経済産業省
Ministry of Economy, Trade and Industry
METI

Policies on Space Industry and Utilization

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Today's Topics

1. Japan's Space Development System
2. Space Programs by METI
3. Official Financial Tools

Japan's Space Policy and Organization

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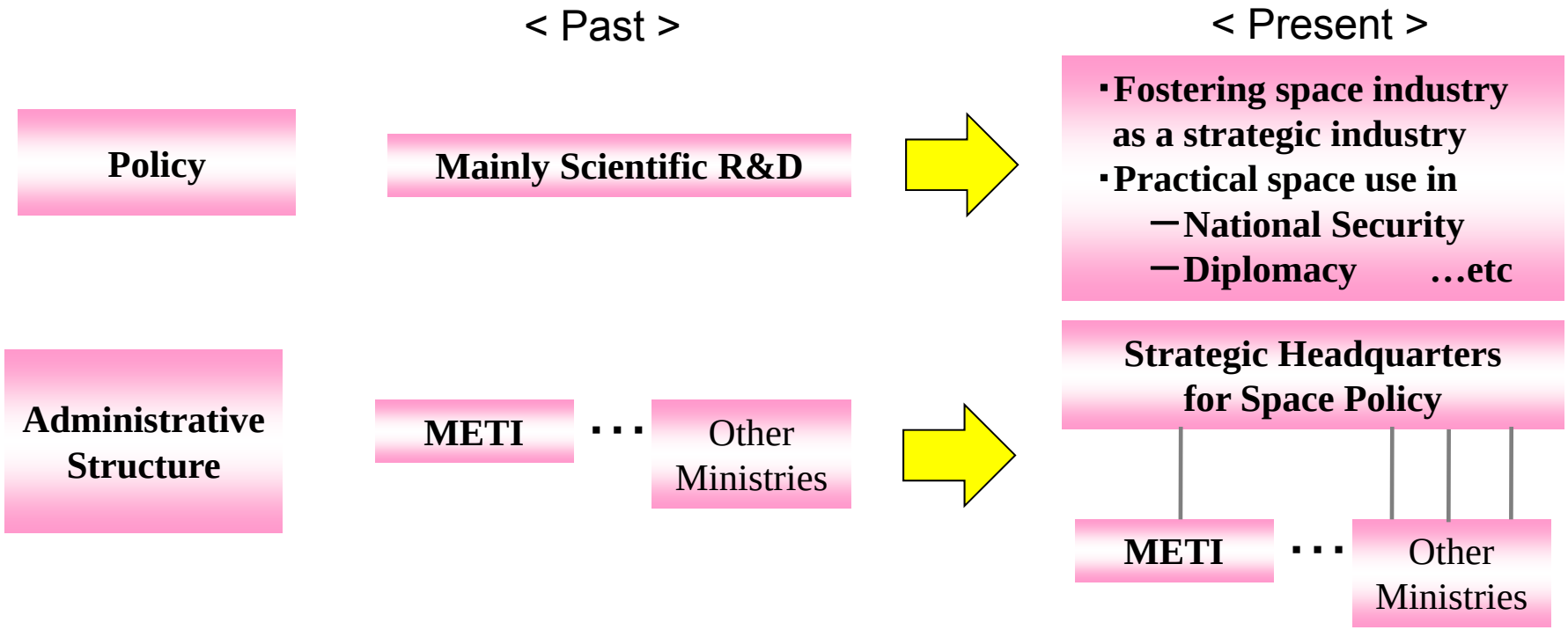
Japan's Space Policy is based on the Basic Space Law legislated in 2008.

1. The government sets space policy as a national strategy, and established "The Strategic Headquarters for Space Policy (SHSP)", led by the Prime Minister.
2. The government focuses on practical space utilization and international cooperation as well as scientific research & development.
3. The SHSP adopted the Basic Plan for Space Policy in 2009, a 5-year plan with a view to development over 10 years.



METI Policy and Organization

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○ Since the space industry plays an important role in Japan's national space program, METI initiated a policy of strengthening industrial competitiveness in collaboration with The Strategic Headquarters for Space Policy.

○METI carries out the following policies:

（1）Research and development of key technologies for the space industry

（2）Enhancement of space utilization in various sectors

（3）Promotion of international space cooperation for future economic activities

（4）Management of trade / investment

Space Industry

- SJAC
- Satellites：
  NEC, MELCO
- Launch vehicles：
  IHI, IHI Aerospace, MHI, KHI
- Ground facilities & space use services:
  Pasco, Hitachi, Sky Perfect JSAT, Sumitomo etc.

Public agencies

- Satellite R&D: USEF
- Sensor R&D: JAROS
- Remote sensing:
  ERSDAC, AIST, JOGMEC
- Satellite Positioning: SPAC
- Overall R&D: JAXA

METI R&D projects

~ some projects have been implemented through international cooperation ~

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	Project Name	Overview
Satellite	ASNARO Project with advanced ground station ASNARO-1 (under development) ASNARO-2 (under development)	Standardized small satellite bus for industrial application with internationally competitive performance. ASNARO-1 (OPT, GSD : less than 0.5m) ASNARO-2 (SAR, GSD : less than 1.0m)
	SERVIS-1(launched in 2003) -2(launched in 2010) -3(under development)	Verification of advanced COTS parts and components for spacecrafts. SERVIS-1,-2 Launch by Rockot (Russia / EU).
Sensor	Hyper spectral Sensor -under development-	We are aiming for the first practical hyper spectral sensor in the world. It will be launched in 2015 or later.
	ASTER (Multispectral) on NASA's Terra satellite	Over 10 years observation continuing. ASTER Global Digital Elevation Model come in service with NASA from June 2009.
Remote sensing	Utilization of the earth observation Satellite data -for hyper spectral and aster sensor-	Data utilization in various field.①exploration of oil and metal resources ②agriculture ③monitoring environment ④Making map
Launch System	Air Launch System -under development-	Low cost & high flexibility launch system to satisfy launch requirements from small satellite.

METI R&D project –ASNARO–

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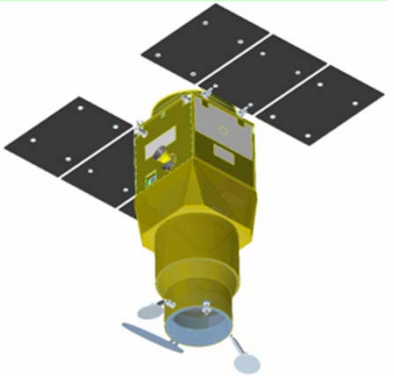
◆ASNARO：Advanced Satellite with New ARchitecture for Observation Project



a) Target

- Standard small satellite bus system（weight: about 500kg）
- Low cost (6 billion JPY government budget)
- Short-term delivery (Development 4 years, Recurring 2 years)

→ the first satellite making use of the ASNARO Project with
High performance optical sensor（GSD：less than 0.5m from the orbit of 504km）

b) Concept

- Standardization of interface between components
- Modularization of components
- Open interface specifications and conditions for all space industries
- Organizing consortium-based work to change the spacecraft development architecture

c) Future development

- Constellation
- High maneuverability；altitude control and orbit transition
- Applicable to various missions

METI R&D project – ASNARO Project –
Correlation with satellite mass and GSD (ground resolution)

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Light & Low GSD

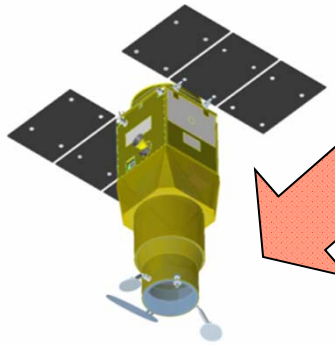
Heavy & Low GSD

＜multi function＞

Light & High GSD

Heavy & High GSD

PROBA-1:2
Beijing-1:6
TOPSAT:6
OFEQ-5:2
RazakSat
EROS-A:1
CARTOSAT-1:5
SPOT-5:2
ALOS:6
Formosat-2:4
TacSat-2:7
ORBVIEW-4:2
CARTOSAT-2:7
IKONOS:0
KOMPSAT-2:6
ORBVIEW-3:4
EROS-B:6
Pleiades
QuickBird-2:2
WorldView-2
WorldView-1:7
GeoEye-1



ASNARO-1
500kg
less than 0.5m GSD
800Mbps

地上分解能GSD（m）

1

0.1

100

1000

10000

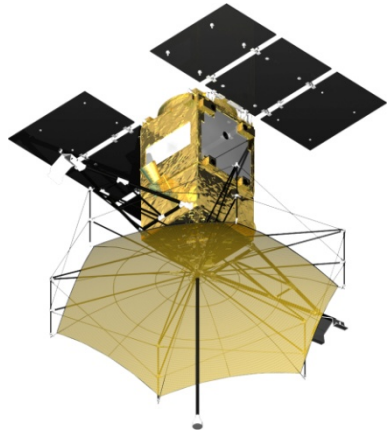
質量（ｋｇ）

Satellites

- IKONOS:0
- EROS-A:1
- PROBA-1:2
- OFEQ-5:2
- ORBVIEW-4:2
- QuickBird-2:2
- SPOT-5:2
- ORBVIEW-3:4
- Formosat-2:4
- CARTOSAT-1:5
- TOPSAT:6
- Beijing-1:6
- EROS-B:6
- KOMPSAT-2:6
- ALOS:6
- TacSat-2:7
- CARTOSAT-2:7
- GeoEye-1
- WorldView-1:7
- RazakSat
- WorldView-2
- Pleiades

METI R&D project –ASNARO2–

◆ASNARO2 （under reviewing)



a) Target

- Standard small satellite bus system（weight: about 500kg）
- Low cost
- Short-term delivery (Development 4 years, Recurring 2 years)

→ the second satellite making use of the ASNARO Project with
High performance radar sensor（GSD：less than 1.0m from the orbit of 500km）

b) Concept

- 1st X-band radar satellite in Japan
- The most advanced GSD in radar compared to other satellites in the world
- Constellation with ASNARO-1

c) Future development

- High maneuverability；altitude control and orbit transition
- Applicable to various missions

METI R&D project – SERVIS –

◆ SERVIS: Space Environment Reliability Verification Integrated System

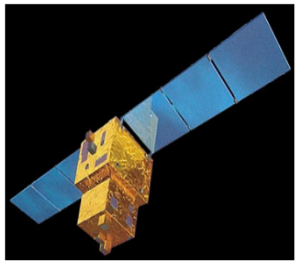
a) Objective

- To establish low cost spacecraft technology by utilizing commercial-off-the-shelf parts and technologies (COTS)
- Compared with MIL class, highly reliable parts-applied equipment, COTS-applied equipment has advantages:
  - higher performance, applying cutting-edge technologies
  - lower costs, lighter and smaller
  - stable supply, short term delivery

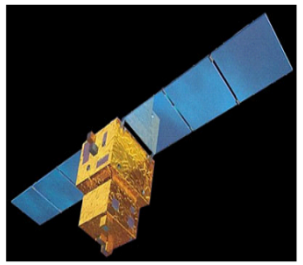
b) Project flow

① Extensive COTS ground evaluation tests, especially for radiation tolerance
② Confirmation by on-orbit verification
③ Evaluation and correlation of both results

- COTS Evaluation Guideline
- Equipment Design Guideline
- Development low cost satellite bus system and equipment
- COTS Database, 204 COTS have been tested, 60% of which are usable for LEO



SERVIS-1
- Flight in 2003
- 5.2 billion yen



SERVIS-2
- Flight in 2010
- 3.8 billion yen

Future Satellite Bus Systems

METI R&D project – Hyper spectral sensor –

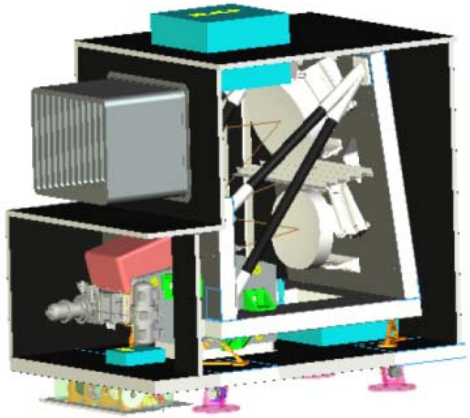
-Developing a hyper spectral sensor with a survey on the utilization on oil, gas and mineral resource exploration, agriculture and environmental monitoring, etc.

-Data sharing helps us to promote practical use, so data will be distributed to the customer in various fields.

< Hyper spectral sensor development program >

	Japan (METI)	Germany (DLR)	Italy (ASI)	U.S.A (NASA)
Spatial Resolution	30m	30m	30m	60m
Swath Width	30km	30km	30km	150km
Number of Bands	185	244	249	213
Band Range	400-2500nm	420-2450nm	400-2500nm	380-2500nm
Launch year	2015	2015	2013	2020

< Japan's Hyper spectral sensor >

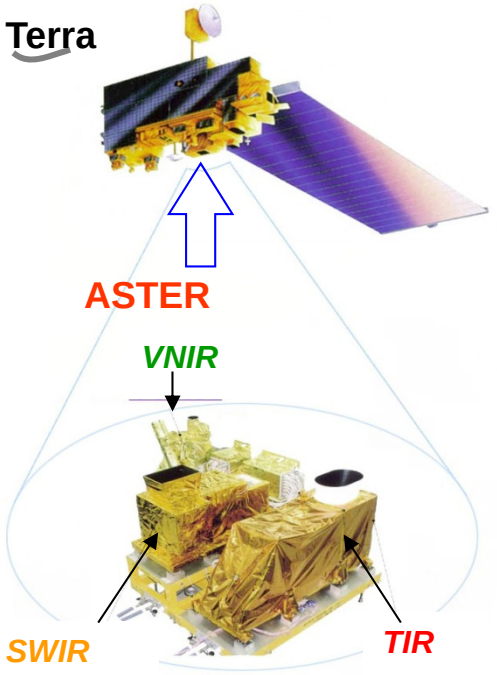


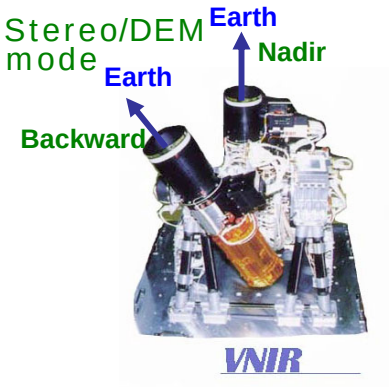
・HISUI will be launched by H-IIA rocket in 2015 or later

・HISUI will be onboard JAXA's ALOS-3 satellite

METI R&D project –ASTER (Multispectral) –

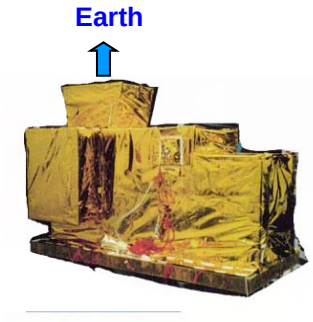
◆ ASTER: Advanced Spaceborne Thermal Emission and Reflection Radiometer





VNIR

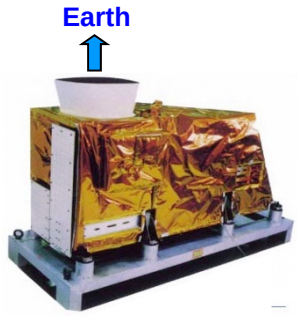
Visible **N**ear **I**nfrared **R**adiometer
Spectral Range: 3 Bands
0.52 - 0.86 μm
Spatial Resolution: 15 m
Cross Track Pointing: ±24°



SWIR

Short **W**ave **I**nfrared **R**adiometer
Spectral Range: 6 Bands
1.60 - 2.43 μm
Spatial Resolution: 30 m
Cross Track Pointing: ±8.55°

- **ASTER** is the optical multispectral sensor.
- **ASTER** was launched in December 1999 aboard the **Terra** platform of NASA.
- **ASTER** is currently-operated
- **The ASTER Project** is a **Japan-US** cooperative Earth-observing project.

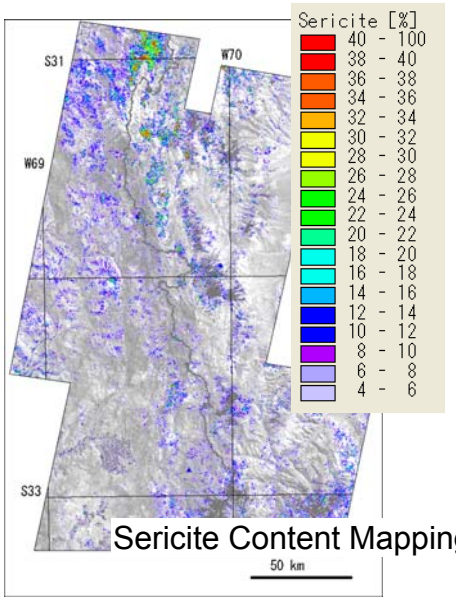


TIR

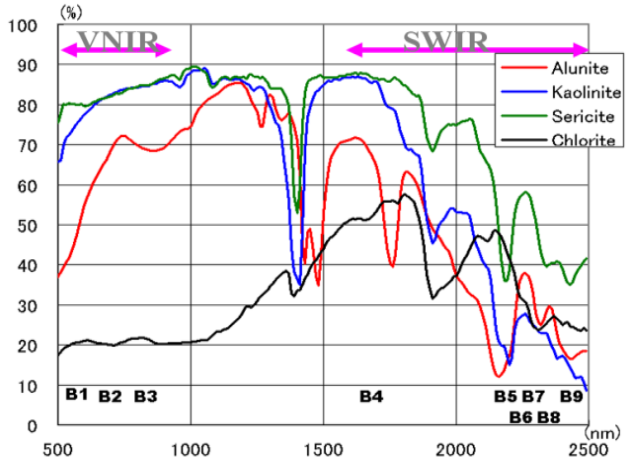
Thermal **I**nfrared **R**adiometer
Spectral Range: 5 Bands
8.125 -11.65 μm
Spatial Resolution: 90 m
Cross Track Pointing: ±8.55°

METI R&D project –Utilization of the Satellite data–

1)exploration of oil and metal resources

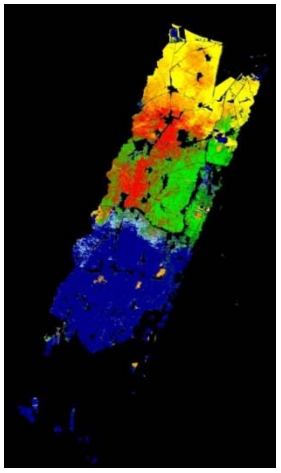


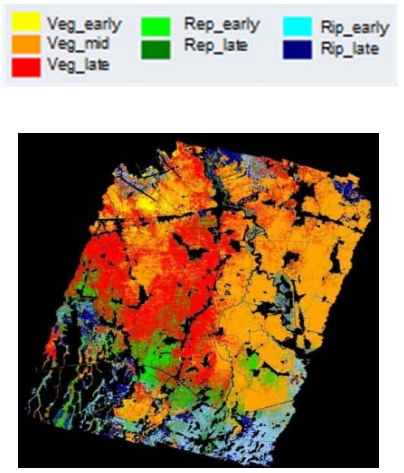
Sericite Content Mapping



Spectrum Profile

2)agriculture

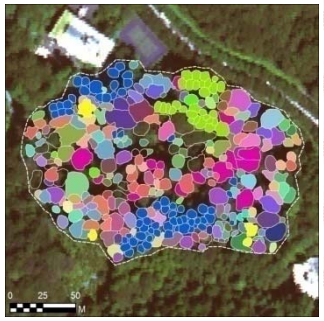


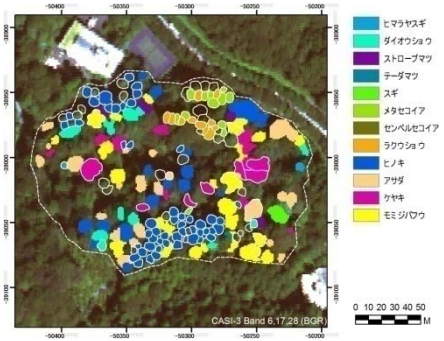


(L)Indramayu area (R)Suban area

The classification of the wetland rice growing phase in Indnesia

3)monitoring environment

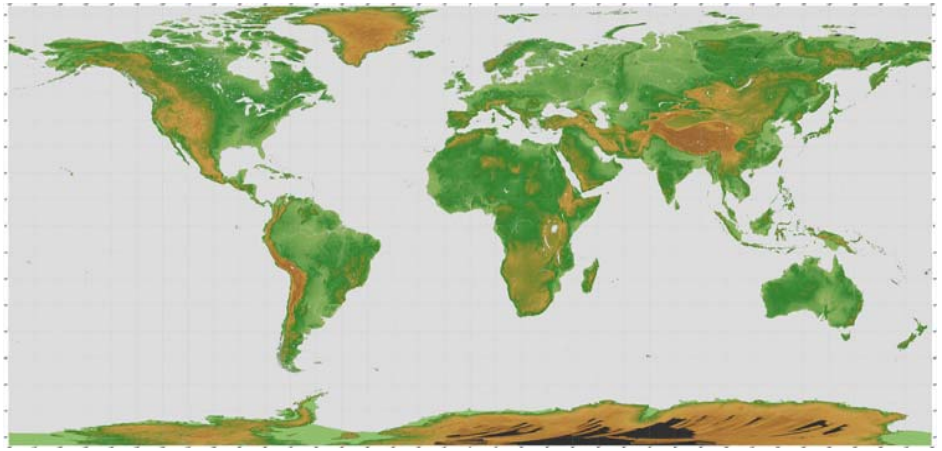




results of field survey Estimated results of airplane hyper sensor

The classification of tree species

4)Making map



Aster GDEM(Global Digital Elevation Model)

METI's International Cooperation With Peru in Space

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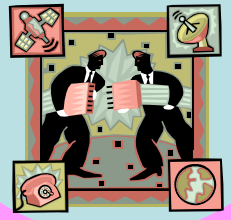
Technical Cooperation

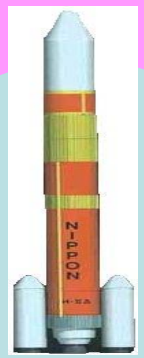


Finance

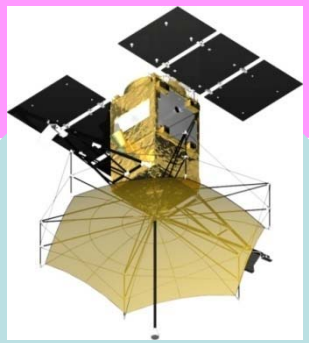
Data Utilization

All-in-one Package

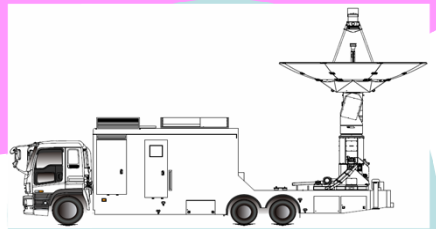
Launch



Satellite



Ground Facilities



Thank you for your attention !!

METI is willing to support economic development projects in Peru with various Japanese official financial, technical, and capacity building tools.