1. Company Introduction
Mitsubishi Electric Corporation (MELCO)

MELCO, one of the long-established & blue-chip company (founded in 1921), is world’s leading manufacturer of electronic products and systems in a broad range of fields, automotive equipment, factory automation systems etc. Over the past four decades, we have been involved in many satellite projects for telecom operators, government agencies, and other large-scale clients.

President & CEO : Masaki SAKUYAMA

Head Quarters : Tokyo, JAPAN

Net Sales in 2013 : US$40,543M*

Employee : 120,958**

Moody’s Rating : A1***

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* As of Mar.31,2014,  Exchange rate of JPY100 against USD
** Inclusive employees of consolidated subsidiaries
*** As of Jan, 2014
2. Space Business at MELCO
MELCO’s achievements in space business

Participated in around 560 satellite projects all over the world

- Top satellite manufacturer leading space activities in Japan
- 560 satellite projects MELCO has participated in
  - About 60 prime contracts - satellite system
  - Over 500 subcontracts - onboard equipment

- MELCO’s achievements in space business
- Participated in around 560 satellite projects all over the world

Prime-contract
Sub-contract

Europe
Inmarsat, SES
Siriu ...

South America
Brazil
Es’hail 2

North America
US
Nimiq-5,6

South America
Brazil
SatMex6

Egypt
Nilesat201

Egypt
Nilesat201

Qatar
Es’hail 2

TURKSAT-4A/4B

Turkey

China
Sinosat
Asiasat...

Japan
Koreasat-3,5

Superbird- C2,
MTSAT-2 ...

Korea

Telkom, Palapa-D...

Indonesia

Singapore/Taiwan

ST-2

India
INSAT...

Thailand

Thaicom-4

Thailand

Thaicom-4

Australia

Optus C1

Australia

Optus C1

Europe

Inmarsat, SES
Siriu ...

South America
Brazil
Es’hail 2

North America
US
Nimiq-5,6

South America
Brazil
SatMex6

Egypt
Nilesat201

Egypt
Nilesat201

Qatar
Es’hail 2

TURKSAT-4A/4B

Turkey

China
Sinosat
Asiasat...

Japan
Koreasat-3,5

Superbird- C2,
MTSAT-2 ...

Korea

Telkom, Palapa-D...

Indonesia

Singapore/Taiwan

ST-2

India
INSAT...

Thailand

Thaicom-4

Thaicom-4

Australia

Optus C1

Australia

Optus C1
Communication

- MELCO’s strategic core model: GEO Satellite bus “DS2000”
- Utilized in areas of communication and broadcasting
- Chosen as the prime contractor for
  - Türksat-4A/4B (Turkey)
  - ST-2 (Singapore/Taiwan)
  - Superbird C2 (Japan) ...and others.

Navigation

- Emits positioning signals for car and maritime navigation, aviation.
- First navigation satellite system in Japan:
  - 4 units of quasi-zenith satellites
- First quasi-zenith satellite “Michibiki” launched on Sep. 2010

Earth Observation

- Observes the earth from LEO, equipped with optical & SAR sensors.
- GOSAT
  - observe the greenhouse gases
- ALOS-2
  - disaster surveillance
- “Himawari 7/8/9”
  - meteorological observation
Heritage of Satellite System

Over 10 space crafts in operation

As of September, 2014

In Orbit

**OPTUS C1**: GEO
In orbit since Jun/03

**MTSAT-2**: GEO
In orbit since Feb/06

**ETS-VIII**: GEO
In orbit since Dec/06

**SB-C2**: GEO
In orbit since Aug/08

**QZS#1**: HEO
In orbit since Sep/10

**DRTS**: GEO
In orbit since Sep/02

**GOSAT**: LEO
In orbit since Jan/09

**SOLAR-B**: LEO
In orbit since Sep/06

**ST-2**: GEO
Hi- Power Communications
In orbit since May/11

**TURKSAT-4A/B**: GEO
Hi- Power Communications

4A has successfully launched in Feb/2014

**ALOS-2**: LEO
Environmental Observation

Successfully launched in May/2014

**Himawari-8/9**: GEO
Meteorology

**Es'hail 2**: GEO
Hi- Power Communications

**QZS #2/#3/#4**: HEO & GEO, GPS

To be launched in 2014/2016

**HTV #1/#2/#3/#4**: Transfer Vehicle
(Aug/09, Jan/11, Jul/12, Aug/13)

**Es'hail 2**: GEO

**GOSAT-2**: LEO
CO2 monitoring

**ST-2**: GEO

**QZS #2/#3/#4**: HEO & GEO, GPS

**HTV#5/#6/#7**: Transfer Vehicle

**GOSAT-2**: LEO
CO2 monitoring

**QZS#1**: HEO

**HTV #1/#2/#3/#4**: Transfer Vehicle
(Aug/09, Jan/11, Jul/12, Aug/13)
3. Future Europe-Japan Industrial Cooperation
Industry Level Cooperation

**Satellite Components**
- Solar Array Panel
- Li-Ion Battery Assembly
- Heat Pipe Embedded Honeycomb Panel

- Share 33%
- Share 42%
- Share 36%

**European Space Industry**
- TAS
- Airbus
- OHB

**LTPA base**

**Transmitter/Receiver Attitude Sensor...**

**Satellite System**
- MELCO Standard GEO Platform DS2000

- Not yet provided

**European SATCOM Operator**
- SES
- Eutelsat

**Lunch Service**
- MELCO COMSAT

- SB-C2 : GEO
- ST-2 : GEO

- Lunched by Ariane-5
Earth Observation Field

ALOS-2(L-band SAR) ↔ TERA-SAR(X-band SAR) Cooperation

- L-SAR and X-SAR have different scattering characteristics
- There is possibility to make new data utilization by combining L/X SAR data.

- Launched by H2A in May, 2014.
- Advanced L-band SAR with Active Phased Array Antenna technologies
  - Normal collection
    - 3/5m resolution, 70km swath
  - High resolution mode
    - 1x3m resolution, 25km swath
  - Scanning mode
    - 100m resolution, 490km swath

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X-band (wavelength: ~3cm)
- Surface scattering on canopy top
- Cannot penetrate the canopy

L-band (wavelength: ~25cm)
- Back scattering on the trunk and ground
- Can penetrate the canopy

©JAXA
Satellite Navigation Field

QZS (Quasi Zenith Satellite) ↔ Galileo + EGNOS Cooperation

Common Development of GNSS Application

- Safety of Life
  - Aviation
  - Rail
  - Maritime
  - Inland waterways
  - Ambulance
  - Police / Fire
  - Search and Rescue
  - Personal Protection
  - Traffic surveillance
  - Dangerous goods trans.
  - ADAS

- Mass Market
  - Personal communication and navigation
  - Cars / motorcycles
  - Trucks & buses
  - Light Commercial Vehicles
  - Personal outdoor recreation
  - Others...

- Professional
  - Oil and Gas
  - Mining
  - Timing
  - Environment
  - Fleet Management
  - Asset Management
  - Geodesy
  - Meteorological forecasting
  - Land Survey / GIS
  - Precision survey
  - Precision Agriculture
  - Fisheries / EEZ
  - Vehicle control and robotics
  - Construction / Civil Engineering
  - Space

Cooperative investigation of SOL (Safety of Life) application is one of candidates

- Integrity (error-free), Standards, Regulation, Continuity, Availability, Accuracy
- Low costs, Low power cons., Small size, Friendly use, Best perf. accordingly
- High precision, High accuracy, High reliability

European GNSS Programs Galileo and EGNOS, 3rd Meeting of the International Committee on GNSS, 2008

European Space Solutions, 2014
Safety concept of GNSS based train location determination system
Government・Agency Level Cooperation(IDEA3)

Parts、Parts Procurement Field

EEE Parts

Common development of high functional EEE parts
(FPGA, ASIC and etc.)

Parts Procurement

- Modern spacecraft require large amounts of EEE components
  (typically make up 8-20% of the cost of a spacecraft)
- For space programs, the co-ordinated or centralized procumbent of the EEE parts has merits to improve the overall quality, reliability, on-schedule delivery of the components and also for cost reduction by bulk purchasing.