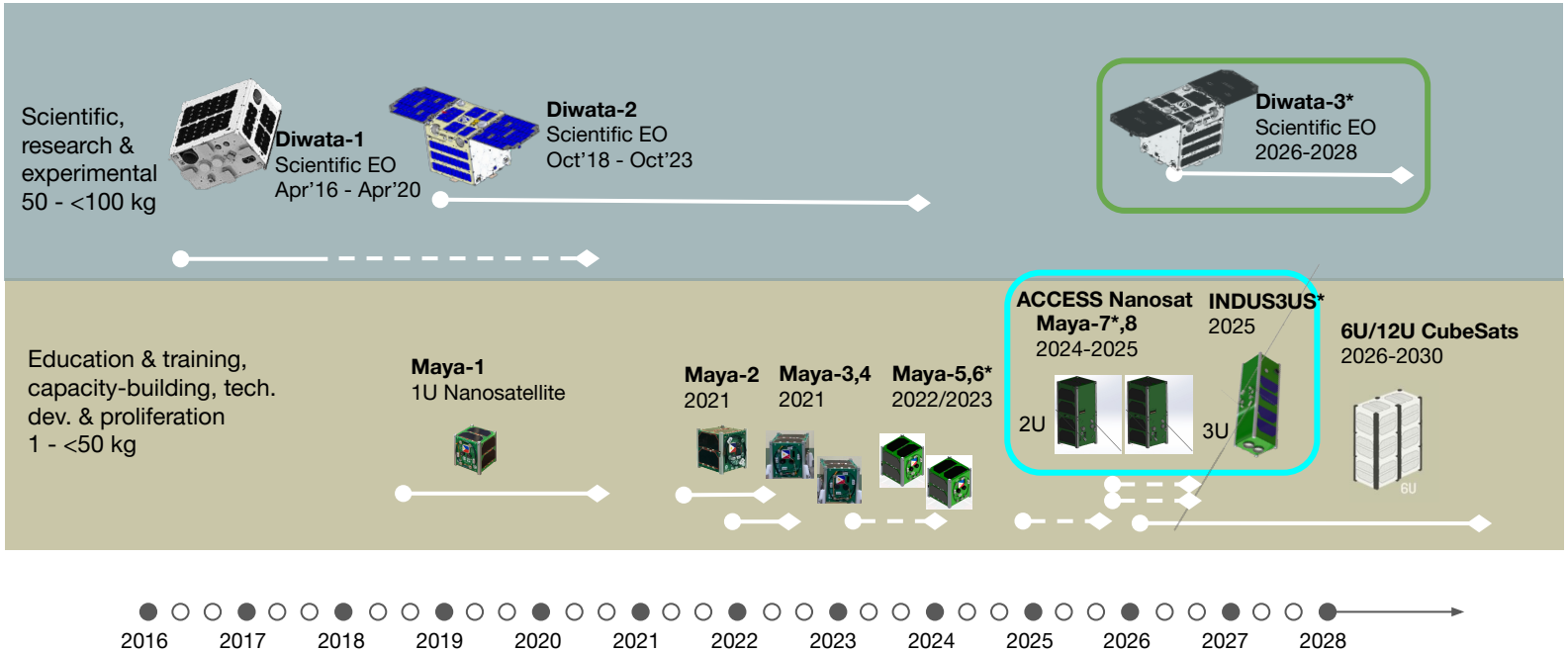
Small Satellite Technology Roadmap



*Ongoing development

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ACCESS Nanosat Project

Advancing Core Competencies and Expertise in Space Studies Nanosatellite Project (ACCESS Nanosat)

- PhilSA continues the country's nanosatellite R&D and educational initiatives, leveraging the accomplishments of STAMINA4Space Program.
- Provides opportunities for Filipinos to pursue a master's degree specialized in space engineering with hands-on satellite project experience

Scholarship grants for *Master of Science / Master of Engineering in Electrical Engineering* program (*nanosat engineering track*) of UP Diliman

+

Hands-on nanosatellite project experience with PhilSA personnel serving as mentors

- Contributes to establishing a sustainable pool of trained space scientists and engineers in the country

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ACCESS Nanosat Project

Advancing Core Competencies and Expertise in Space Studies Nanosatellite Project (ACCESS Nanosat)

- Seven members have been selected from across country - undergoing mission design phase.
- Project-based learning approach - nanosat design, development and operation activities are part of or integrated into the nanosat courses at EEE Institute, UP Diliman.
- PhilSA engineers and scientists mentor the scholars in the overall process of satellite development.

ACCESS Nanosat Project team members

Maya-3 & -4 flight models AIT done by 1st batch of STEP-UP Project scholars (Image credit: DOST)

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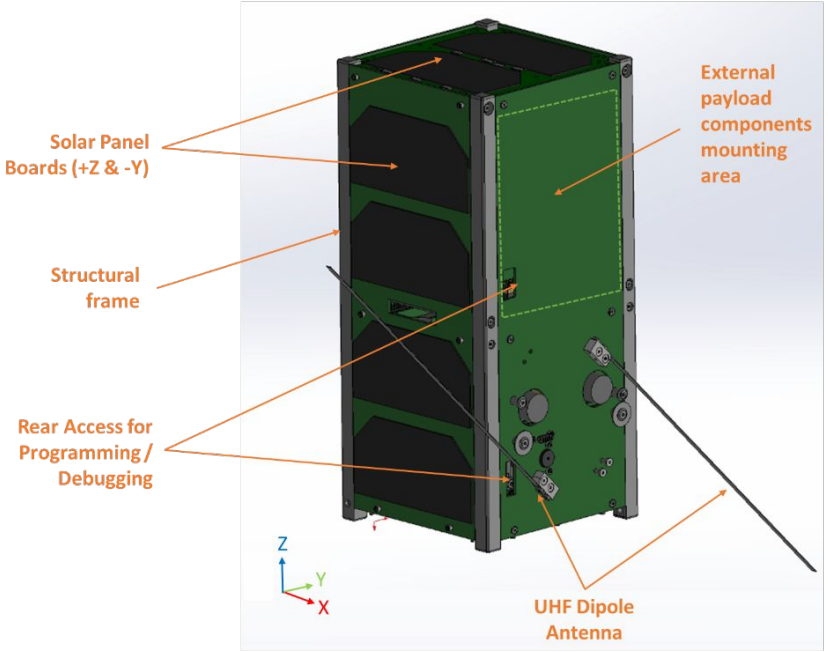
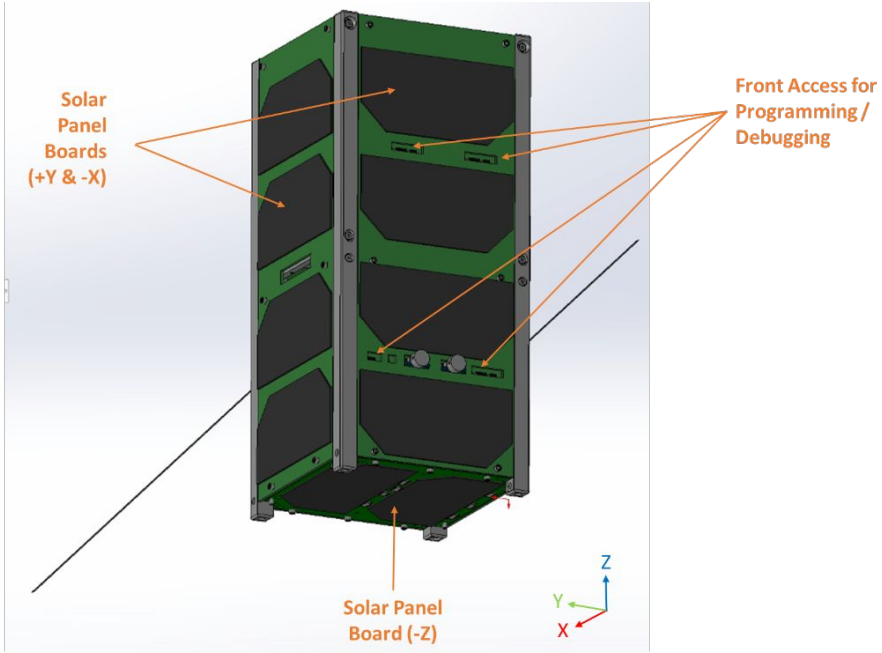
Basic Maya-7 CubeSat Information





Preliminary CAD drawings of the 2U CubeSat showing external boards and parts

- Based on the BIRDS bus design heritage from Kyutech and incorporating improvements from Maya-5/6 CubeSats
- 2U CubeSat form factor measuring 10 cm x 10 cm x 22.7 cm and weighing less than 2.7 kg.

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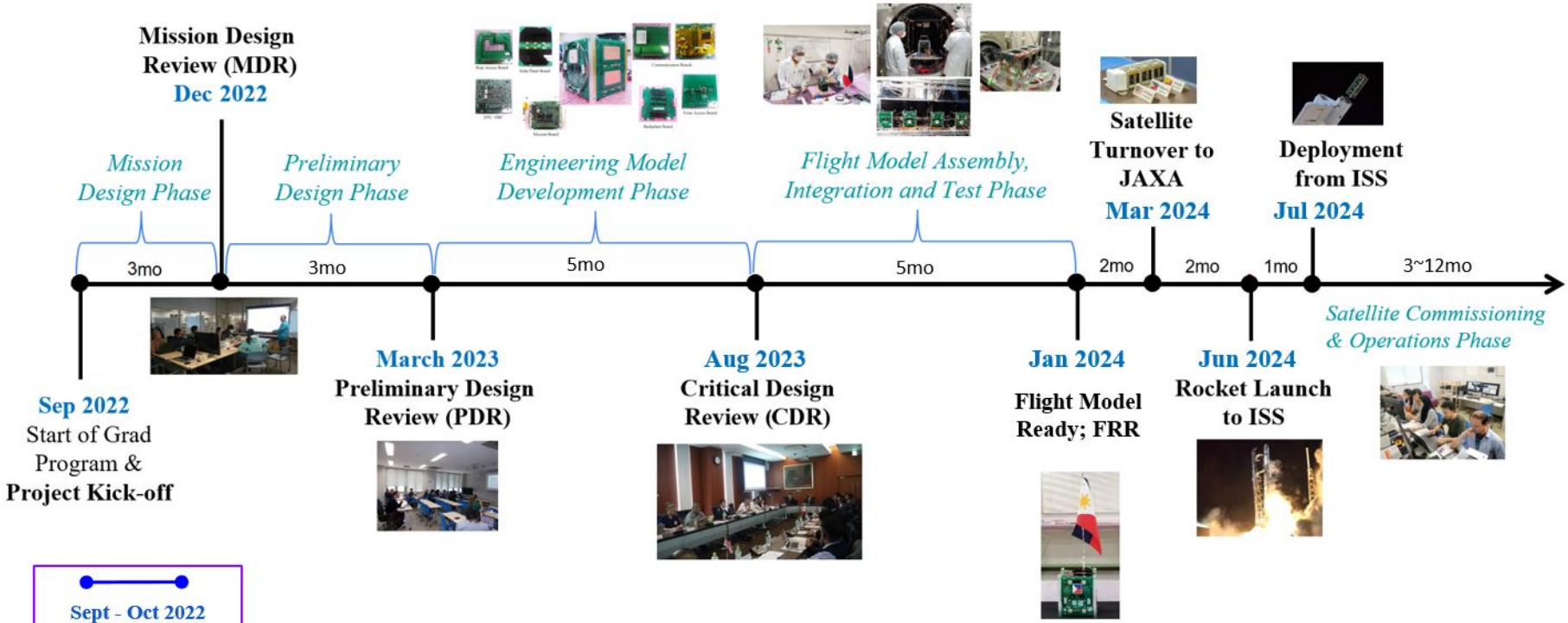
Satellite Project Life Cycle under ACCESS Nanosat



Project Duration from Kick-off to Early Operations: ~2 years

16 months: satellite development from KO to FM AIT

5 months: post-FRR, turn over to JAXA to ISS deployment

3 months: early satellite operation phase

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ENCRADLE Project

Expanding Nanosatellite Collaborative Research And Development and Educational Efforts in Philippine Universities Project (ENCRADLE)

- Aims to promote the expansion of nanosatellite R&D and educational activities in the academe, leveraging the gains from previous efforts

ENCRADLE Activities for 2022

- ***CubeSat Design & Development Web Series***

– Organized by STEP-UP Project (UPD) and PhilSA to share knowhow on satellite engineering to PH university teachers.
– 24 participants from 11 universities
– Covered introductory topics e.g., small satellite systems engineering, project management, space environment testing, CubeSat subsystems, ground station operations, safety review

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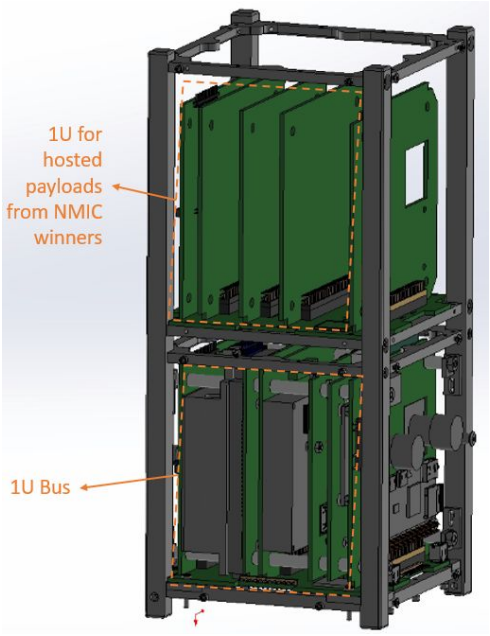
ENCRADLE Activities for 2022

- ***Nanosatellite Mission Idea Contest***

– Inspired by the UNISEC-Global's Mission Idea Contest
– Competition open to Philippine university teams to propose mission ideas for the 2U CubeSat (Maya-7) to be developed under ACCESS Nanosat Project
– Top teams get an opportunity to participate in the mission design phase culminating in Mission Design Review (MDR) and
– To realize their proposed missions by developing payloads and integrating them with Maya-7.



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Nanosat Mission Idea Contest 2022

NMIC Orientation & Tutorial Webinar attended by 76 participants from 10 universities throughout the country

Final Presentations and Evaluation virtual event wherein the 8 finalists pitched their mission ideas

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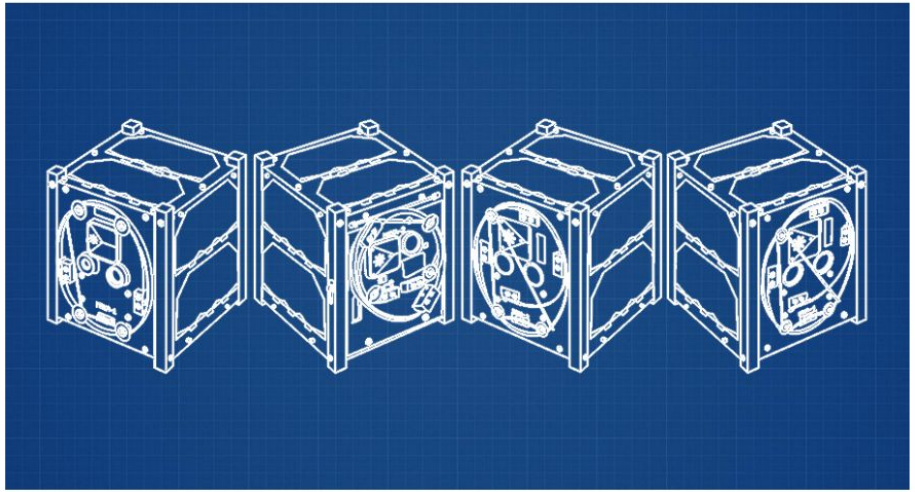
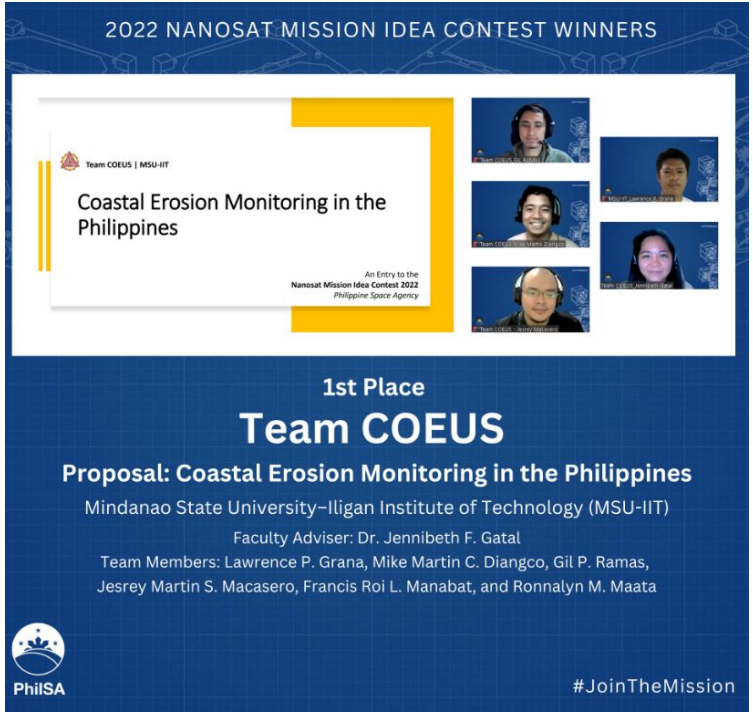
Nanosat Mission Idea Contest 2022

PhilSA announces winners of Nanosat Mission Idea Contest

Posted by: Philippine Space Agency 4 November 2022

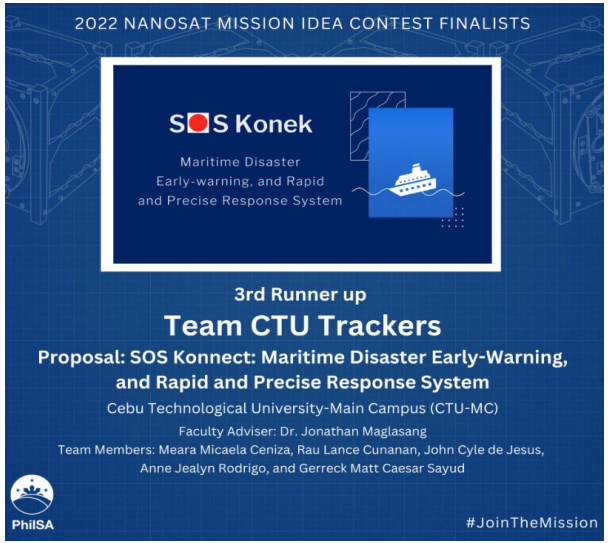




PhilSA announced the NMIC Top 4 teams. They have joined the ACCESS Nanosat team in the mission design phase activities leading to the MDR.

PhilSA

Nanosat Mission Idea Contest 2022



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PhilSA

Summary

- Leveraging the gains from previous efforts, PhilSA is set to continue and expand the Philippines' nanosatellite research & development and educational activities.
- PhilSA's ISKUELA thrust cascades SSTA knowhow and capabilities across the country
    - Engaging and capacitating different sectors (academe, government agencies, private sector and industries) through various technology transfer and training activities.
    - Multiplies the value of the country's current capabilities
- ACCESS Nanosat Project supports the delivery of graduate space engineering education by providing hands-on training to scholars on CubeSat development, integrated as part of nanosat engineering courses at the University of the Philippines-Diliman.
    - Contributes to establishing a sustainable pool of trained space engineers to support the county's SSTA human resource requirements

PhilSA

Summary

- ENCRADLE Project promotes and provides an effective platform for collaborative nanosatellite R&D activities among/with Philippines universities.
  - Knowhow transfer & training through CubeSat design & development workshops
  - Nationwide mission idea contest gives universities an opportunity to contribute mission ideas, develop and integrate payloads for the country's upcoming 2U CubeSat.
- Ongoing mission design process of the 2U CubeSat under ACCESS Nanosat Project
- ACCESS Nanosat and ENCRADLE Projects complement the country's space industry capacity-building efforts pursued through the INDUS3US Project.

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End of Presentation