PIONEERING INDONESIA NANOSATELLITE

PROGRESS REPORT

Zulfa Dhiyaulhaq

International Astronautical Federation Workshop
Sunday, September 30th 2018

Consist of 17.000+ Island

Located in Pacific Ring of Fire

Ilegal Logging and Ilegal Fishing

Mastery of satellite technology

Capacity building

Started from Nanosatellite at University Degree

SPECIFICATION

Size : 100 mm x 100 mm x 113,5 mm (1U)

Weight : 0.8 - 1,1 Kg.

Planning for Orbital duration is 1 year

Height orbital : 380-400 km

Orbit target : Polar

Frekuency : 435.825 Mhz

Satellite transmission power: 1 W

Antenna feed loss : 0.58 dB

Ground Station Location: Surya University, Pusteksat LAPAN

Launch time : Late 2019

MISSION OBJECTIVE

- Indonesian student opportunities (First Indonesia Nanosatellite)
- Future scientific space technology
- Short text messages for remote area (APRS)
- Communication for amateur radio communication

Q1 2016
Project
Started

Q2 2016
Design Phase

Q1 2017
Subsystem
Development

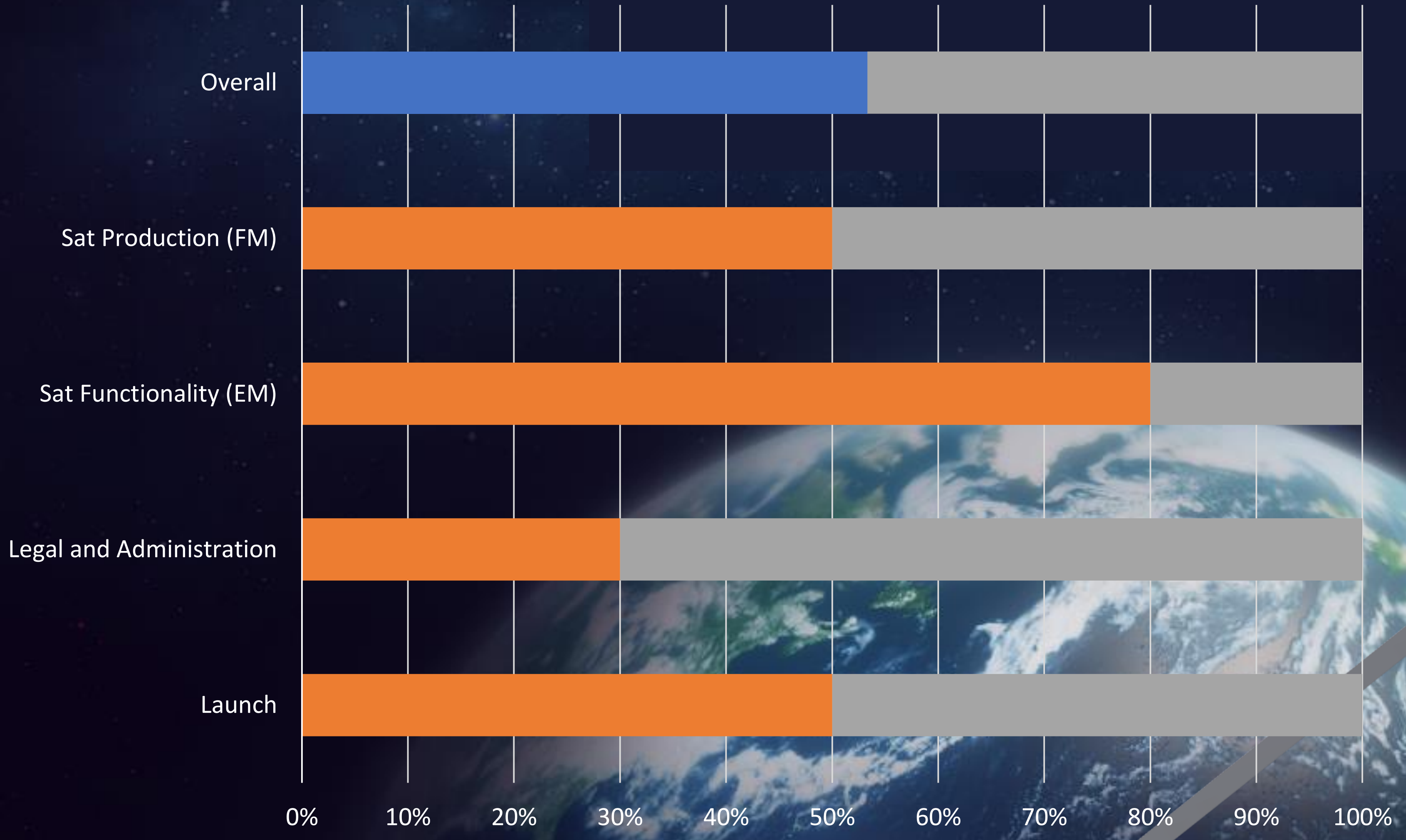
Q3 2017 EM
Development

Q3 2018
Quantification
Test

FM
Manufacture

Q3 2019
Saellite
Launch

PROGRESS

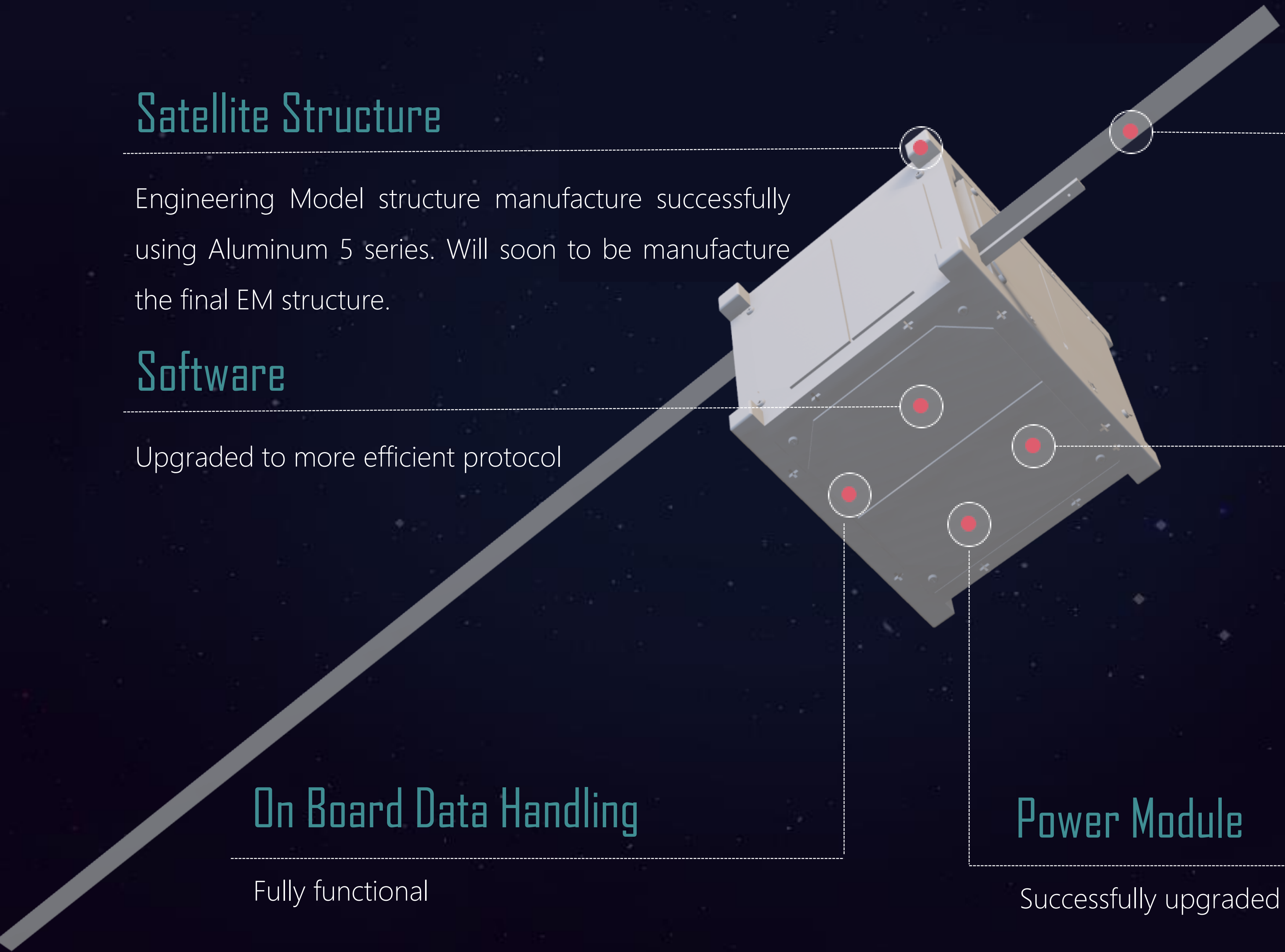

Overall
Sat Production (FM)
Sat Functionality (EM)
Legal and Administration
Launch
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

Satellite Structure

Engineering Model structure manufacture successfully using Aluminum 5 series. Will soon to be manufacture the final EM structure.

Software

Upgraded to more efficient protocol



Antenna Deployment System

Successfully working mechanically and electrically

Not yet tested in controlled temperature and pressure

APRS Payload Module

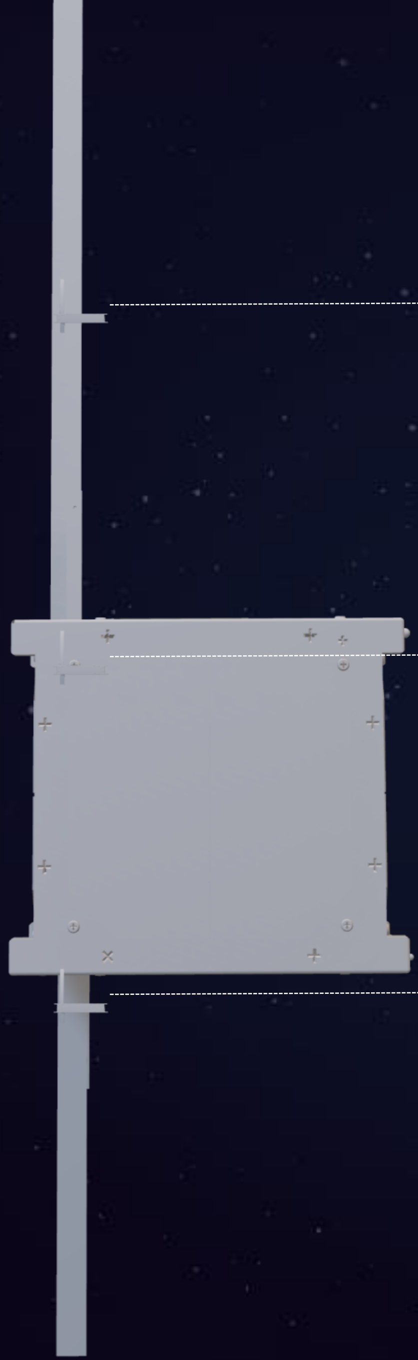
Succesfully receive and transmit in both frequency

On Board Data Handling

Fully functional

Power Module

Successfully upgraded to SMD PCB



Thermal Vacuum Testing

Radio module successfully tested in controlled pressure and temperature in LAPAN Facility

EMC Testing

Approaching for MoU with Indonesia Science Institute (LIPI)

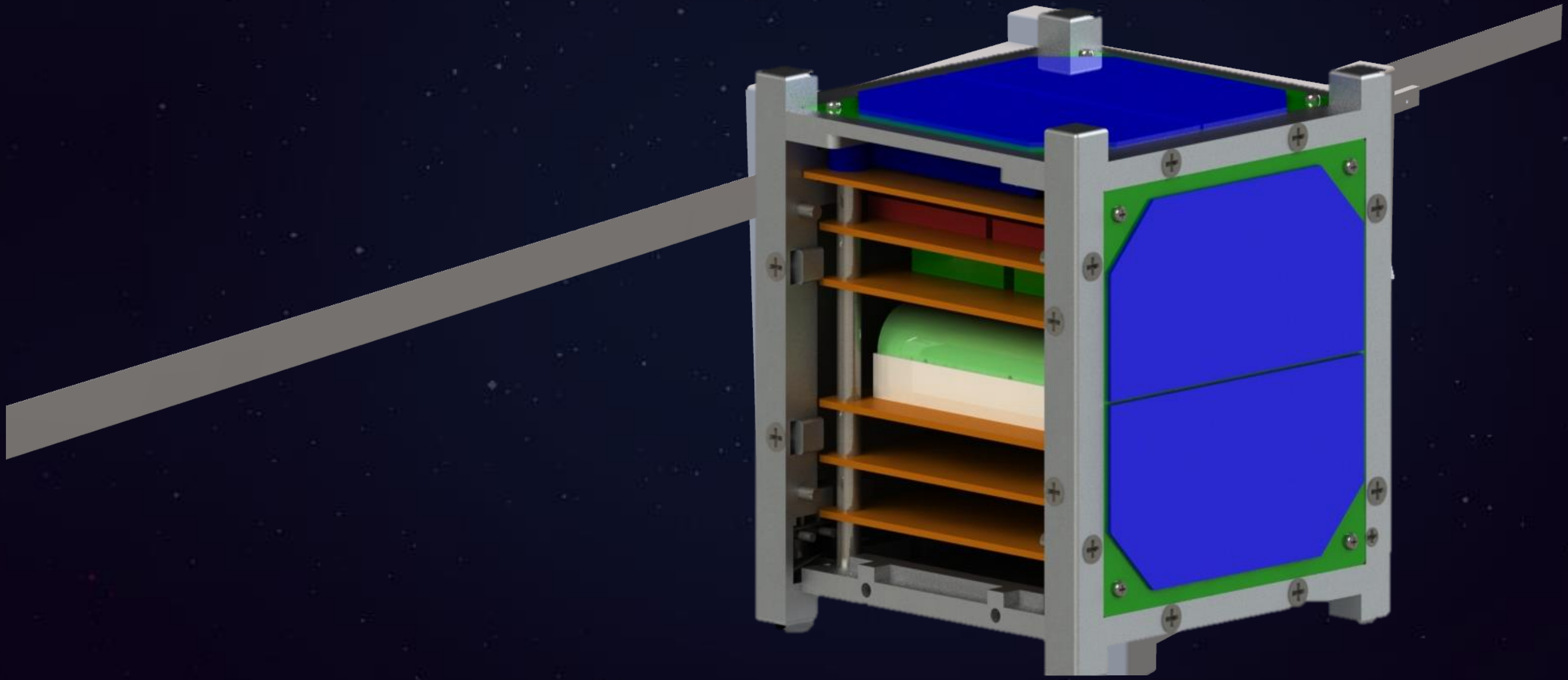
Vibration Testing

On hold waiting for assembly process

GROUND STATION

Upgrade to more sensitive system with QFH for UHF and VHF spectrum. Successfully receive and transmit signal

Satellite Design



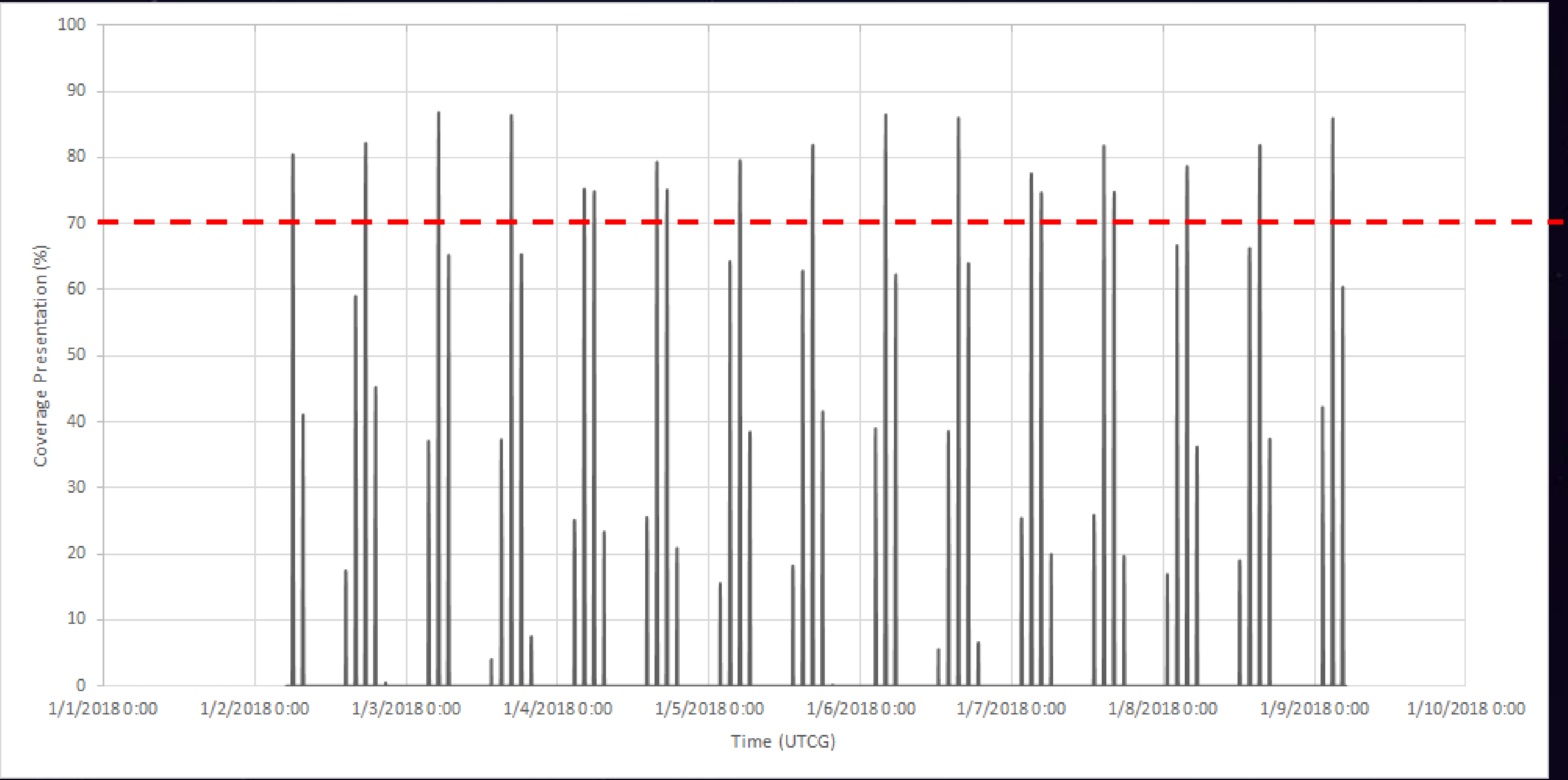
Orbit Simulation

Initial Condition

Orbital Elements	Value
Semi-Major Axis (Km)	6775.734821
Eccentricity	0.000406
Inclination (deg)	51.714
Right Ascending of Ascension Node (deg)	127.92
Argument of Perigee (deg)	76.008
True Anomaly (deg)	133.805
Apogee Altitude (Km)	400.34877
Perigee Altitude (Km)	394.84687

Simulation

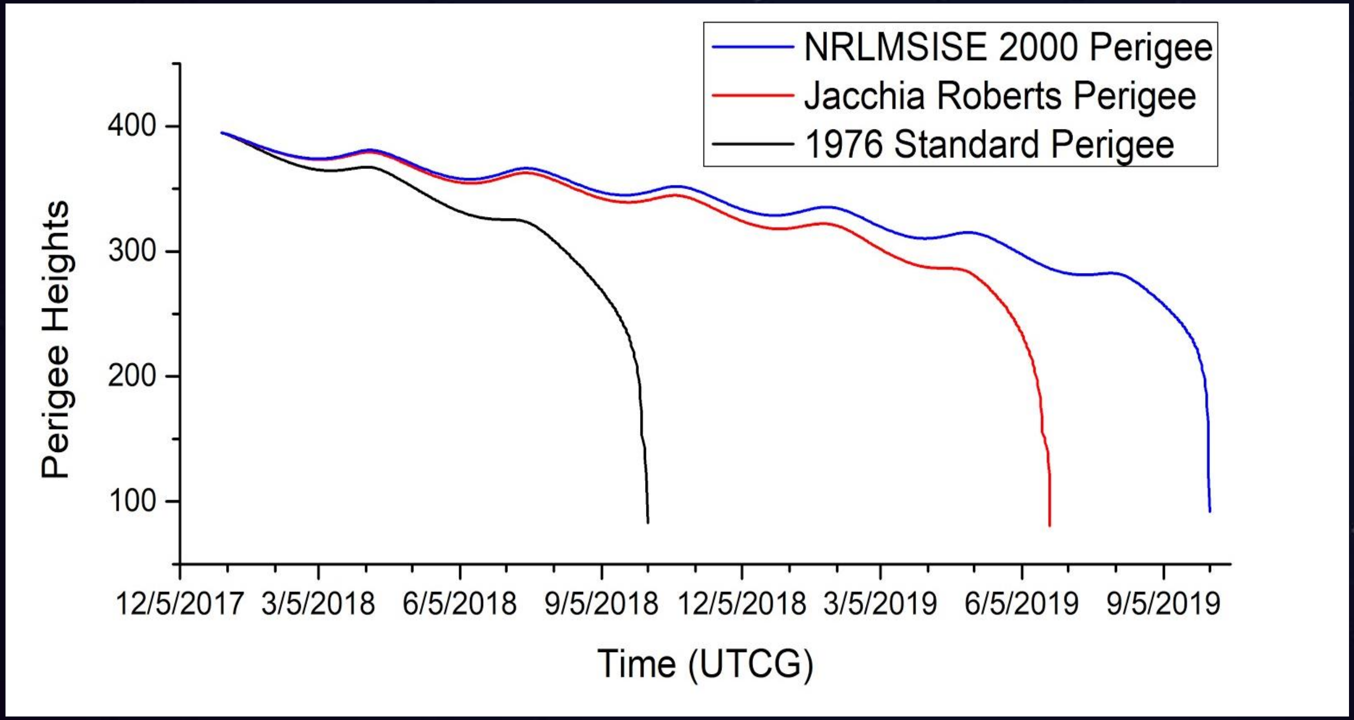
Satellite Coverage in Indonesia



Dialy 70% region coverage

Lifetime Simulation

Lifetime Prediction



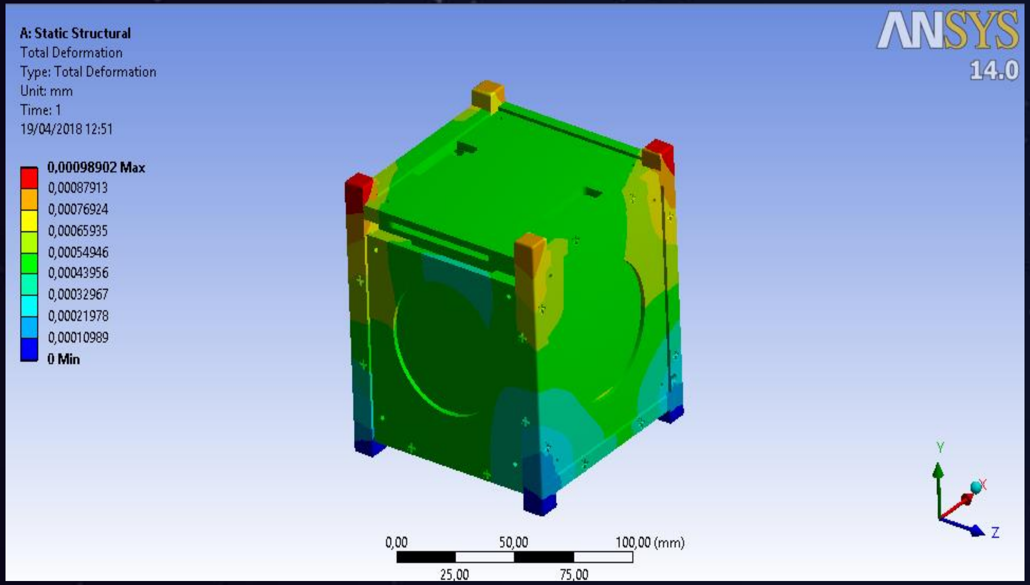
Lifetime prediction of Surya Satellite-1 with different atmosphere model

Link Budget Calculation

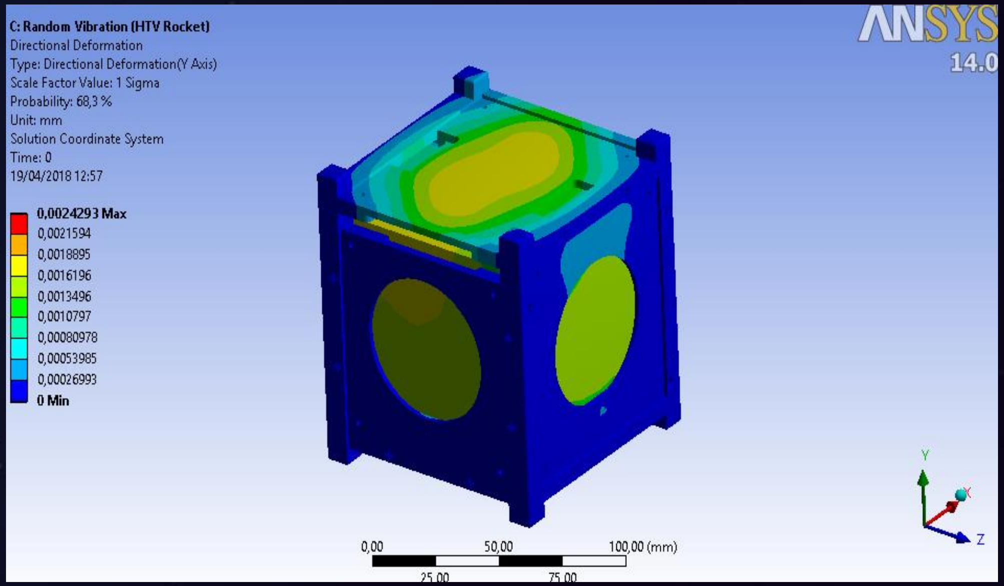
Parameters	Value
Satellite antenna gain (dbi)	0
Satellite transmitted power (W)	1
Satellite Antenna feed loss (db)	0.58
Ground station antenna gain (dbi)	13
Ground station transmitted power (W)	5
Ground station antenna feed loss (db)	1.5
Frequency (MHz)	435.825
Distance (Km)	400
Uplink received power (dBm)	-108.3
Downlink received power (dBm)	-117.8

Structure Simulation

Static Analysis



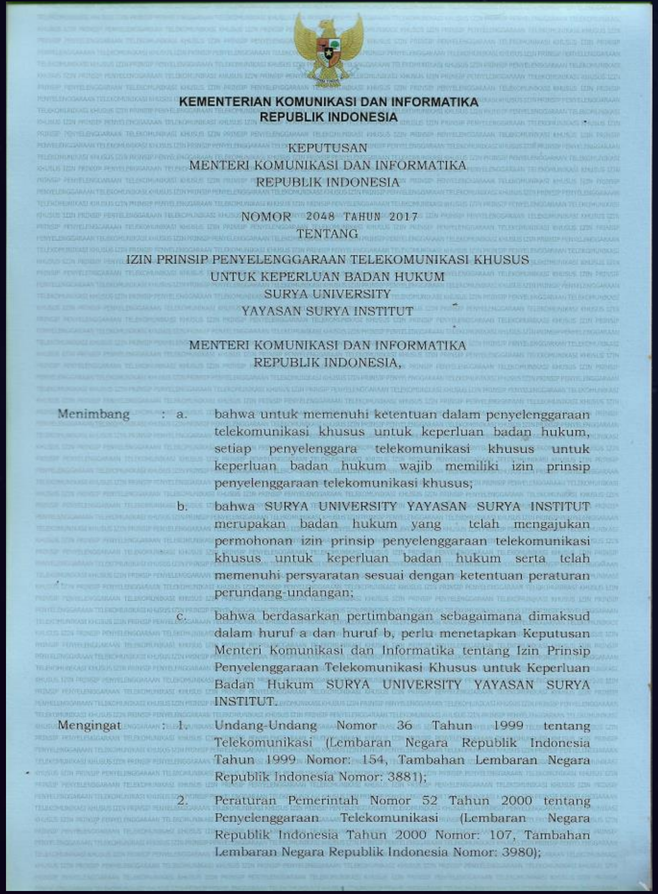
Random Vibration



Small deformation (0.9 micron at max) and in-safe rage vibration means it will survive in rocket launch environment

Principal Permit of Special Telecomunication

Principal permit of special telecommunication has been obtained from Ministry of Communication and Informatics



KEMENTERIAN KOMUNIKASI DAN INFORMATIKA
REPUBLIK INDONESIA

KEPUTUSAN
MENTERI KOMUNIKASI DAN INFORMATIKA
REPUBLIK INDONESIA

NOMOR 2048 TAHUN 2017
TENTANG
IZIN PRINSIP PENYELENGGARAAN TELEKOMUNIKASI KHUSUS
UNTUK KEPERLUAN BADAN HUKUM
SURYA UNIVERSITY
YAYASAN SURYA INSTITUT

MENTERI KOMUNIKASI DAN INFORMATIKA
REPUBLIK INDONESIA,

Menimbang : a. bahwa untuk memenuhi ketentuan dalam penyelenggaraan telekomunikasi khusus untuk keperluan badan hukum, setiap penyelenggara telekomunikasi khusus untuk keperluan badan hukum wajib memiliki izin prinsip penyelenggaraan telekomunikasi khusus;

b. bahwa SURYA UNIVERSITY YAYASAN SURYA INSTITUT merupakan badan hukum yang telah mengajukan permohonan izin prinsip penyelenggaraan telekomunikasi khusus untuk keperluan badan hukum serta telah memenuhi persyaratan sesuai dengan ketentuan peraturan perundang-undangan;

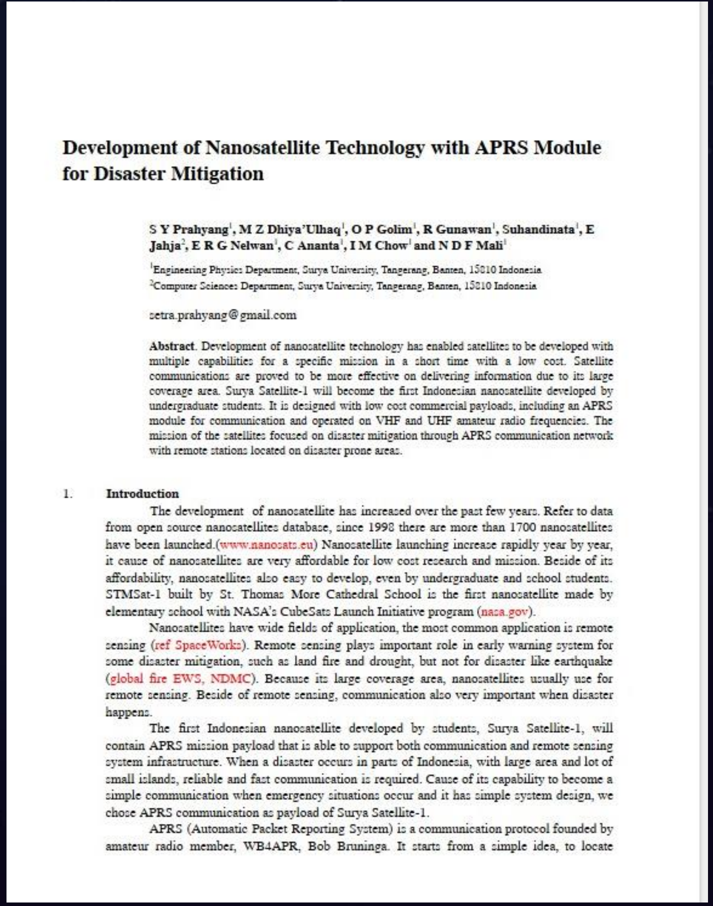
c. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a dan huruf b, perlu menetapkan Keputusan Menteri Komunikasi dan Informatika tentang Izin Prinsip Penyelenggaraan Telekomunikasi Khusus untuk Keperluan Badan Hukum SURYA UNIVERSITY YAYASAN SURYA INSTITUT;

Mengingat : 1. Undang-Undang Nomor 36 Tahun 1999 tentang Telekomunikasi (Lembaran Negara Republik Indonesia Tahun 1999 Nomor: 154, Tambahan Lembaran Negara Republik Indonesia Nomor: 3881);

2. Peraturan Pemerintah Nomor 52 Tahun 2000 tentang Penyelenggaraan Telekomunikasi (Lembaran Negara Republik Indonesia Tahun 2000 Nomor: 107, Tambahan Lembaran Negara Republik Indonesia Nomor: 3980);

Publication

Publication at **IOP conference Science journal**



Development of Nanosatellite Technology with APRS Module for Disaster Mitigation

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Abstract. Development of nanosatellite technology has enabled satellites to be developed with multiple capabilities for a specific mission in a short time with a low cost. Satellite communications are proved to be more effective on delivering information due to its large coverage area. Surya Satellite-1 will become the first Indonesian nanosatellite developed by undergraduate students. It is designed with low cost commercial payloads, including an APRS module for communication and operated on VHF and UHF amateur radio frequencies. The mission of the satellites focused on disaster mitigation through APRS communication network with remote stations located on disaster prone areas.

1. **Introduction**

The development of nanosatellite has increased over the past few years. Refer to data from open source nanosatellites database, since 1998 there are more than 1700 nanosatellites have been launched.(www.nanosats.eu) Nanosatellite launching increase rapidly year by year, it cause of nanosatellites are very affordable for low cost research and mission. Beside of its affordability, nanosatellites also easy to develop, even by undergraduate and school students. STMSat-1 built by St. Thomas More Cathedral School is the first nanosatellite made by elementary school with NASA's CubeSats Launch Initiative program (nasa.gov).

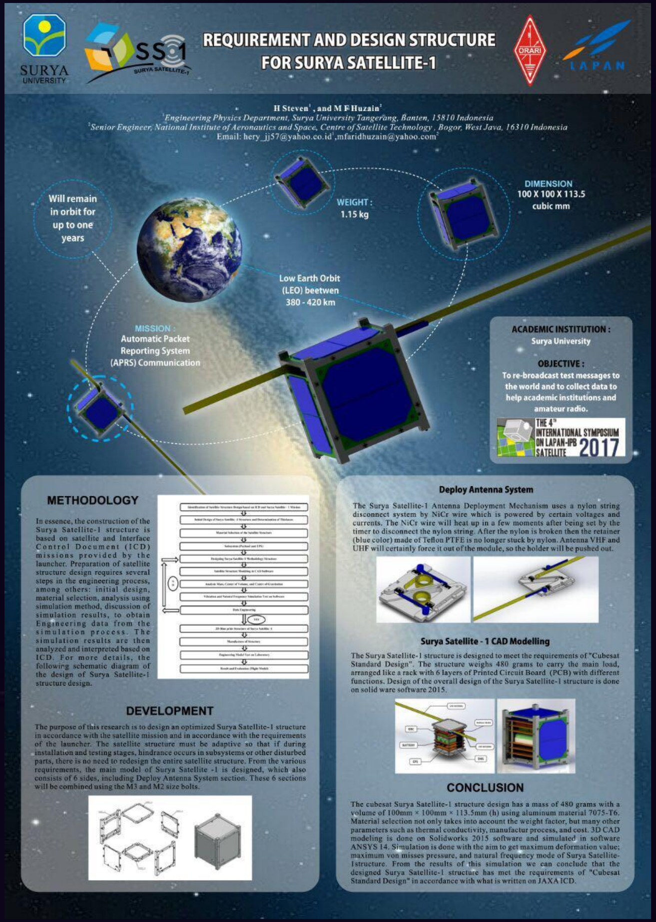
Nanosatellites have wide fields of application, the most common application is remote sensing (ref SpaceWorks). Remote sensing plays important role in early warning system for some disaster mitigation, such as land fire and drought, but not for disaster like earthquake (global fire EWS, NDMC). Because its large coverage area, nanosatellites usually use for remote sensing. Beside of remote sensing, communication also very important when disaster happens.

The first Indonesian nanosatellite developed by students, Surya Satellite-1, will contain APRS mission payload that is able to support both communication and remote sensing system infrastructure. When a disaster occurs in parts of Indonesia, with large area and lot of small islands, reliable and fast communication is required. Cause of its capability to become a simple communication when emergency situations occur and it has simple system design, we chose APRS communication as payload of Surya Satellite-1.

APRS (Automatic Packet Reporting System) is a communication protocol founded by amateur radio member, WB4APR, Bob Bruninga. It starts from a simple idea, to locate

International Conference

Presented at LISAT Conference

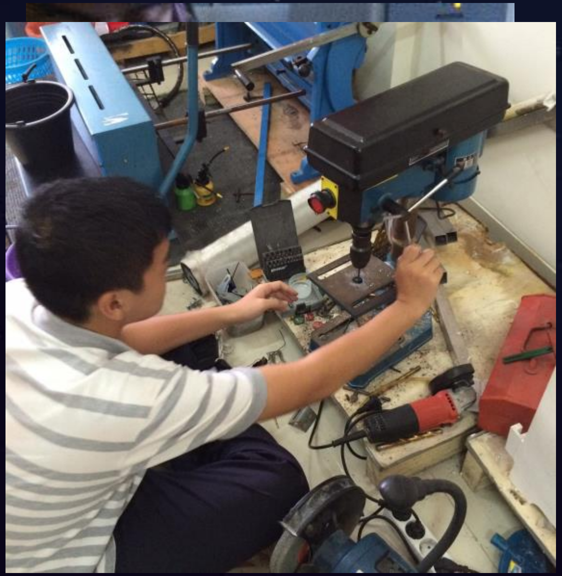


Manufacturing

SS1
SURYA SATELLITE - 1

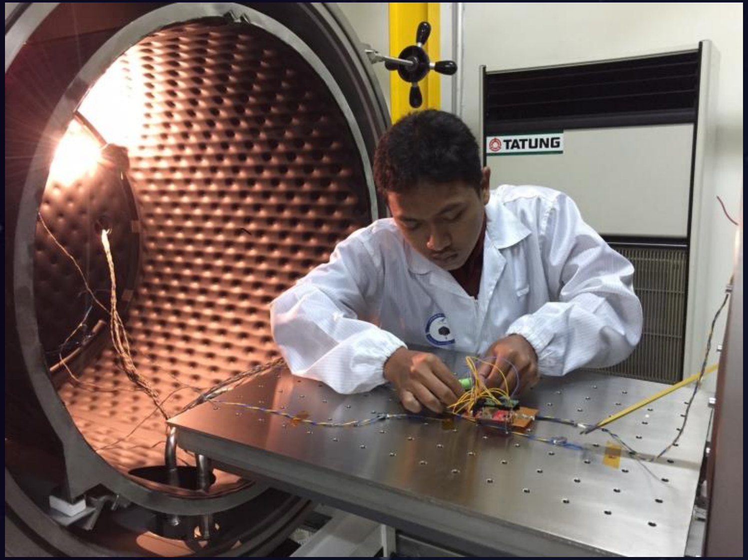


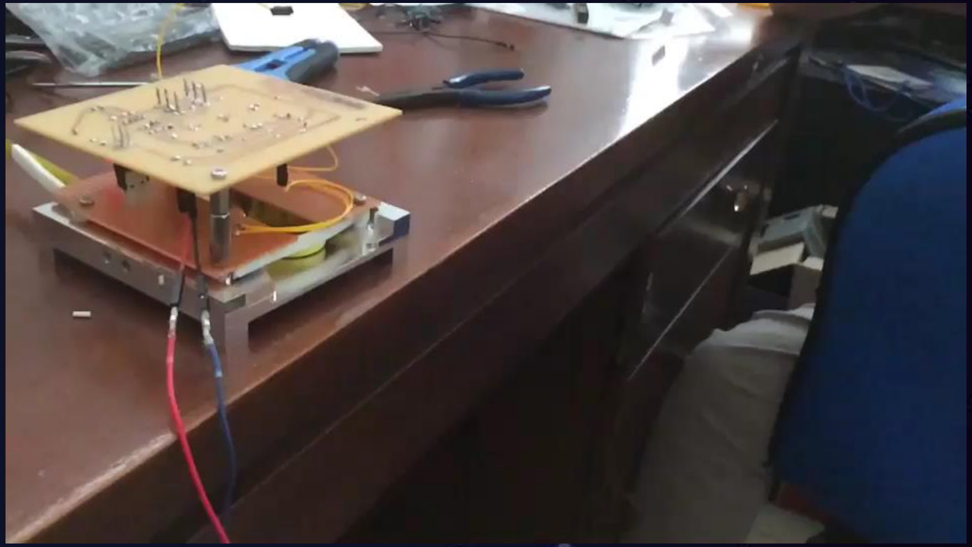


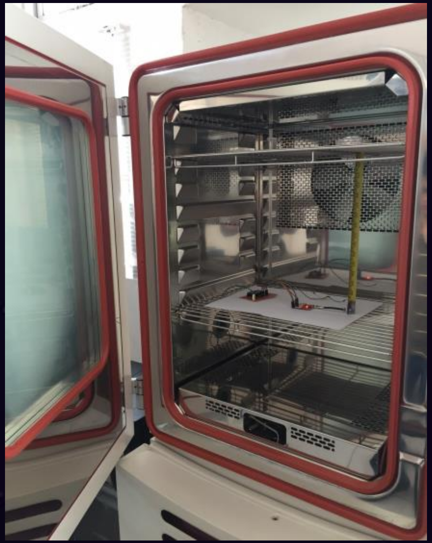



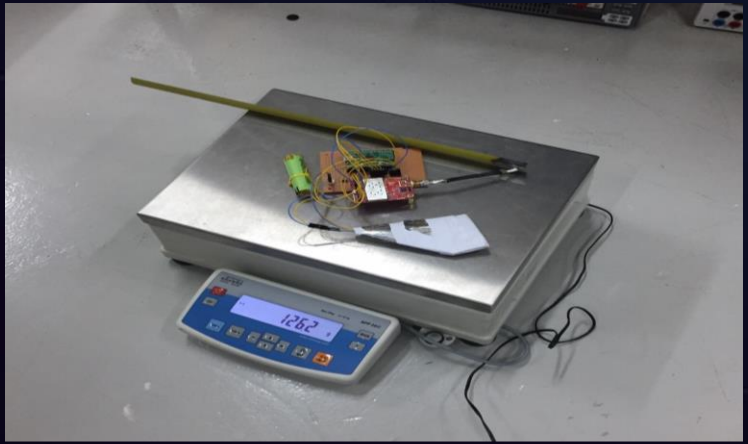


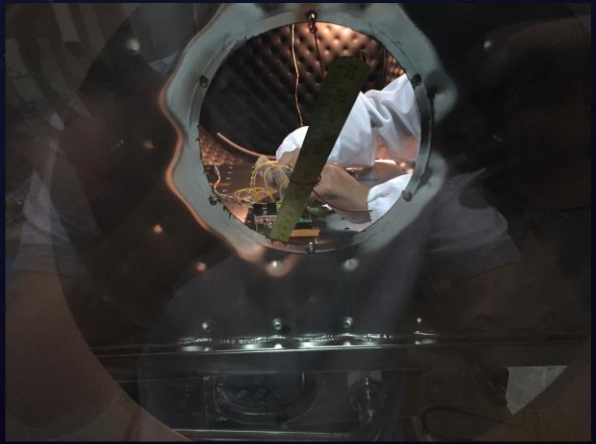
Testing Process



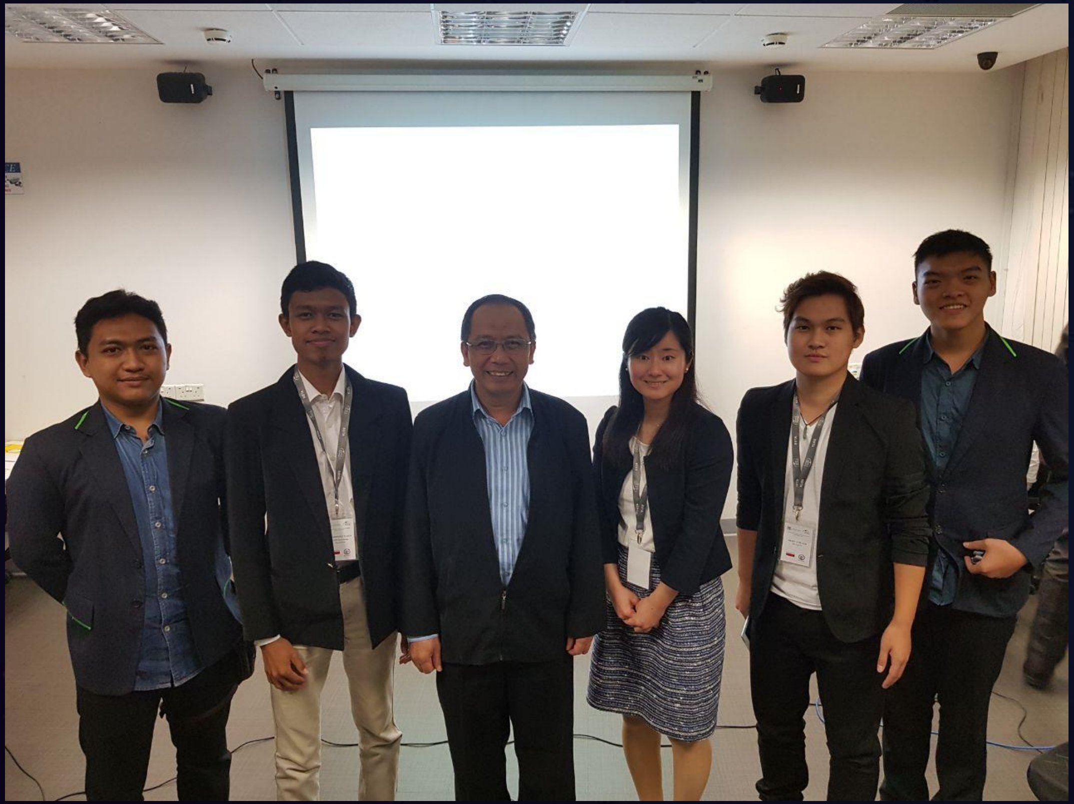








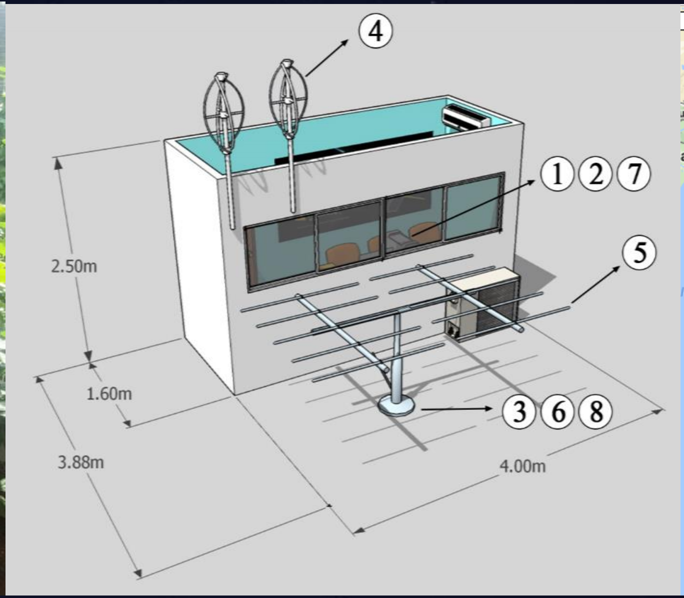
Coordination between Stakeholders

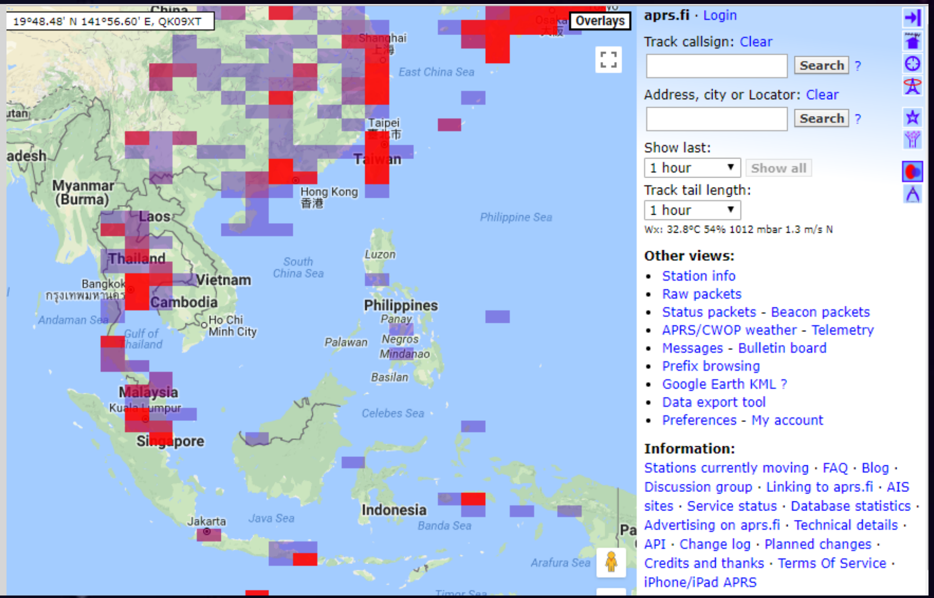


Meet with Chairman of LAPAN and UNOOSA Delegation
31 Jan 2018

Visit NUS Satellite Facilities
3 Feb 2018

Ground Station Development





Ground Station Development
Current location: LAPAN, Bogor

Future Design
Location: Great Western Resort Tangerang

Interconnected Amateur Station

Conclusion

"We are happy and ready to get this opportunity to launch our satellite with KiboCUBE Programme"

THANK YOU

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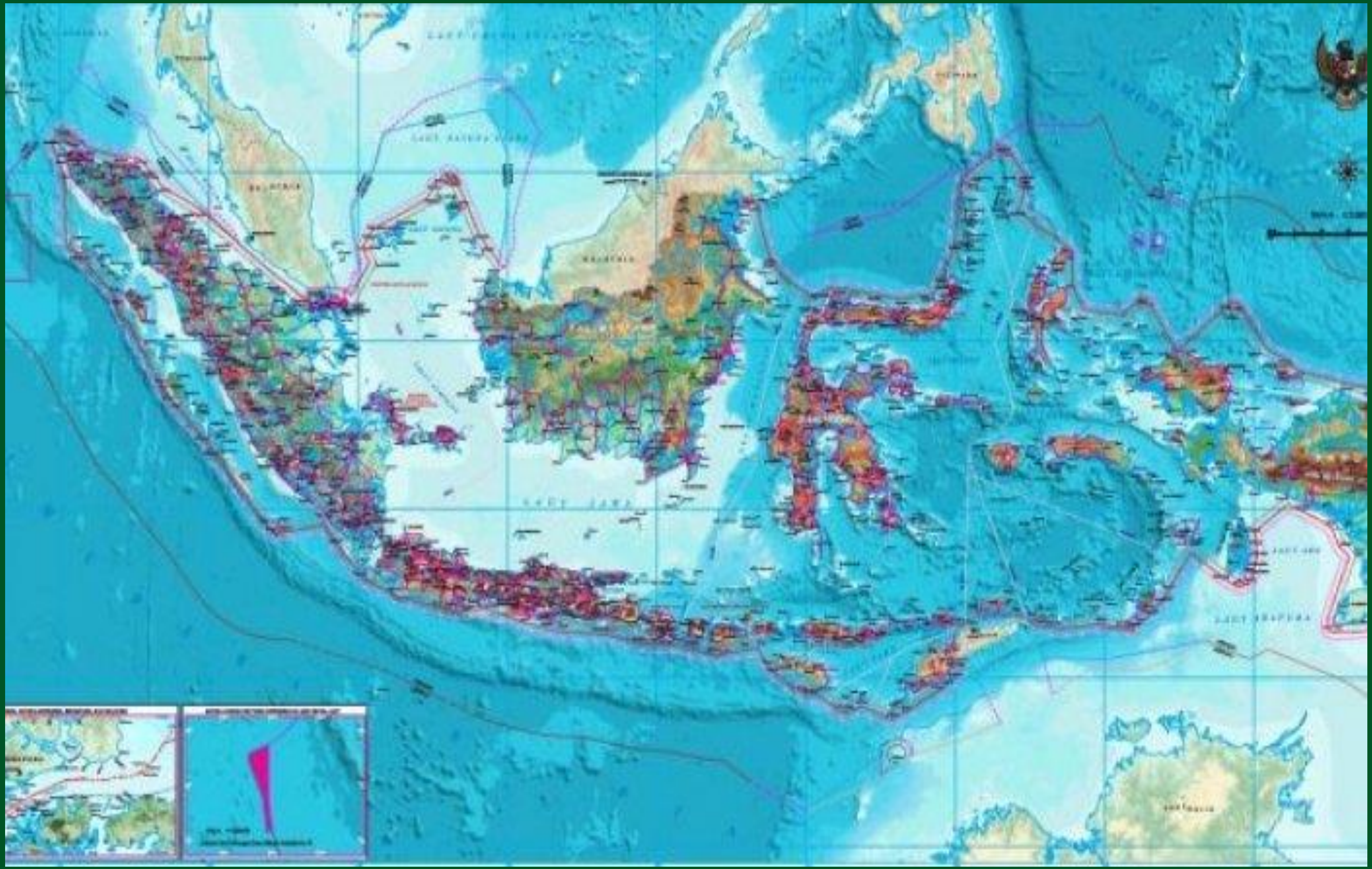
How can KiboCUBE contribute to Indonesia Space Development ?-1



INDONESIA ISLANDS		
No	PROVINCE	34
1.	Kep. Riau	2408
2.	Papua Barat	1945
3.	Maluku Utara	1474
4.	Maluku	1422
5.	Nusa Tenggara	1192
6	The rest 29 provinces	7061
Total islands		17504

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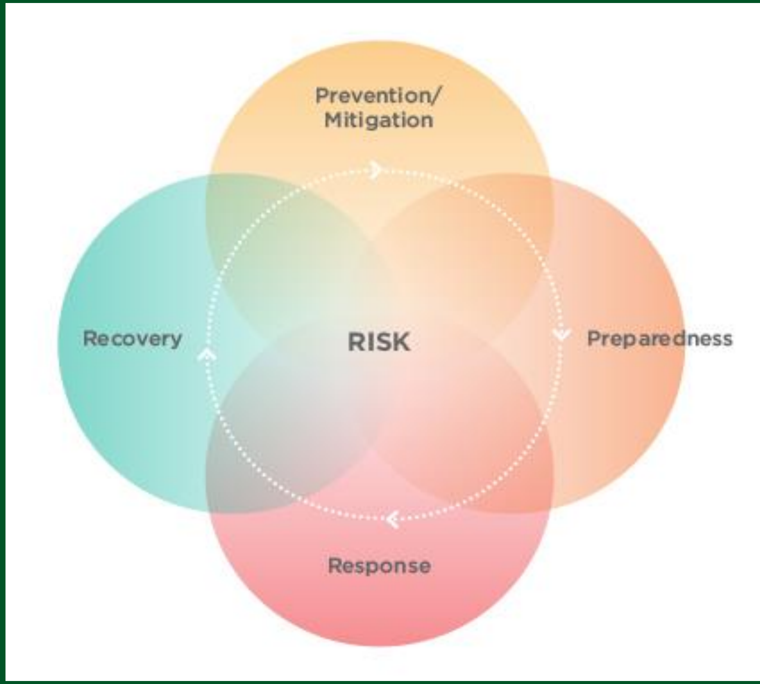
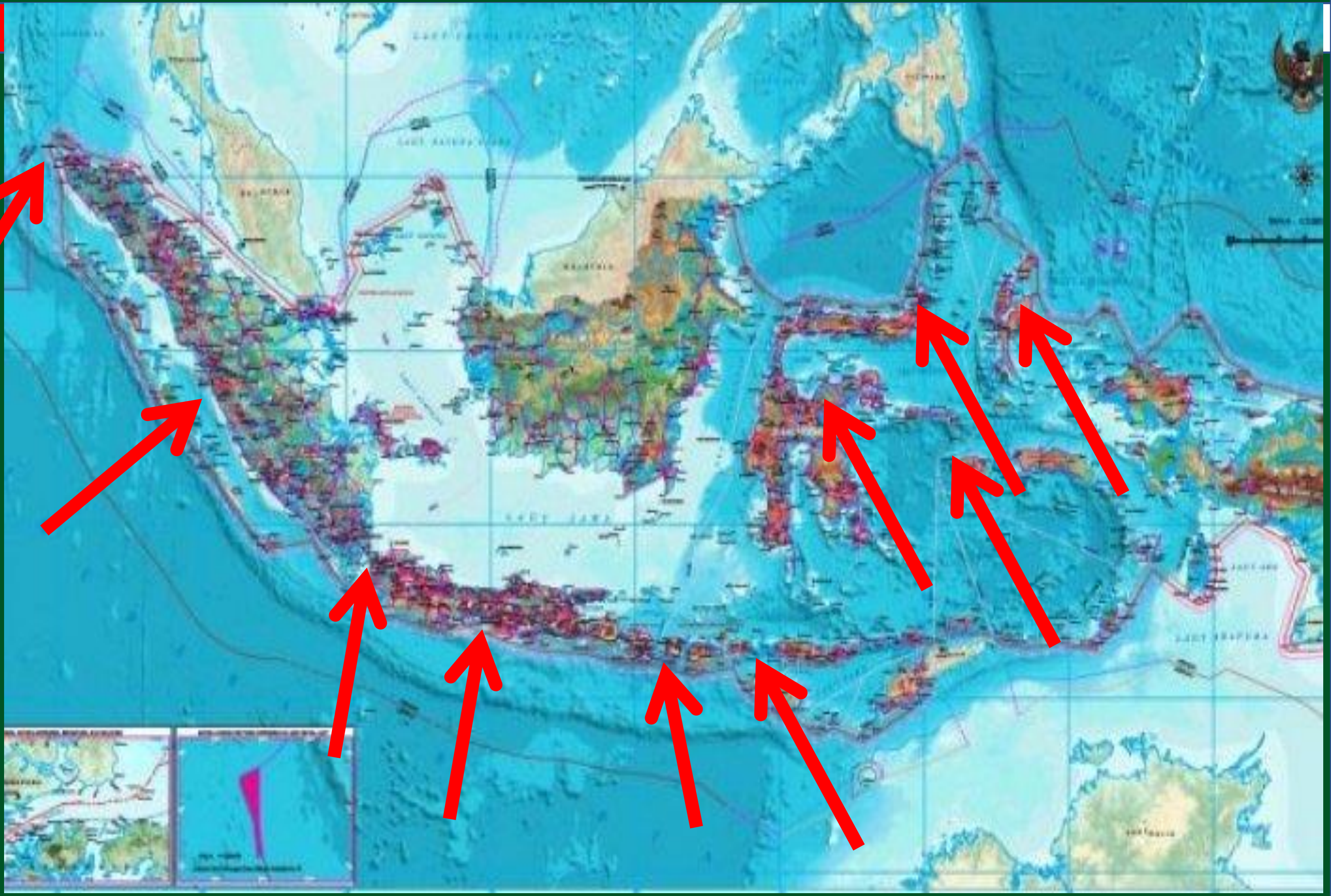
How can KiboCUBE contribute to Indonesia Space Development ? -2

DISASTER MANAGEMENT





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How can KiboCUBE contribute to Indonesia Space Development ? -3

This horse-shoe shaped ring is about 40,000km long and runs from Chile, northwards along the South American coast through Central America, Mexico, the west coast of the US and the southern part of Alaska, through the Aleutian Islands, the Philippines and Indonesia before curving back to New Guinea, the southwest Pacific islands and New Zealand.

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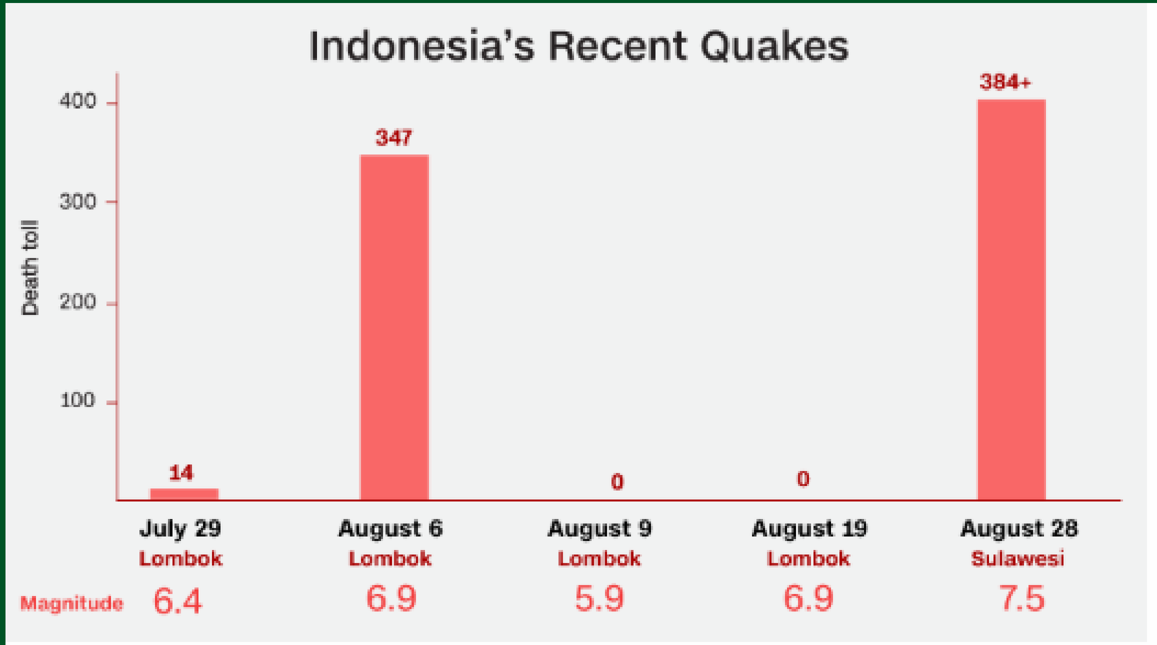
How can KiboCUBE contribute to Indonesia Space Development ? -4

Active volcanoes In Indonesia

How can KiboCUBE contribute to Indonesia Space Development ? -4



The quakes come a month after a trio of earthquakes hit several islands in the South Pacific and Indonesia, including Lombok, which is still recovering from the effects of an August 5 earthquake that killed more than 430 people.

CNN's Stella Ko contributed to this report.

CNN World » U.S. | Africa | Americas | Asia | Australia | China | Europe | Middle East | UK International Edition +

Rescuers race to reach survivors after Indonesia earthquake and tsunami rattled 2.4 million people

By Nicole Chavez and Mochammad Andri, CNN
Updated 0614 GMT (1414 HKT) September 30, 2018

News & buzz

Wikipedia entry for 'Devil's Triangle' changed to match...

Lindsey Graham may have single-handedly saved Brett Kavanaugh's...

Ad VfbW e.V. Hamburg

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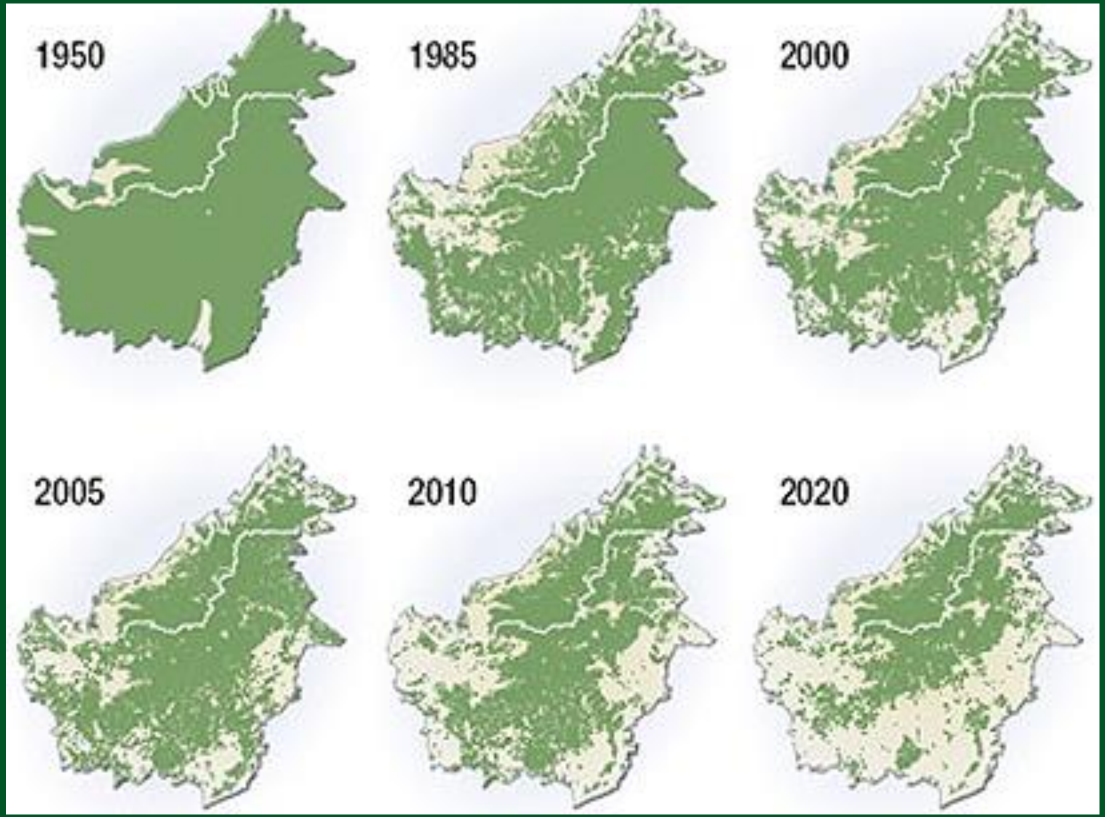
How can KiboCUBE contribute to Indonesia Space Development ? -5



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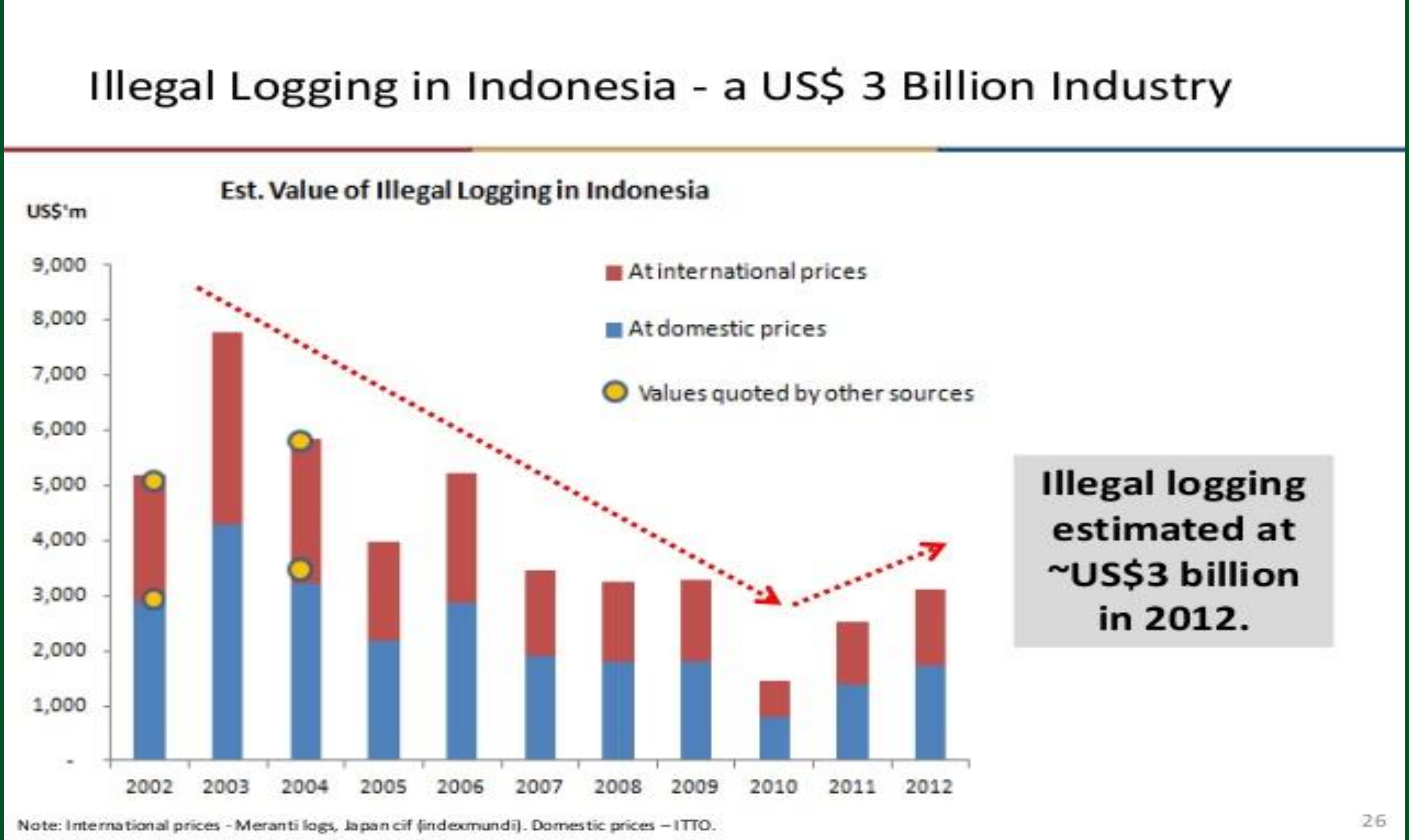
How can KiboCUBE contribute to Indonesia Space Development ? -6



How can KiboCUBE contribute to Indonesia Space Development ? -7

Illegal Fishing Costs Indonesia 3 Billion Dollars A Year

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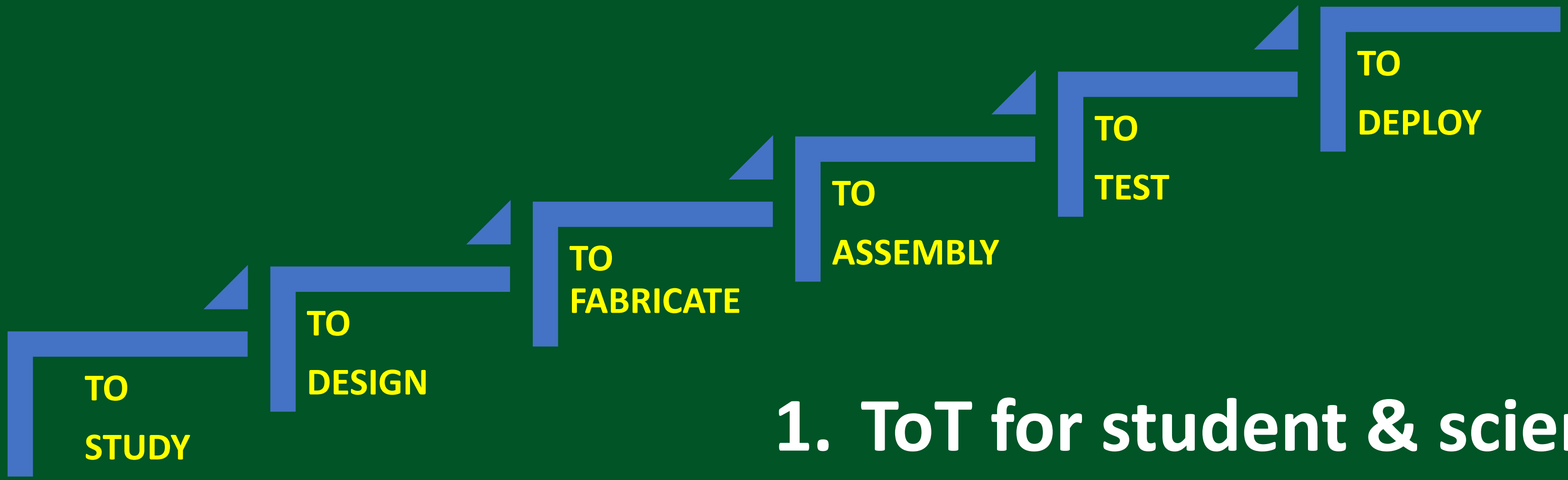
How can KiboCUBE contribute to Indonesia Space Development ? -8

Because KiboCUBE aims is to provide educational or research institutions from developing countries of United Nations membership with opportunities to deploy, from the ISS Kibo, cube satellites (CubeSats) which they develop and manufacture.



1. ToT for student & scientist
2. Space science & utilization course

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Our future mission after KiboCUBE

We will do our best, hand in hand with international [JAXA & UNOOSA] by doing and using space technology to take efforts to solve global environmental problems and reduce the environmental disaster which caused both, by human and nature.

MONITORING SATELLITE

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What do you expect from space agencies or related organizations from other nations, such as JAXA and UNOOSA ?

Guidance in technical aspects, especially in overcoming real future problems

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THANK YOU

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