

*6th Virtual
UNISEC-Global Meeting*

New Directions of MELCO Space Business

20th, February 2021

Mitsubishi Electric Corporation(MELCO)
Electric Systems Group, Fellow
UNISEC Advisory Board Member

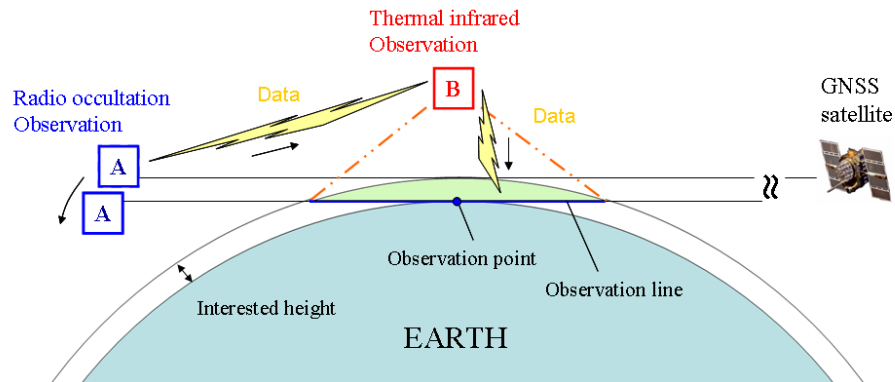
Hiroshi Koyama

■ Winner of Nano-satellite Constellation Mission Idea Contest(MIC)

“Integrated Meteorological / Precise Positioning Mission Utilizing Nano-Satellite Constellation”

Yuki SATO & Munetaka KASHIWA

Mitsubishi Electric Corporation, Advanced Technology R&D Center



■ MELCO supports following UNISEC Activities

- 6th UNISEC Global Meeting(2018)
- 7th UNISEC Global Meeting(2019)
- UNISEC Space Job Fair(2019)
- UNISEC Space Job Fair(2020)

■ MELCO supports UNISEC as Advisory Board Member

Communication

- MELCO established strategic standard Geosynchronous platform “DS2000”
- Chosen as the prime contractor for
 - E’s hail-2(Qatar)
 - Türksat-4A/4B (Turkey)
 - ST-2 (Singapore/Taiwan)
 - Superbird C2 (Japan) ...and others.

Superbird-C2



Türksat-4A/4B

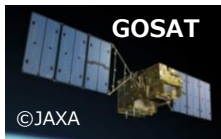


Es'hail 2



Earth Observation

- Earth Observation from Low Earth Orbit using optical or SAR sensors
- Chosen as the prime contractor for
 - GOSAT : greenhouse gases monitoring
 - ALOS-2/3: disaster surveillance
 - “Himawari 7/8/9”: meteorological
 ...and others.



Navigation

- 4QZSs, 24hrs service has started from 2018, 7QZSs, self-contained navigation service, will start from 2023
- Chosen as the prime contractor for
 - 1st QZS(Michibiki)
 - 1stFollow On, 2nd-7th QZS



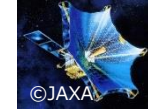
Space Exploration

- Astronomy using space telescope, VLBI etc.

Solar-B



MUSES-B



- Ground based telescopes



- H-II Transfer Vehicle(HTV)



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SAR :Synthetic Aperture Radar
 VLBI :Very Long Baseline Interferometry
 TMT :Thirty Meter Telescope
 ALMA :Atacama Large Millimeter/submillimeter Array

New Solutions using High Precision Navigation

- QZSS is a Japanese regional satellite positioning system
- QZSS unique function
 - **Positioning Augmentation** : QZSS provides **Centimeter Class Augmentation (CLAS)**
- MELCO promotes utilization of High Precision Navigation signal, CLAS
- To realize High Precision Navigation Society, New Solutions are under investigation using 3 core technology, QZSS(CLAS), CLAS User Terminal and 3D Digital Map

QZSS(CLAS)

- To provide CLAS compatible signal in worldwide way, "Sapcorda* Services GmbH" has been established
- * Safe And Precise CORrection DAta



CLAS User Terminal



3D Digital Map

- **Dynamic Map Platform Co.Ltd. (DMP)** has established in 2017 to provide and update "Dynamic Map" for Japanese highways.



Dynamic Map

- Create new solutions using CLAS

Automated Driving Agriculture



Snowblower



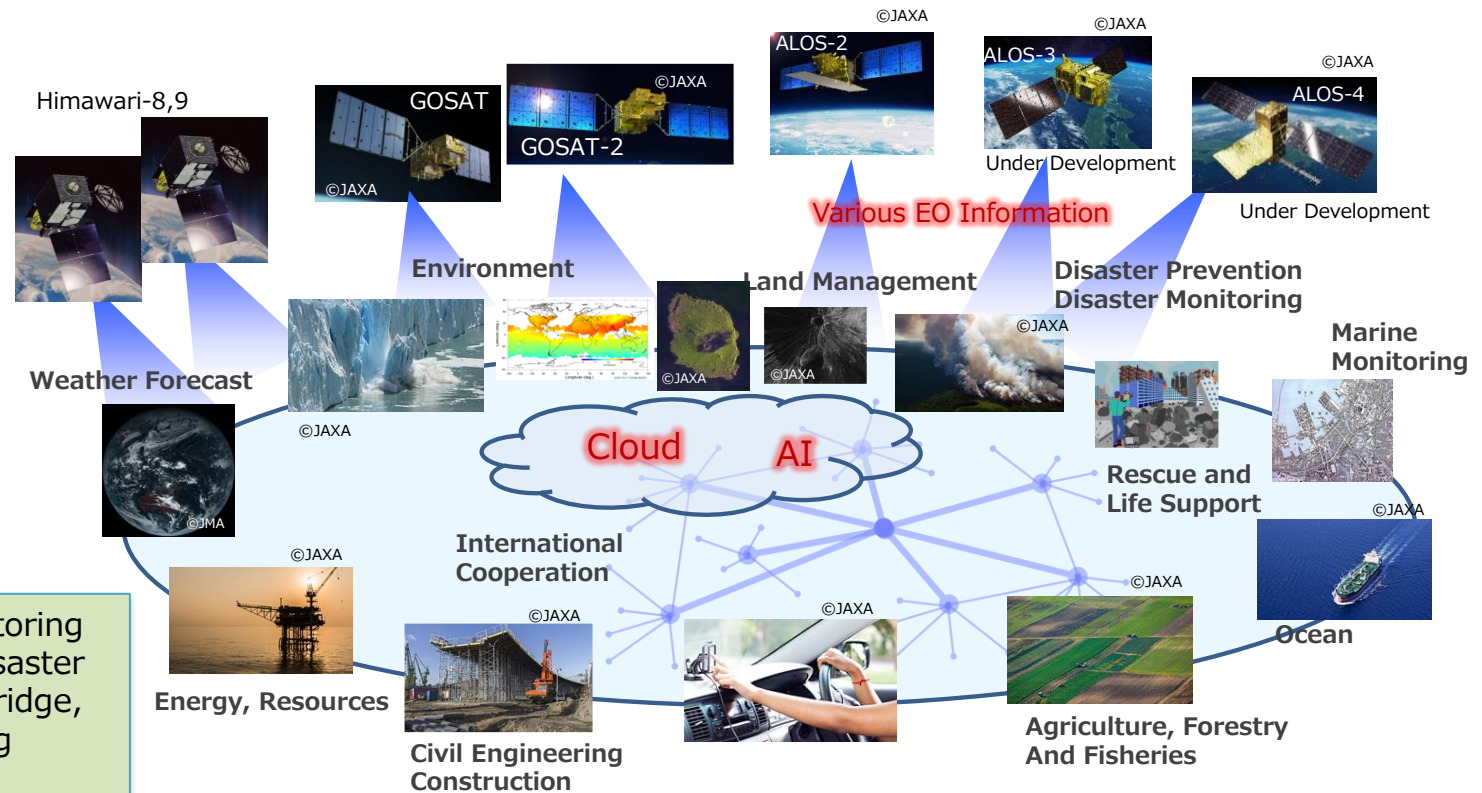
Drone



- CLAS and Dynamic Map provided by DMP will be installed in Nissan ARIYA.
<https://global.nissannews.com/en/>

New Solutions using Data from Earth Observation Satellites

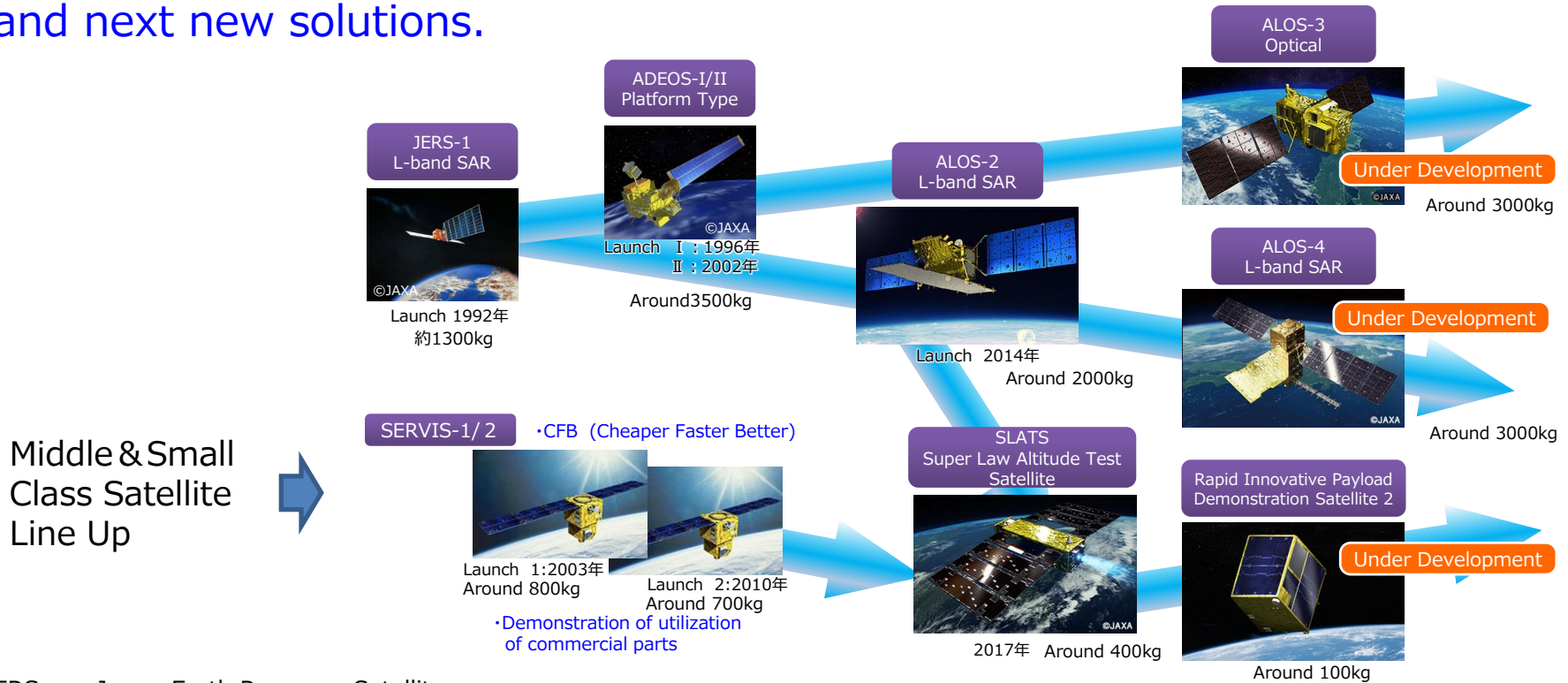
- In addition to data from optical satellites, data from Synthetic Aperture Radar (SAR) satellites is utilized in more active manner.
- MELCO promotes to combine information from “Space Systems(Earth Observation Data)” and “Big Data/Cloud/AI” to produce future new business and solutions.



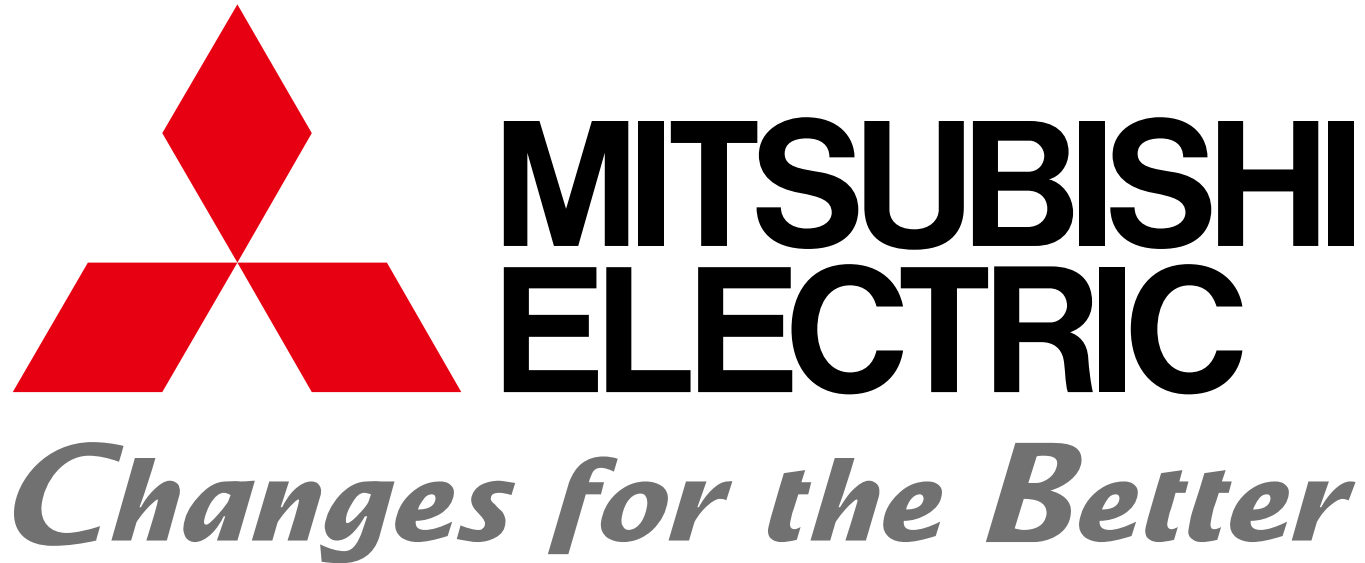
- Solutions for Disaster Monitoring of damage after natural disaster
- Infrastructure (Building, Bridge, Roads and etc.) Monitoring
- Solutions for Ocean
- Maritime Domain Awareness

Small Satellite for New Solutions

- MELCO has experiences to develop & integrated various kinds of observation satellites such as large multi-mission platform(ADEOS1/2), high-resolution imaging satellite(ALOS-2:SAR、ALOS-3:OPS)
- MELCO has started to develop **small satellites(SLTATS, RAPIS-2) for constellations and next new solutions.**



JERS : Japan Earth Resource Satellite
 ADEOS : ADvanced Earth Observing Satellite
 ALOS : Advance Land Observing Satellite
 SERVIS: Space Environment Reliability Verification Integrated System



MELCO would like to make various international cooperative activities in New Solutions