



Indonesia

Mountain VIEWS

Mountain Volcanoes
Identification and Early Warning System



Indonesia

Telkom University Team Members



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01

MISSION OVERVIEW

02

CONCEPT OPS

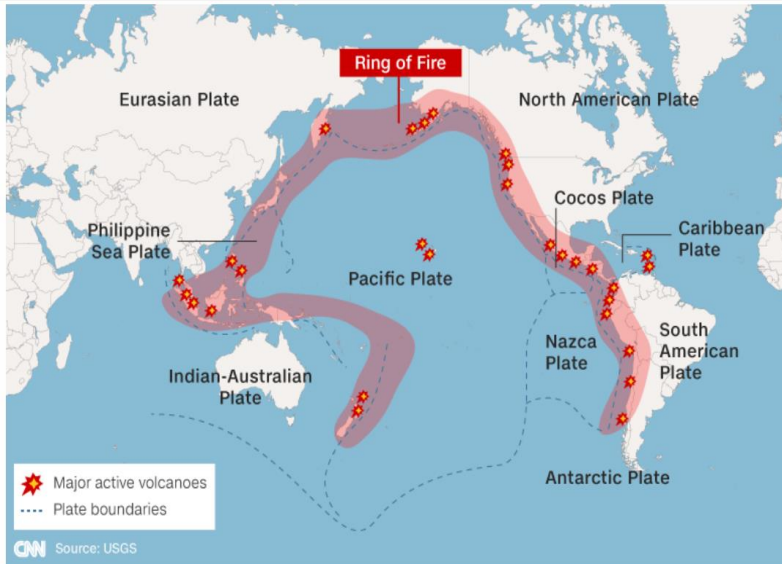
03

SPACE SEGMENT

04

CHALLENGE

The evolution of earth created a volcanoes chain along the pacific region called the **ring of fire**. Indonesia has **127 active volcano** and it has caused more than **427,997 volcanic eruptions** that damage more than **17,842 residence**, **6,988 ha of land**, **civil infrastructure**, and **fatalities** since 2011.





World Africa Americas Asia Australia China Europe India Middle East United Kingdom

Mount Sinabung volcano erupts in Indonesia, killing 7



Photos: Mount Sinabung erupts in Indonesia

Source: <https://edition.cnn.com/2016/05/22/asia/indonesia-mt-sinabung-volcano-erupts>

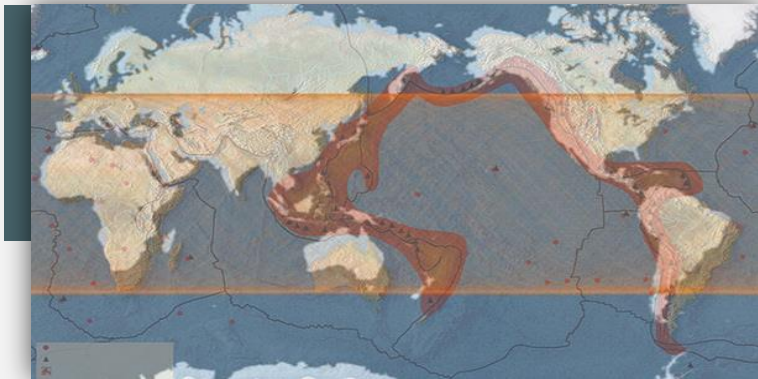
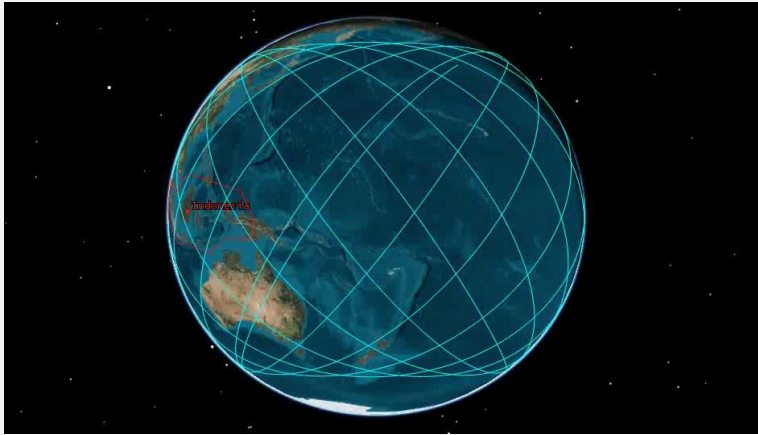
World Africa Americas Asia Australia China Europe India Middle East United Kingdom

Indonesia's Mount Agung volcano erupts



Source: <https://edition.cnn.com/2017/11/27/world/gallery/bali-volcano-erupts/index.html>

MISSION OVERVIEW



Average Revisit Time of ISS



Concept Operation

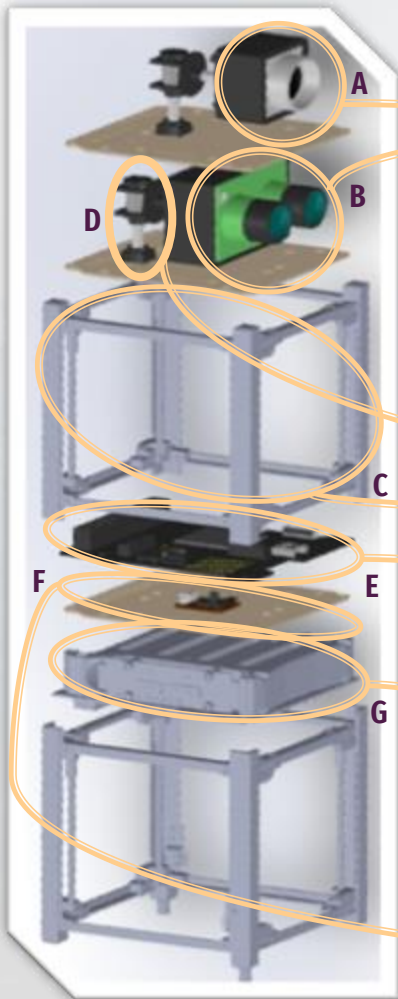
Propagator data compute the real-time satellite position, orbital parameter, thermal compared to the volcano coordinate autonomously.

Satellite applies a self-update configuration along with the ground periodic check.

Satellite provide the statistic of thermal data and volcano physical image.

Mountain VIEWS possibly carry on another objective in the other region

Mountain VIEWS Platform



Ultra wide range **thermal camera** and double lens of High-Definition **multispectral camera** payload



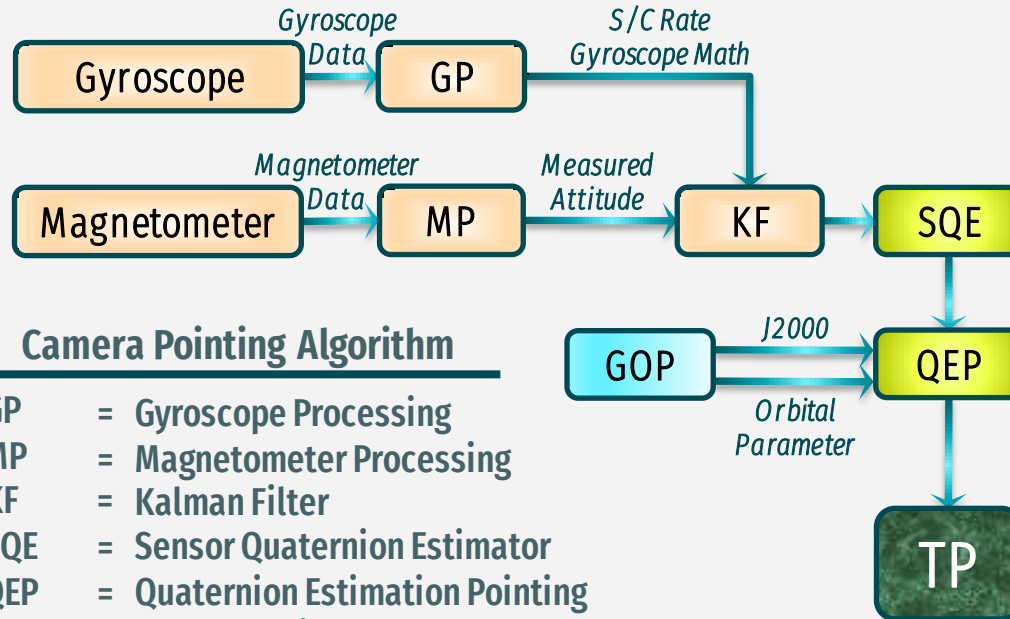
Space-Proven **2U Kit structure** and provide two axis **camera motor**



High endurance **OBC**, high precision **AOCS sensor**, and hot redundant **power supply unit** for bus components

Mountain VIEWS Propagator

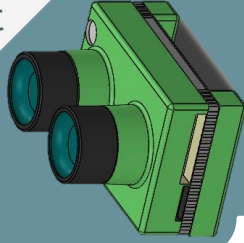
The computational program that processes the ISS position data and orbital velocity, compared to sensor data to control the camera orientation.



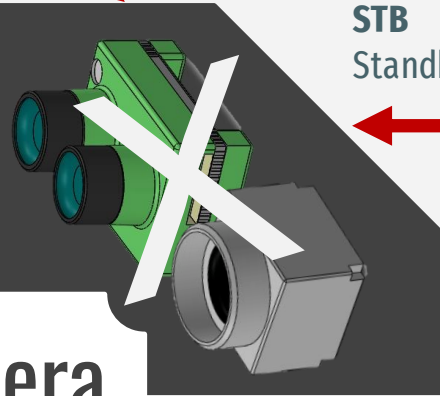
Camera Pointing Algorithm

- GP = Gyroscope Processing
- MP = Magnetometer Processing
- KF = Kalman Filter
- SQE = Sensor Quaternion Estimator
- QEP = Quaternion Estimation Pointing
- GOP = Ground Orbit Parameter
- TP = Target Pointing

AMTC
Autonomous
Multispectral without
Thermal Camera

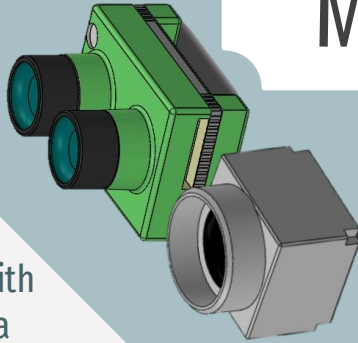


STB
Standby

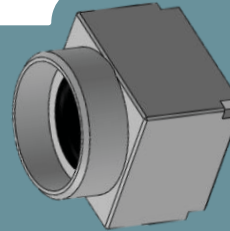


**Camera
Mode**

AMWTC
Autonomous
Multispectral with
Thermal Camera



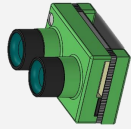
PTC
Possibly with or
without Thermal
Camera



←→ Commanded
←→ Automatic

SPACE SEGMENT

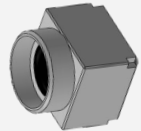
5



Multispectral Camera

The camera has resolution 4000 x 3000 pixels, 5 spectral bands on the sensor to adjust the wavelength and highspeed capture mode in mapping the volcanic condition and the extent of volcanic haze during the eruption

Flight Height (km)	FOV (°)	Pixel Size (um)	Focal Length (mm)	GSD (cm/pixel)	Coverage (m)
330	30°	1.55	11.56	4.42	177 x 133
400				5.36	215 x 161
460				6.17	247 x 185

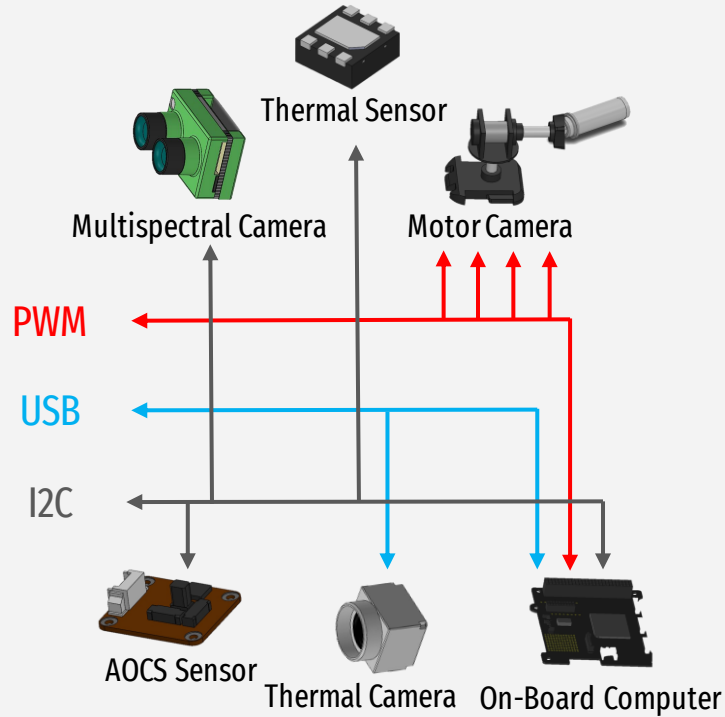


Thermal Camera

The camera can detect the temperature from -40 degrees to +600 degrees Celsius with a spatial resolution of 640 x 480 IR to ensure the precision of visualization and mapping of temperature distribution in 8-14µm wavelength.

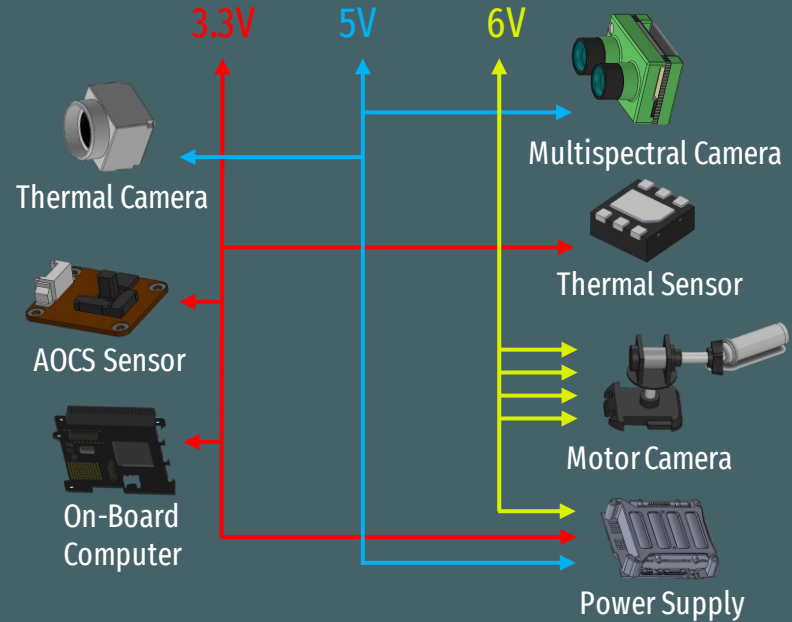
Flight Height (km)	FOV (°)	Pixel Size (um)	Focal Length (mm)	GSD (cm/pixel)	Coverage (m)
330	30°	12	14.33	34.26	219 x 164
400				41.52	266 x 199
460				47.75	306 x 229

Mountain VIEWS



Communication Interface

Interface



Power Interface

SPACE SEGMENT

7

Mountain VIEWS Specification

Components	Mass	NORMAL		1 CELL FAILURE	
		Standby	Operational (12 min)	Standby	Operational (12 min)
OBC	58 gr	1.155 Wh	1,155 Wh	1.155 Wh	1.155 Wh
Thermal Camera	55 gr	1.2 Wh	1.2 Wh	1.2 Wh	1.2 Wh
Multispectral Camera	80 gr	2 Wh	8 Wh	2 Wh	8 Wh
4x Motor Camera	106.4 gr	1.344 Wh	3.048 Wh	1.344 Wh	3.048 Wh
Magnetometer	8 gr	0.00825 Wh	0.00825 Wh	0.00825 Wh	0.00825 Wh
Gyroscope	2 gr	0.02013 Wh	0.02013 Wh	0.02013 Wh	0.02013 Wh
Thermal Sensor	2 gr	0.00001155 Wh	0.00001155 Wh	0.00001155 Wh	0.00001155 Wh
TOTAL Consumptions	-	5.73 Wh	13.43 Wh	5.85 Wh	13.43 Wh
Battery	310 gr	64 Wh	64 Wh	48 Wh	48 Wh
TOTAL Mass	621.4 gr	-	-	-	-
DOD	-	10%	21%	13%	28%

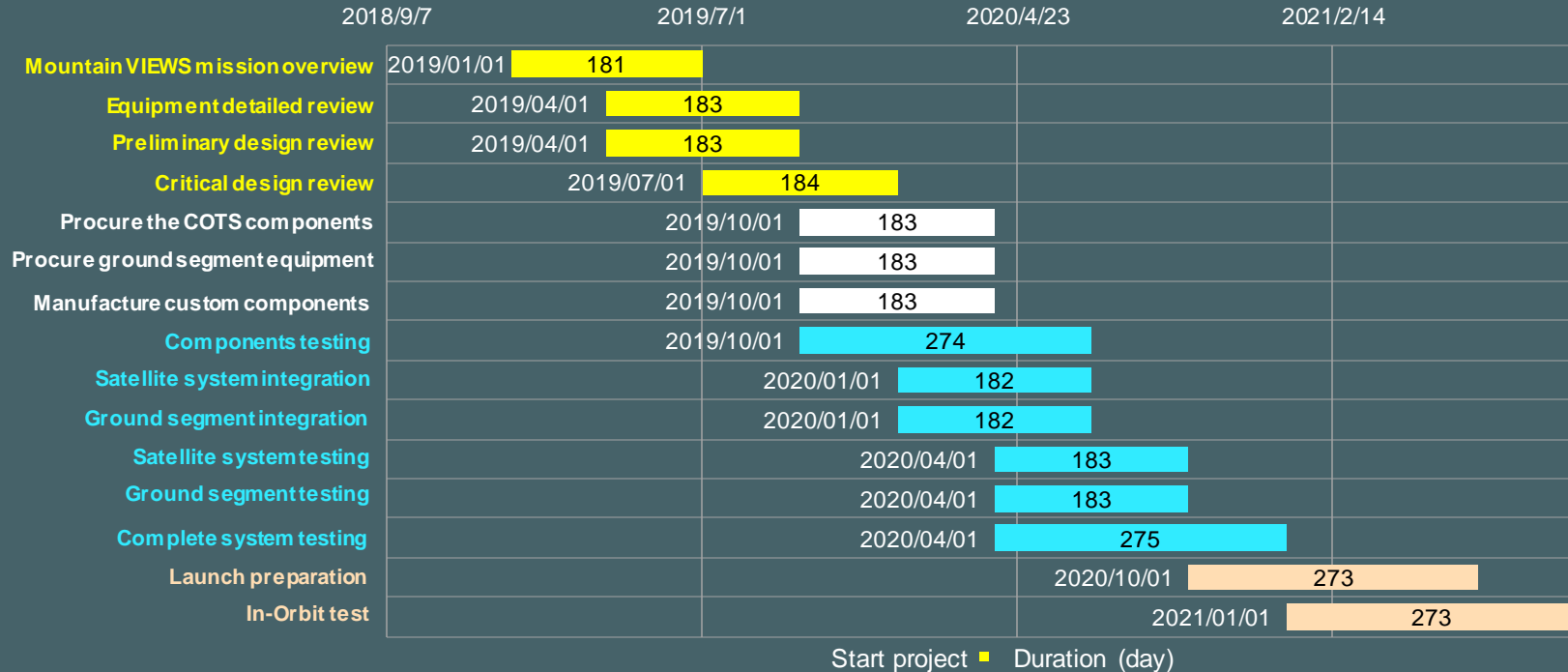
RISK ANALYSIST

Risk	Critically	Failure Detection Isolation and Recovery (FDIR)
System Failure	Critical	FDIR: Failed to run the satellite system, Safe mode. Check: Processor periodic check needed (heartbeat, temperature, data consistency, communication)
Bus Hardware Failure	High	FDIR: Failed to run the command or store the telemetry, due to an error in bus component Check: Internal equipment check (health check, temperature, communication)
Payload Hardware Failure		FDIR: Failed to run the command or store the telemetry, due to an error in payload component Check: Internal equipment check (health check, temperature, communication)
Software Anomaly	Medium	FDIR: Failed to process the command due to corrupt or error flag in OBC or Module Check: Monitoring data consistency, verify the telemetry and command
Power Anomaly		FDIR: Failed to generate enough power to module. Check: Monitoring the charge discharge ratio and battery cell condition

Collaborative Research

The realization of Mountain VIEWS takes about 3 years. The project is led by Telkom University satellite laboratory by involving Telkom University stakeholders and expert advisers

TIMELINE



Humanity above Smart Technology

- Ararkula MIC Team -

TERIMA KASIH

ありがとうございました

THANK YOU!



Ararkula MIC Team
Telkom University
Indonesia



THANKS TO