Current Progress on Space Science and Technology Development in Indonesia

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CORE COMPETENCES OF LAPAN

- Space & Atmosphere Science
- Aerospace Technology
- Remote Sensing
  - Rocket
  - Satellite
  - Aeronautics
  - National Remote Sensing Data Bank
  - National Earth Observation System
- Aerospace Policy Studies
Space and Atmosphere Science
Space Science 2015 - 2018

2015
- Space Weather and space debris
  Information based on ground and space-based data
- Equatorial Ionospheric Anomali observation system

2016
- Development of Space weather and space debris prediction method by using real time data
- High resolution optical observation and real time data
- Real time data transfer

2017
- Development of Space Weather Information and Forecast Services as the Regional Warning CenterRadar
- Observation on ionospheric parameters, geomagnetic observation in southern Indonesia
- Development of National Observatory

2018
- Standardized space weather information
- Development of near real time analysis for space weather data
- Development of space debris model
- Ionospheric observation network and geomagnetic observation on Southern and northern Indonesia
- Development of National Observatory
Situs Pemantauan Realtime Benda Jatuh Antariksa Buatan
## Space Science 2019 - 2023

### 2019
- Development of new observatory
- Dissemination and mitigation protocol of space debris
- Development of orbital decay (life time) – Computation model

### 2020
- Development of optical telescope for new observatory
- Development of orbital decay (life time) – Computation model
- Integration of space-atmospheric Decision Support System

### 2021
- Astronomical observation program begins
- Optical observation of space debris, sky survey
- Development of Decision Support System of man-made space objects

### 2022
- Development of Decision Support System of man-made space objects
- Development of space-based observation of space-atmospheric coupling
- Astronomy and space weather observation network

### 2023
- Development of Decision Support System for hazardous space object
- Integration of Decision Support System of space-atmospheric coupling
- Astronomy and space weather observation network
Development of DSS Applications 2015-2018

- Satellite Disaster Early Warning System (SADEWA)
  - Real time satellite-based observation and prediction of extreme rainfall and potential hydro-meteorological disaster in Indonesia to support disaster management.

- Maritime Information System (SEMAR)
  - Real time satellite-based observation and prediction of oceanic and atmospheric condition in Indonesia to support marine safety and fish production. Also provide information on potential fishing ground and ships location.

- Indonesia Atmospheric Composition Information System (SRIKANDI)
  - Real time satellite-based observation and prediction of atmospheric composition and air quality over Indonesia to support environmental and forest fire management.

- Indonesia Climate Change Information System (SRIRAMA)
  - Long term model-based climate change projection over Indonesia to support national, regional and urban planning and development.
DECISION SUPPORT SYSTEM DEVELOPMENT ROADMAP

**OBSERVATION**
- Satellite, Radar, Airborne & Terrestrial Observation
- LAPAN Flying Laboratory in Operation
- LAPAN Rocket Sounding in Operation
- LAPAN Satellite Observation in Operation

**DSS for Ocean & Maritime Operation**
- DSS for Disaster Management
- DSS for Food Security
- DSS for Transportation Safety
- DSS for Water Resource Management

**DSS for Atmospheric Environment**
- DSS for Energy Security
- DSS for Defense & Security
- DSS for Forest & Ecosystem Management

**PREDICTION**
- Equatorial Atmosphere Model
  - HPC 2000 Cores
- Atmosphere-Ocean Coupled Model
  - HPC 5000 Cores
- Climate Model + Data Assimilation
  - HPC 10,000 Cores
- Atmosphere-Space Coupled Model
  - HPC 20,000 Cores

**USER / PARTNER**
- BENEFIT FOR THE NATION / COMMUNITY

**LAPAN**
- Integrated Atmosphere-Space DSS

**CENTER OF ATMOSPHERIC SCIENCE AND TECHNOLOGY**

Aerospace Technology
Pemanfaatan LSA

LSA Series 01
Utility/Exp. aircraft

Prototype National

1st flight Sertifikasi N219

Prototype Float

Pengembangan N219A, Feasibility study, Pengembangan Float Gear

Uji terbang & sertifikasi LSU05

Akses Landasan Ops & Flying Lab

Sertifikasi LSU 03 Design Capacity

LSU - 02 - LD Emergency flight

Operasi KKP Comm & Weather Aspect Maritime operation

CONOPS MSS

Pengembangan Lab. Bertahap

Maritime operation – Pemda – garis pantai – NSPK – kebencanaan

Penghargaan Karya anak Bangsa

Pengembangan Lab. Bertahap

Penggunaan BRISat untuk Komunikasi LSU/UAV

Pengembangan Rumpin sebagai Aeronautics Tech. Park

Konsolidasi UKM Dirgantara Engineering Service

Pengembangan Testing Tools Kendali u MALE LSA02

Modifikasi Manned Aircraft ke Unmanned Aircraft

Basic Prototype LSU Series

PTN

MSS

Operasi KKP
Comm & Weather Aspect Maritime operation

Pengembangan PUI Penerbangan

2013

2014

2019
Pengembangan MALE dan System Pemantauan Berbasis

**LSU_LSA**

**Ground Test System**
Komunikasi UAV base on Satelit

Simulasi dan Ground Test System Kendali MALE UAV-LSAUAV

Validasi Testing Tools dan Komponen kendali

Pengembangan System Avionic Mandiri

Pelaksanaan Test Flight Hasil konversi Manned Aircraft ke Un Manned Aircraft

Pemasangan System Sensor Aircraft, sehingga menjadi Aircraft Instrumentation

Pemasangan System Kendali, Actuator dan On Board Processot ke Aircraft

Pemasangan flight Test Instrumentation untuk kepentingan validasi dan test flight LSA MALE UAV

Integrasi Komunikasi Satelit, System LSU dan LSA MALE menjadi System Pemantauan berbasis MALE dan Tactical UAV

2019 → 2020

2022

2023
LAPAN Satellite Program & Future

- LAPAN Satellite Program continued with LAPAN-A4 Satellite Development
- LAPAN-A5 (SAR) and LAPAN-Sat Constellation are currently studied

**LAPAN-A4 Satellite**
(ready to be launched in 2020)
MISION : Earth observation, Maritim Observation (AIS), Earth Magnetic Field Measurement

<table>
<thead>
<tr>
<th>Payload-1</th>
<th>4 band pushbroom imager</th>
</tr>
</thead>
</table>
| Spatial resolution | Blue : 450-510nm  
Green: 523-605nm  
Red : 629-690nm  
NIR : 774-900nm |
| GSD | 20m |
| Swat Width | 300 km |

**LAPAN-A5 Satellite**
Missions :
- Monitor ships (coupled with AIS) and ocean pollutions
- Monitor ice in artic (for the benefit of vessel voyages)
- Classification of land cover, creating Digital Elevation Model (DEM).
- Monitor flood area.

<table>
<thead>
<tr>
<th>SAR Parameter</th>
<th>Value/type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polarisasi</td>
<td>Full Circular</td>
</tr>
<tr>
<td>Frekuensi</td>
<td>5.6 GHz</td>
</tr>
<tr>
<td>Mode</td>
<td>Stripmap</td>
</tr>
<tr>
<td>Spotlight</td>
<td>Spotlight</td>
</tr>
<tr>
<td>Swath</td>
<td>15 – 45 Km</td>
</tr>
<tr>
<td>Look Angle</td>
<td>20° – 35°</td>
</tr>
<tr>
<td>PRF</td>
<td>4000 – 5000</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>15 – 28 MHz</td>
</tr>
<tr>
<td>Pulsa width</td>
<td>15 – 20 usec</td>
</tr>
<tr>
<td>ADC</td>
<td>5 bit</td>
</tr>
</tbody>
</table>
LAPAN Satellite Development

Cooperation Focus & Plan

- **Sat Usage & Application**
- **Design of Satcom LEO, & SAR**
- **AIS Sat Data Center** (PT. Telkom, JAXA, Hokkaido & Chiba Univ, ISRO, ORARI, Univ, & Local Govt, Etc)

01

- **Sat Usage & Application**
- **Design of Satcom LEO, & SAR**
- **LAPAN-A4 AIT** (PT. Telkom, JAXA, Hokkaido & Chiba Univ, ISRO, ORARI, Univ, & Local Govt, Etc)

02

- **Sat Usage & Application**
- **Network of Satcom LEO, & SAR**
- **TTC GS Network** (Startup, PT. Telkom, JAXA, NASA, ISRO, KSAT, Univ & Local Govt, Etc)

03

- **Sat Usage & Application**
- **Design of Satcom LEO, & SAR**
- **AIT of Satcom LEO/SAR** (Startup, PT. Telkom, JAXA, ISRO, NASA, ESA, Univ, & Local Govt, Etc)

04

- **Sat Usage & Application**
- **New Satellite Industry**
- **Ops of Satcom LEO/SAR** (Startup, PT. Telkom, JAXA, ISRO, NASA, ESA, ORARI, Univ, & Local Govt, Etc)

05

2019 2020 2021 2022 2023
Rocket Development Achievements

- RX 1220 Dissemination Joint Program
- RX 320 Dissemination
- RX 450 Qualification Tests
- RX 1220 Dissemination Joint Program
- RX 320 Payload Joint Program – TUB
- RX 450 Qualification Tests
- RX 1220 Dissemination Joint Program
- RKX TJ 200 Qualification Tests
- RX 450 Acceptance Tests
- RX 1220 Dissemination Joint Program
- RKX TJ 200 Qualification Tests
- RX 450 Acceptance Tests
- RX 1220 Dissemination Joint Program
- RKX TJ 200 Qualification Tests
- RX 450 Dissemination Joint Program

2014

2015

2016

2017

2018
Rocket R&D Future Plan

- Multi Stage Sounding Rocket Joint Cooperation w/ China
- RX 320 Atmospheric Sensor Payload Flight Test Joint Program w/ TU Berlin
- Indonesian Spaceport Feasibility Studies
- Indonesian Spaceport Design and Preparation Coordination
- Spaceport Development

2019
- 2020
- 2021
- 2022
- 2023

Rocket Technology Dissemination Joint Cooperation Program w/ National Consortium, private sectors and universities for RX 1220, RX 450, Lightning Trigger and Weather Modification usages

- High Speed Rocket Control System w/ turbojet and solid rocket motor R&D
- Low-speed RKX Qualification & Acceptance Tests
- Liquid Propellant Rocket Research and Development

Qualification and Acceptance Tests
Dissemination
Remote Sensing Technology & Application
LAPAN National Remote Sensing Data Bank (BDPJN) 2014-2018

2014
- Prototype platform services for Gov. Institution
- Integration system for data acquisition and processing system.

2015
- Platform for near real time data services
- ISO 9001:2008
- Customer satisfaction index (CSI)

2016
- Disaster recovery center (DRC)
- System Integration for data acquisition, processing system, and data distribution
- ISO 9001:2008
- CSI 89,77

2017
- Center of Excellence for Tech. & Data RS (PUI)
- Upgrading data acq. capability: Very High Resolution Optical and SAR Ground Station
- Data services for National Priority Programs
- ISO 9001:2015
- ISO 27001:2013
- CSI 90,69

2018
- Services for all Government Ministries / Agencies
- Services for all Government Provinces
- Data center web portal (BDPJN portal)
- Building global business: Prototype platform services for South East Asia countries
Next 5 years plan (2019-2023)

- All government institution data link and access (Implementation Space Law UU 21/2013 and Gov. Regulation PP 11/2018), serve National Priority Program
- Building national GS network (Nat/International Satellites), upgrade SPACeMAP
- Building the national business community: start up, UMKM
- Joint development with International private companies for regional data node

2019
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2021
- All government institution data link and access (Implementation Space Law UU 21/2013 and Gov. Regulation PP 11/2018), serve National Priority Program
- Network of National GS for National/International Satellites, Upgrade SPACeMAP
- Building national business community: start up, UMKM
- Joint development with International private companies for regional data node

2022
- All government institution data link and access (Implementation Space Law UU 21/2013 and Gov. Regulation PP 11/2018), serve National Priority Program, Operation SPACeMAP
- Building regional/international GS network
- Building national business community: start up, UMKM
- Joint development with International private companies for regional data node

2023
- All government institution data link and access (Implementation Space Law UU 21/2013 and Gov. Regulation PP 11/2018), serve National Priority Program, Operation SPACeMAP
- Community of RS companies to serve national and regional needs
- Operational SEA GS Network
- Operational Regional Data Node (ReDaNo) for SEA countries
Remote Sensing Application 2014 - 2018

2014: National Earth Observation System (SPBN) to provide information about Natural Resources and Disaster Mitigation based on in-house research

2015: National Earth Observation System (SPBN) to provide information about Natural Resources and Disaster Mitigation at Province level (34 provinces finished 2015-2017)

2016: Automated processing system for Potential Fishing Ground Information from Remote Sensing

2018: Updated National Earth Observation System (SPBN) to provide information about Natural Resources and Disaster Mitigation

Example use of the measurement tools
2017: Remote Sensing for Crop Insurance
Research collaboration with Dutch Institutions (Geospatial for Indonesia/G4INDO Project)
Remote Sensing Application cluster 2014-2019

Natural Resources
- Forest Monitoring
- Mining
- Paddy Growth Monitoring
- Industrial Area
- Oil Palm Plantation
- Potential Fishing Ground
- Small Islands and Archipelagos

Environment and Disaster
- Hotspot
- Burned Area
- Earthquake Impact
- Floods
- Landslide
- Volcano Eruptions

Other Strategic
- Cannabis Identification
- Country Border

NATIONAL INSTITUTE OF AERONAUTICS AND SPACE OF INDONESIA
REMOTE SENSING APPLICATION CENTER
Lombok Earthquake
Remote Sensing Application 2019 - 2023

2019
Proposed multiyear Research collaboration with CSIRO related with Satellite earth observation based system to support monitoring and assessment of United Nations sustainable development goals and blue economy related indicators (KKP, BIG, LIPI, IPB, ITS)

2020
Proposed Research collaboration with Wageningen University related with Satellite earth observation based system (RADAR) to support monitoring and assessment of peat area in Indonesia

2021
Develop Android/iOS Application for Natural Resources Information based on Remote Sensing

2022
Develop National Earth Observation System dashboard compatible with LAPAN engine (Data Center) for easier and faster image processing for SDGs monitoring in Indonesia

2023
Develop Remote Sensing Science and Technology Park
http://lapan.go.id/