Innovative Space Technology for Evolving Needs in the Philippines

COUNTRY REPORT
APRSAF-25
Outline

- PHL Space Development
- Philippine Space Policy
- R&D and Capacity Building
- Philippine Aerospace Industries
- Industry Strengths
- Strategies for Space Industry Development
- Enabling Environment
- Joint projects between academe, government and industry
- Promotions
- Partnerships and Cooperation
PHILIPPINES DOST

PHL Space Development

Research and Development

Capacity and Institution Building

Collaboration and Partnerships

Policy Development

Technology Transfer

Small Satellite Mission Training in CCSTEAP, India

Solid Propellant Rocket Research

Weather and Amateur Satellite Ground Station Development

Bus and Payload Development

Industry Development

Applications and services for the Filipino people

Milestones

Microsatellites/Nanosatellites launched (DIWATA-1, 2 & MAYA-1)

Photo credit: DOST-ASTI/ PHL-MICROSAT

DIWATA-1

MAYA-1

DIWATA-2

Policy Development
1. National Security and Development
2. Hazard Management and Climate Studies
3. Space Research and Development
4. Space Industry Capacity Building
5. Space Education and Awareness
6. International Cooperation
R&D and Capacity Building

Photo credit: DOST-ASTI
Maya-1 was released from the ISS last **August 10, 2018** along with cubesat of Bhutan and Malaysia

**Missions:**
- Store-&-forward
- Ham radio communication
- Image and Video capture
- Technology demonstration

Photo credit to ISS Astronaut Alexander Gerst
DIWATA-2 launched via JAXA’s H-IIA F40 rocket at Tanegashima Space Center, Japan on **October 29, 2018**.
Developed in-house capabilities in UP EEEI for local design, assembly and testing of key components from Diwata-2. Engaged PNRI, EPDC, ADMATEL, PTRI and NSB Engineering.

Formal partnerships with local industries to work together and exchange best practices in furthering mastery, innovation and advancement in space technology.

Photo credit: PHL-MICROSAT
Developing a Local Industrial Base

Amateur (“Ham”) Radio Payload
Attitude Control Unit (ACU-Ex)
Sun Aspect Sensor (SAS-Z)

Photo credit to PHL-MICROSAT
Diversity within the PHL-Microsat team

- Aerospace Engineering*
- Computer Science
- Cosmoscience*
- Electrical Engineering
- Electronics and Communication Engineering
- Energy Engineering
- Environmental Science
- Geodetic Engineering
- Geomatics Engineering
- Material Science and Engineering
- Mechanical Engineering
- Meteorology
- Physics
- Remote Sensing
- Space Engineering*

Note: With asterisk (*) are fields from Japanese Universities.
# PHL Satellite Utilization

<table>
<thead>
<tr>
<th>Data</th>
<th>Applicable sensor complement</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIWATA-1</td>
<td>SMI (Spaceborn Multispectral Imager)</td>
<td>Change detection; land and coastal monitoring</td>
</tr>
<tr>
<td>Kompsat-3</td>
<td>AEISS (Advanced Earth Imaging Sensor Systems)</td>
<td>Resource management and environmental monitoring</td>
</tr>
<tr>
<td>Kompsat-5</td>
<td>COSI (Korea SAR Instrument), X-band</td>
<td>Imagery for various GIS</td>
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<tr>
<td>GeoEye-1</td>
<td>GeoEye-1 Satellite Sensor</td>
<td>Precise change detection and mapping</td>
</tr>
<tr>
<td>COSMO-SkyMed</td>
<td>SAR Satellites</td>
<td>Risk and forestry management</td>
</tr>
<tr>
<td>Planets constellation (Dove, RapidEye)</td>
<td>RapidEye satellite sensors</td>
<td>Blue carbon mapping; resource and flood hazard mapping, infrastructure monitoring</td>
</tr>
<tr>
<td>SAR</td>
<td>SAR Satellite</td>
<td>Maritime surveillance, disaster monitoring, land cover and land use classification</td>
</tr>
<tr>
<td>Himawari-8</td>
<td>Hydro-meteorological Satellite</td>
<td>Weather forecasting and monitoring</td>
</tr>
</tbody>
</table>
Space Technology Applications (STA)

- Blue Carbon Program
- Sea level rise
- Urban heat Maps
- Geosafer Mindanao flood hazard mapping
- Urban drainage
- Light Pollution
- Landfill site suitability
- Infrastructure monitoring
- Landslide mapping
- River bathy mapping
- SAR utilization
- ASTI Labelling Machine (ALaM)
Solutions using Geospatial Technologies
Philippine Rice Information System (PRISM)

Project
4-year R&D collaborative project (2014-2017) in support of the Department of Agriculture’s Food Staples Sufficiency Program (FSSP).

SAR images acquired

<table>
<thead>
<tr>
<th>Data</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tbody>
<tr>
<td>Sentinel 1</td>
<td>-</td>
<td>-</td>
<td>326</td>
<td>481</td>
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<tr>
<td>TerraSAR-X</td>
<td>105</td>
<td>67</td>
<td>315</td>
<td>437</td>
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<tr>
<td>CSK</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Total</td>
<td>120</td>
<td>67</td>
<td>641</td>
<td>918</td>
</tr>
</tbody>
</table>

Smartphone-based surveys

Field activities conducted every season

Turn-out of field data

<table>
<thead>
<tr>
<th>Data</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2nd Sem</td>
<td>1st Sem</td>
<td>2nd Sem</td>
</tr>
<tr>
<td>No. of Farmer’s Field</td>
<td>780</td>
<td>760</td>
<td>1060</td>
</tr>
<tr>
<td>Field Profile</td>
<td>770</td>
<td>758</td>
<td>1057</td>
</tr>
<tr>
<td>Cultural Management</td>
<td>604</td>
<td>684</td>
<td>949</td>
</tr>
<tr>
<td>Production Data</td>
<td>537</td>
<td>616</td>
<td>467</td>
</tr>
<tr>
<td>Monitoring</td>
<td>5,940</td>
<td>5,592</td>
<td>8,632</td>
</tr>
<tr>
<td>Rice and Non-Rice Validation Points</td>
<td>1,798</td>
<td>1,875</td>
<td>1,816</td>
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</tbody>
</table>
STA in the next five years

- Disaster preparedness
- Maritime surveillance
- Land cover and land use classification
- Environment and Infrastructure monitoring

Photo Credits: SSTL, UK
PHL Aerospace Industries

Semiconductor / Electronics
- Electronics manufacturing and laboratory services
- Failure analysis and materials characterization
- Electro-hydraulics and electro-mechanical actuation systems
- Electronics – PCB Assembly
- OSAT, RF, Microwave, Millimeter wave assembly and test
- Software

Materials / Machining / Tooling
- Machining
- Sheet metal fabrication
- Furnishing / Fixtures for commercial aircrafts
- Toolings
- Aluminum extrusions
- Surface finishing
- Aerospace materials (aluminum and metal sheets)
- Surface treatment, chemicals and metal working fluids
PHL can have a captured market in aerospace, satellite manufacturing and launching

PHL has a big market for satellite phone and telecommunication services

Export projections of $1.5 billion in the next 10 years

Contributes 2,200 in direct-employment

PHL has local pool of local talents in producing remote sensing products and applications utilizing navigation satellite systems

Projected 0.57% share of 2022 GDP
Strategies for Industry Space Development

Create a robust and thriving space industry to support country’s economic growth, improve productivity and competitiveness of other industries through the development of new services.

Creation of Space Industry Development Agenda

Joint projects of the academe-government-industry

Incentive programs for the academe and industry

Offering of high-value products and services locally and abroad
Enabling environment for collaboration

Photo credit to DOST-ASTI/PHL-MICROSAT
Joint projects between academe, government and industry

Top and Bottom Left Photos are from Surface Technology International, http://www.sti-limited.com/
Bottom Right Photo is from Analog Devices Inc., http://www.analog.com/
Promotion

• Information and education campaign materials
• Expo / Exhibits – National and Regional Science and Technology Week Celebration
• Tri-Media (TV, radio and print) and social media
• Space showcase at the Museum for Kids
• Hackathon
• School competitions
• Hosting of and attendance to local and regional conferences and trainings
• Space R&D programs / competitions
• RS/GIS training for Cambodia and Local Government Units in the Philippines
Kibo-ABC Members and Students from Philippines Participated in the Special Lecture of the "Double Layered Liquid Ball" Experiment

Last Updated: September 28, 2018

Dr. Satoshi Matsumoto joined the Kibo-ABC regular monthly web conference on April 26th. He gave a special lecture on the "Double Layered Liquid Ball" experiment which was carried out as part of JAXA astronaut Norishige Kanai’s Asian Try Zero-G 2018 in February 2018. Approximately 30 students--the proposers of this experiment along with their classmates--from Philippine Science High School Central Visayas Campus joined the lecture and had an enriching experience through a lively discussion with Dr. Matsumoto.

Live Contact with the International Space Station

With the participation of
University of the Philippines - Integrated School
and Holy Angel University

February 17, 2018 (Saturday), 4:00 PM
Meralco Innovation Hall,
Electrical and Electronics Engineering Institute
University of the Philippines Diliman
2018 Activities

• 74th Session of UN-ESCAP, May 11-16, 2018
• ASEAN Workshop entitled: "The use of geospatial information on Statistic Data", June 11, Lao PDR
• Hosting of Space Forum, National Science and Technology Week, July 20, Manila, Philippines
• ASEAN Microsatellite Consortium Meeting, Hokkaido University, Japan
• UNOOSA+50, June 2018, Vienna, Austria
• EU-ASEAN Workshop on Space Applications in Bangkok, 18 - 19 September 2018
• International Training – Workshop on Beidou Satellite Navigation System and Applications in the Belt and Road Countries, Sept 3-16, Beijing, China
• High-Level Stakeholder Workshop on the Development of the National Spatial Data Infrastructure (NSDI) on 4 September 2018
• 6TH ASEAN Workshop on Ground Station Experts Exchange ON 15-16 OCTOBER 2018, Kuala Lumpur, Malaysia

2019 Activities

• Co-hosting of Training – Workshop on Beidou Satellite Navigation System and Applications in the Belt and Road Countries, July 2019, Manila, Philippines
• Co-hosting of EU-ASEAN Workshop on Space Applications in the Manila, Philippines, June 2019
• Co-hosting of International Geospatial Conference, Manila, 2019
• Participation in the 75th Session of UN-ESCAP, May 2019
• Participation in the 26th Session of the Asia-Pacific Regional Space Agency Forum (APRSAF-26), November 2019
• Participation in the Asian Conference on Remote Sensing, Korea
• Possible Hosting of the 6th ISPRS International Conference on Geoinformation Science (GeoAdvances 2019), Manila, Philippines, November 2019
Partnership

- Hokkaido University, Japan
- Tohoku University, Japan
- University of Kyushu, Japan
- Japan Aerospace Exploration Agency (JAXA)
- CSSTEAP, India
- China Ministry of Science and Technology
- ROSCOSMOS, Russia

Cooperation

- ASEAN Sub-Committee on Space Technology Applications (ASEAN-SCOSA)
- United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP) Regional Cooperation in Space Applications (RESAP)
- United Nations Office for Outer Space Affairs (UNOOSA)
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