INDONESIAN NATIONAL AEROSPACE POLICIES

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LEMBAGA PENERBANGAN DAN ANTARIKSA NASIONAL (LAPAN)

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Introduction

Space technology and information technology are the most important technololgies in modern life, not only in global and national scale, but also in personal activities.

Space technology is used for telecommunication, survaillance, and navigation. Indonesia as maritime continent, with about 17,000 islands (13,466 named islands), needs space technology.

Since space technology is close related to aeronautics technology, Indonesia has “National Institute of Aeronautics and Space”, in which space and aeronatics (aerospace) science and technology developments, as well as policy studies, are conducted.

A Brief History of Aerospace Activities in Indonesia

- The Aviation Board was established on 1955 based on Government Regulation No. 5/1955. This board later changed to become the National Aeronautics and Space Council of the Republic of Indonesia (DEPANRI) by Presidential Decree No. 99/1993. DEPANRI is chaired by the President of Republic of Indonesia with members consisting of State Minitry of Research and Technology (also as vice chairman and acting chairman), Minister of Foreign Affairs, Minister of Trade and Industry, Minister of Defence, and State Minister of Development Planning.
- Space technology activities in Indonesia started in the 1960s. In 1962 PRIMA (Proyek Roket Ilmiah dan Militer Awal) – the Primilinary Project on Scientific and Military Rocket was started. The first rocket produced by this project (i.e. Kartika) was launched on 14 August 1964 from Launching Station at Pameungpeuk, West Java.
- National Institute of Aeronautics and Space (LAPAN) was established based on Presidential Decree No. 236/1963.
- In 1976 Indonesia became the third country using telecommunication satellite, PALAPA.

KARTIKA Rocket of ITB/TNI-AD/LAPAN

A Brief History of Aerospace Policies in Indonesia

In 1998 DEPANRI held National Aerospace Congress. The congress was attended by various aerospace stakeholders in Indonesian and produced very important documents:

a. The National Aerospace Concepts, as an elaboration of the perception and attitude of the nation in dealing with the utilization;
b. General policy for the second Long Term Development Program;
c. The amended national position on geostationary orbit (GSO);
d. Law reform, especially in national space legislation program by ratifying relevant international legal instruments for space activities, enactment of a national space act and the determination of a national position on definition/delimitation of outer space;
e. Policy on aerospace international cooperation.

A Brief History of Aerospace Policies in Indonesia

- International space treaty, conventions, and agreement have been ratified by Indonesia:
  a. Convention on International Liability for Damage Caused by Space Objects of 1972, known as Liability Convention 1972, which was ratified by Presidential Decree of the Republic of Indonesia No. 20/1996.
  b. Convention on Registration of Objects Launched into Outer Space, also known as the Registration Convention 1975, ratified by the Republic of Indonesia Presidential Decree No. 5/1997.
  c. Agreement on the Rescue of Astronouts, the Return of Astronouts and the Return of Objects Launched into Outer Space, 1968, known as the Rescue Agreement, 1968, which was ratified by the Republic of Indonesia Presidential Decree No. 4 of 1999;
  d. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 1967, known as the Space Treaty 1967, which has been ratified by the Law of the Republic of Indonesia No. 16/2002.

A Brief History of Aerospace Policies in Indonesia

Some bilateral and regional space agreements have been signed and ratified by Indonesia:

a. Memorandum of Understanding Between the National Institute of Aeronautics and Space of the Republic of Indonesia (LAPAN) and the National Space Development Agency of Japan (NASDA) for the Cooperative Project of Utilization for the Japanese Earth Resources Satellite-1 data which was signed on 23 August, 1994.

b. Collaborative Research Agreement Between the National Space Development Agency of Japan and the National Institute of Aeronautics and Space of the Republic of Indonesia (LAPAN) for Studies for Production of Fundamental Datasets for Earth Science and Technology Researches signed on 21 December, 1994.

c. Agreement between the European Space Agency and the Indonesian National Institute of Aeronautics and Space concerning the Direct Reception, Archiving, Processing and Distribution of ERS-1 SAR Data were signed on 1 February, 1995.

d. Memorandum of Understanding between the National Institute of Aeronautics and Space (Space agency) of the Republic of Indonesia and the Indian Space Research Organization (ISRO) of the Republic of India for Cooperation in the Establishment of Telemetry, Tracking and Command Station for Satellites and Launch Vehicles signed on 25 April, 1997.

e. Convention of the Asia-Pacific Space Cooperation Organization, which was signed by Indonesia on October 28, 2005.

f. Agreement Between the Government of the Republic of Indonesia and the Government of the Russian Federation on Cooperation in the Field of Exploration and Use of Outer Space for Peaceful Purposes, signed December 1, 2006 and has been ratified by Presidential Decree No. 1 of 2010.

g. Agreement between the Government of the Republic of Indonesia and the Cabinet of Ministers of Ukraine on Cooperation in the Exploration and Peaceful Uses of Outer Space, signed on 6 November 2008 and has been ratified by Presidential Decree No. 16 of 2011.

A Brief History of Aerospace Policies in Indonesia

- Space Law No. 21/2013 was enacted on 6 August 2013.

PRESIDEN
REPUBLIK INDONESIA

UNDANG-UNDANG REPUBLIK INDONESIA
NOMOR 21 TAHUN 2013
TENTANG
KEANTARIKSAAN

DENGAN RAHMAT TUHAN YANG MAHA ESA

PRESIDEN REPUBLIK INDONESIA,

Menimbang:

a. bahwa Antariksa merupakan ruang beserta isinya yang terdapat di luar Ruang Udara yang mengelilingi dan melingkupi Ruang Udara serta merupakan ciptaan Tuhan Yang Maha Esa yang dipergunakan untuk sebesar-besarnya kemakmuran rakyat sebagaimana diamanatkan dalam Undang-Undang Dasar Negara Republik Indonesia Tahun 1945;

b. bahwa posisi geografis wilayah Indonesia yang terbentang di garis khatulistiwa dan terletak di antara dua benua dan dua samudra menjadikan Indonesia sebagai negara yang memiliki ketergantungan dalam pemanfaatan teknologi Keantariksaan dan sekaligus keunggulan komparatif yang berbasis ilmu dan teknologi bagi kemajuan peradaban serta kesejahteraan manusia Indonesia pada khususnya dan umat manusia pada umumnya;

c. bahwa peraturan perundang-undangan Keantariksaan saat ini belum mengatur secara terpadu dan komprehensif serta belum menjadi landasan hukum bagi Penyelenggaraan Keantariksaan;

d. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a, huruf b, dan huruf c, perlu membentuk Undang-Undang tentang Keantariksaan;

Indonesian Space Policies in Space Law No. 21/ 2013

- The space law consists of general policies related to space activities, i.e. space science, remote sensing, aerospace technology mastery, space launch and space commercial activities.
- LAPAN as government institution has authority to conduct all space activities in Indonesia, in addition to current duty as aerospace research and development institution.
- LAPAN is directly responsible to the President of Indonesia, while its activities are technically coordinated by a ministry for research and technology.
- The space law is intended to promote self-sufficiency and national competitiveness, to encourage space exploration and utilization for national prosperity and productivity, to ensure space activity sustainability, to provide law basis for space activities, to ensure security and safety in space activities, to ensure the implementation of international agreement, and to support national defence and integrity.

Current Indonesian Space Activities

Space Activities include five activities:

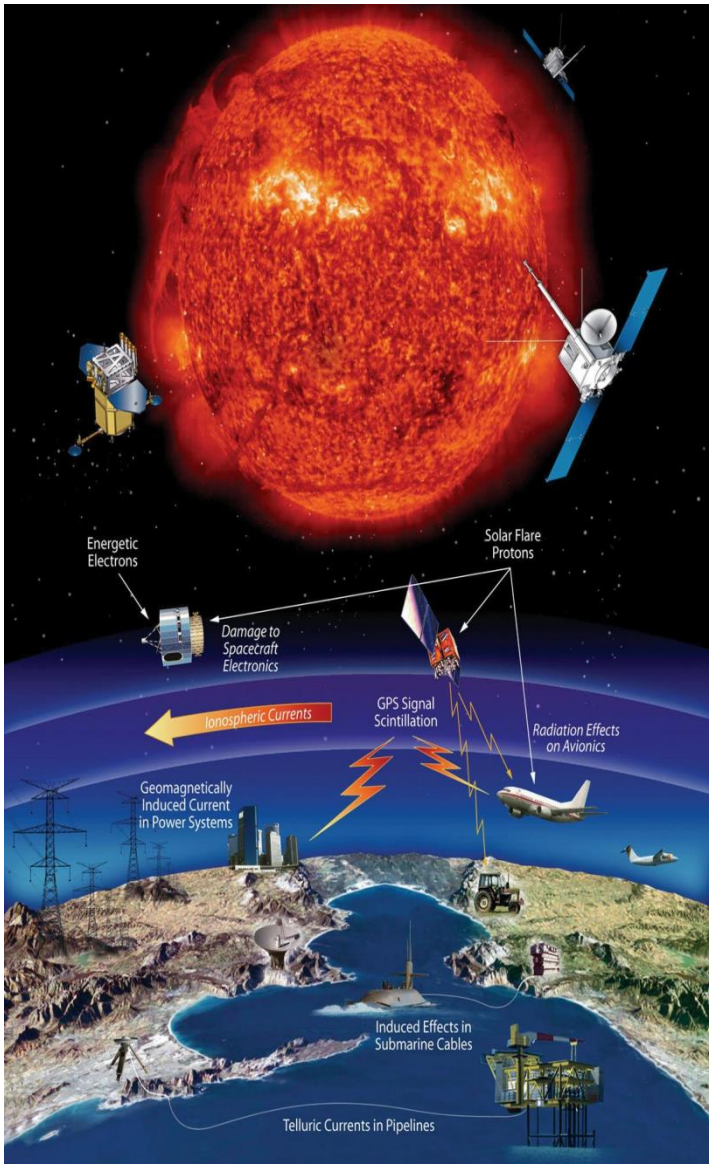
a. space science,
b. remote sensing,
c. aerospace technology mastery,
d. space launch (under longterm planning)
e. and space commercial activities (under planning).

Current Indonesian Space Activities

Space Science Activities:
- Space Weather
- Space Environment
- Astrophyiscs

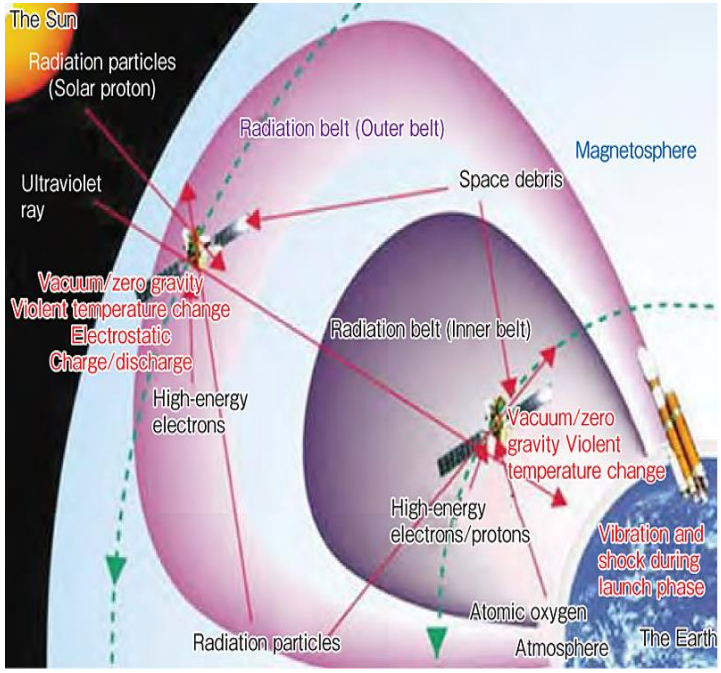
What is space weather

- "Conditions on the Sun and in the solar wind, magnetosphere, ionosphere and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems and can endanger human life or health."
- Heliophysics is the science of space weather, includes solar physics, plasma physics, and space physics.



What is space environment?

- **Space environment** is a branch of astronautics, aerospace engineering and space physics that seeks to understand and address conditions existing in space that affect the operation of spacecraft.
- The space environments considered include energetic particle radiation, plasmas, atmospheres, micro-particles, and contamination. They can all cause serious problems for space systems and experts need to carefully take them into account during the development of spacecraft.
- Space environment also includes stuidies on space debris.



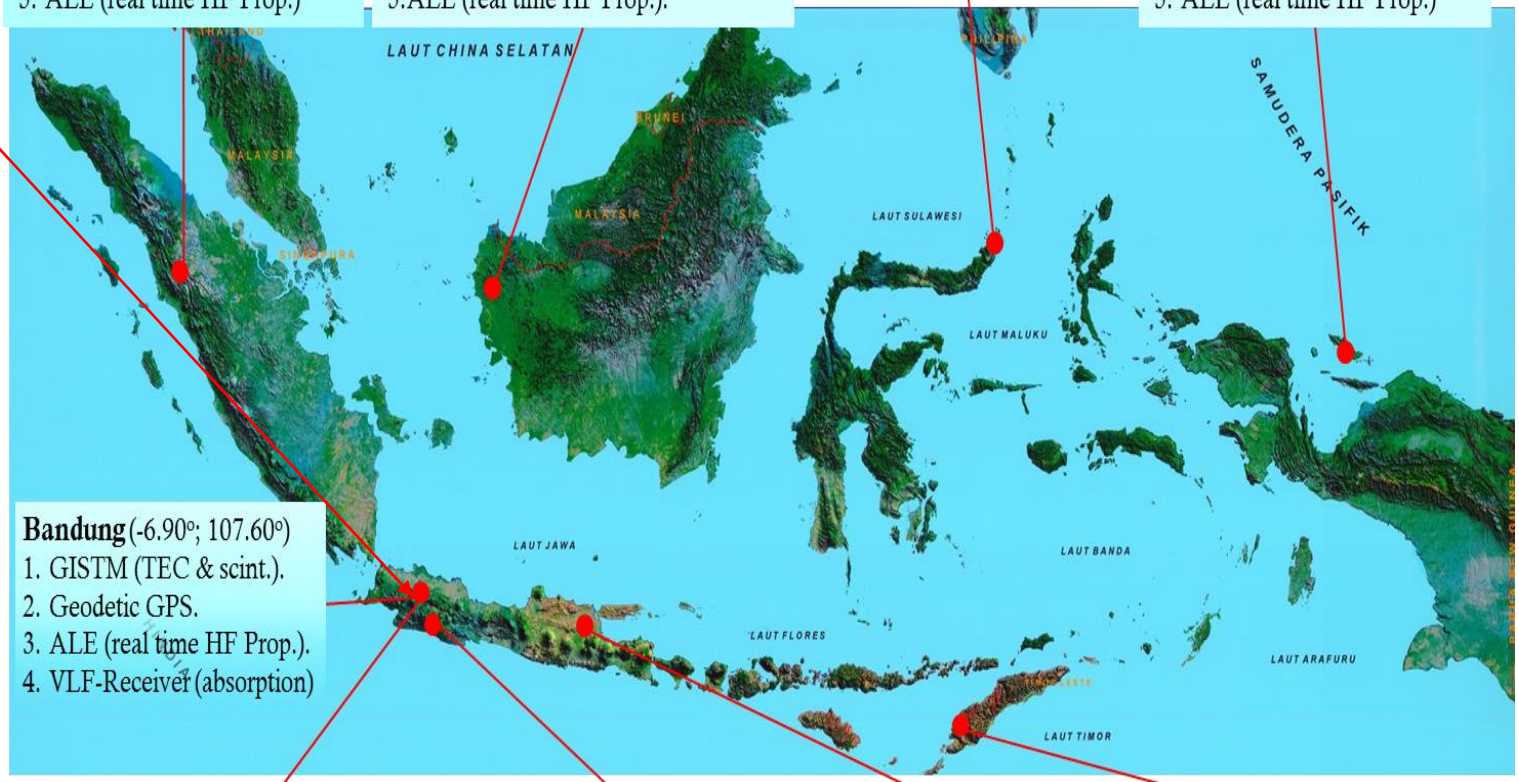
Astronomical Observatory & Space Weather Monitoring Station

Kototabang (-0.3°; 100.35°)
1. Magnetometer
2. Ionosonde (electtron density)
3. VHF Radar (meteor)
4. ISM (scintillation)
5. ALE (real time HF Prop.)

Pontianak (-0.03°; 109.33°)
1. Magnetometer
2. Ionosonde (electron density)
3. GISTM (TEC & scintillation)
4. MF-radar (neutral wind)
5. ALE (real time HF Prop.).

Manado (1.34°; 124.82°)
1. Magnetometer
2. Ionosonde (electron density)
3. GISTM (TEC & scint.).
4. ALE ((real time HF Prop.)

Biak (-1.0°; 136.0°)
1. Magnetometer
2. Ionosonde (electron density)
3. GISTM (TEC & scint.)
4. MWR (neutral wind).
5. ALE (real time HF Prop.)



Bandung (-6.90°; 107.60°)
1. GISTM (TEC & scint.).
2. Geodetic GPS.
3. ALE (real time HF Prop.).
4. VLF-Receiver (absorption)

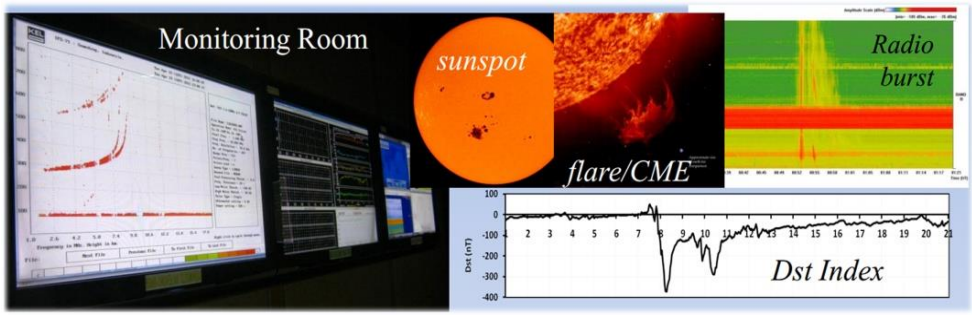
Sumedang (-6.91°; 107.83°)
1. Solar Spectrograph
2. Telescope
3. Magnetometer
4. Ionosonde (electron density)

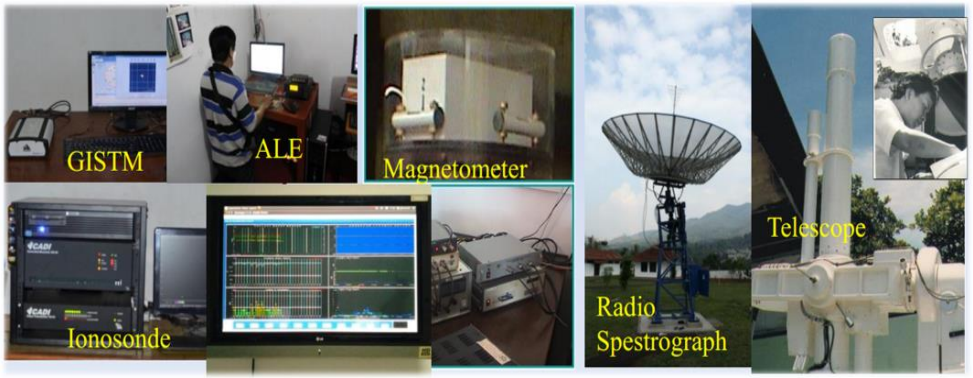
Pameungpeuk (-7.65°; 107.96°)
1. Magnetometer
2. Ionosonde (electron density)
3. ALE (real time HF Prop.)

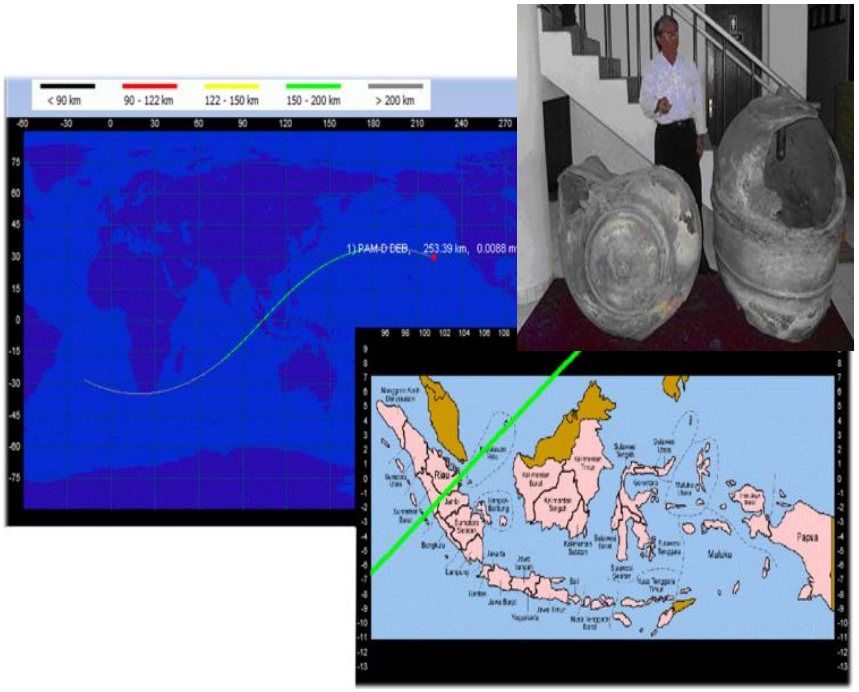
Watukosek (-7.57°; 112.68°)
1. Telescope
2. Magnetometer
3. ALE (real time HF Prop.).

Kupang (-10.16°; 123.67°)
1. Magnetometer
2. Ionosonde (electron density)
3. GISTM (TEC & scintillation).
4. ALE (real time HF Prop.)

Space weather, space environment, and space debris monitoring mainly done by LAPAN







Astronomy, Astrophysics, and Solar Physics mainly done by ITB and Bosscha Observatory

Space Technology Development:

- Aeronautics
- Satellite
- Rocket

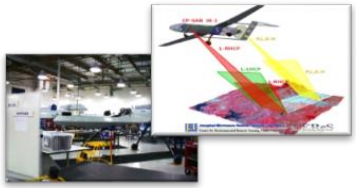
Aeronautics to Support Space Technology

LAPAN SURVEILLANCE UAV (LSU)

2012-2014
[3 M]

2015-2016
[20 M]

2017-2018
[40 M]



2019
[30 M]

LSU

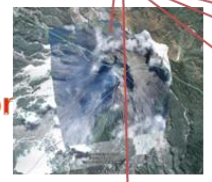
- Rancang Bangun LSU-01,02& 03
- Pengembangan pemanfaatan LSU-02
- Litbang Subsystem (Kendali,TTC,Manufacture, Flight Test)

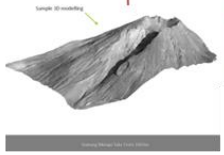
- Integrasi dan Uji Coba LSU-05 dengan Muatan SAR+Test Sub system
- Detail Desain & Manufacture LSU pertahanan (LSU-Han)+Hybrid
- Pengembangan pemanfaatan LSU-02, LSU-03

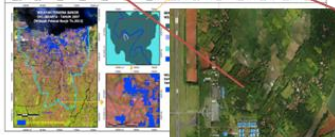
- Pembuatan Prototipe dan Pengujian LSU-Han
- Pengembangan pemanfaatan LSU-05 (airborn remote sensing)
- Pemanfaatan LSU-02, LSU-03, Urban Mapping by Hybrid UAV

- Uji coba pemanfaatan LSU-Han
- Pemanfaatan LSU-05 untuk pertanian perkebunan (airborne remote sensing)

Needs & Application

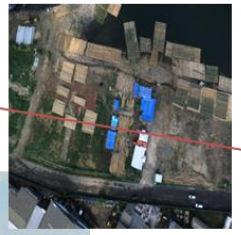






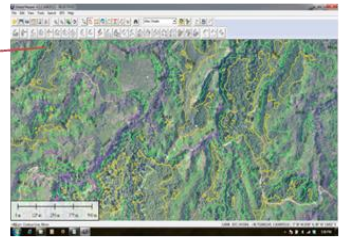
Disaster Monitoring

Military Operation

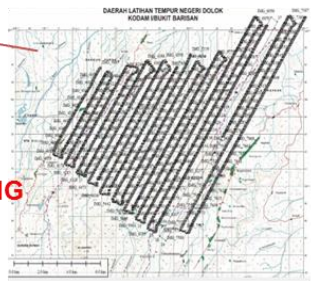


AGRICULTURE /MAPPING

Plantation Management



BORDER MONITORING



Aeronautics to Support Space Technology

LAPAN SURVEILLANCE AIRCRAFT (LSA)

2012-2014
[15 M]

LSA

- Pengembangan LSA-01
- Operasi dan pemanfaatan LSA-01
- Conceptual Design LSA-UAV

2015-2016
[40 M]

- Detail Design LSA-UAV berbasis LSA-01 & Manufacturing LSA-UAV
- Pengembangan pemanfaatan LSA-01 untuk Pertanian dan Patroli Maritim

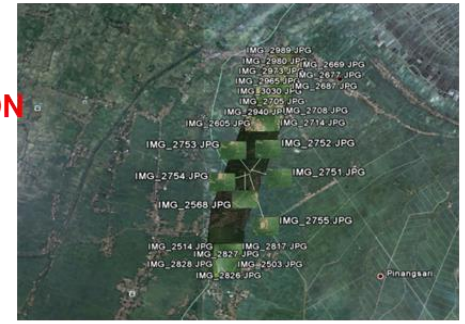
2017-2018
[40 M]

- Prototyping, Uji Coba Skala Lab System Kendali LSA UAV (High Altitude Long Endurance LSA)
- Pengembangan pemanfaatan LSA-01 untuk Patroli Maritim

2019
[60 M]

- Prototipe pesawat terbang tanpa awak berbasis LSA-02H (High Altitude Long endurance)
- Pemanfaatan LSA-01

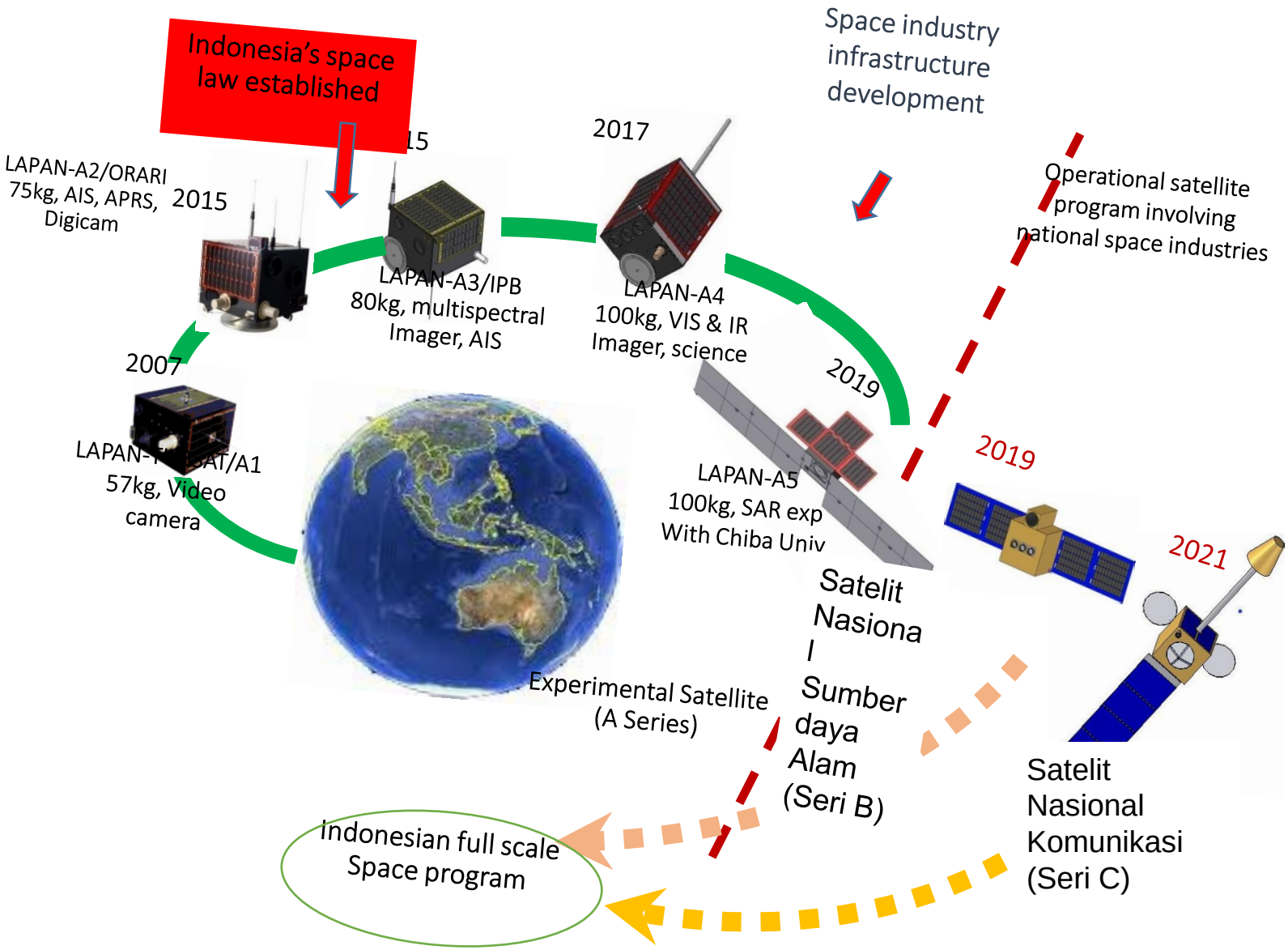
NEEDS & APPLICATION



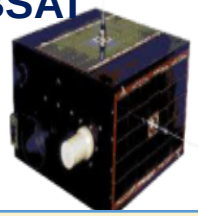
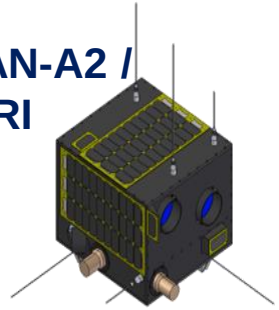
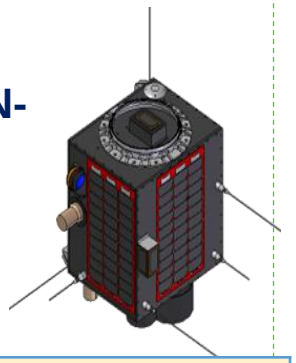
AIRBORNE & REMOTE SENSING VALIDATION

MARITIME PATROL & SECURITY

Developing Satellite Technology



Developing Satellite Technology

	LAPAN-A1 / TUBSAT 	LAPAN-A2 / ORARI 	LAPAN-A3 / IPB 
Mision	**Video Surveilence**	Earth Surveilance, **maritime monitoring,** Amateur Communication	Experimental remote sensing, **maritime monitoring**, Science exp.
Payload	Analog Video Camera, Low resolution VideoCam	Digital Space Camera, Analog Video Camera, AIS, APRS	4 band pushbroom imager, Hi res DigitalCam, AIS, APRS
Spectral resolution	Kappa PAL Camera (752 x 582 pixel)	Digital Camera (2048 x 2044 pixel) Analog Camera (752 x 582 pixel)	450 - 520 nm; 520 - 600 nm; 630 690 nm; 760 - 900 nm
Spatial resolution	5 m (3,5 km swath), 200m (80 km swath)	4 m (7 km swath), 5 m (3,5 km swath)	18 m (100 km swath) / 10 m (75 km)
Orbit	635 km, 97,6 deg	650 km, 8 deg, Near-Equatorial	650 km, 97,6 deg
Data TX, and TT&C	S-Band : 2220 MHz, UHF : 437,325 MHz	S-Band : 2220 MHz, UHF : 437,325 MHz	X-Band : 8116 - 8284 MHz, UHF : 437,325 MHz
Downlink rate	5 Mbps	5 Mbps	105 Mbps
Total weight	57 kg	74 kg	80 kg
Dimension	450 x 450 x 270 mm	500 x 470 x 360 mm	500 x 500 x 700 mm
Launch	2007	Mid 2015	End of 2015

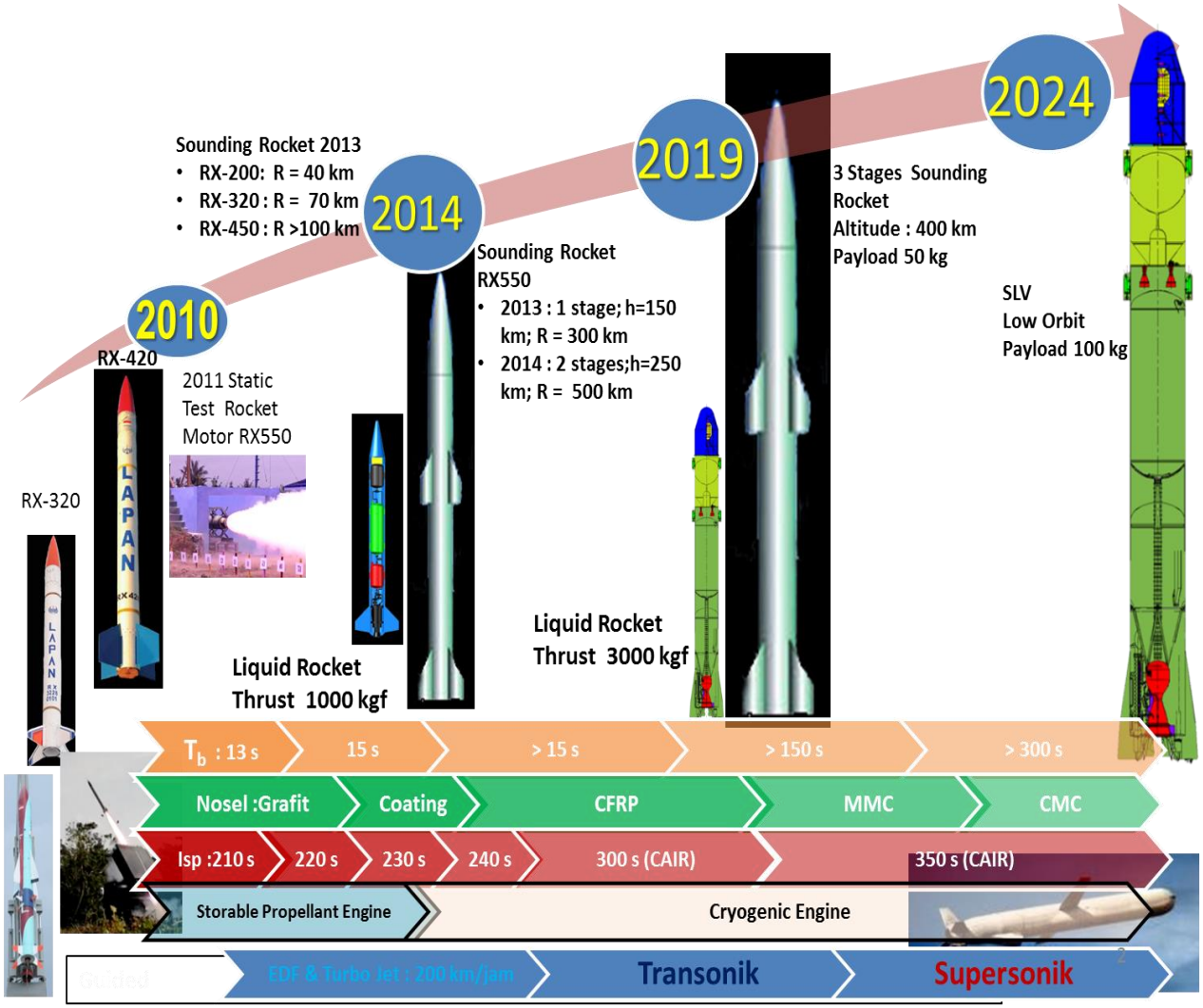
Developing Satellite Technology

LAPAN-A4

LAPAN-A5

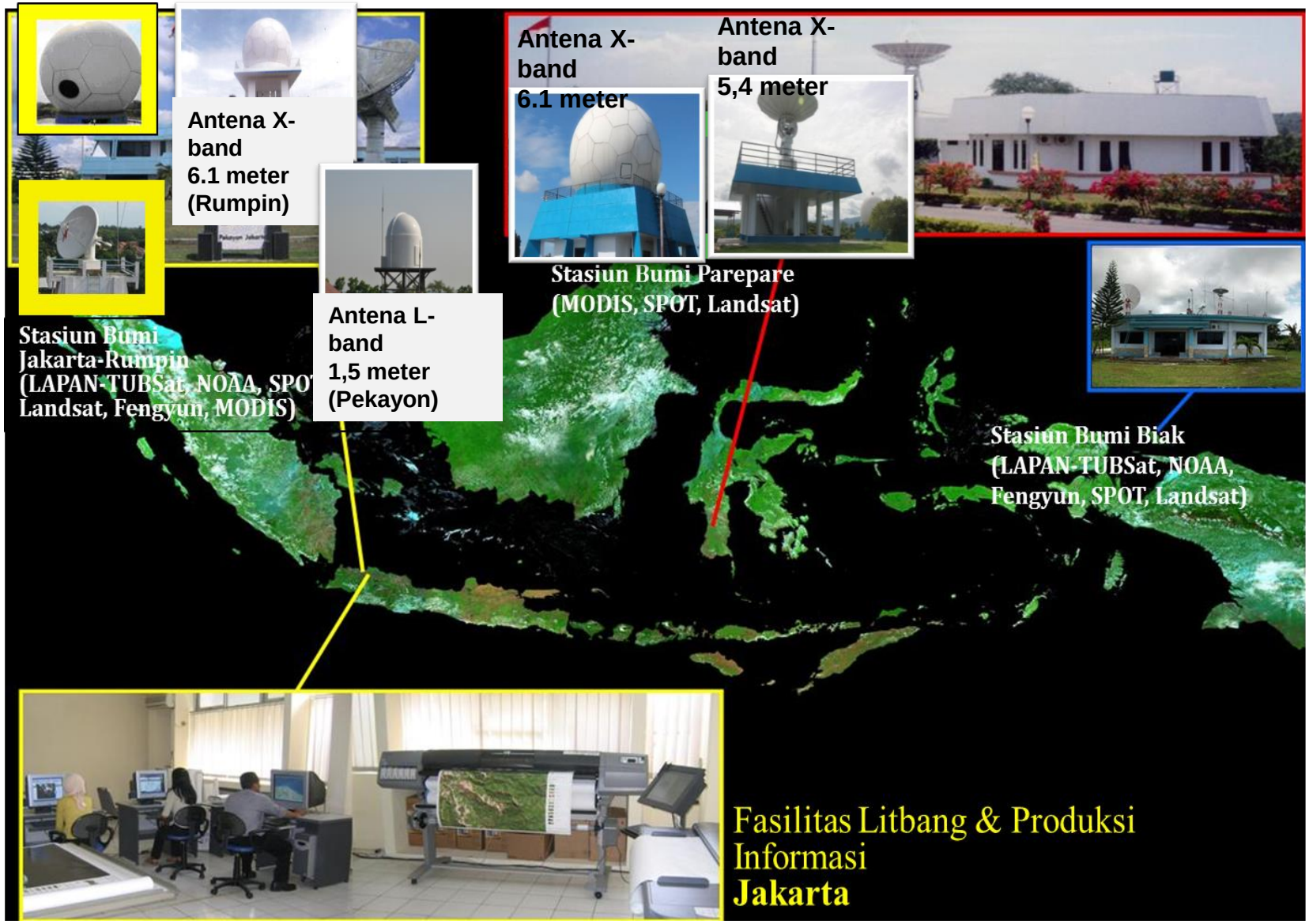
Mision	Experimental remote sensing (Validation of Optical data pre-processing algorithm)	Experimental remote sensing. (Development of SAR data pre-processing algorithm jointly with Chiba University)
Payload	Visible and Near Infrared imager experimental,	Shyntetic Aperture Radar Experimental (deployable dimension 450 x 70 cm)
Spectral/discrimina-tion mode	NIR Bolometer camera, Selectable with 10 nm interval.	L-band; HH, HV, VH, VV polarimetry
Spatial resoluition	5 m (3,5 km swath), 1 km	30 m (100 km)
Orbit	650 km, 97,6 deg	650 km, 97,6 deg
Payload TX, TTC	X-band, S-band	X-Band, S-band
Downlink rate	200 Mbps	200 Mbps
Dimension	*Max 60x60x80 cm³*	*Max 60x60x80 cm³*
Weight	100 kg	100 kg

Sounding rocket to satellite launching rocket

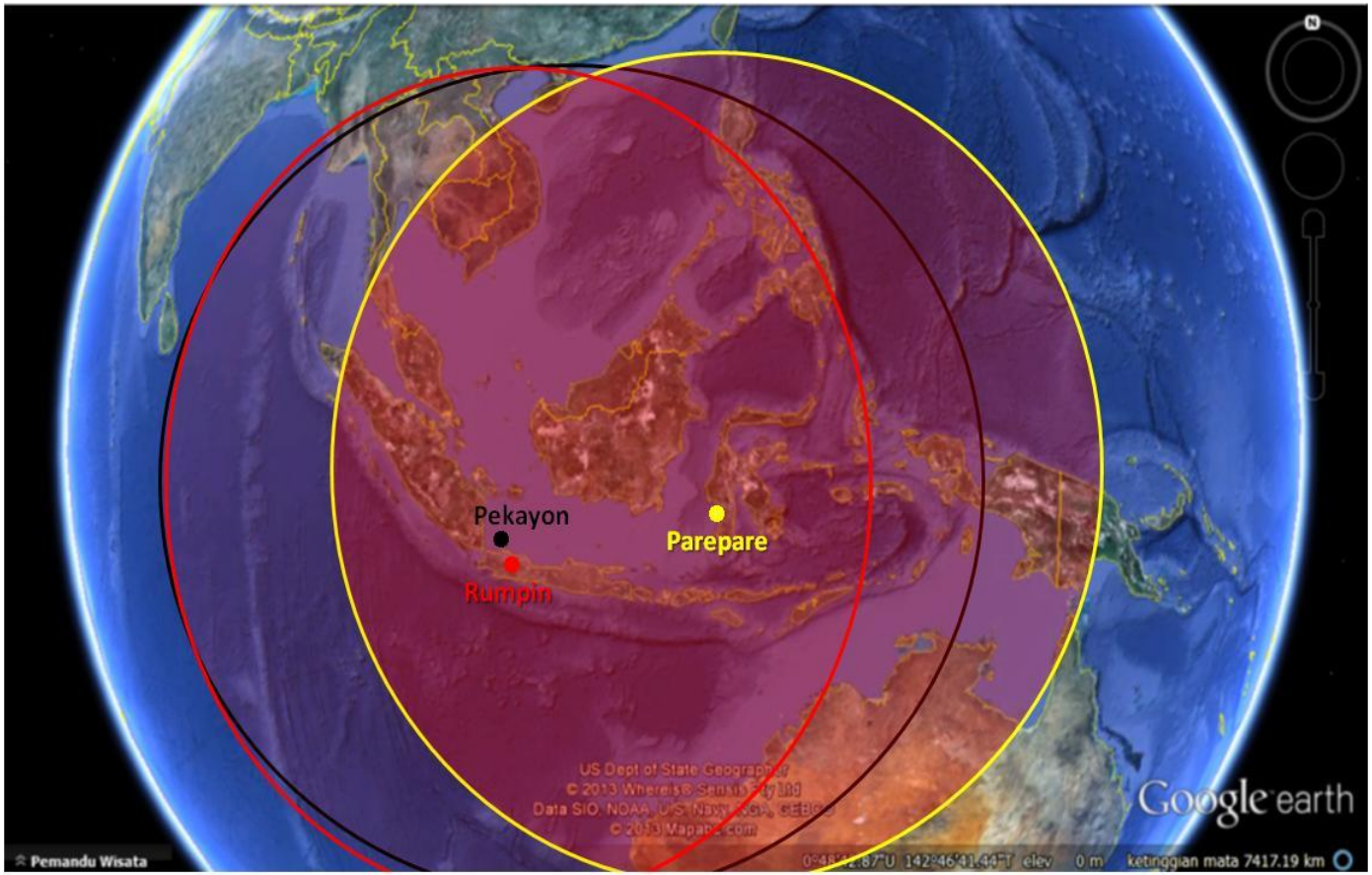


Remote Sensing

Ground Stations & Image Production



Coverage


Pekayon
Parepare
Rumpin
Google earth
Pemandu Wisata
ketinggian mata 7417.19 km

National Space Development Master Plan

- In the Space Laws No. 21/2013, it is mentioned that LAPAN should prepare a Master Plan for the implementation of national space guidelines. The master plan drawn up for a period of 25 (twenty five) years. Therefore, the current master plan is being drawn up, both academic and legal draft of President Regulation. The master plan has been proposed as one of national legislation program (prolegnas) in 2014.
- The master plan will be prepared taking into account basic capabilities and the national and international strategic environment. The master plan contains the vision and mission, policies, strategies and short, medium, and long-term strategic plans.

National Space Development Master Plan

- The main issues in the master plan includes
  - the construction of national observatory to support space science;
  - to strengthen national remote sensing data bank;
  - to strengthen aeronautics technology for developing UAV (Unmanned Aerial Vehicle) and transport aircraft;
  - to develop national satellite for remote sensing, telecommunication, and navigation, starting from developing micro-satellite;
  - to develop rockets for satellite launching, starting from developing sounding rockets;
  - and to build aerospace port in Eastern Indonesia;
  - as well as to strengthen space policy studies.
- To enhance public awareness, space science and technology education center should be built in locations of LAPAN's station all over Indonesia.
- The national aerospace master plan should be supported by preparing human resources and related industries.
- National and international cooperation on space science, technology, and policy studies should be encouraged.

Concluding Remaks

The enactment of Space Law No. 21/2013 and current capabilities have provided a strong foundation for the national space development.

The national space development master plan mandated by space law No. 21/2013 will be guidelines for the implementation of national space activities for next 25 years.