

International Symposium on Ensuring Stable Use of Outer Space

宇宙空間の安定的利用の確保と国際シンポジウム

SSA Capabilities and Policies in Japan

Space Situational Awareness Workshop:
Perspectives on the Future Directions for Korea

January 24 – 25, 2019

The K Hotel Seoul, Seoul, South Korea

Susumu Yoshitomi

JSF, Special Advisor

yoshitomi@jsforum.or.jp

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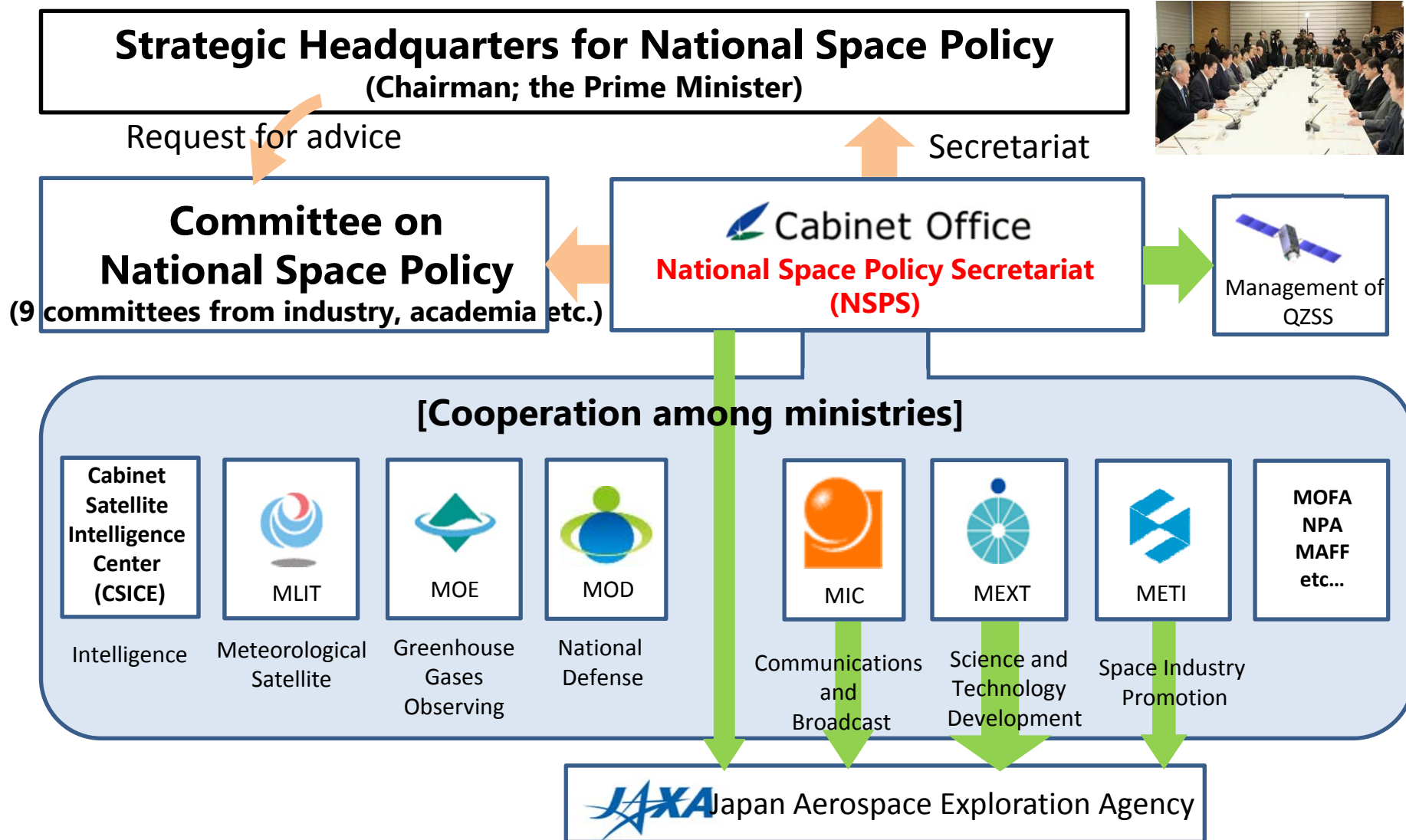
1. Cabinet Office

2. MEXT/JAXA

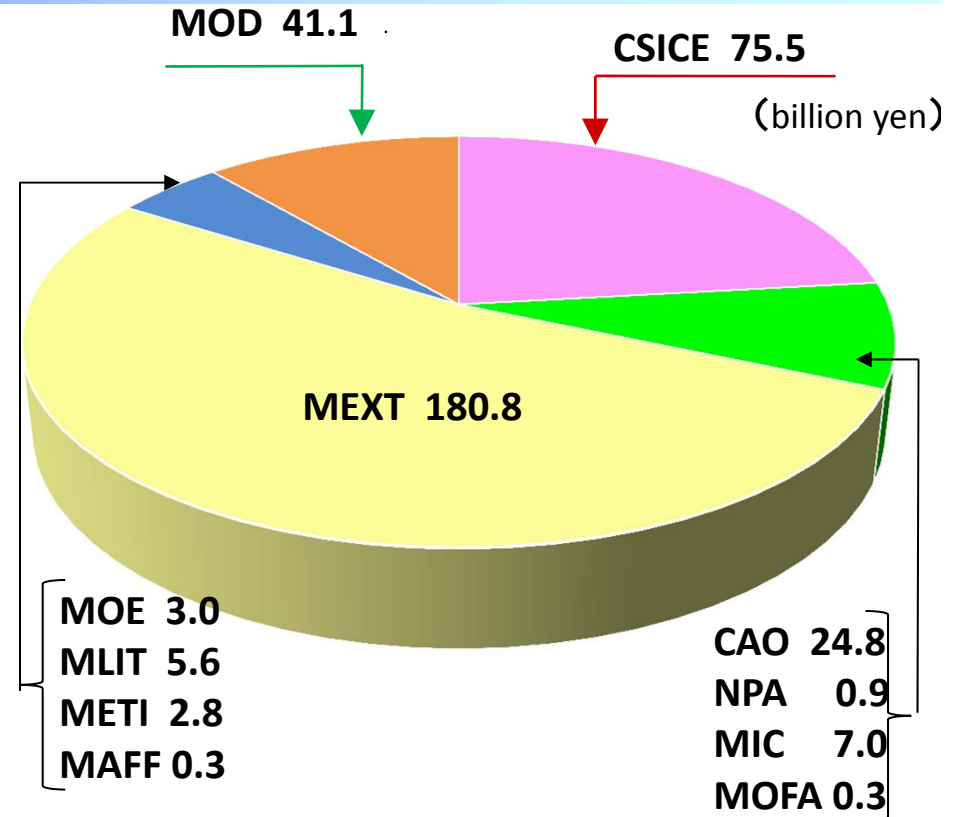
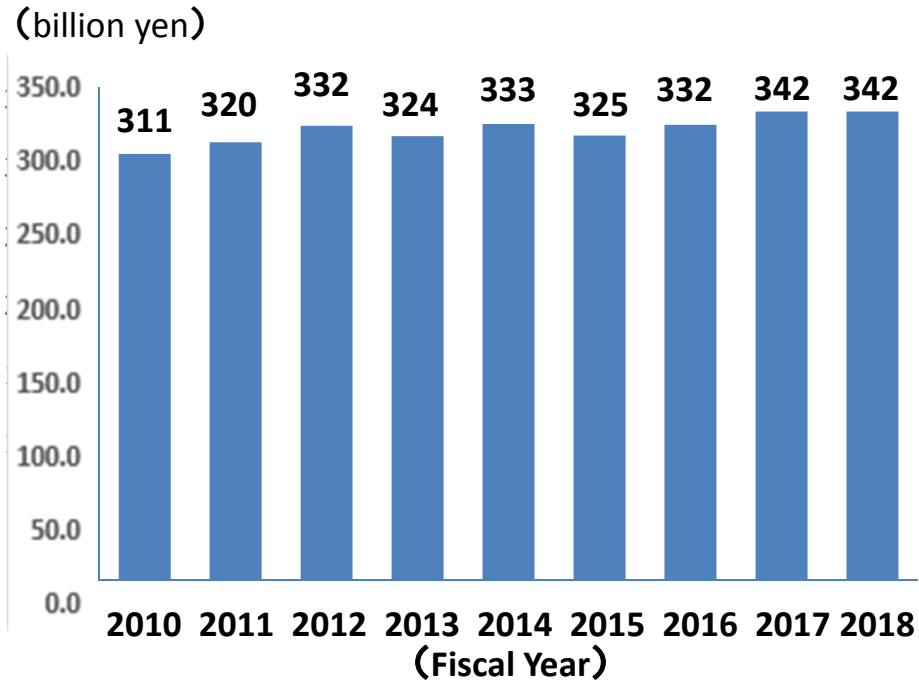
3. MOD

4. Summary

The Cabinet Office comprehensively navigates space policy



Space budget in Japan stays around ¥340B.



MLIT: Ministry of Land, Infrastructure and Transport
MOE: Ministry of the Environment
MOD: Ministry of Defense
MIC: Ministry of Internal Affairs and Communications
MEXT: Ministry of Education, Culture, Sports, Science and Technology

METI: Ministry of Economy, Trade and Industry
MOFA: Ministry of Foreign Affairs of Japan
NPA: National Police Agency
MAFF: Ministry of Agriculture, Forestry and Fisheries of Japan
CSICE: Cabinet Satellite Intelligence Center

※ Each FY Budget includes supplementary budget.

Initiatives for SSA, MDA and TTX are proceeding

Implementation Plan of the Basic Plan on Space Policy

SSA(Space Situational Awareness)

■ New SSA system in Japan will start operating in 2023. CAO, MEXT and MOD will start deliberations on the operation and maintenance.



MDA(Maritime Domain Awareness)

■ GOJ is steadily developing the Maritime Situational Display System and other systems to effectively gather, share, and distribute information. GOJ is also promoting maritime information gathering and observation, including the use of earth observation satellites.



TTX(Table Top Exercise)

■ Japan will for the first time participate in the Schriever Wargame, a multilateral tabletop exercise in the space field, in FY2018.



Japanese Space Acts

Act No. 76 of 2007 started as of November 15, 2018

The effective date of the law concerning the launching of satellites and the management of satellites (Act No. 76 of 2007) was set as November 15, 2018



Authorization for launch of satellites

Introduced a preliminary accreditation system for model design of rockets and conformity to launch facility standards.

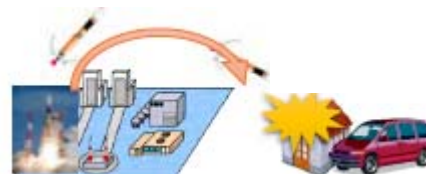
Authorization for management of satellites

Points of preliminary review.

- (1) Accurate and smooth implementation of the Convention on Space,*
- (2) Prevention of harmful contamination of outer space,*
- (3) About ensuring safety around the landing point in re-entry*

Third-party liability

Mandatory to launch insurance for insurance to compensate for third party damage.



JAXA contributes to space security

Prime Minister Abe

- In recent years, as threat against the national security environment surrounding Japan increases, space security is extremely important. Under this awareness, not only the Ministry of Defense, but also relevant agencies including JAXA, should proceed medium and long-term efforts including the national security issues.



JAXA 4th medium and long-term target (1 March 2018)

Term: 7 years from April 2018

Implementation of basic plan on space policy and research and develop plan **JAXA should change itself to an organization which leads society by science and technology and creates new values.** JAXA promotes projects in consideration of 4 pillars below.

- ✓ **Secure national security and realize safe & secure society**
- ✓ **Expand utilization of space and industrial promotion**
- ✓ **Creation of world class results in space science and exploration fields**
- ✓ **Promote the aeronautical industry and strengthen international competitiveness**

2018/6/14



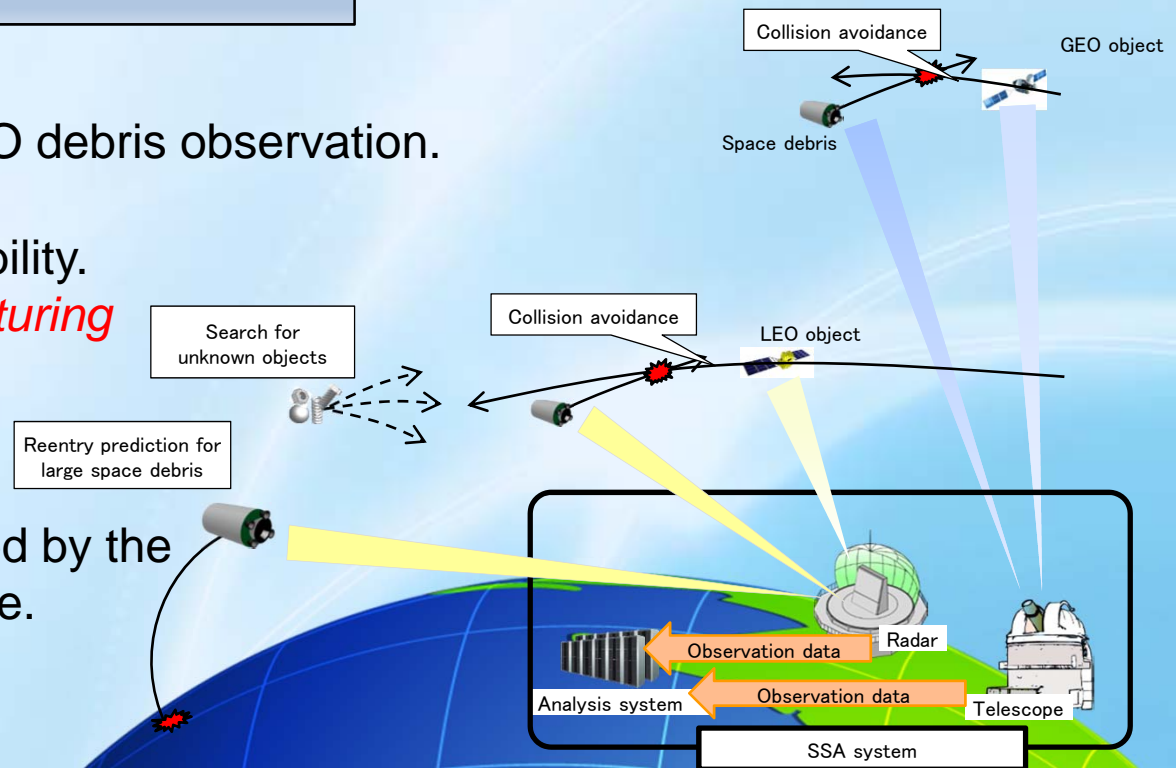
Current Issues and Future SSA System

Current Issues

- ◆ Aging System: Both radar and telescope systems are **over 10 years old**.
- ◆ Low Capability: Current radar can **observe about 5 % of LEO debris** in JSpOC catalog.
- ◆ Limited Contribution: SSA analysis JAXA can perform with own data is limited.

New SSA System

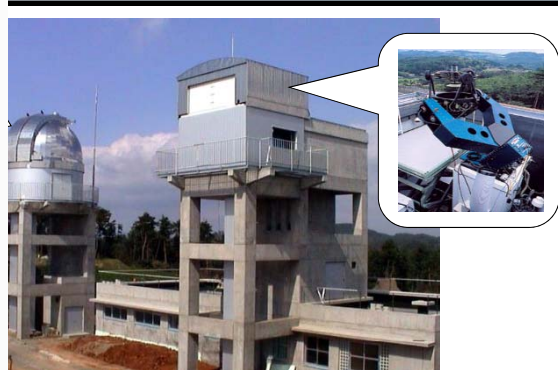
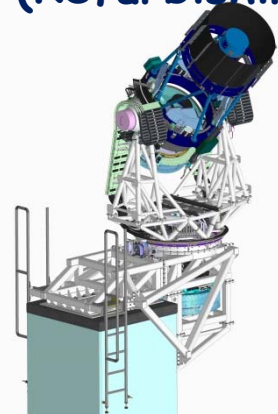
- ◆ **Radar:** *Newly developing*
Enhances capability for LEO debris observation.
- ◆ **Telescope:** *Refurbishing*
Maintains the current capability.
- ◆ **Analysis System:** *Restructuring*
Enhances the capability for conjunction assessment and re-entry analysis with the data that will be provided by the new radar and the telescope.





JAXA's SSA System

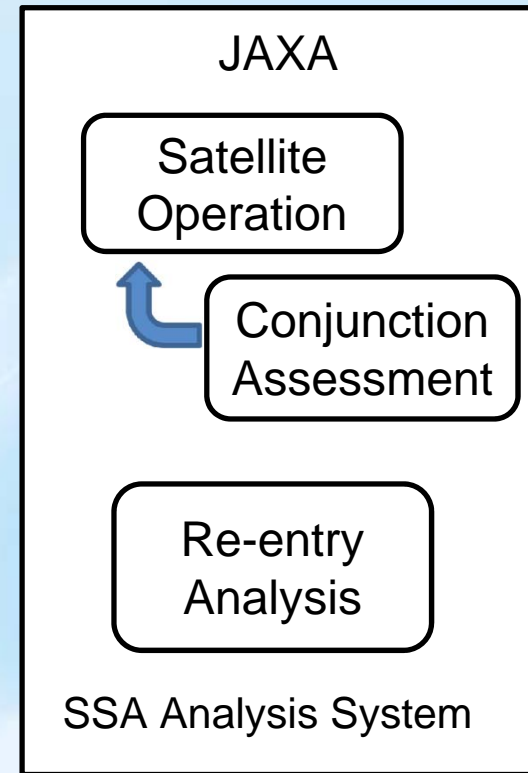
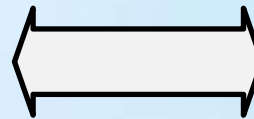
(Refurbishing)



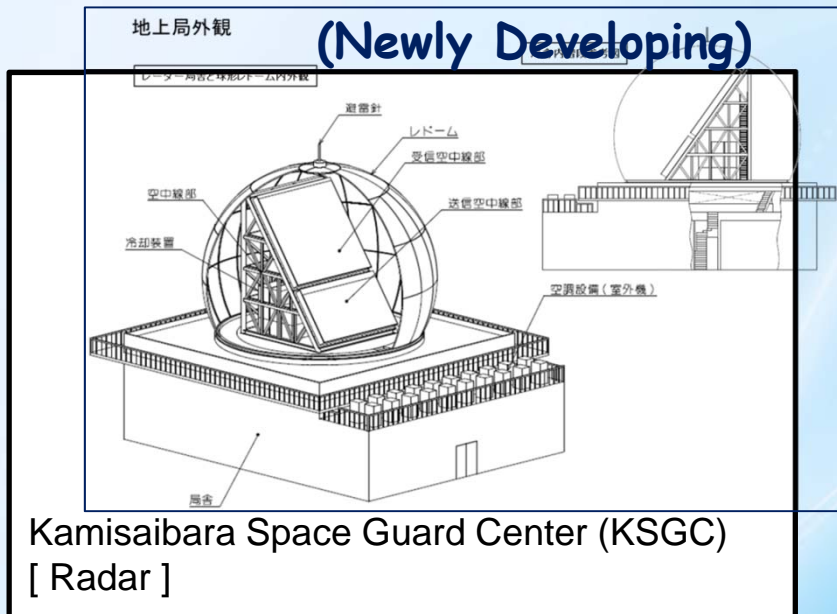
Bisei Space Guard Center (BSGC)
[Telescope]

Current Facility was transferred from JSF to JAXA in 2017

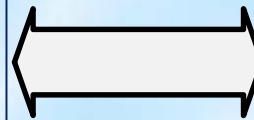
Since 2001



(Newly Developing)



Since 2004





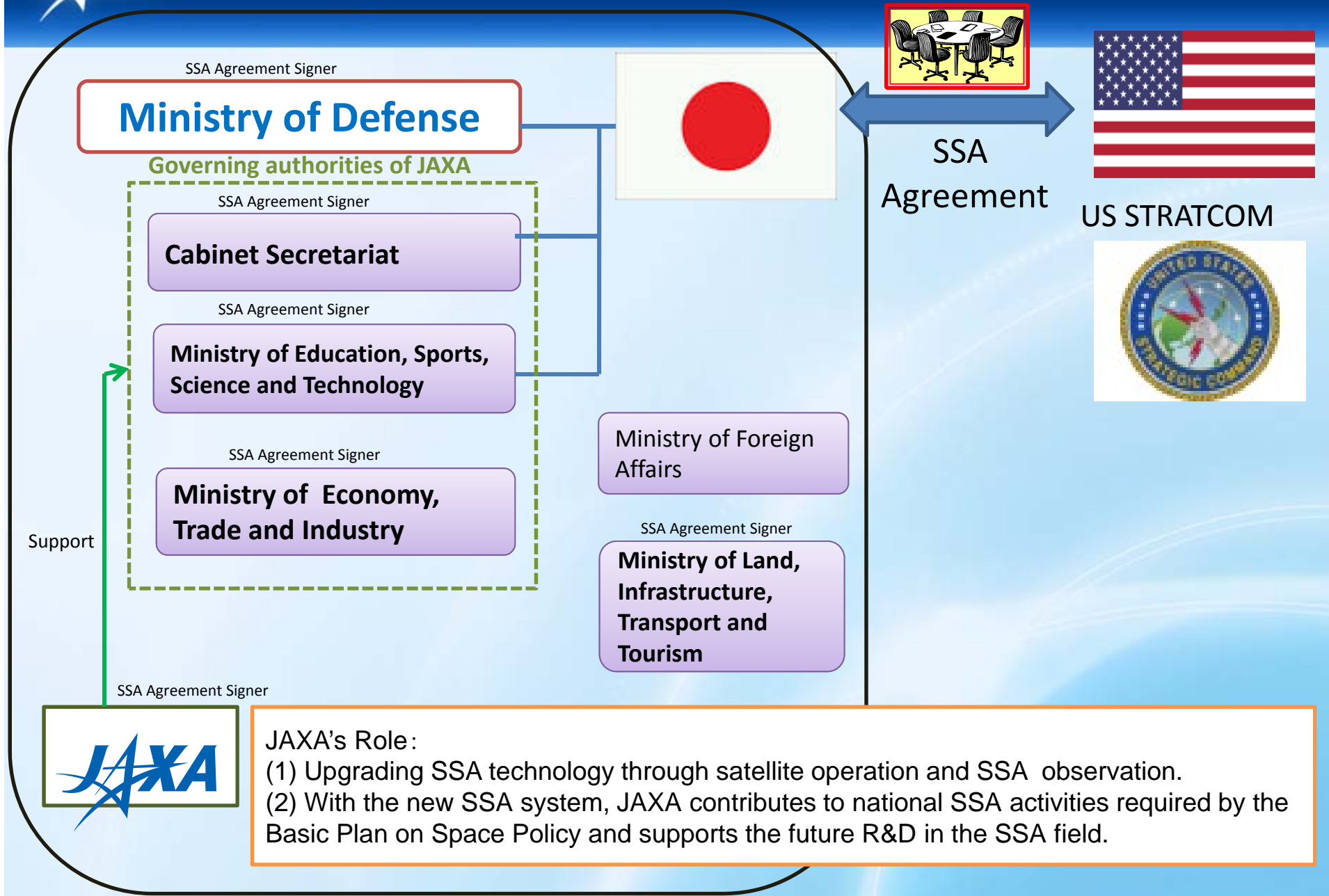
Major Specifications and Schedule

		New System	Present System
Radar	Observation capability	10 cm class (650 km high)	1.6 m class (650 km high)
	No. of simultaneously observable objects	Max 30	Max 10
Tele-scope	Limiting magnitude	18th (1 m telescope) 16.5th (50cm telescope)	18th (1 m telescope) 16.5th (50cm telescope)
Analysis system	No. of managed objects	Max 100,000	Max 30,000
	No. of observation paths (radar)	10,000 paths/day	200 paths/day
	Observation planning	Automatically	Manually

	FY28 (2016)	FY29 (2017)	FY30 (2018)	FY31 (2019)	FY32 (2020)	FY33 (2021)	FY34 (2022)
Basic Plan on Space Policy	Construct SSA-related facilities and an operational framework integrated with MOD, JAXA and other Japanese governmental institutions. (CAO, MOFA, MEXT, MOD, etc.)						
	JAXA	Design	Construction, tests		Integration	Trial operation	





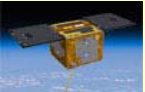
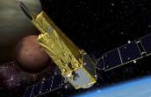

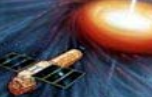
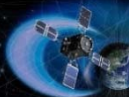
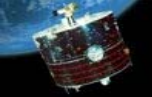

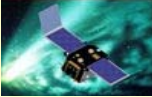




SSA framework in Japan

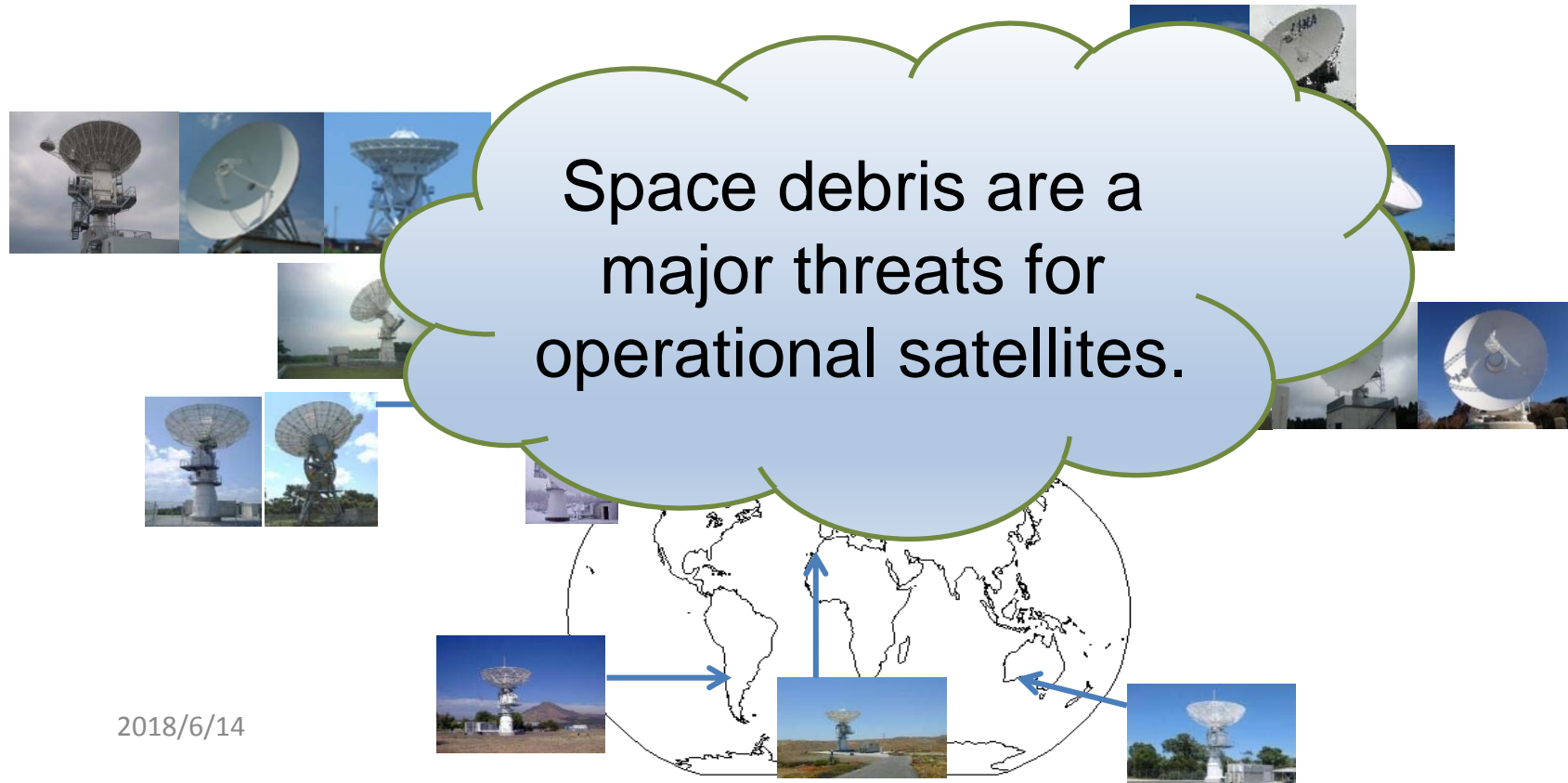


JAXA's Role:

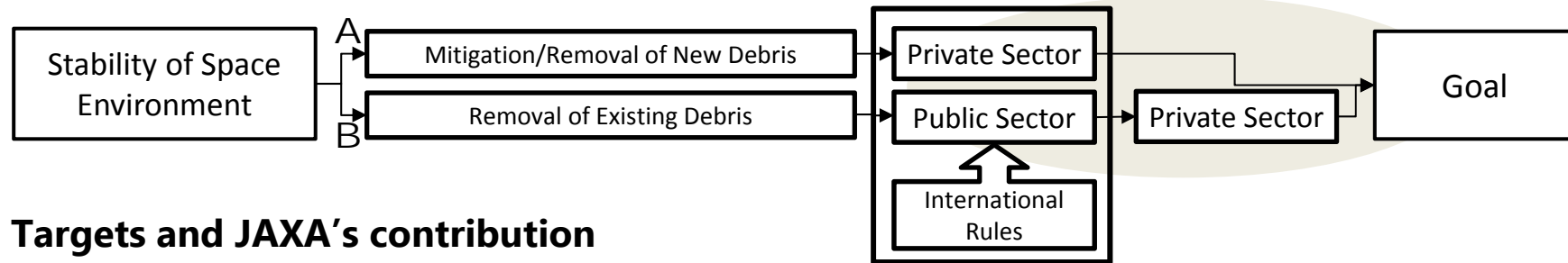
- (1) Upgrading SSA technology through satellite operation and SSA observation.
- (2) With the new SSA system, JAXA contributes to national SSA activities required by the Basic Plan on Space Policy and supports the future R&D in the SSA field.

Satellites & Ground Systems Operated/Managed by JAXA

<p>Communications, Engineering Test Satellites</p>  <p>WINDS</p>  <p>AJISAI</p>  <p>SDS-4</p>	<p>Astronomy Satellite</p>  <p>Sprint-A</p>  <p>Solar-B</p>  <p>Astro-E2</p>  <p>ERG</p>  <p>GEOTAIL</p>	<p>Earth Observation Satellites</p>  <p>GOSAT</p>  <p>INDEX</p>  <p>GCOM-W</p>  <p>ALOS2</p>  <p>SLATS</p>  <p>GCOM-C</p>
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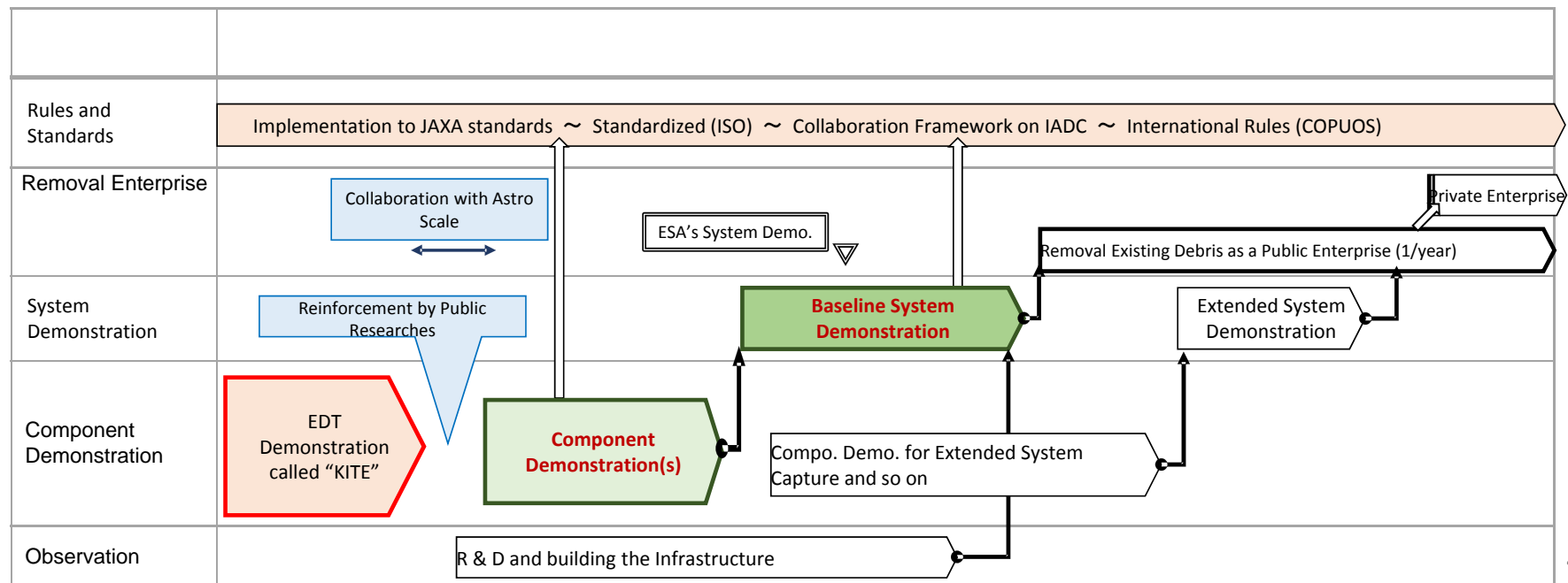


Calling for Debris Removal R & D Proposal



□ Targets and JAXA's contribution

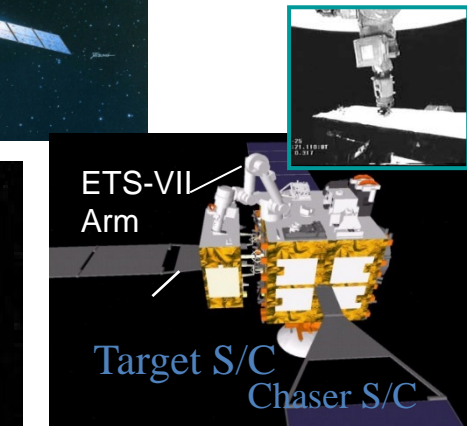
- **Target A** 【Private Sector】 : Mitigation or Removal of New Debris ⇒ **Support Private Sectors**
- **Target B** 【Public Sector】 : Removal of Existing and Dangerous Debris ⇒ **Main Contribution**



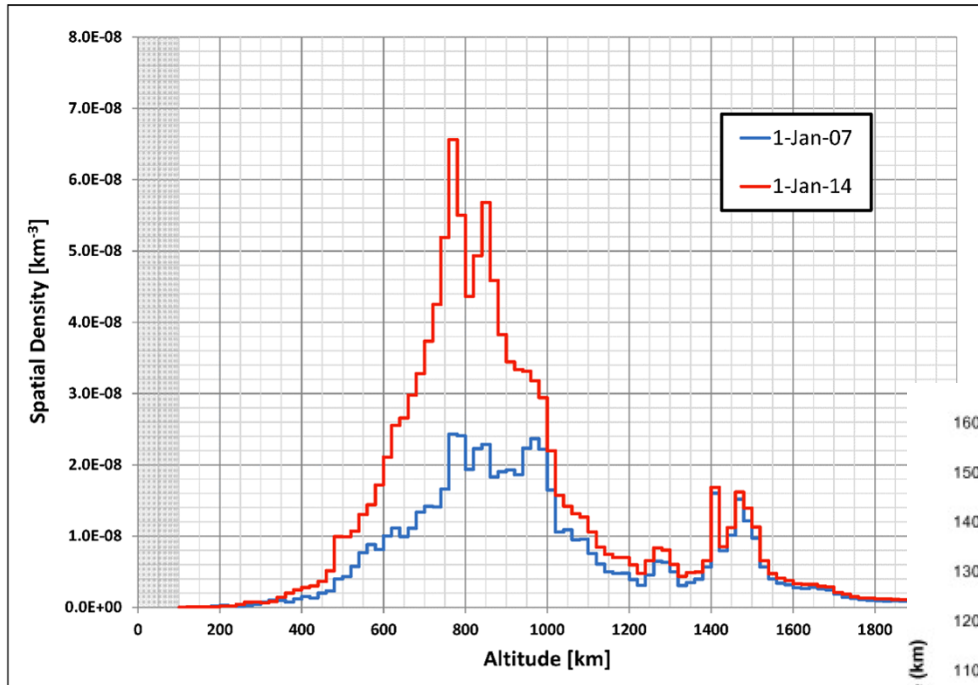
Heritage of Technologies in JAXA

JAXA has been studying cost-effective ADR
Background: experiences through ETS-VII, HTV, Hayabusa, etc.

- Autonomous Rendezvous/Docking
- Image processing to locate a target object
- Autonomous navigation
- Space robotics

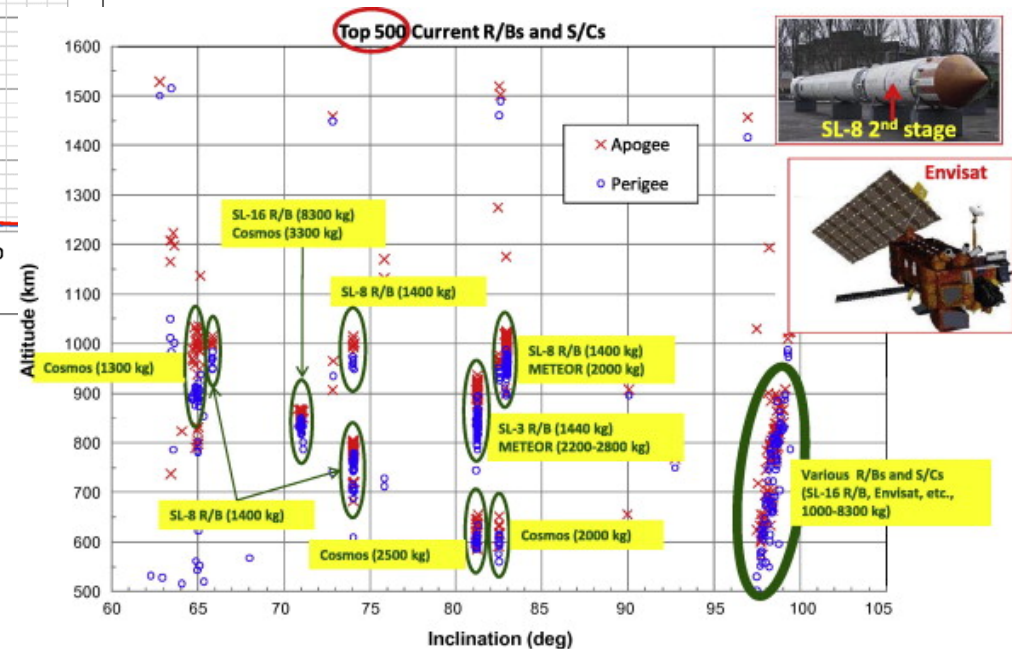


Expected Targets of Space Debris Removal



Orbital Debris Quarterly News, NASA, No.2, 18, 4.2014.

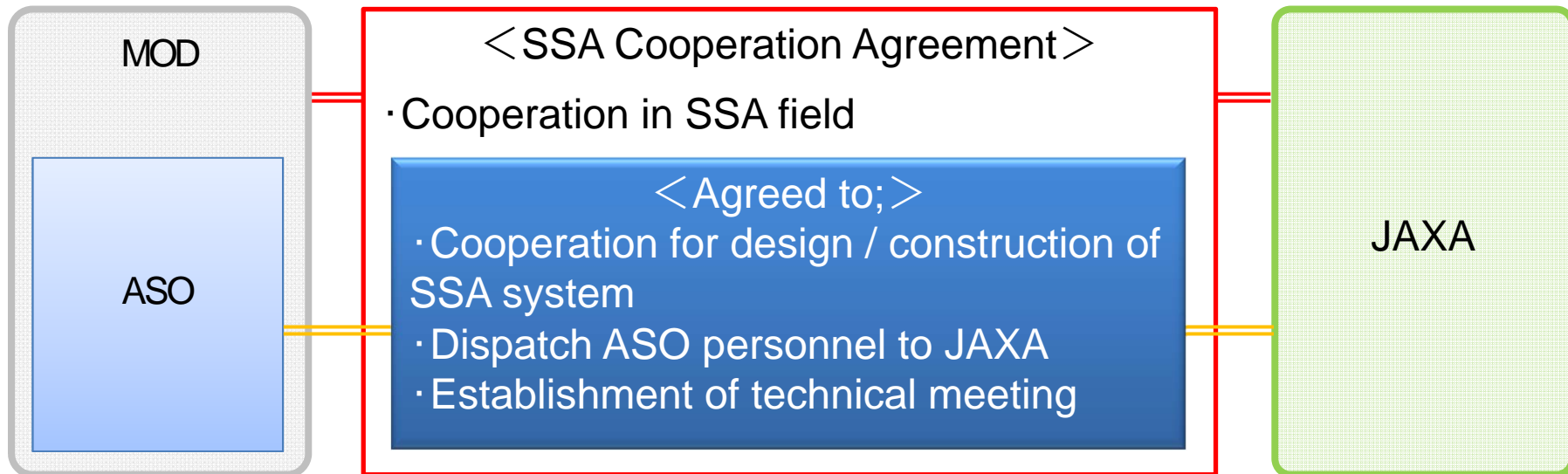
- Targets should exist on clouded orbits.
- Targets are on a few orbital groups, that is, on a few useful orbits.
- Multiple debris removals per one mission might be possible. -> Lower cost
- ADR satellite might take piggyback launch, because a main satellite will be usually inserted to such a useful orbit. -> Lower cost



Liou, J.-C., An active debris removal parametric study for LEO environment remediation. Adv. Space Res. 47, 3.2011.

Cooperation between ASO/MOD and JAXA

- In 2017, MOD and JAXA concluded the partnership agreement which provides the framework of general cooperation concerning SSA.
- In the same year, ASO and JAXA concluded an other appendix to the agreement relating to design / construction of SSA system.



- Dispatch an officer from ASO to JAXA (Tsukuba Space Center) for obtaining knowledge of SSA.

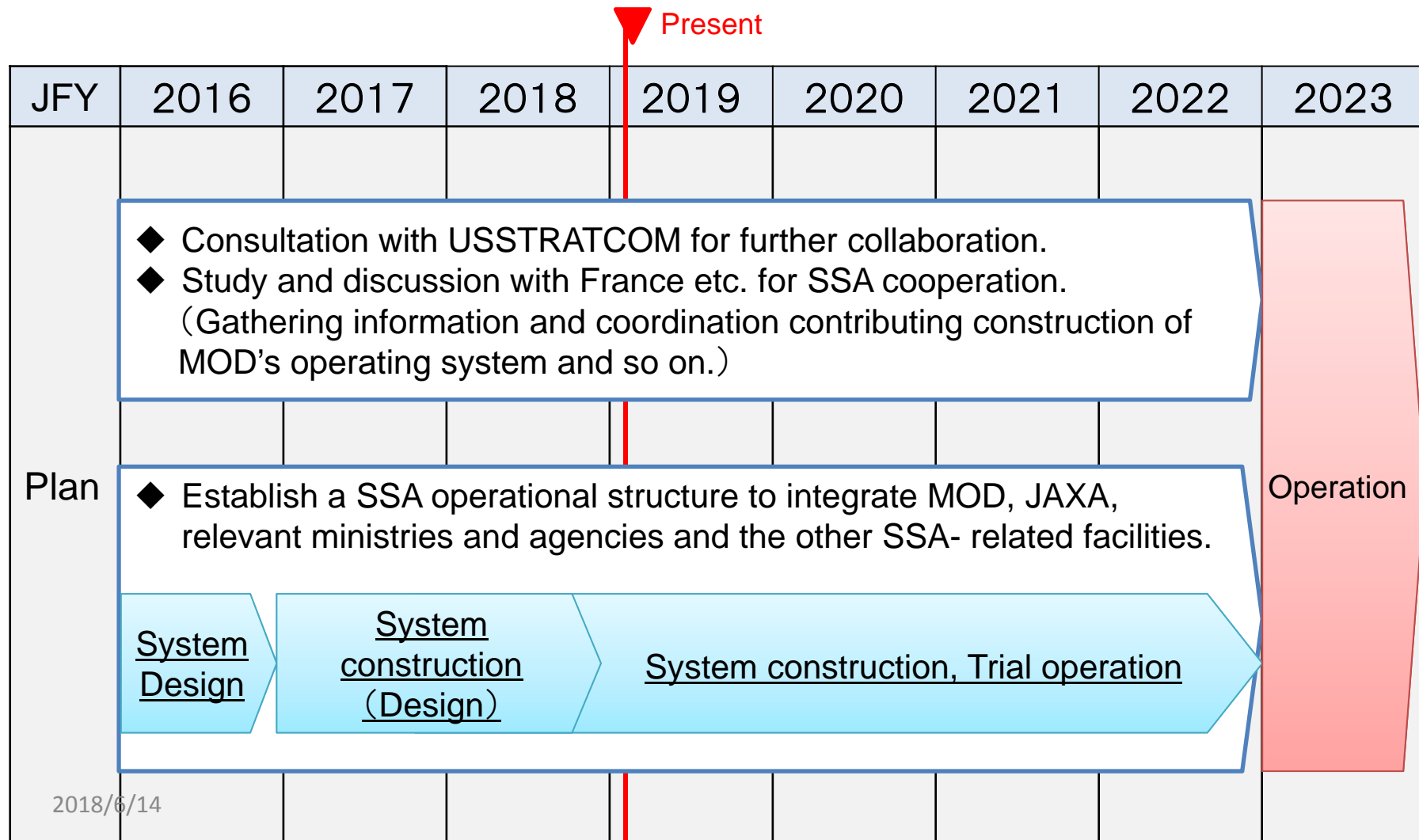


Dispatch personnel



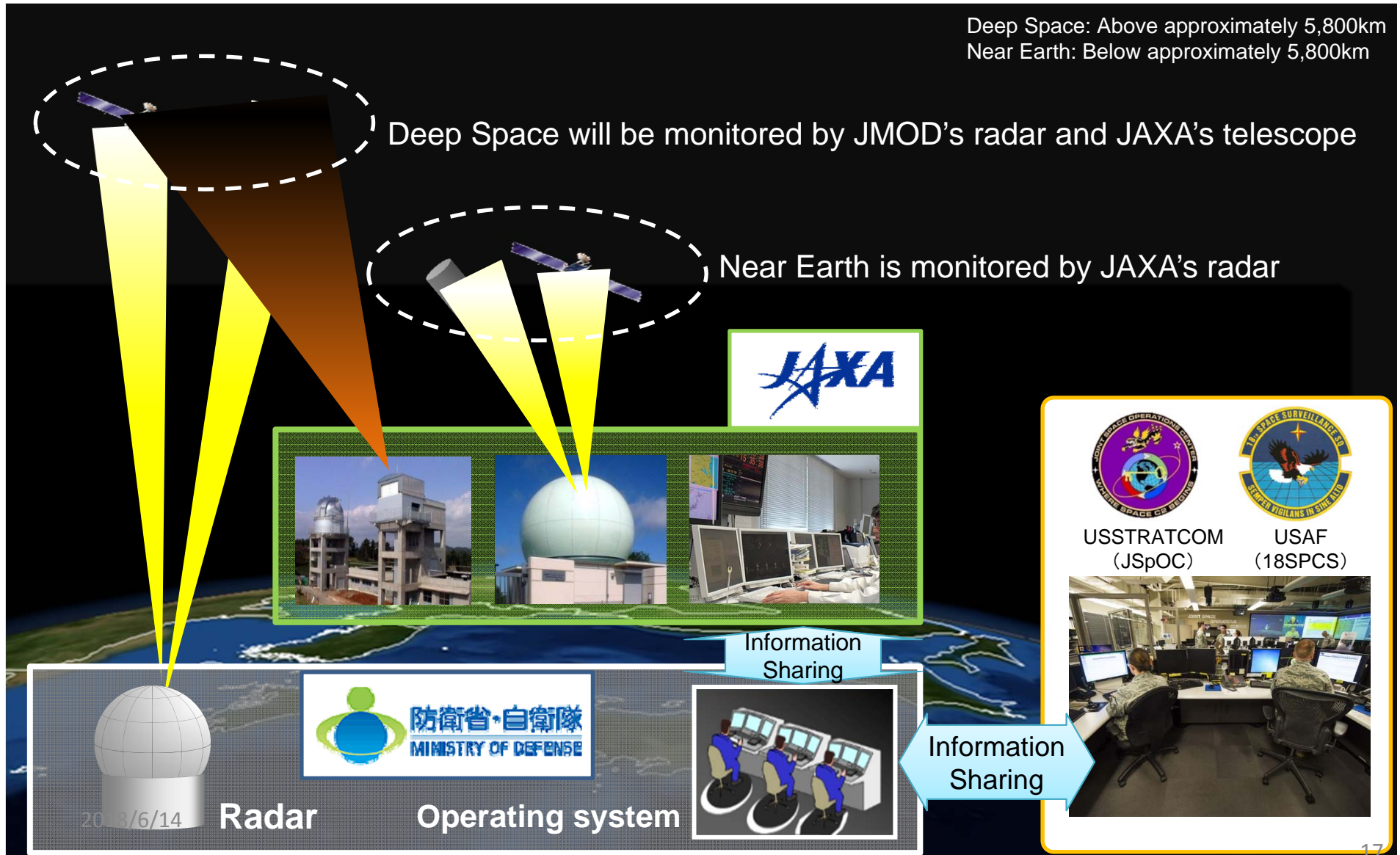
The schedule relating to constructing of SSA structure

- Achieve SSA initial operational capability by JFY 2022 based on the Implementing schedule of the Basic Plan on Space Policy (revised in JFY2018) decided by the Strategic Headquarters for Space Policy to monitor and detect the threat against stable use of space and perform required processing.



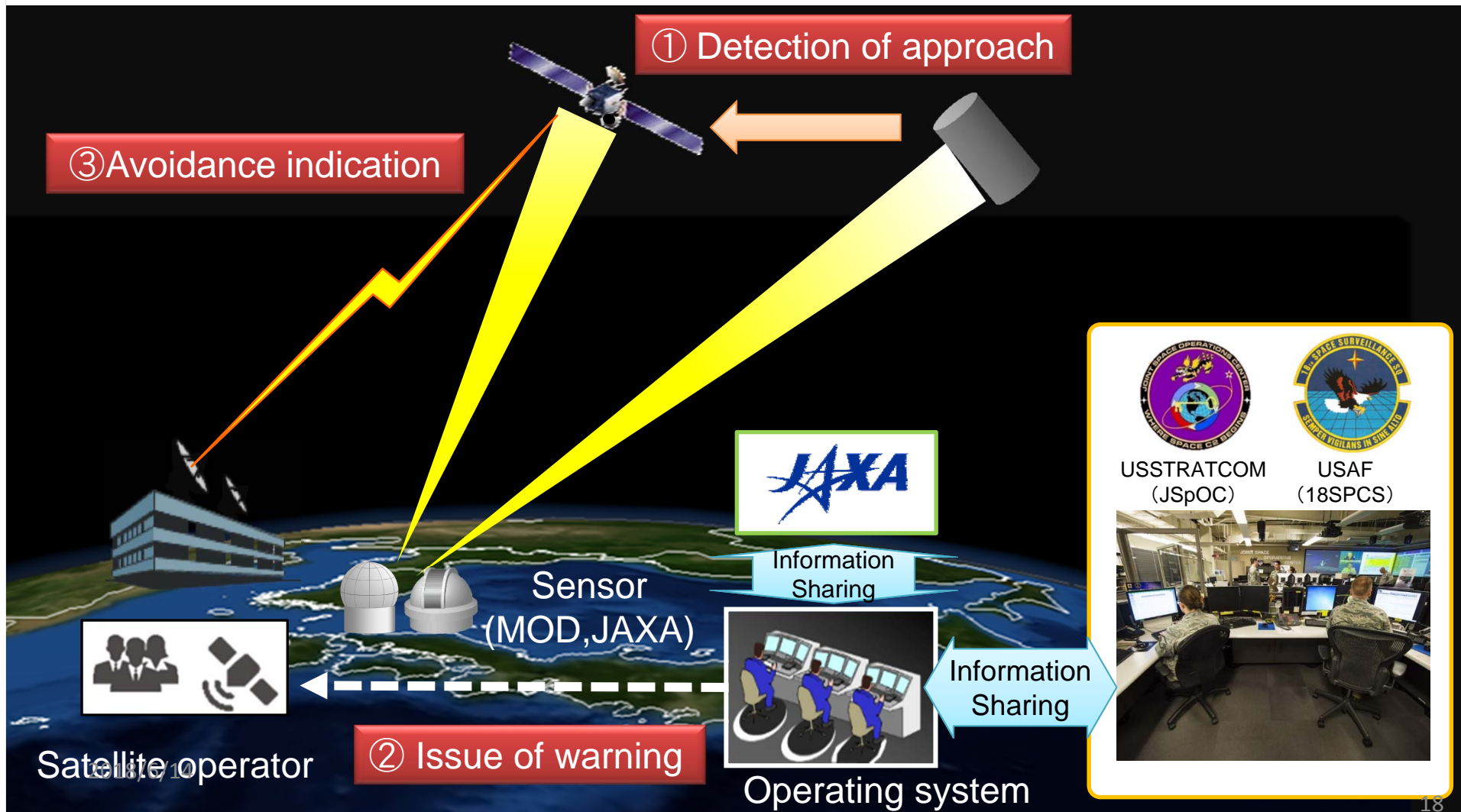
The Ground Design of SSA structure

- MOD will grasp space situation by sharing the information timely with U.S. forces and JAXA.



Concept of Operations about SSA (satellite protection)

- Conjunction Analysis based on orbit information obtained from MOD and JAXA sensor as well as U.S. Air forces.
- Issue a warning to satellite operators, if there is a risk of collision.
- Satellite operator receives warning and they have to avoid collisions, as necessary.



Multilateral Partnership

➤ Participation in [Global Sentinel](#)

- ◆ Multinational tabletop exercise emulating SSA structure of respective countries for about 5-year-future.
- ◆ ASO has been participating in TTX as player since 2016.
- ◆ Director General, A5 participated in DV Day during the TTX period.



(Situation of the exercise)



(Situation of DV Day)

➤ Participation in [Schriever Wargame](#)

- ◆ Multinational tabletop exercise of policy, strategy and operation relating to outer space for 10-year-future .
- ◆ ASO has been participating in various planning meetings toward Schriever Wargame 2018 to contribute to consideration of multilateral partnership.

2018/6/14

International Symposium on Ensuring Stable Use of Outer Space

2019

Space is much more congesting

Tokyo, Japan

28 February and 1 March, 2019

International Symposium on Ensuring Stable Use of Outer Space

宇宙空間の安定的利用の確保に関する国際シンポジウム

2018

SSA & STM

宇宙状況把握と宇宙交通管制

2017

宇宙空間の安定的利用の
確保に関する国際シンポジウム
— SSA、MDAを中心として —

INTERNATIONAL SYMPOSIUM ON
ENSURING STABLE USE OF OUTER SPACE
— FOCUSING ON SPACE SITUATIONAL AWARENESS
AND MARITIME DOMAIN AWARENESS

Summary

- ✓ **Japanese Space Act started as of November 15, 2018**
- ✓ **JAXA's New SSA System**
- ✓ **JAXA initiated Space Debris Removal R&D together with Industries**
- ✓ **MOD's SSA System**
- ✓ **International SSA/STM Symposium 2019**