MicroDragon: a Vietnamese Ocean-observation Microsatellite Based on Hodoyoshi Architecture

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Outline

- Space Education Program (Vietnam-Japan)
- MicroDragon Satellite Overviews
- Conclusion

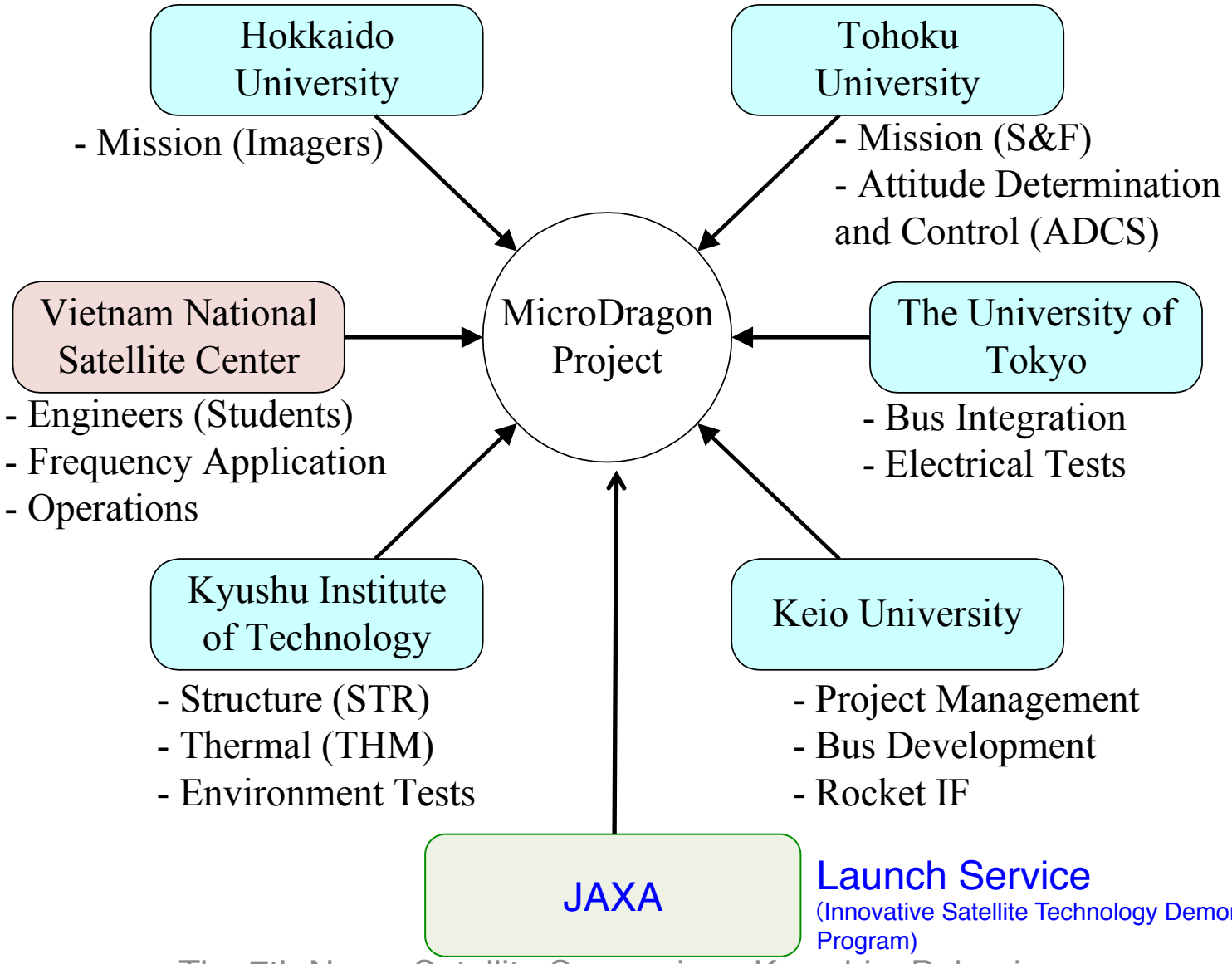
Space Education Program

- Four-year capacity building（2013/9-2017/9）
- 36 staff members from VNSC (Vietnam National Satellite Center) to study in Master program in Japan
- Develop a microsatellite MicroDragon (MDG)

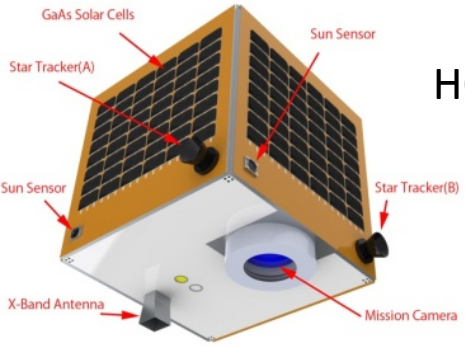
Motivations

- Vietnam's Space Technology Development Roadmap:
  - 1U CubeSat PicoDragon (2013 ISS)
  - 3U CubeSat NanoDragon (proj. 2016)
  - Small Earth Observation Satellite LOTUSat (proj. 2019)
- Advance in Technology from both development and and utilization perspectives

MDG Project Context

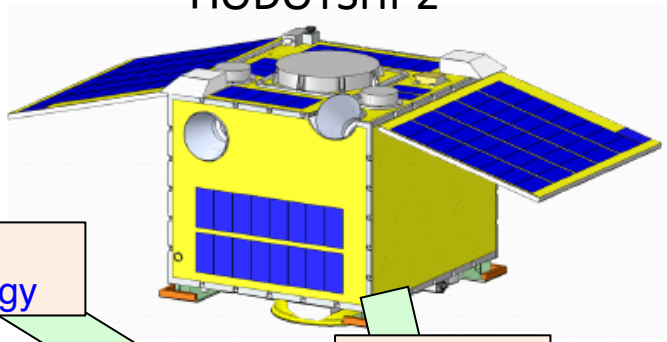


HODOYOSHI Evolution

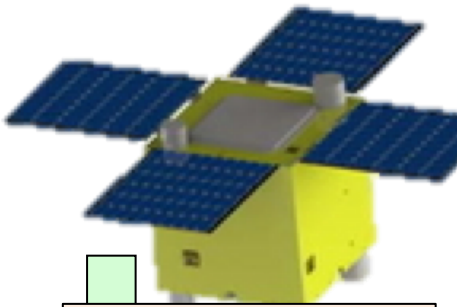


HODOYOSHI-1

HODOYSHI-2



PROCYON

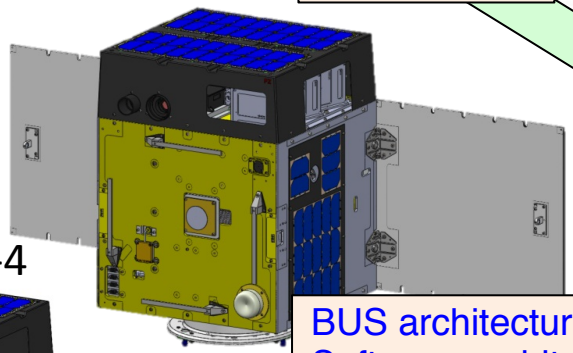


ADCS Technology

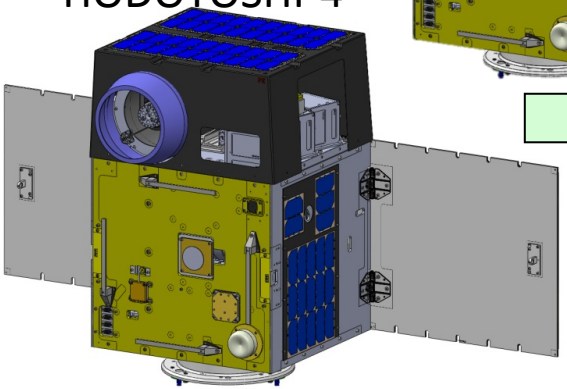
Mission Payloads

Improved software architecture

HODOYOSHI-3

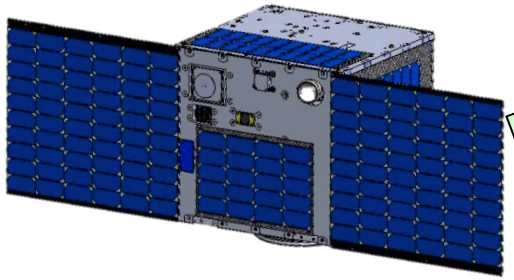


HODOYOSHI-4



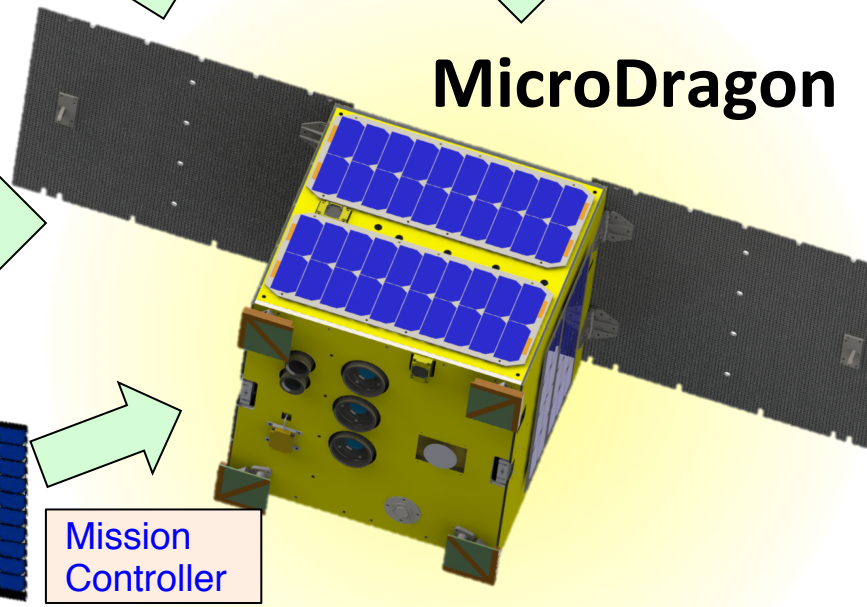
BUS architecture
Software architecture

UNIFORM-1



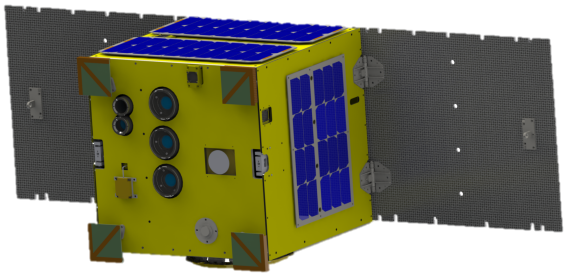
Mission Controller

MicroDragon



MDG Specs

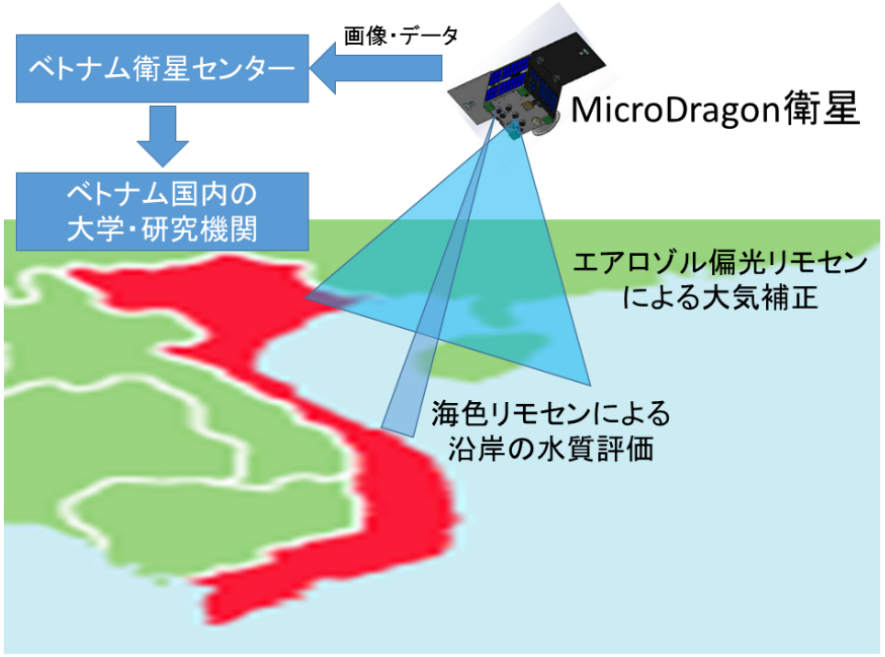
Size	approx. 0.5 m ×0.5 m × 0.5 m (stowed) approx. 1.4 m (SAP deloployed)
Mass	approx. 50 kg
Orbit (Planned)	SSO 500 km LTDN 9:30
ADCS	Three-axis Earth Pointing
EPS	Solar Cells 2x Solar Array Paddles (SAPs) + 5x Body Mount Cells
	Generation 100 W (max) Consumption 50 W (avg) Bus Voltage 28V (unreg) + 5V (reg) Battery 5.8AH Li-ion
COM	S-band 4kbps （CMD） S-band 4/32/64kbps（TLM） X-band 10Mbps（Mission）

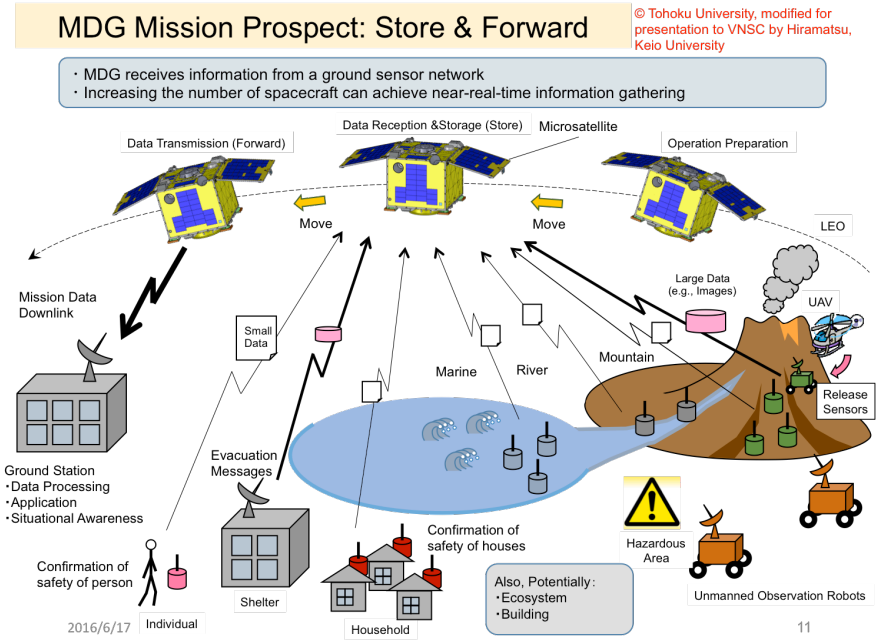


MDG Missions

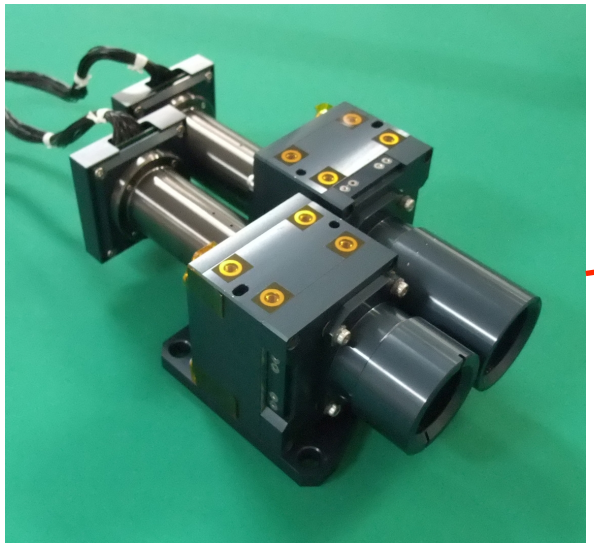
Mission	Ocean Color Remote Senging (Hokkaido U) Store & Forward (Tohoku U) Antimony Tin Oxide Coating Solar Cell (Kyutech) Atomic Oxygen Effect Characterization (Kyutech)

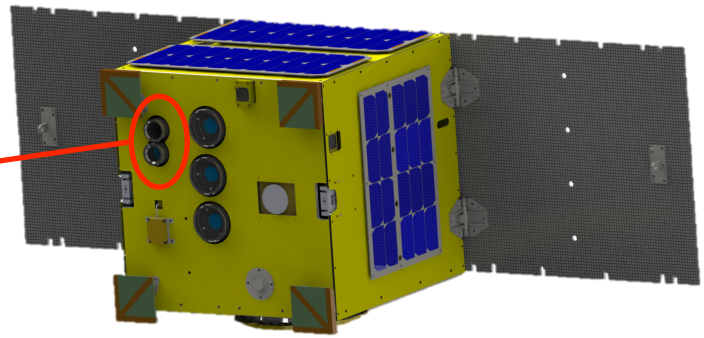
Student Research





Mission Payload: SMI

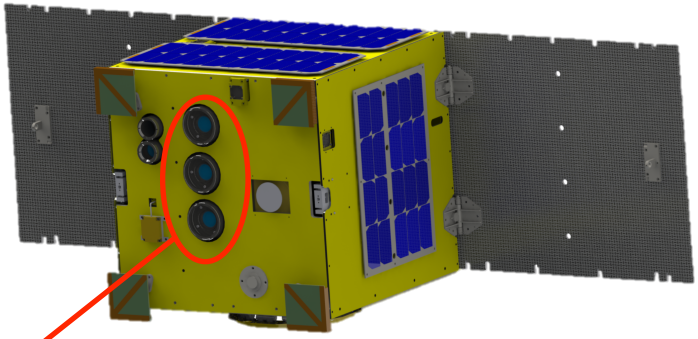


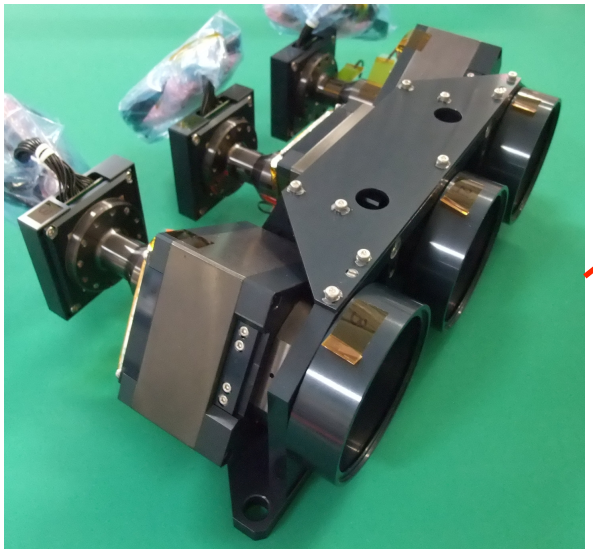


- Ocean Color Remote Sensing using Spaceborne Multispectral Imager
  - Multispectral Imaging using Tunable Bandwidth (based on RISING-2 & DIWATA-1)
  - From ocean color analyze the amount of alpha-chlorophyl from plankton
  - Applied for Marine Utilization

Mission Payload: TPI

- Aerosol Observation using Triple Polarization Imager

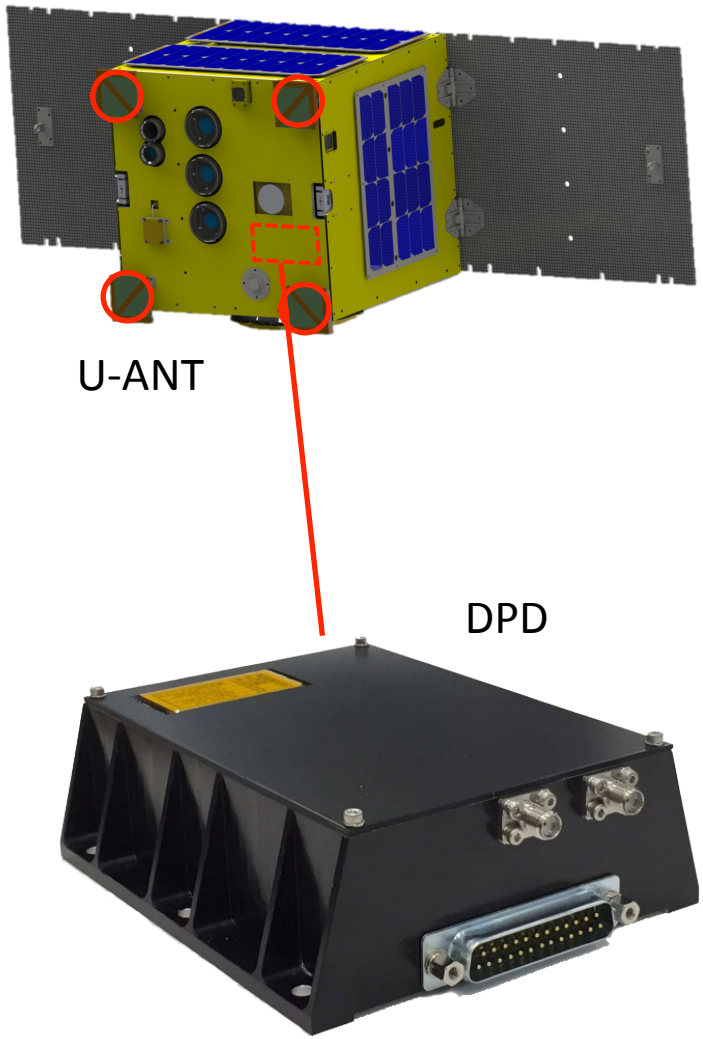




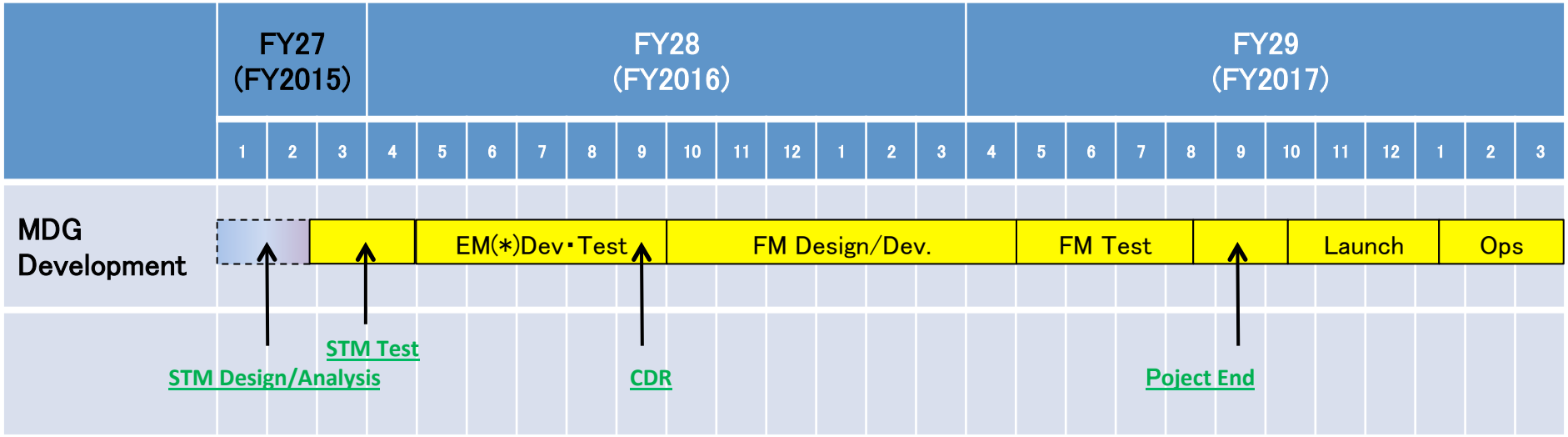
- Aerosol observation can be used for atmospheric correction of ocean color remote sensing
- May contribute to other applications
  - Global warming estimation

Mission: Store & Forward (S&F)

- Collect data from ground sensors
- Supplement Ocean Observation
- Possibility of other applications
  - Disaster Monitorin
- Potential Collaboration
  - S&F network with Hodoyoshi satellites



Schedule


FY27
(FY2015)
FY28
(FY2016)
FY29
(FY2017)
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3
MDG
Development
EM(*)Dev・Test
FM Design/Dev.
FM Test
Launch
Ops
STM Design/Analysis
STM Test
CDR
Poject End

Project Status

As of October 2016

- Bus Components Procurement – Completed
- Mission Payloads EM - Completed
- Structural Design – To be Completed by 2016
- Flight Software Development – Ongoing

Coming up Next

- Development of FM – Begin 2016
- Finish FM Test Campaign – Summer 2017
- Delivery to JAXA – End of 2017 (TBD)

Conclusion

- Vietnamese Young Engineers and Japanese University Researchers work together to develop a microsatellite
  - Assist Vietnam's Strategy in Space Technology Development
  - Based on Flight-Proven Hodoyoshi Satellite Architecture
  - To be completed by Sept. 2017
- Expected to be a model case of Japanese international collaboration
  - Potential of Further International Collaboration Opportunities
  - Enhance Microsatellite Components Supply Chain


THANK YOU