UNISEC STUDENT REPRESENTATIVE (MALAYSIA)

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UNISEC USM STUDENT CHAPTER

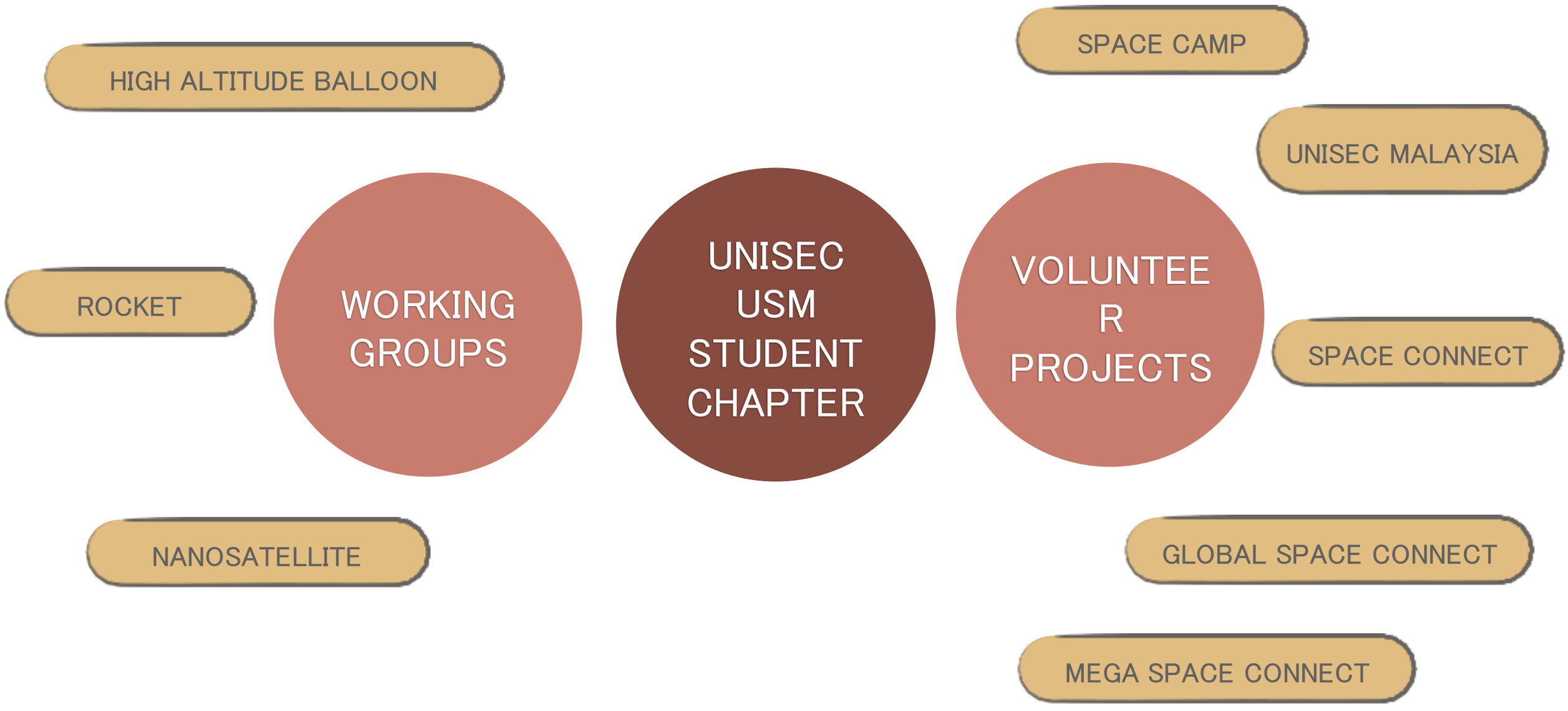
- Established in October 2019, with 25 fresh members

- Mentored by seniors from previously known as Space Crews, postgraduates students and Malaysia Space Initiative (MiSI).

- Start up alongside with other three universities — Universiti Islam Antarabangsa (UIA), Universiti Teknologi MARA (UiTM), Universiti Putra Malaysia (UPM)

- Making up to almost 100 fresh members in UNISEC Malaysia comprise of a balance ecosystem between students, lecturers, researchers, private companies and government bodies.

HOW DO WE GO ABOUT?



SUSTAINABLE DEVELOPMENT GOAL (SDG)

ONGOING RESEARCH

DEVELOPMENT OF ADCS FOR MYSAT

INTRODUCTION

MISSION OVERVIEW

Natural Disasters in the South East Asia (SEA) impacts to the socioeconomics

1

2

By studying the ionosphere, these data can be used as a disaster management

Parameter studied :

1. Electron Density
2. Temperature
3. Magnetic Field

3

4

This data is further disseminated for the use of local and global researchers.

MISSION CONCEPTS AND REQUIREMENTS
MISSION OBJECTIVES

MEASURE
Electron-Density

DEVELOP
Capabilites in Building a Nanosatellite

PREPARE
Future Space Professionals

MOTIVATE
To work in the Field of Space Technology

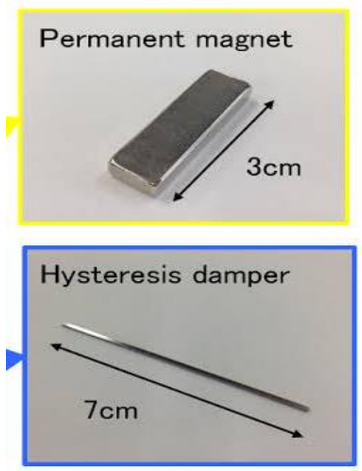
SUBSYSTEM DESIGN
PAYLOAD AND OBDH SYSTEM

ELECTRON DENSITY AND TEMPERATURE PROBE (TENEP) SCIENCE UNIT	
Function	1. Measure the floating potential shift between two probes 2. Determine the electron temperature and density
Data Collection	Rate collected on orbit : 1394 bit/s
Developer	1. Plasma and Space Science Center, National Cheng Kung University 2. Redeveloped by : USM Space System Lab
Dimension	1. Circuit Board : 10cm x 16cm 2. Disk Electrode Diameter : 10 cm
Power	900 mW
Mass	200g

SUBSYSTEM DESIGN
ATTITUDE DETERMINATION CONTROL SYSTEM

Motivation

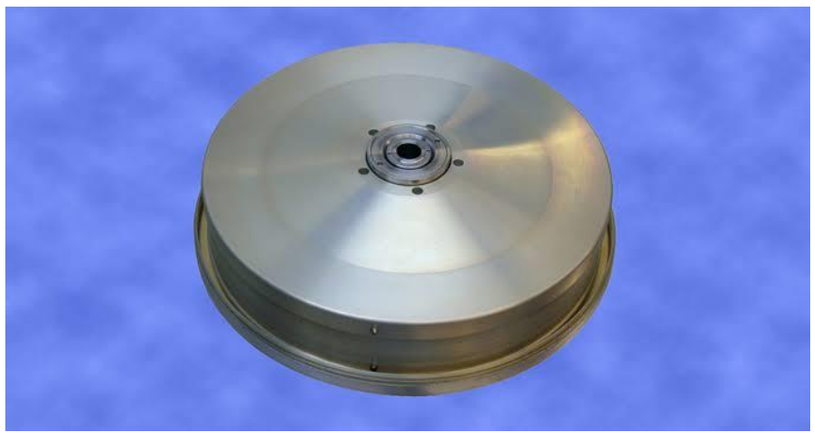
Low cost, Limited Performance, Simple



Permanent Magnet and Hysterisis Rod

Magnetorquer

High cost, Robust Performance, Complex



Reaction Wheel

SUBSYSTEM DESIGN
ATTITUDE DETERMINATION CONTROL SYSTEM

DEVELOPMENT OF ADCS FOR MYSAT	
Requirements	1. Stabilizes the MYSat upon launching 2. Controls the attitude despite external disturbances torques act on it
Disturbance Environment	1. Gravity-gradient disturbance 2. Magnetic torque disturbance 3. Aerodynamic disturbance
Mass and Power Budget	1. +/- 100g 2. No power consumption
Control Actuator	Permanent Magnet and Hysterisis Damper
Lifetime Limits	Almost to none
Attitude Maneuverability	Very limited
Pointing Options	North or South pointing

SUBSYSTEM DESIGN
ATTITUDE DETERMINATION CONTROL SYSTEM

Take advantage of magnetic field alignment

Inclination 51.74 degree, 380-420km

Requires to make about 10 days settling time to **B** +/- 20 degrees

Hardware :

1. Permanent Magnet - Restoring Torque
2. Hysterisis Rods - Dampening Torque

Performance :

1. Alignment = +/- 15 Degrees of **B**
2. Settling time 1-2 Weeks

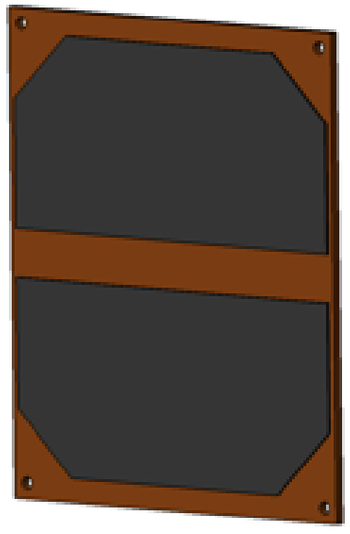
SUSTAINABLE DEVELOPMENT GOAL (SDG)

THANK YOU FROM UNISEC MALAYSIA!

SUBSYSTEM DESIGN

POWER SYSTEM

SOLAR CELL TYPE
Hexagonal GaAs Solar Cell
Efficiency: 30.32%



SOLAR POWER
- Total Power: 6.76 W
- Per Panel: 1.69 W

AREA
Per Cell (8 Cell): 34.69 cm2

BATTERY CAPACITY
839.14 mAh

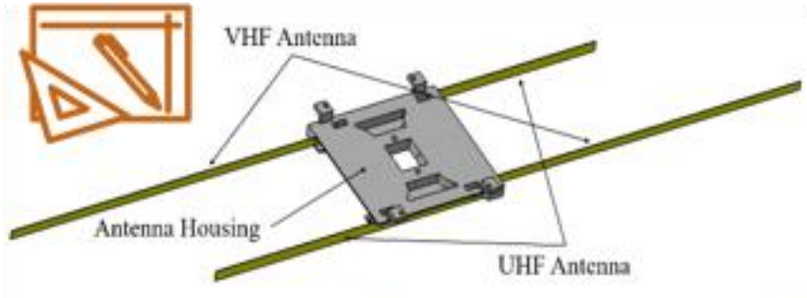
SOLAR POWER VS AREA

Cell Shape	Maximum (W)	Mean (W)
Hexagon	3.46	1.65
Square	2.81	1.34
Triangular	2.82	1.35

Solar power clearly affected by cell area

SUBSYSTEM DESIGN

COMMUNICATION SYSTEM



ACCESS DURATION

Max. : 10.64 min

Min. : 0.41 min

Mean : 8.31 min

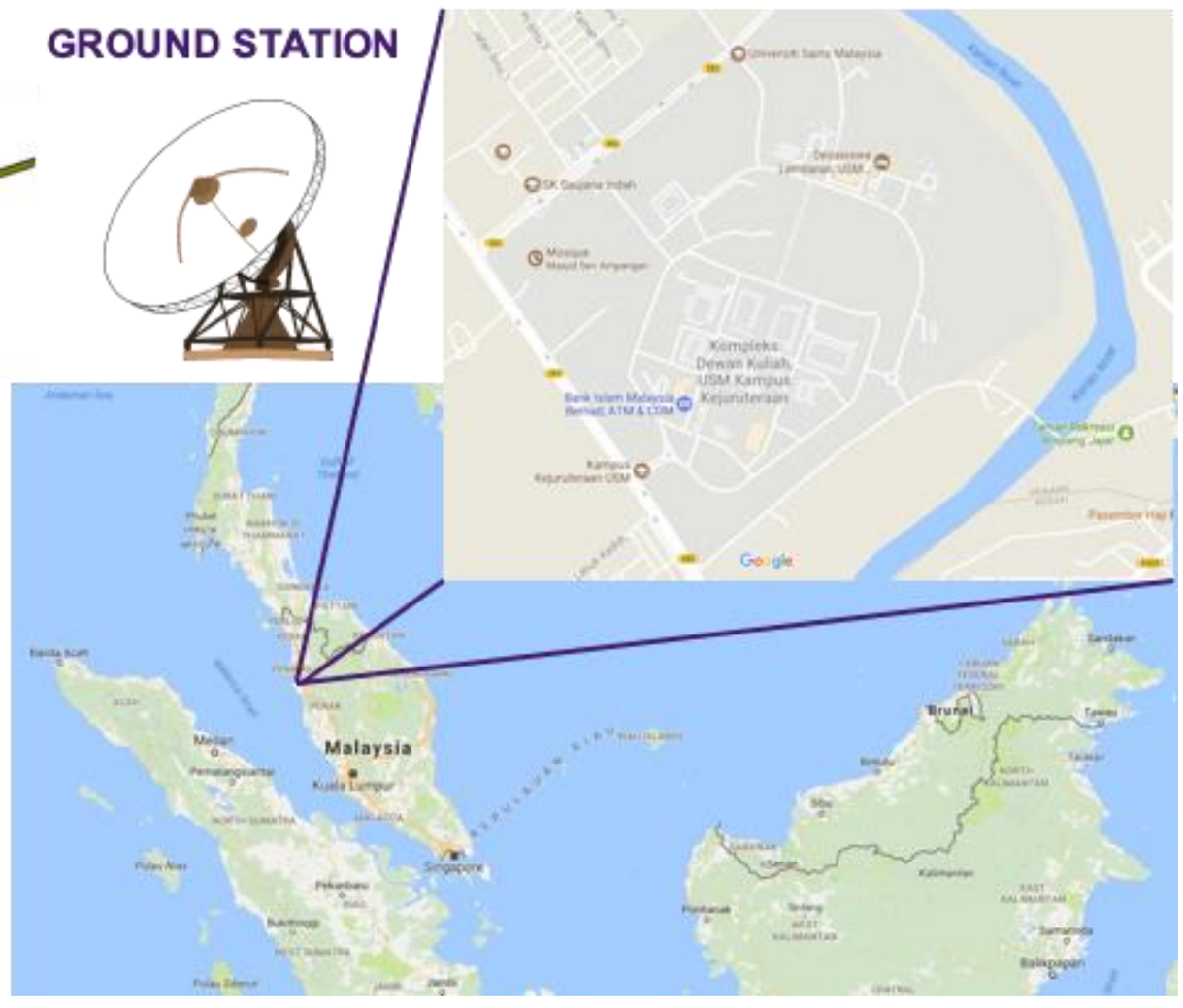
CONTACT

4 ~ 5 times per day

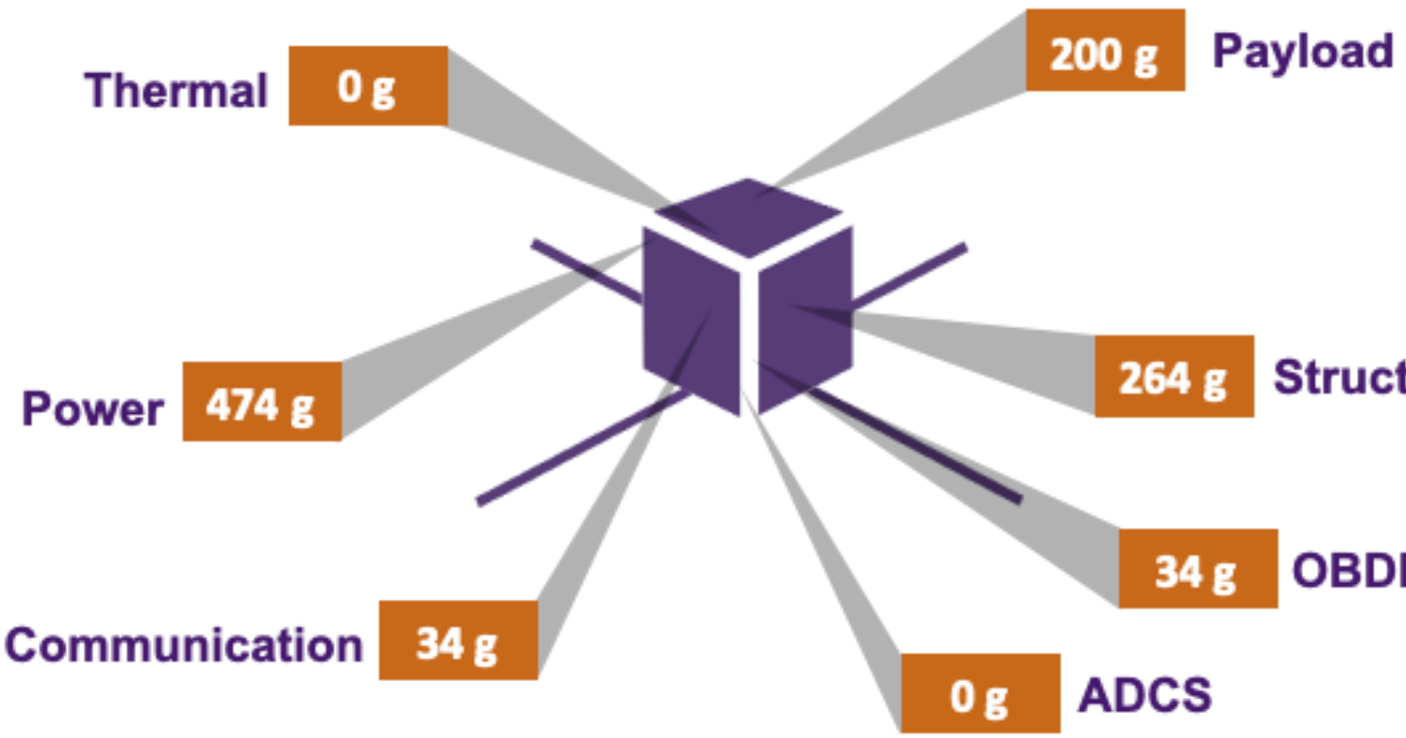
LINK BUDGET

Uplink Margin (dB): 42.31

Downlink Margin (dB): 23.58



SUBSYSTEM DESIGN
STRUCTURE SYSTEM



Passive Thermal Technique

No Attitude Control

Total Mass ~ 1 kg

Center of Gravity (mm) (-1.158, 1.154, -1.380)