Implementation Plan of the Basic Plan on Space Policy (revised FY2017)

（Tentative Translation）

December 12, 2017
National Space Policy Secretariat

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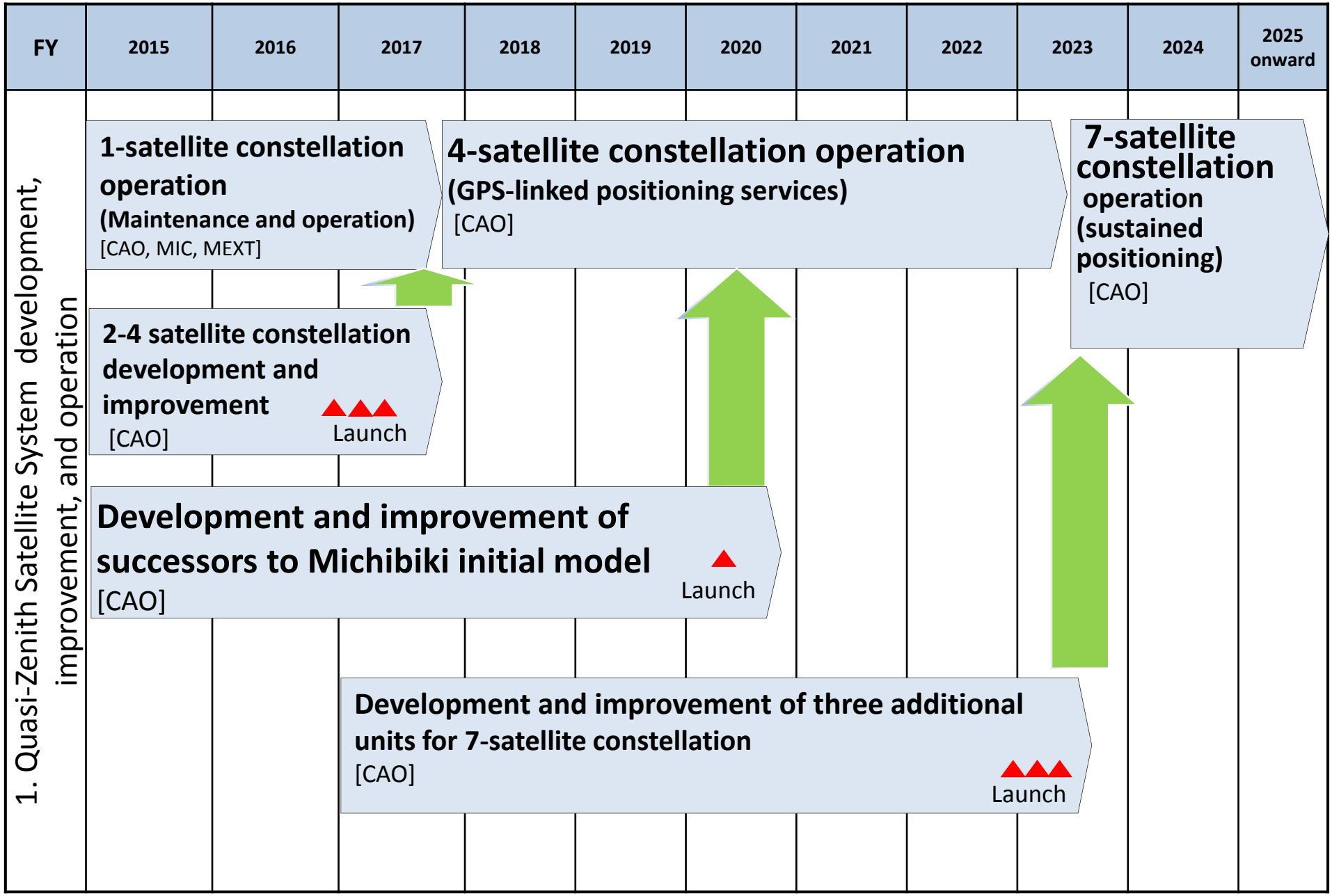
Provisional translation (as of 13 Dec 2016)



1. Quasi-Zenith Satellite System development, improvement, and operation

Target

[Security] Japan will comprehensively reflect in design and operational frameworks the measures, etc. required to ensure the resiliency of Quasi-Zenith Satellites and other positioning systems. To ensure that the use of Quasi-Zenith Satellites helps to strengthen Japan's national security capabilities, we will consider the functions and performance required and reflect the results of those deliberations in design, as well as undertaking steady development. Japan will further intensify coordination between Quasi-Zenith Satellites and GPS satellites.

[Civil sector] Japan will move forward with the design, development, and operation of highly reliable satellites for the civil sector, to ensure that the services that they provide are available at all times, including supplementing Quasi-Zenith Satellites with GPS, reinforcing GPS, and offering message communications.

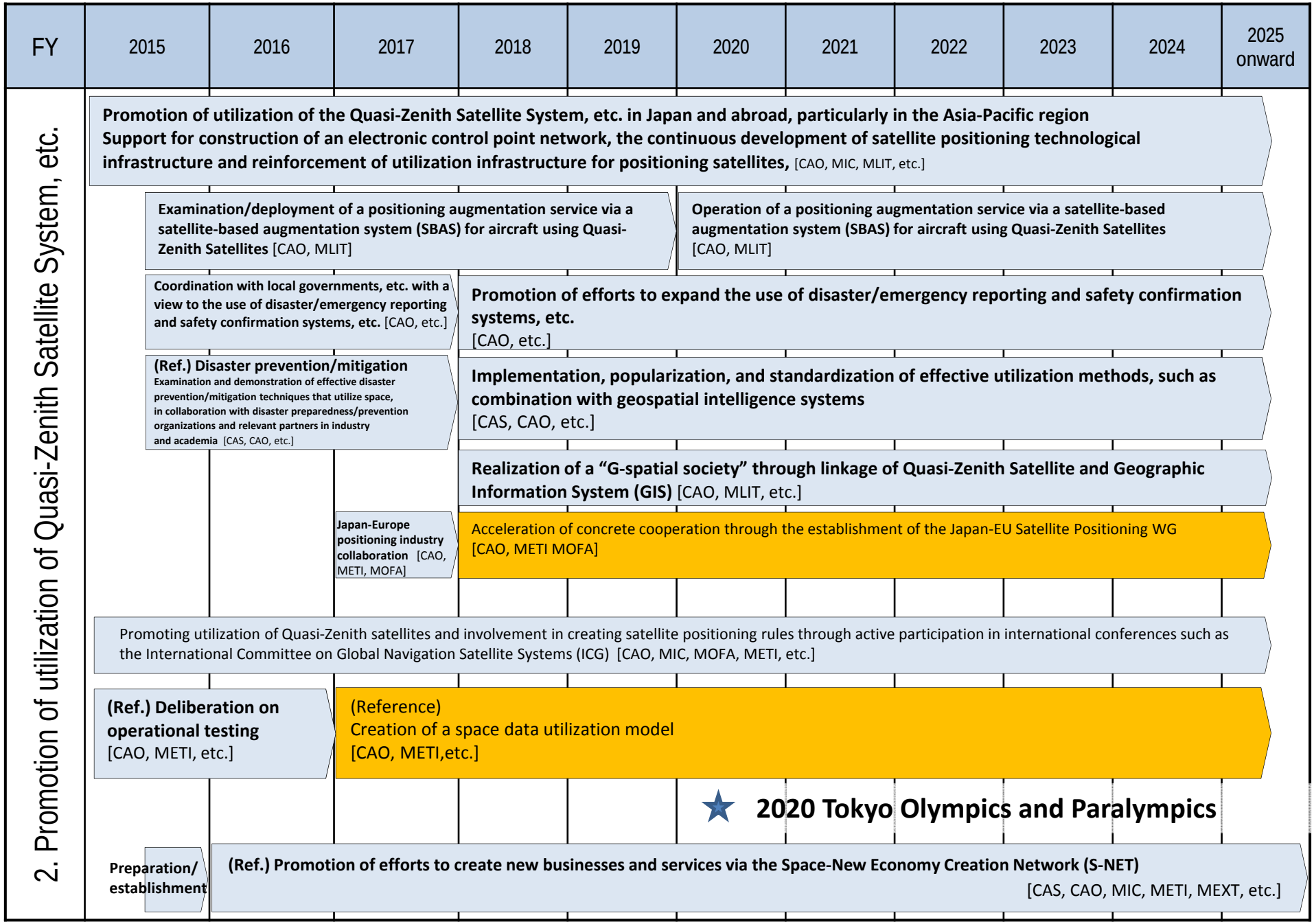
Achievements/status by end of FY2017

- We launched the second to fourth Quasi-Zenith Satellites. We will start test operation and establish a four-satellite constellation of Quasi-Zenith Satellites.
- We will proceed with the development and incorporation of required performance improvements for the successor to the first Quasi-Zenith Satellite "Michibiki," which is due to be launched in FY2020.
- We started deliberations on the specifications of a 7-satellite constellation which we aim to establish in FY2023.

Initiatives in FY2018 and beyond

- We will steadily proceed with development and improvement in order to establish the 7-satellite constellation of Quasi-Zenith Satellites in FY2023.
- To establish the 7-satellite constellation, we will continue developing the system to maintain the required functions, improve performance, conduct continuous review, and develop satellite positioning technology in FY2018.
- We will determine the specifications of the 7-satellite constellation in FY2018.

4. (2)①i) Satellite positioning



2. Promotion of utilization of Quasi-Zenith Satellite System, etc.

Target

[Security] Japan will move forward with the utilization of Quasi-Zenith Satellites, in order to ensure the stable use of outer space, the strengthening of Japan's national security capabilities via the utilization of space, and the reinforcement of the Japan-U.S. Alliance via space cooperation.

[Civil sector] In light of needs for the use of Quasi-Zenith Satellites in Japan's public and civil sectors, Japan will move forward with the development of services that use Quasi-Zenith Satellites and will seek to diversify the fields in which they are used. Overseas, Japan will promote the development of networks of electronic reference stations and other positioning infrastructure, and the roll-out of services that utilize Quasi-Zenith Satellites.

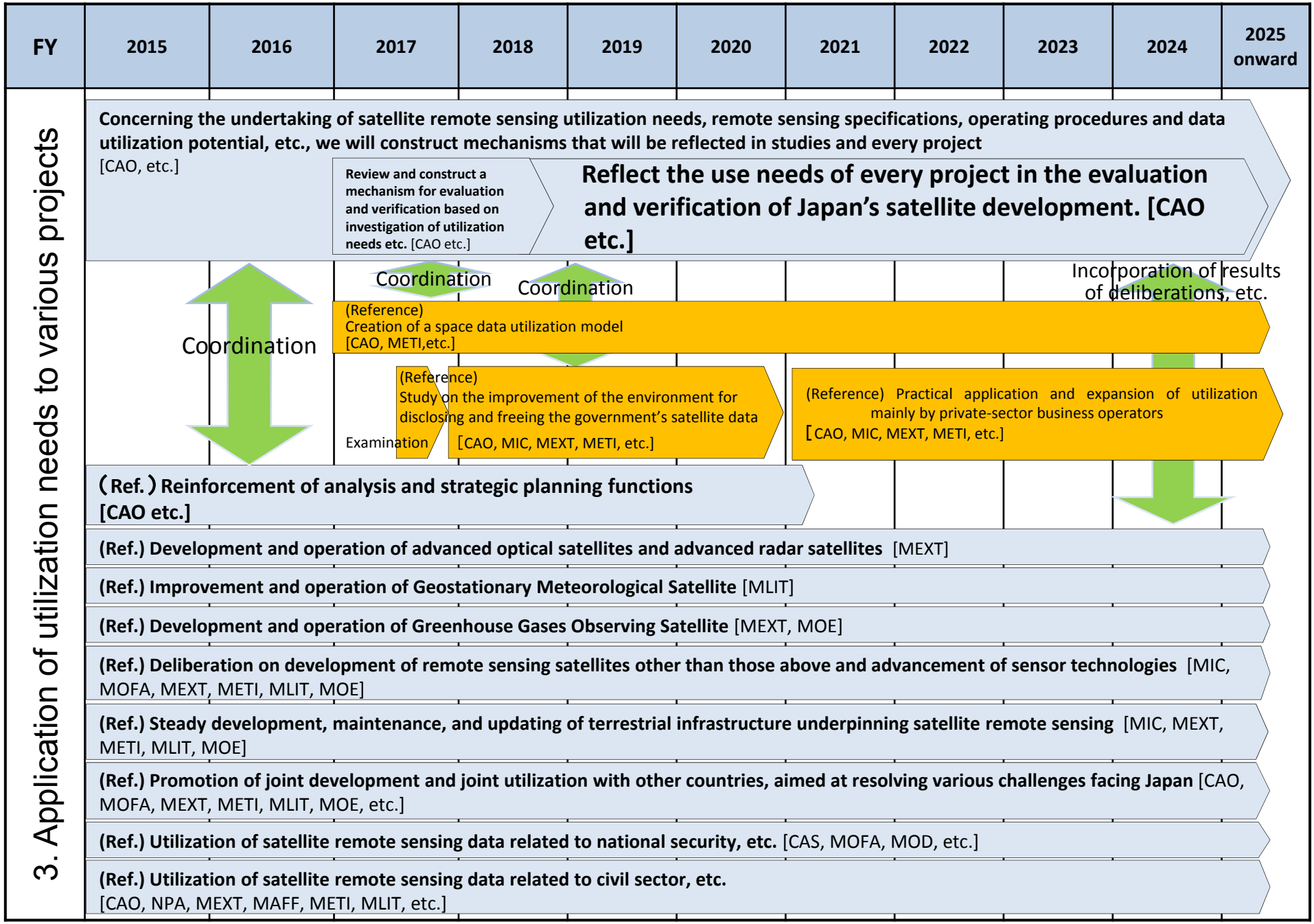
Achievements/status by end of FY2017

- We improved the environment for practical application of the results of the use of the Quasi-Zenith Satellite system through the implementation of demonstration projects in various fields, including agriculture and ITS.
- While proceeding with the development of networks of electronic reference stations in the Asia-Pacific region, we conducted a demonstration and a feasibility study using the Quasi-Zenith Satellite system in industrial fields in the region. In addition, we conducted deliberations on and put into practice cooperation in the use of positioning satellites with Europe and the United States by holding the 12th meeting of the International Committee on Global Navigation Satellite System (ICG), for example.
- We made progress in the development of the Satellite-Based Augmentation System (SBAS) for aircraft using Quasi-Zenith Satellites in order to start operating the system in FY2020.
- Concerning the satellite-based safety confirmation system, we conducted a demonstration test in cooperation with local governments.

Initiatives in FY2018 and beyond

- In FY2018, we will create a model of advanced utilization of the Quasi-Zenith Satellite system by conducting demonstrations in various fields, including agriculture and ITS, under the project to create a model of advanced space data model (space data utilization model project). At the same time, we will expand the utilization of space data by improving the environment for practical application of the results.
- Furthermore, while proceeding with the development a network of electronic reference stations and other positioning infrastructure in the Asia-Pacific region, we will conduct demonstrations in industrial fields, including ITS, through cooperation between the public and private sectors. We will also implement cooperation in the use of positioning satellites with Europe and the United States by accelerating concrete cooperation through the establishment of the Japan-Europe Satellite-Positioning Working Group
- In order to expand the use of Quasi-Zenith Satellites abroad, we will conduct initiatives to raise awareness regarding them, for example, by continuing to actively communicate information to foreign public sector and private sector officials at international meetings and on other occasions.
- In FY2020, we will start a positioning augmentation service via a satellite-based augmentation system (SBAS) for aircraft using Quasi-Zenith Satellites.
- We will introduce the satellite-based safety confirmation system in five prefectures in FY2018 and in 20 prefectures in FY2021.

4. (2)①ii) Satellite remote sensing



3. Application of utilization needs to various projects

Target

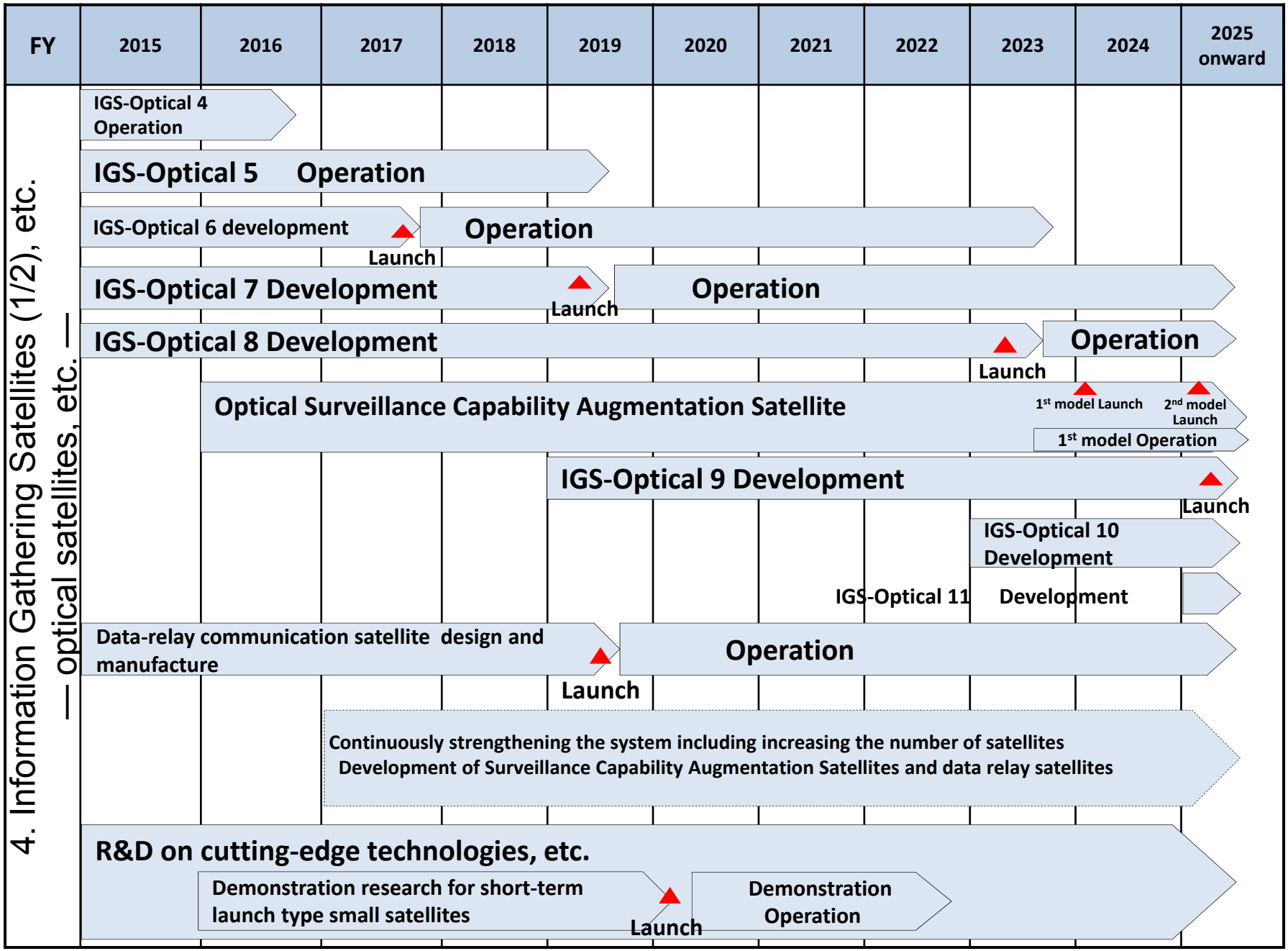
[Security/civil sector] After identifying needs for the use of satellite remote sensing in the security and civil sectors, Japan will draft a mechanism for sharing this information with those undertaking satellite-related projects.

Achievements/status by end of FY2017

- Under the space data utilization model project, we investigated and reviewed the future needs for utilization of remote sensing satellites while actually using remote sensing satellite data in various fields and conducted a trial with a view to putting into practice a system to evaluate and verify Japan's satellite development.
- Through the review meetings of the project attended by relevant government ministries and agencies, we established a system whereby information concerning satellite utilization needs discovered through this project is shared among relevant government ministries and agencies.

Initiatives in FY2018 and beyond

- By continuing to implement this project in FY2018, we will continuously discover satellite utilization needs, and we will also conduct deliberations on a specific system whereby information concerning satellite utilization needs is shared among relevant government ministries and agencies and is reflected in future satellite development and future provision of satellite data.
- When conducting the deliberations, we will take into consideration the results of the deliberations on initiatives for the strengthening of analysis and strategic planning functions concerning Japan's space policy etc.



*All of the above: CAS

*The above operational periods are figures reflecting the design life, and some satellites are used for a longer time than these periods.

4. Information Gathering Satellites, etc. (optical satellites, etc.)

Target

[Security] (civil sector) Japan will examine preparations for the reflection of user needs and verification of operational effects, as well as approaches to the sharing of information and mission assurance of Information Gathering Satellites, and will put together the requisite measures.

Achievements/status by end of FY2017

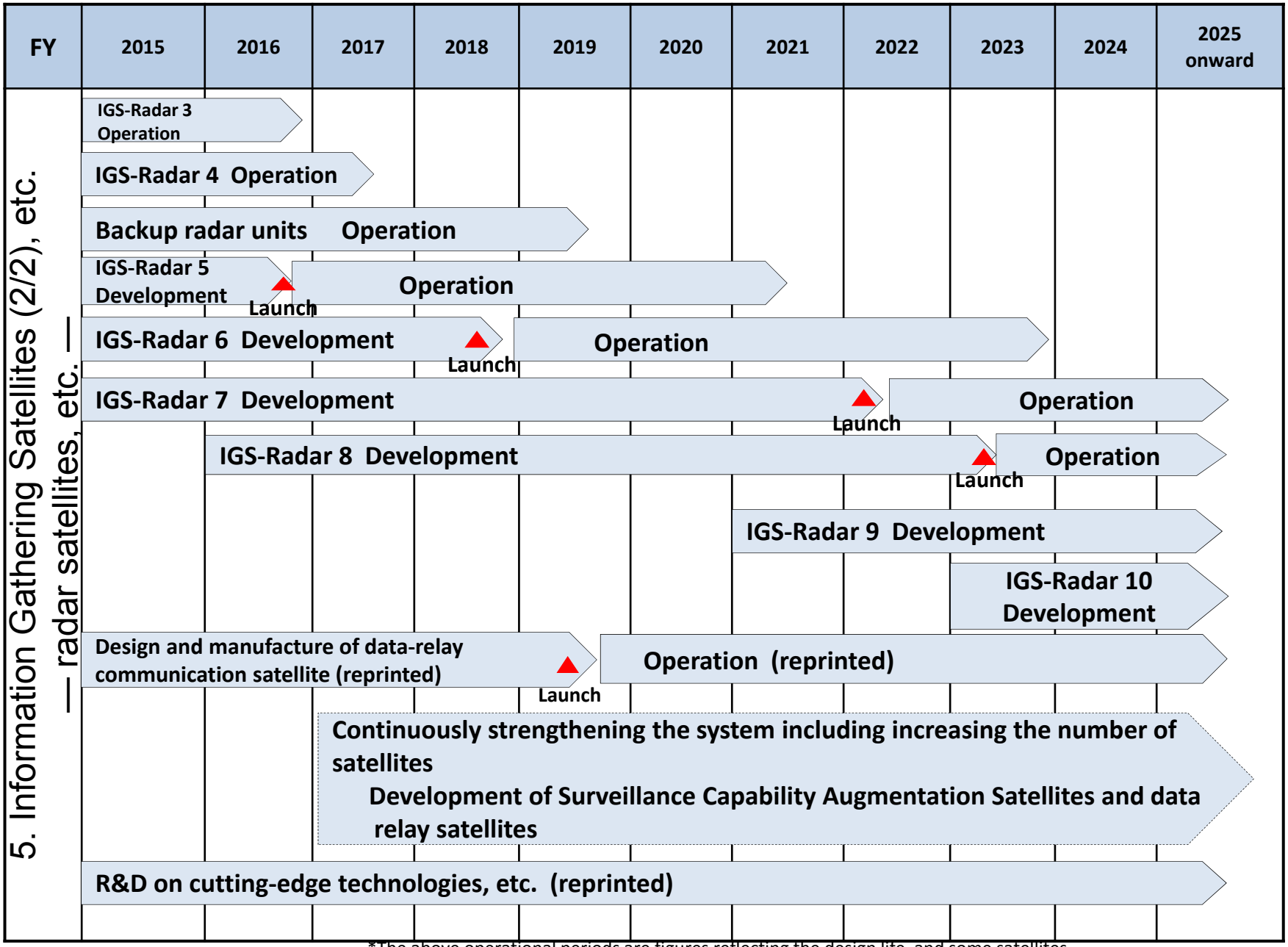
■ We will operate the 4th and 5th optical satellites, develop and operate the 6th optical satellite, and develop the 7th and 8th optical satellites, the 1st and 2nd Optical Surveillance Capability Augmentation Satellites, and the 1st Data Relay Satellite, as well as conducting R&D on advanced technology, including the demonstration research of short-term launch type small satellites, etc. as planned.

■ In addition to realizing users' needs by conducting image analysis training, for example, we reported the correspondence to related ministries and agencies.

Initiatives in FY2018 and beyond

- Japan will continue to operate the 4th to 6th optical satellites, develop the 7th and 8th optical satellites, the 1st and 2nd optical surveillance capability augmentation satellites, and the 1st Data Relay Satellite, as well as conducting R&D focused on advanced technology including the demonstrating research of short-term launch small satellites, etc.
- To enable imaging to take place at more diverse intervals, Japan will begin developing Optical Surveillance Capability Augmentation Satellites, with a view to supplementing the aforementioned four core satellites with four Surveillance Capability Augmentation Satellites and two Data Relay Satellites, thereby putting in place a total of ten satellites, while also considering its fiscal plan including the required optimization of the budget through cost cutting policies, etc. Japan will also start experimental study of small alternative satellites that are able to launch within a short period.
- Japan will conduct deliberations on the enhancement of mission assurance of Information Gathering Satellites and take necessary measures.

4. (2)①ii) Satellite remote sensing



*All of the above: CAS

*The above operational periods are figures reflecting the design life, and some satellites are used for a longer time than these periods.

5. Information Gathering Satellites, etc. (radar satellites, etc.)

Target

[Security] (civil sector) Japan will examine preparations for the reflection of user needs and verification of operational effects, as well as approaches to the sharing of information and mission assurance of Information Gathering Satellites, and will put together the requisite measures.
Japan will continue to strengthen the Information Gathering Satellite system by increasing the number of satellites and enhancing and reinforcing the functions of the satellites comprising the 4-satellite constellation, thereby ensuring that the Prime Minister's Office and other bodies can make more accurate decisions on security policy, as well as making a more direct contribution to the activities of the Self-Defense Forces and other relevant organizations.

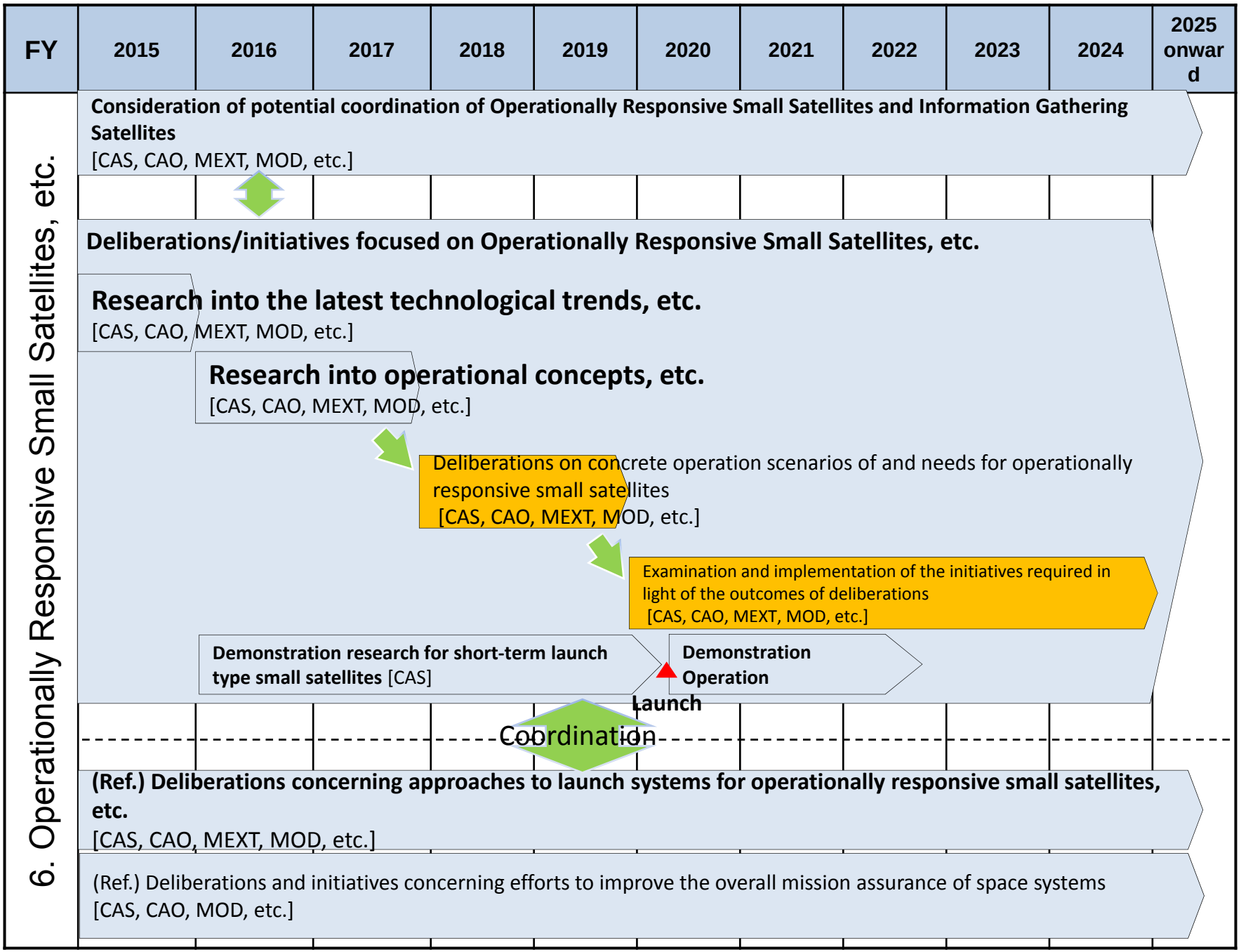
Achievements/status by end of FY2017

- We will operate the 3rd and 4th radar satellites and reserve satellite, and develop and operate of the 5th radar satellite, and develop the 6th to 8th radar satellites and the 1st Data Relay Satellite, as well as conducting R&D focused on advanced technology, etc. as planned.
- In addition to realizing users' needs by conducting image analysis training, for example, we reported the correspondence to related ministries and agencies.
- (Described above)

Initiatives in FY2018 and beyond

- We will operate the 3rd to 5th radar satellites and a reserve satellite, and develop and operate the 6th radar satellite, and develop the 7th and 8th radar satellites and the 1st Data Relay Satellite, while continuing R&D focused on advanced technology, etc.
- To enable imaging to take place at more diverse intervals, Japan will begin developing Optical Surveillance Capability Augmentation Satellites, with a view to supplementing the aforementioned four core satellites with four Surveillance Capability Augmentation Satellites and two Data Relay Satellites, thereby putting in place a total of ten satellites, while also considering its fiscal plan including the required optimization of the budget through cost cutting policies, etc. Japan will also start experimental study of small alternative satellites which is able to launch within a short period.(reprinted)
- Japan will conduct deliberations on the enhancement of mission assurance of Information Gathering Satellites and take necessary measures.
- (Described above)

4. (2)①ii) Satellite remote sensing



6. Operationally Responsive Small Satellites, etc.

Target

[Security] Taking into account deliberations concerning efforts to improve the overall mission assurance of space systems, Japan will conduct research concerning the operational needs and concepts for operationally responsive small satellites, etc., identifying and summarizing approaches to such satellites.

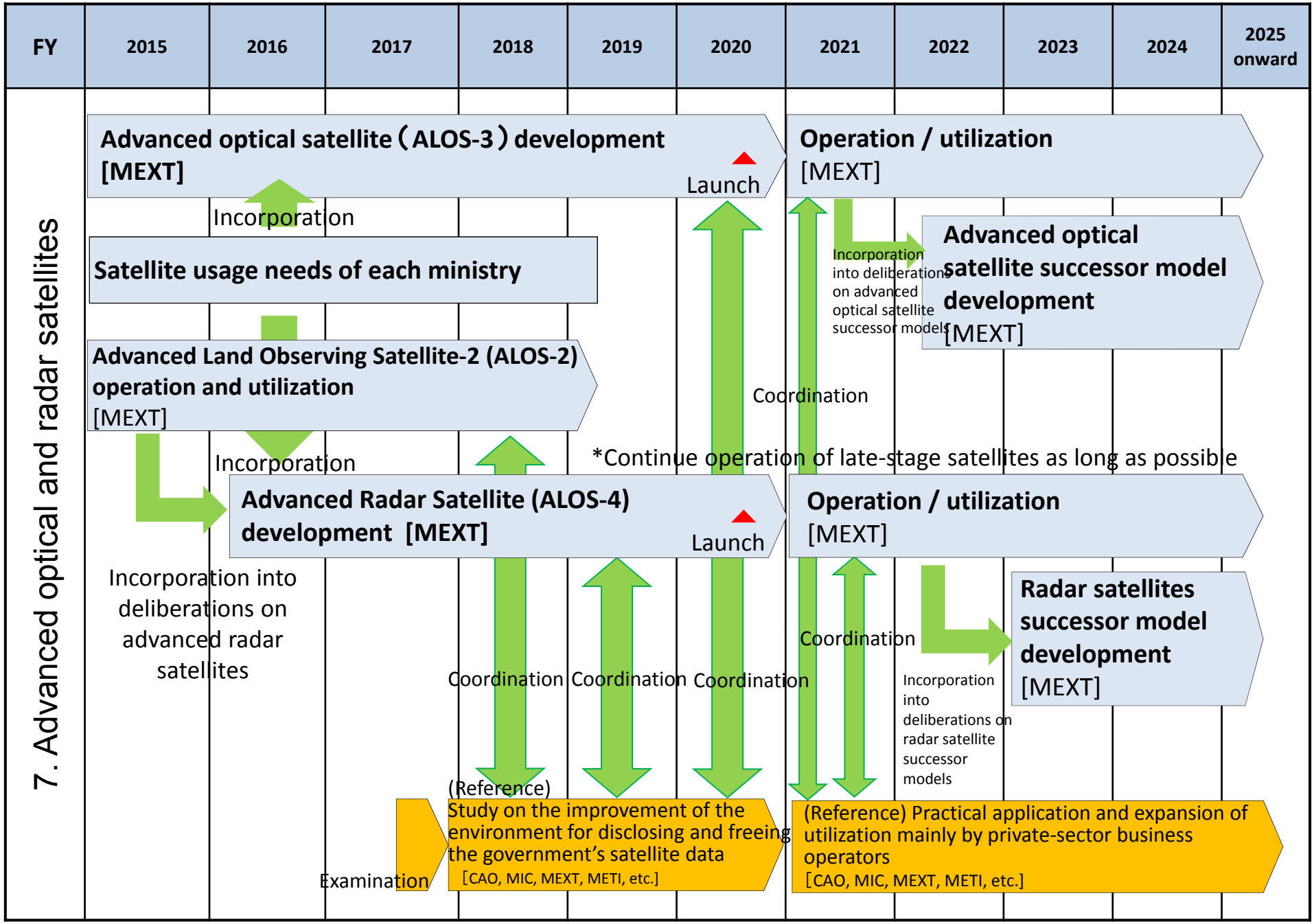
Achievements/status by end of FY2017

- Related ministries and agencies studied operational needs, operational concepts, etc. for small satellites etc. that can possess realizable responsiveness from the sides of both performance and cost.
- We moved forward with demonstration research for the purpose of gathering necessary technical information for a short-term launch small satellite, which can function as an alternative to IGS for a fixed interval in the event that an unexpected situation occurs.

Initiatives in FY2018 and beyond

- Based on the status of deliberation at ministries and agencies and the results of participation in the Schriever Wargame, a U.S.-organized multilateral tabletop exercise, the Cabinet Office, in cooperation with relevant ministries and agencies, will review concrete operation scenarios of operationally responsive small satellites and the accompanying needs, including the use of commercial satellites, by the end of FY2019.

4. (2)①ii) Satellite remote sensing



7. Advanced optical and radar satellites

Target

[Security/civil sector] To contribute to space security and efforts to promote the civilian use of space, Japan will develop and operate advanced optical and radar satellites that leverage Japan's technical strengths, as well as striving to expand the proactive use of the data obtained from these satellites.

To ensure seamless satellite operation, Japan will also develop and operate successor models for these advanced optical and radar satellites.

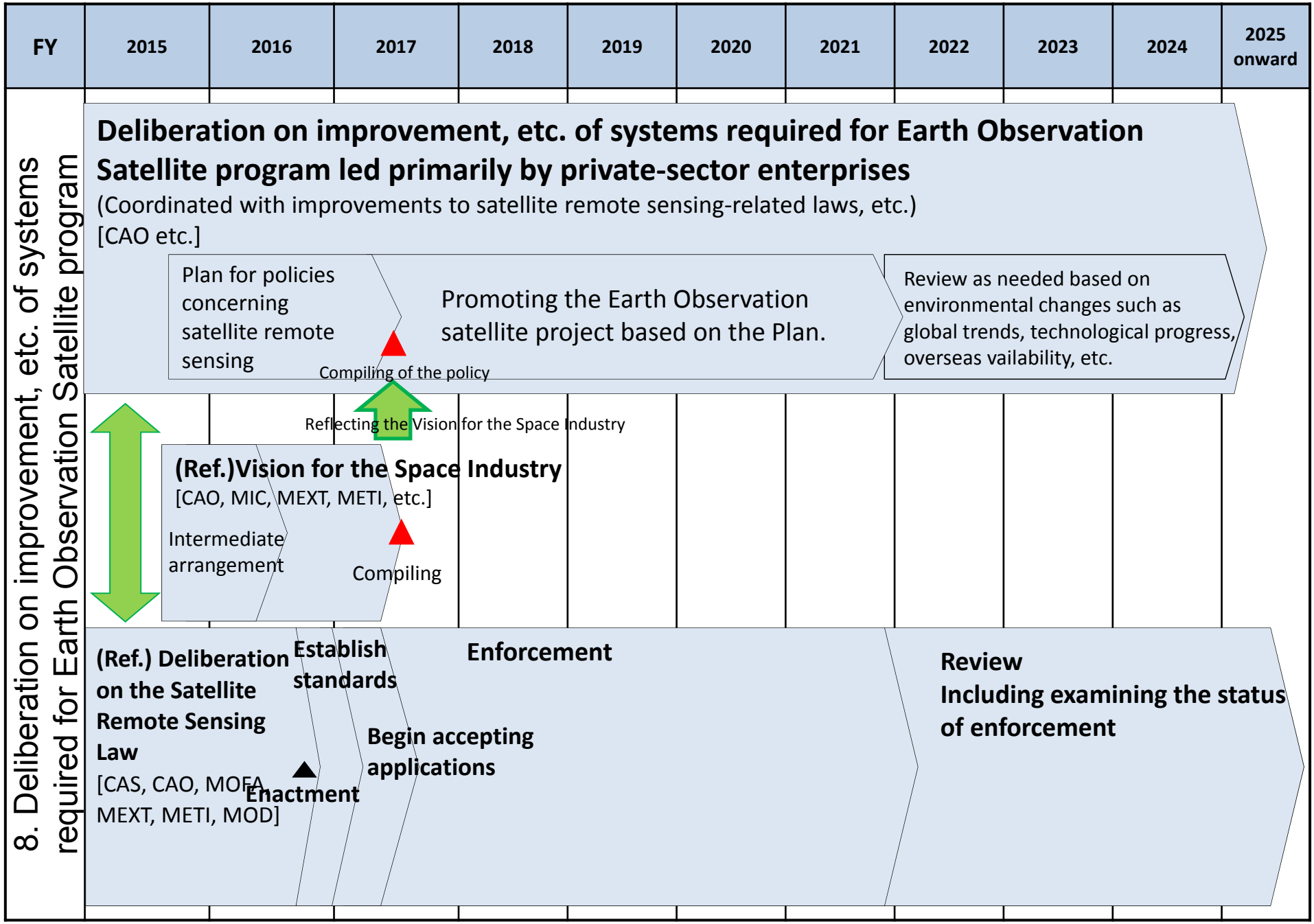
Achievements/status by end of FY2017

- Concerning the Advanced Land Observing Satellite-2 (ALOS-2), we provided observation data to relevant ministries and agencies to be used for disaster management, for example.
- Concerning the advanced optical satellite (ALOS-3), we implemented basic designing, manufactured and tested an engineering model (EM) and a proto-flight model (PFM) and developed ground systems. We have set up an investigative committee with membership drawn from among ministries and agencies involved in disaster preparedness, which has reconfirmed usage needs.
- Concerning the advanced radar satellite (ALOS-4), we completed basic design, manufactured and tested an EM and developed ground systems. We have set up an investigative committee with membership drawn from among ministries and agencies involved in disaster preparedness, which has reconfirmed usage needs, etc.

Initiatives in FY2018 and beyond

- Japan will endeavor to expand the use of data in response to needs such as disaster prevention and response measures, land conservation and management, the securing of resources and energy, the resolution of global environmental problems, and productivity improvement of agriculture, forestry and fisheries industries. In addition, bearing in mind their potential to be used for security purposes in the medium to long term, Japan will continue to develop the advanced optical satellite (ALOS-3), the advanced radar satellite (ALOS-4) and improve ground systems in and beyond 2018.
- Aiming for the expansion of the use and application of advanced optical satellites and advanced radar satellites, we will identify more utilization needs in cooperation with related ministries and agencies, local governments, etc. In collaboration with initiatives to promote efforts to disclose and free the government's satellite data, which will start in FY2018, we will study methods of providing satellite data and will provide feedback concerning utilization needs for future satellite development.

4. (2)①ii) Satellite remote sensing



8. Deliberation on improvement, etc. of systems required for the Earth Observation Satellite program

Target

[Security/civil sector] While maintaining a balance between Japan's national security interests and usage/market expansion in the civil sector, Japan will consider systems, etc. for promoting the Earth Observation Satellite program and will take the requisite measures.

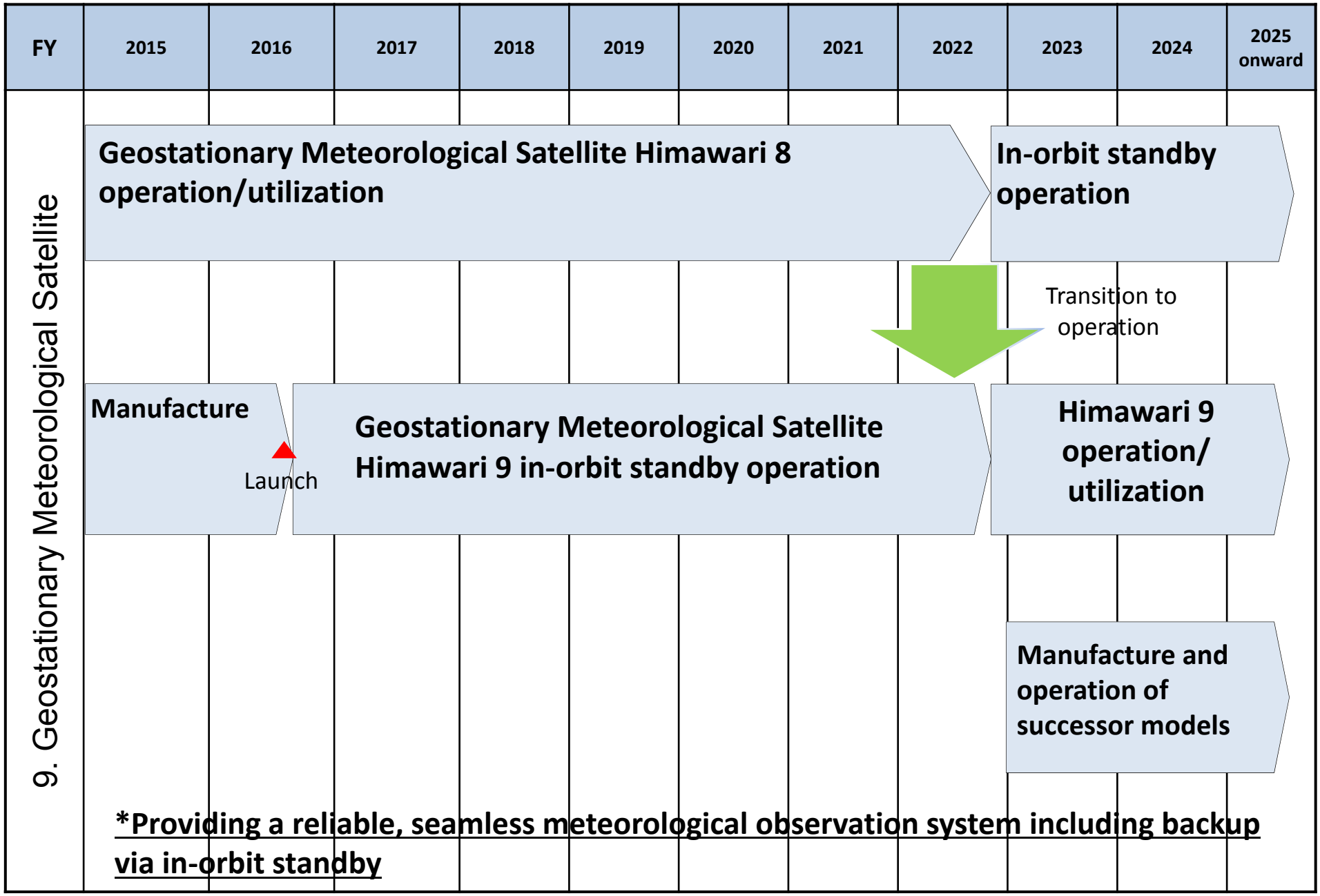
Achievements/status by end of FY2017

- As the objectives for policies concerning satellite remote sensing (regulations and objectives for promotion), in November, we compiled the basic concept concerning the standards for equipment and records and promotion of utilization of remote sensing data under the law concerning satellite remote sensing (Satellite Remote Sensing Law).

Initiatives in FY2018 and beyond

- The basic concept concerning the standards for equipment and records and promotion of utilization of remote sensing data under the Satellite Remote Sensing Law will be revised appropriately based on global trends, technological progress, changes in business models, the potential for sourcing technology overseas, and other environmental changes.
- We will continuously examine the required system developments etc. for private sector business operators to move forward independently with the Earth Observation Satellite program.

4. (2)①ii) Satellite remote sensing



*All of the above: MLIT

9. Geostationary Meteorological Satellite

Target

[Civil sector] Japan will put Himawari 8 into observation operation in FY2015. In addition, Japan will launch Himawari 9 in FY2016 to begin operating in standby mode. From this, Japan will establish a 2-satellite constellation of Geostationary Meteorological Satellites (Himawari 8 and 9) conducting continuous observation, and Japan will also continue to utilize satellite data that is indispensable to the safety and security of its citizens, such as monitoring typhoons, severe rain fall, and other meteorological phenomena.

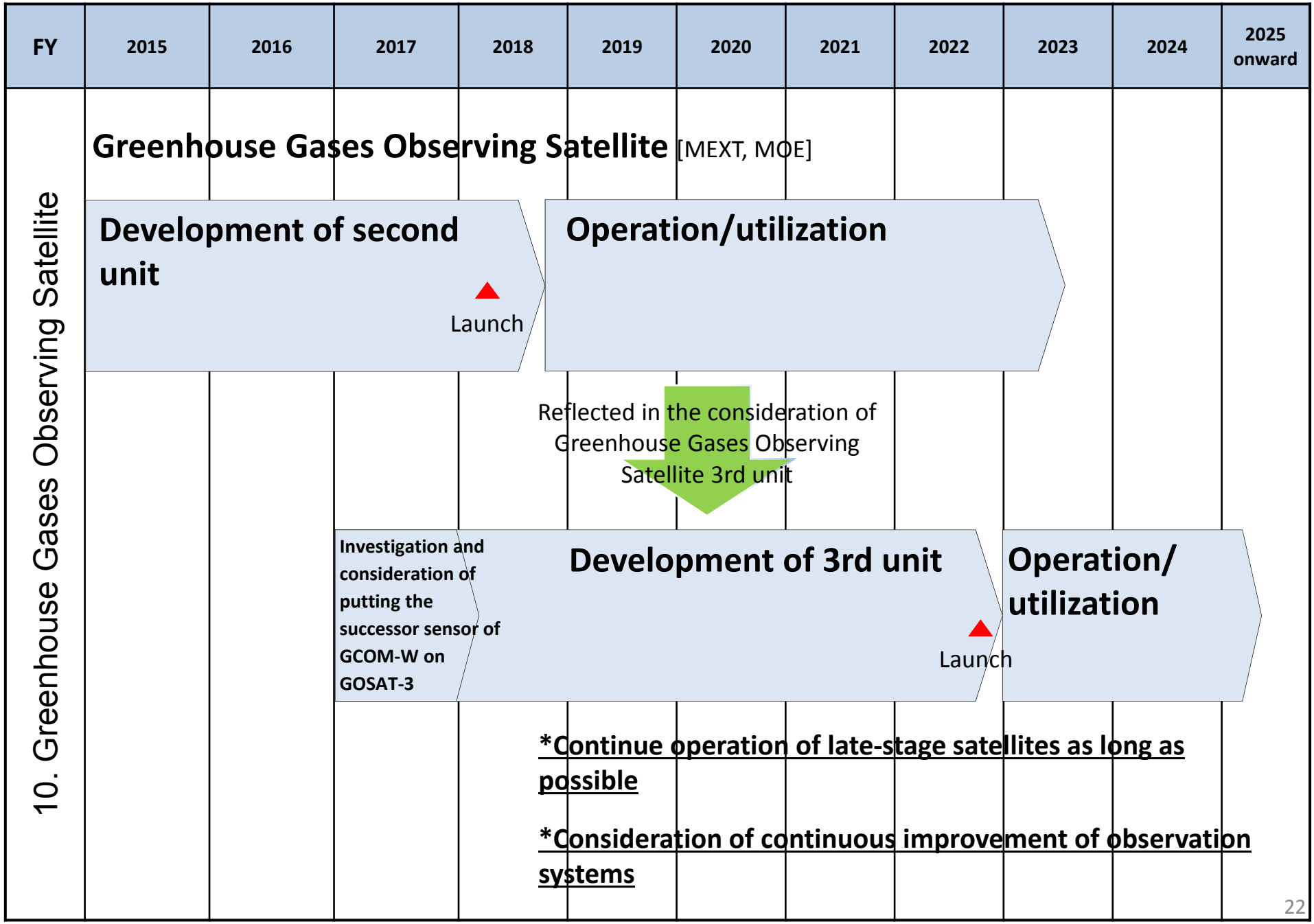
Achievements/status by end of FY2017

- Himawari 8 is carrying out continuous observation operations.
- We continued on-orbit standby operation of Himawari 9.

Initiatives in FY2018 and beyond

- Along with continuing observation by the 2-satellite Geostationary Meteorological Satellites (Himawari 8 and Himawari 9), Japan will continue to utilize satellite data indispensable to the safety and security of its citizens, such as monitoring of typhoons, severe rain fall, and other meteorological phenomena.
- By FY2023 Japan will start manufacturing the Geostationary Meteorological Satellites that will be the successors to Himawari 8 and 9, aiming to put them into operation in around FY2029.

4. (2)①ii) Satellite remote sensing



10. Greenhouse Gases Observing Satellite

Target

[Civil sector] Japan will improve monitoring of the volume of anthropogenic greenhouse gas emissions by major greenhouse gas emitting countries and will put in place a framework for the continuous monitoring of the global distribution of greenhouse gas concentrations and variations therein over time.

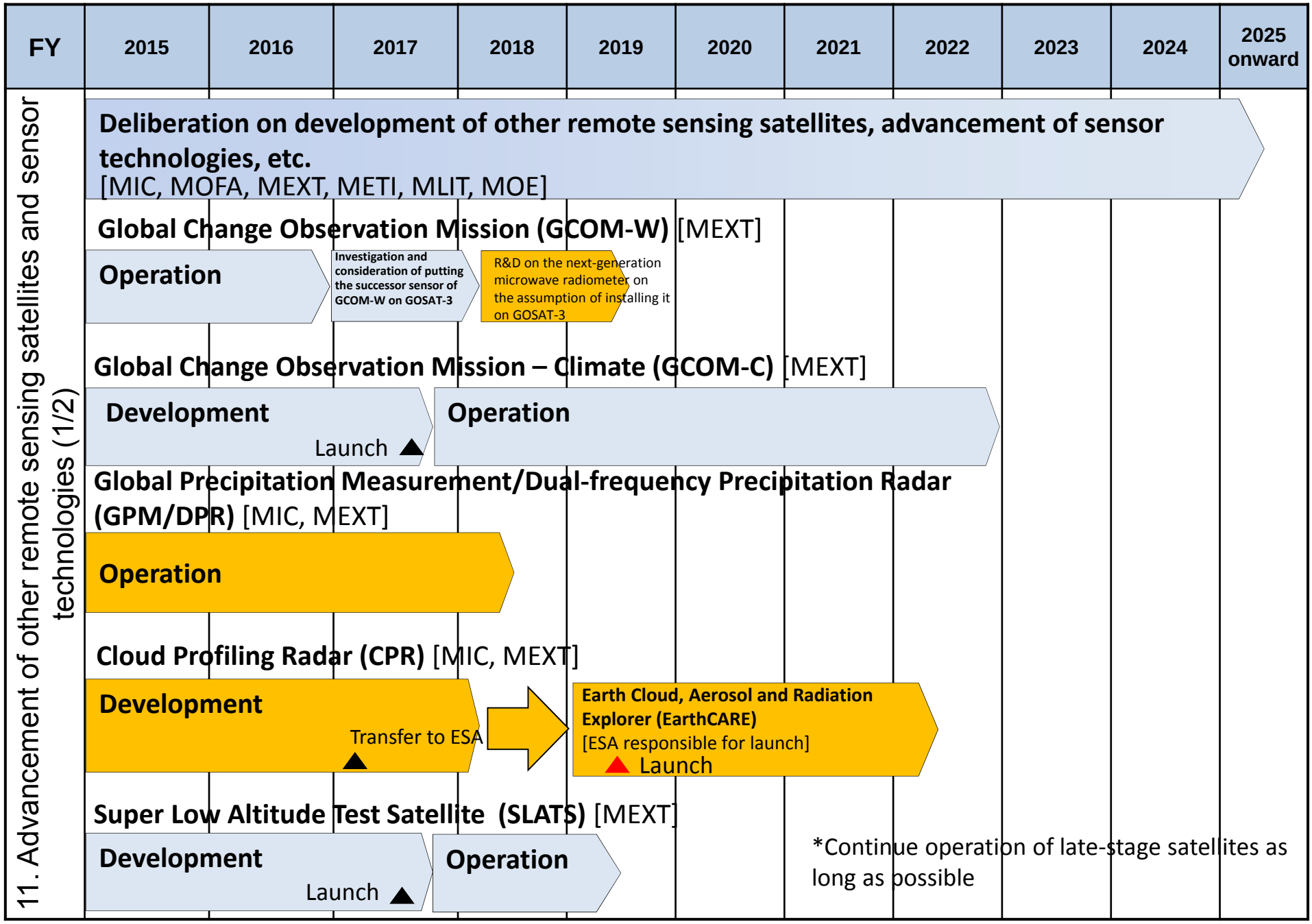
Achievements/status by end of FY2017

- Concerning the second unit, we will continue manufacturing and testing of the satellite bus and observation sensors and testing of the ground system.
- Concerning the first unit, which is continuing observation, we started the analysis concerning methane, which, along with carbon dioxide, is an important greenhouse gas, and showed for the first time in the world that the global methane density has been rising year after year while repeating seasonal fluctuations.
- We will compile and disclose a guidebook as an activity to prepare for the revision of the guidelines of the Intergovernmental Panel on Climate Change (IPCC) so that satellite observation data can be utilized for comparison and verification of greenhouse gas emission volumes to be reported by individual countries in the future based on the Paris Agreement.

Initiatives in FY2018 and beyond

- In addition to manufacturing and testing the satellite system, we will continue testing of the ground system, aiming to launch the second unit in FY2018.
- Regarding the 3rd unit, we will start development in FY2018 based on the results of the investigation and deliberation that took account of the possibility of putting the GCOM-W successor sensor on the 3rd unit.
- We will continue efforts to expand the utilization of observation data as effective information for the international community to measure greenhouse gas emission volumes.

4. (2)①ii) Satellite remote sensing



11. Advancement of other remote sensing satellites and sensor technologies

Target

[Security/civil sector/infrastructure] Japan will steadily move forward with initiatives currently under development, such as those aimed at disaster prevention and response, and will achieve the goals of each initiative. In efforts to develop new satellites and make sensors more advanced, Japan will prioritize those projects with a clear path to their practical application, thereby assisting in the resolution of global issues. In doing so, we will proceed effectively and efficiently, via such strategies as the establishment of standard bus technologies that can be used with several types of satellite.

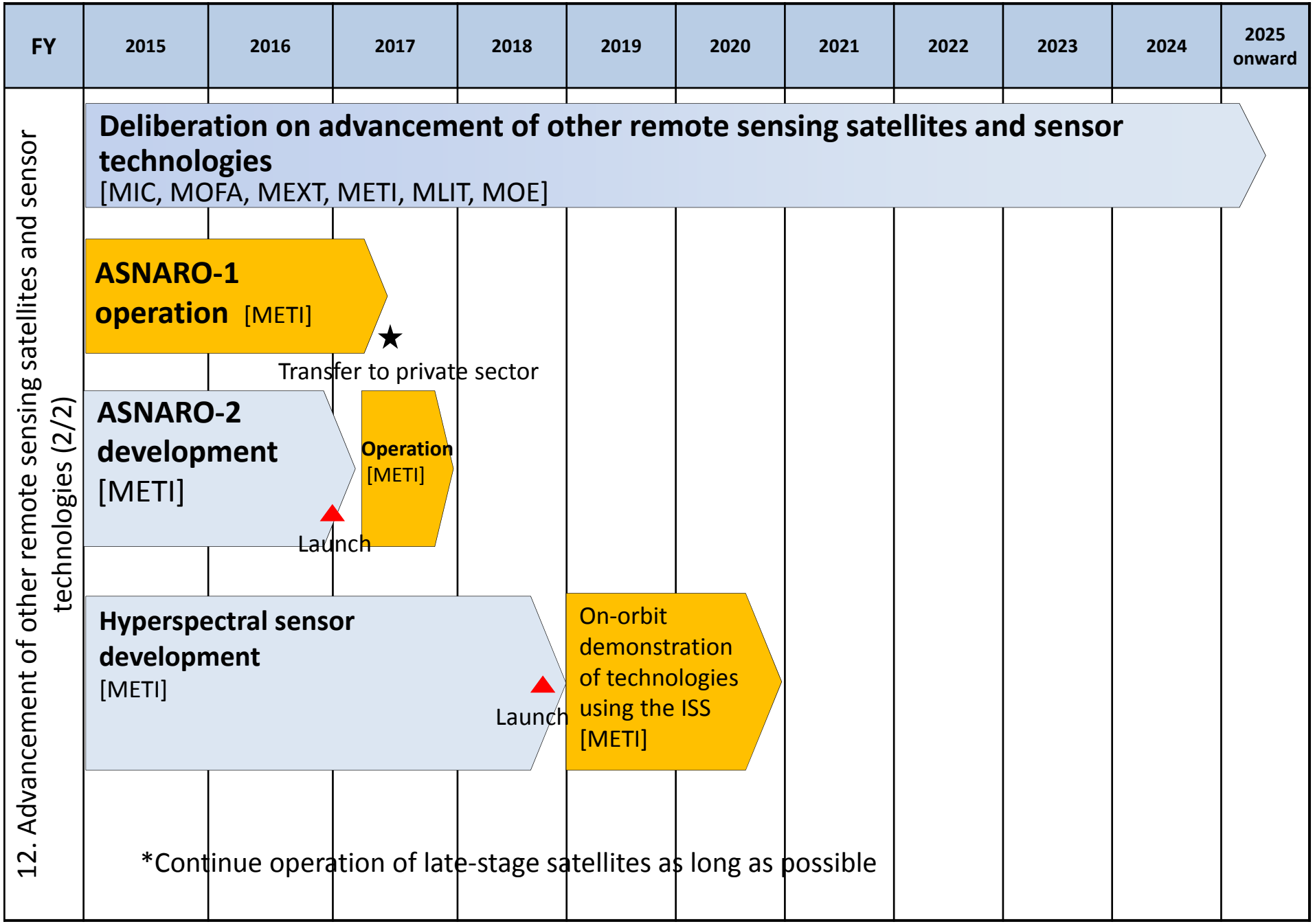
Achievements/status by end of FY2017

- We completed the development of GCOM-C and launched it in FY2017.
- We completed the development of EarthCARE/CPR, supported the satellite system operated by ESA and developed the ground data system.
- We completed the development of SLATS and launched it in FY2017.
- We investigated and considered the possibility of installing the successor on the second unit of the high-performance microwave radiometer (AMSR2) installed on GCOM-W.

Initiatives in FY2018 and beyond

- We will continue the development of EarthCARE/CPR with a view to its launch in FY2019.
- Concerning SLATS, we will complement the fall in the orbit altitude caused by atmospheric resistance with ion engine propulsion power and conduct earth observation and technical evaluation from an ultra-low-altitude orbit.
- We will conduct R&D on the next-generation microwave radiometer, which is the successor sensor to the second unit of the high-performance microwave radiometer (AMSR2) on the assumption of installing it on GOSAT-3.

4. (2)①ii) Satellite remote sensing



12. Advancement of other remote sensing satellites and sensor technologies

Target

[Security/civil sector/infrastructure] Japan will steadily move forward with initiatives currently under development, such as those aimed at disaster prevention and response, and will achieve the goals of each initiative. In efforts to develop new satellites and make sensors more advanced, Japan will prioritize those projects with a clear path to their practical application, thereby assisting in the resolution of global issues. In doing so, we will proceed effectively and efficiently, via such strategies as the establishment of standard bus technologies that can be used with several types of satellite.

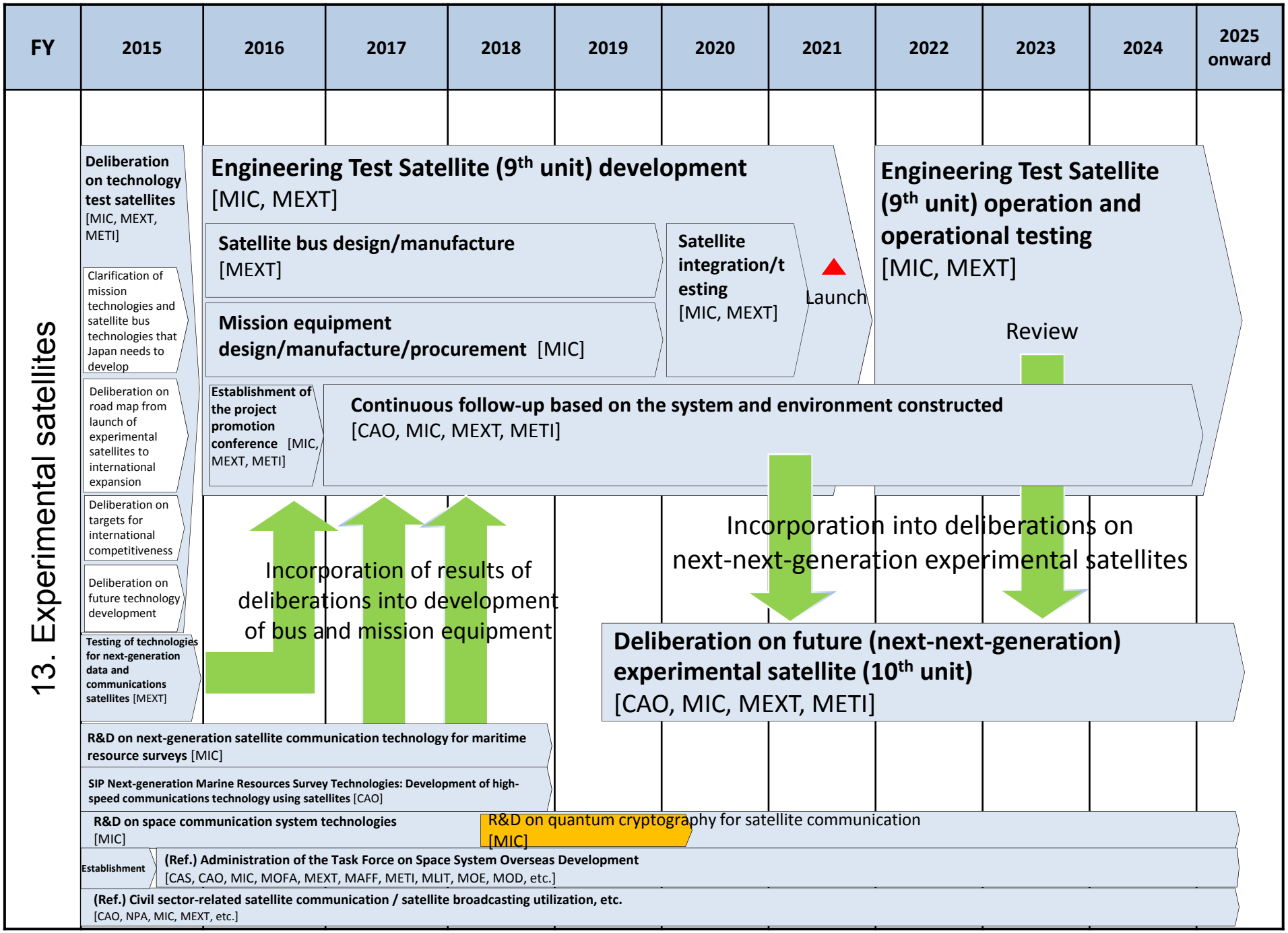
Achievements/status by end of FY2017

- We verified the usefulness of the ASNARO-1 satellite system via the processing and analysis of data obtained from it. Following the entry-into-force of the Remote Sensing Law, ASNARO-1 will be transferred to the private sector for the purpose of commercialization.
- We completed the development of the body of ASNARO-2. ASNARO-2 will be launched by the end of FY2017 and on-orbit demonstration will be conducted.

Initiatives in FY2018 and beyond

- Concerning ASNARO-1 and ASNARO-2, we will conduct overseas promotion and implement initiatives to capture foreign and private-sector demand for satellite data. We will also consider how to create stable domestic demand through active utilization by governmental and public organizations of data collected by private-sector remote sensing satellites .
- With a view to equipping the International Space Station (ISS) with hyperspectral sensors by the end of FY2019, Japan will design, manufacture, and test the necessary equipment and data processing systems, etc.
- Japan will undertake wide-ranging deliberations concerning the use of data obtained from satellites and sensors.

4. (2)①iii) Satellite communication/Satellite broadcasting



13. Experimental satellites

Target

[Civil sector] With a view to enhancing international competitiveness, Japan will develop Engineering Test Satellites, to facilitate the acquisition of satellite technology that will be competitive in global markets.
[Infrastructure] By acquiring the world's most advanced mission technology and satellite bus technology, while forecasting trends in communications and broadcasting satellite markets and technology ten years hence, Japan will maintain and enhance relevant areas of the space industry and the nation’s science and technology infrastructure.

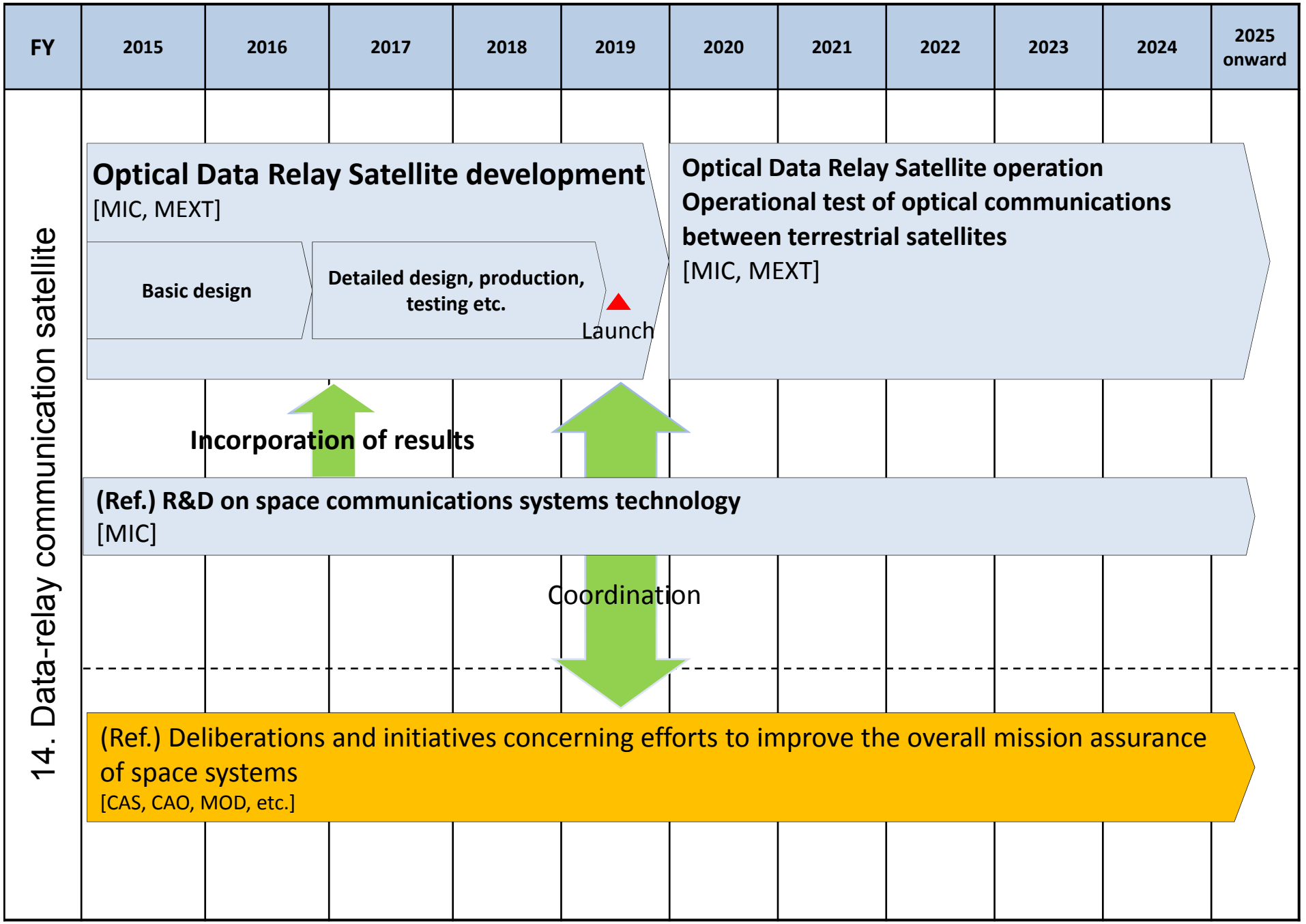
Achievements/status by end of FY2017

- In order to consider the project progress management of the development of the satellite bus and mission components for the 9th Engineering Test Satellite and to study a future engineering test satellite (10th unit), we established a project promotion conference with relevant organizations in FY2016. We are continuously investigating users’ needs and overseas trends and conducting project progress management.
- In the development of the 9th Engineering Test Satellite, we implemented basic design and manufactured and tested an engineering model. Concerning mission equipment, we continued to develop an on-satellite channelizer, a small power supply unit and on-satellite optical communication equipment and started R&D on digital beam forming in FY2017.

Initiatives in FY2018 and beyond

- We will investigate the users’ needs and conduct project progress management in the project promotion conference. In addition, Japan will share information about market and technological trends in the fields of satellite communications and broadcasting. In addition, in order to contribute to the study on a future engineering test satellite (10th satellite), we will continue to study the acquisition of satellite technologies.
- We will start detailed designing and various tests of the satellite bus and mission equipment of the 9th Engineering Test Satellite, aiming to launch the satellite in FY2021.

4. (2)①iii) Satellite communication / Satellite broadcasting



14. Optical Data Relay Satellite

Target

[Security/civil sector] Japan will address future increases in the quantity of remote sensing data and congestion of the radio spectrum by launching Optical Data Relay Test Satellites and acquiring the technology required to relay large volumes of data from Earth Observation Satellites back to the ground in real time, with a high level of resiliency.

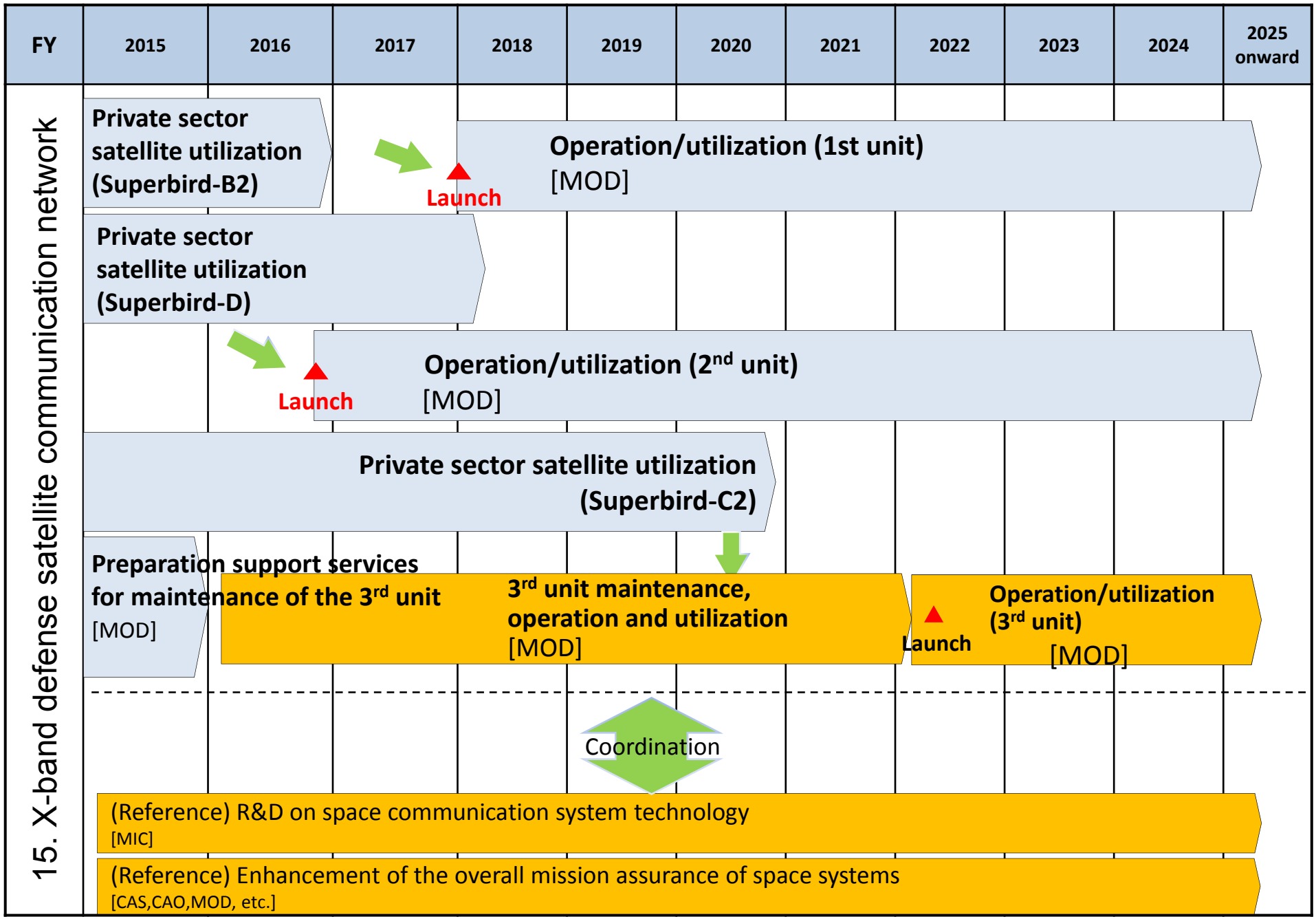
Achievements/status by end of FY2017

- In the field of Optical Data Relay Test Satellites, the purpose of which is to facilitate the transmission of large volumes of data in real time between advanced optical satellites (e.g. ALOS-3) and terrestrial facilities using optical inter-satellite communications technology, we completed the detailed designing of the satellite bus and inter-satellite communications equipment and started the maintenance designing. In addition, terrestrial equipment was improved.
- Concerning JAXA's optical data relay satellite, JAXA concluded a partnership agreement with the National Institute of Information and Communications Technology (NICT). We are considering how to correct the optical axis of on-satellite optical communications equipment, conducting a study on terrestrial measuring equipment, and making adjustments concerning the method of installing the equipment on optical ground stations.

Initiatives in FY2018 and beyond

- We will implement the maintenance designing of the satellite bus and inter-satellite optical communications equipment of the Optical Data Relay Test Satellite. We aim to launch the satellite and start operation in FY2019.

4. (2)①iii) Satellite communication / Satellite broadcasting



15. X-band defense satellite communication network

Target

[Security] Japan will make steady progress in developing the X-Band Satellite-Based Defense Communication Network, to enhance the command & control and information & communications capabilities of the Self-Defense Forces.

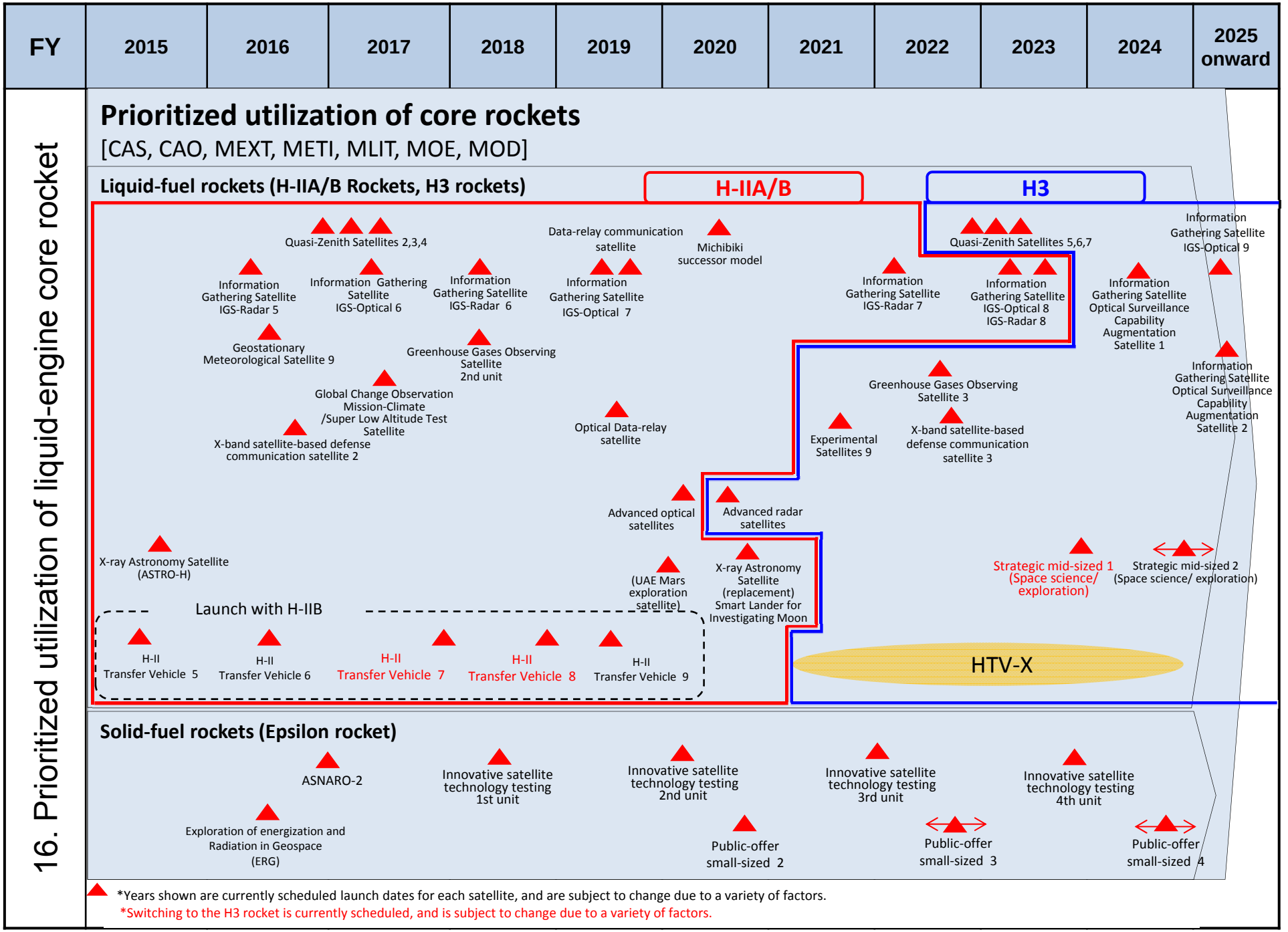
Achievements/status by end of FY2017

- We launched and started operating an X-Band satellite (2nd unit).
- From the viewpoint of ensuring the C4 functions that support quick information sharing and flexible activities of units under joint operation, we included expenditure for the development of parts of the third unit in the budget request in FY2018, as we did in FY2017.

Initiatives in FY2018 and beyond

- We plan to launch the 1st unit in March 2018. We will develop the third unit between FY2017 and FY2022, aiming for its launch in FY2022. Through the development of these satellite communications networks, Japan will enhance the command & control and information & communications capabilities of the Self-Defense Forces.
- We will continue to consider strengthening the satellite communications networks in view of the trends in space communications system technology and the status of deliberation on the overall mission assurance of space systems.

4. (2)①iv) Space transportation systems



16. Prioritized utilization of core rockets

Target

[Infrastructure] To ensure the autonomy of Japan's space activities, we will prioritize the use of domestic core rockets for the launch of governmental satellites.

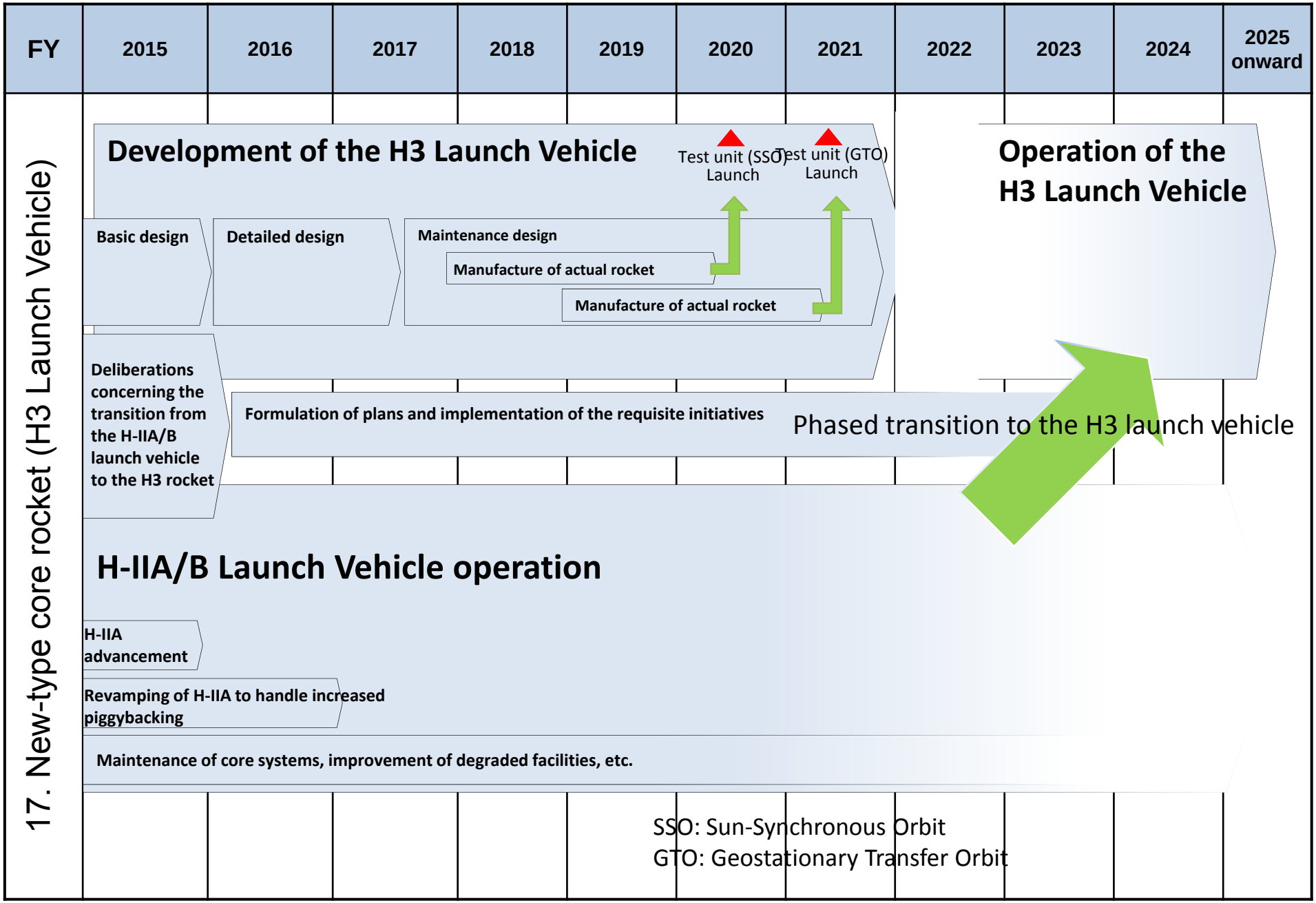
Achievements/status by end of FY2017

- We launched government satellites such as Quasi-Zenith Satellites 2 to 4 with core rockets.
- Concerning the plan to switch from the H-IIA/B rockets to the H3 rocket, we considered the policy for dealing with a change in the plan and how to resolve problems expected to occur at the time of the switch.

Initiatives in FY2018 and beyond

- We will continue to prioritize the use of domestic core rockets for the launch of governmental satellites.

4. (2)①iv) Space transportation systems



*All of the above: MEXT

17. Next Generation Mainstay Launch Vehicle (H3 Launch Vehicle)

Target

[Infrastructure] Japan will steadily promote the development of a comprehensive system integrating the “New-Type Core Rocket” airframe and the terrestrial systems of the Tanegashima Space Center, with the aim of ensuring that Japan has autonomous launch capabilities and enhancing the international competitiveness of launch services.

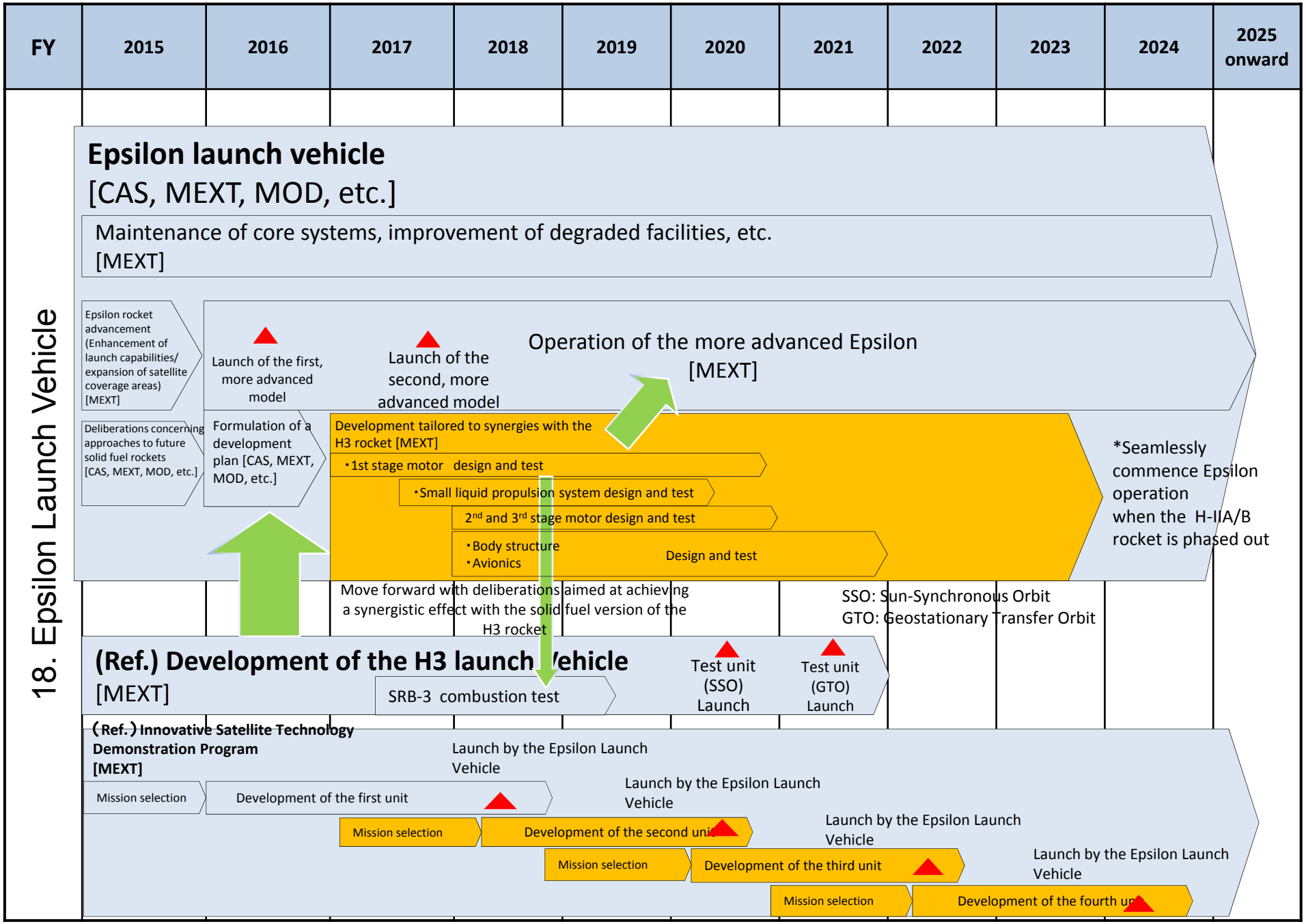
Achievements/status by end of FY2017

- We completed detailed designing for the comprehensive system and shifted to maintenance designing. We also conducted engineering tests (combustion tests of the first- and second-stage engines, element tests, etc.) using specimen for engineering tests of engines, etc.
- We considered the plan to switch from the existing H-IIA/B launch vehicle to the H3 launch vehicle as well as challenges such as how to proceed with the phase-out of the H-IIA/B.

Initiatives in FY2018 and beyond

- In FY2018, we will continue the tests of the first- and second-stage engines and the construction of terrestrial facilities and systems, and we will also implement the maintenance designing of the comprehensive system and start a system combustion test.
- We will start manufacturing the first test model.
- We will continuously reflect the results of investigation(s) for needs trends in development as needed, and we are aiming for the first launch of the test model in FY2020.

4. (2)①iv) Space transportation systems



18. Epsilon Launch Vehicle

Target

[Infrastructure] By the end of FY2015 or thereabouts, Japan will complete upgrading work aimed at enhancing launch capabilities and expanding satellite coverage areas, and will launch the satellites required for these purposes.
Japan will examine approaches to future solid fuel rockets with a view to achieving a synergistic effect with the solid rocket boosters of the “New-Type Core Rocket” and will take the requisite measures.

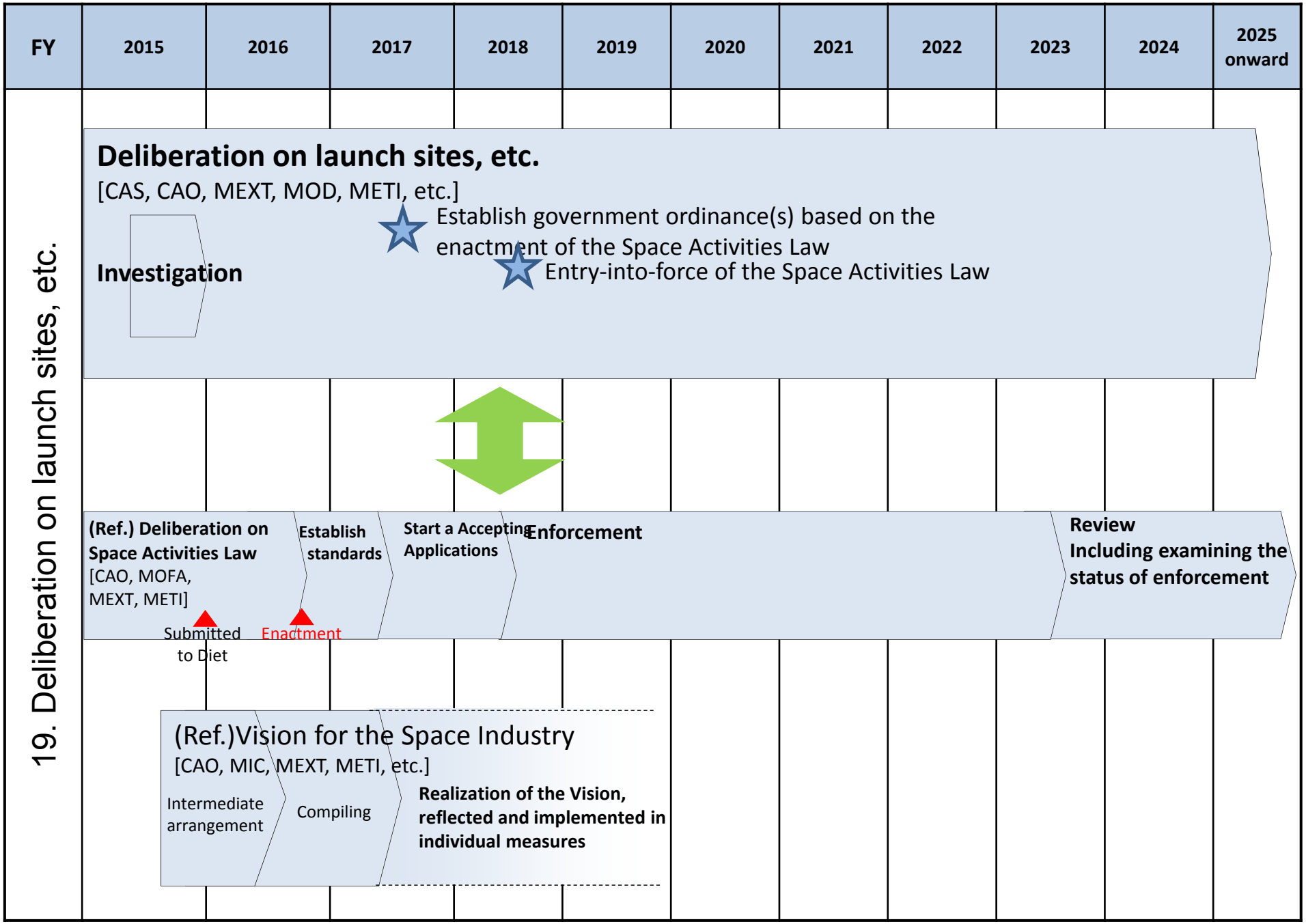
Achievements/status by end of FY2017

- We launched the high-performance small radar satellite (ASNARO-2) with the upgraded launch capabilities.
- We implemented concept design based on the plan for development in synergy with the Next Generation Mainstay Launch Vehicle (H3 launch vehicle) and implemented the design concerning the addition of the thrust vector control (TVC) function to the first-stage motor. We also conducted an initial study on the use of common parts between the gas jet equipment for attitude control of the H3 and the small liquid propulsion system (PBS: post-boost stage) that corresponds to the uppermost stage of the Epsilon Launch Vehicle and on the use of common avionics parts.

Initiatives in FY2018 and beyond

- From FY2018, we will start basic design based on the plan for development in synergy with the H3 in order to strengthen international competitiveness and check the TVC function of the first-stage motor during the combustion test of the solid rocket booster of the H3. We will also start the basic design of the second- and third-stage motors, the body structure, avionics and the small liquid propulsion system (PBS: post-boost stage).

4. (2)①iv) Space transportation systems



19. Deliberation on launch sites, etc.

Target

[Infrastructure] Japan will summarize the points of contention regarding the nation's approach to launch sites, taking into account trends in other countries' approaches to launch sites.

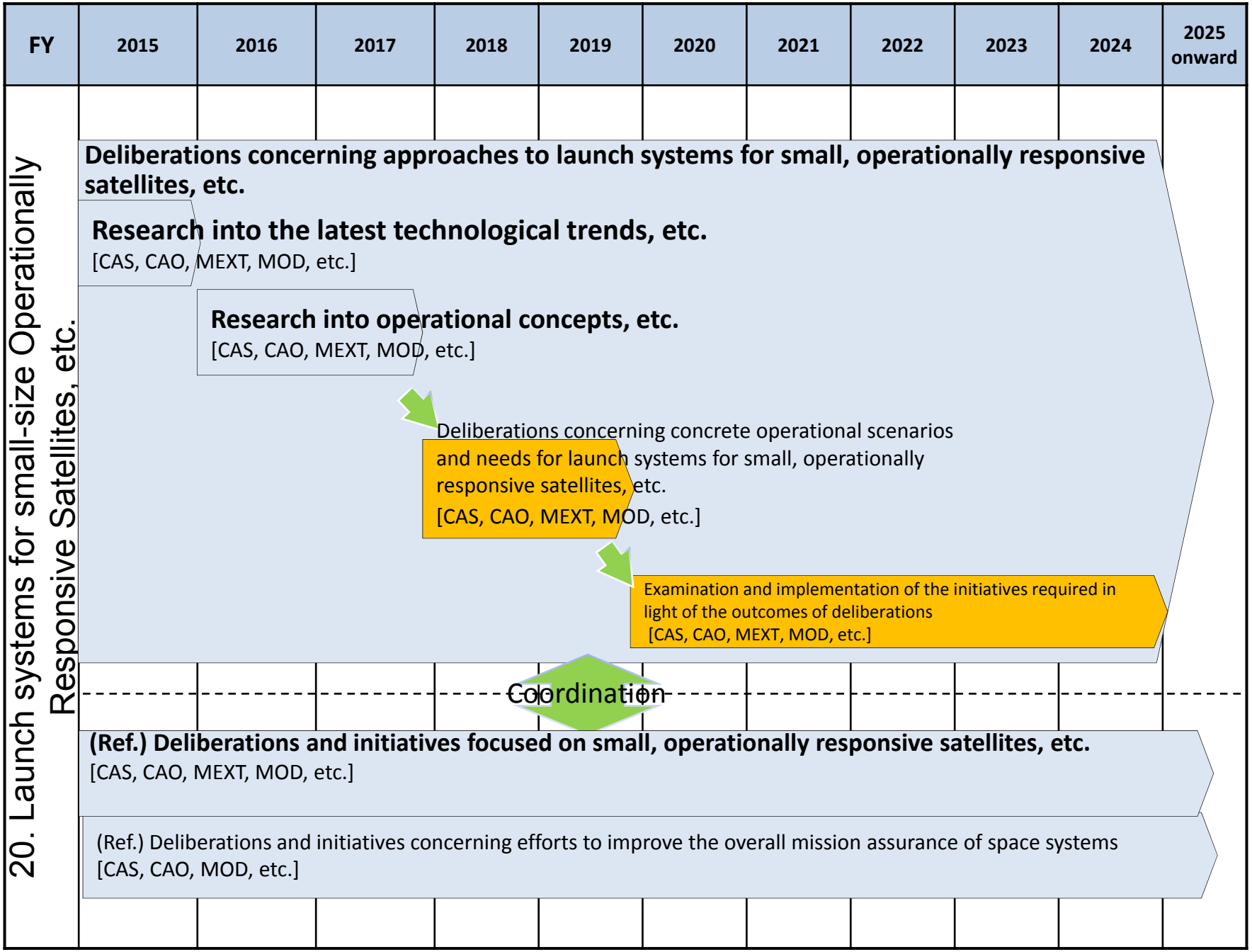
Achievements/status by end of FY2017

- Based on the enactment of the Space Activities Law, we formulated the technical standards, guidelines and application manuals in November 2017 in consideration of the various types of operations of business operators, including rocket ventures aiming for commercial launch services.
- We will investigate matters necessary for the establishment of a launch range, such as the trends concerning rocket ventures (target launch markets, launch ranges, etc.) and launch needs, and summarize the results by the end of FY2017.

Initiatives in FY2018 and beyond

- Concerning the procedures for authorization of a launch range based on the Space Activities Law, we will ensure smooth implementation of business by holding briefings and prior consultations in line with the guidelines and application manuals, for example.
- We will share the results of the investigation of the trends concerning rocket ventures (target launch markets, launch ranges, etc.) and launch needs in FY2017 with relevant parties and conduct necessary initiatives in relation to the deliberation conducted by the entities responsible for the development and management of a domestic launch range.

4. (2)①iv) Space transportation systems



20. Launch systems for small-size Operationally Responsive Satellites, etc.

Target

[Security] In conjunction with research into small, operationally responsive satellites, Japan will collate and identify approaches to launch systems for such satellites (including air launch), tailored to security needs.

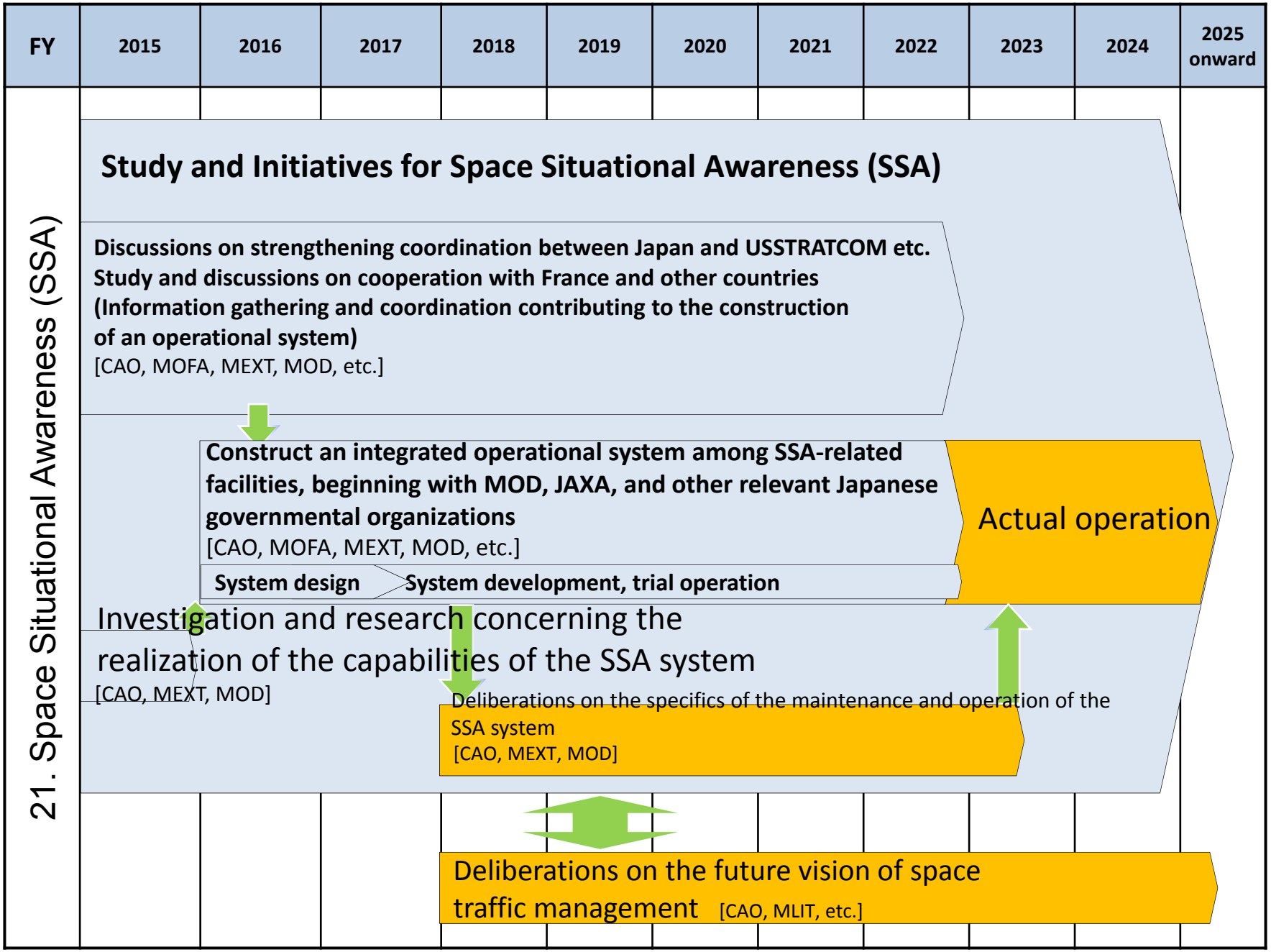
Achievements/status by end of FY2017

■ Relevant ministries and agencies reviewed operational needs and concepts for responsive small satellites etc. that can be realized from the aspects of both performance and cost.

Initiatives in FY2018 and beyond

■ The Cabinet Office, in cooperation with relevant ministries and agencies, will review concrete operation scenarios and the needs by around the end of FY2019 in consideration of the results of the investigations and research conducted until 2017 with respect to operational concepts and the results of the participation in the Schriever Wargame, a U.S.-organized multilateral tabletop exercise.

4. (2) ①v) Space situational awareness



21. Space Situational Awareness (SSA)

Target

[Security] As well as aiming to establish a national operational framework for SSA and seeking to improve its capabilities, Japan will move forward with discussions regarding approaches to enhancing partnerships with the USA, thereby helping to ensure the stable use of outer space and reinforcing the Japan-U.S. Alliance.

(Infrastructure) As well as aiming to establish a national operational framework for SSA and seeking to improve its capabilities, Japan will move forward with discussions regarding approaches to enhancing partnerships with the USA, thereby helping to ensure the stable use of outer space.

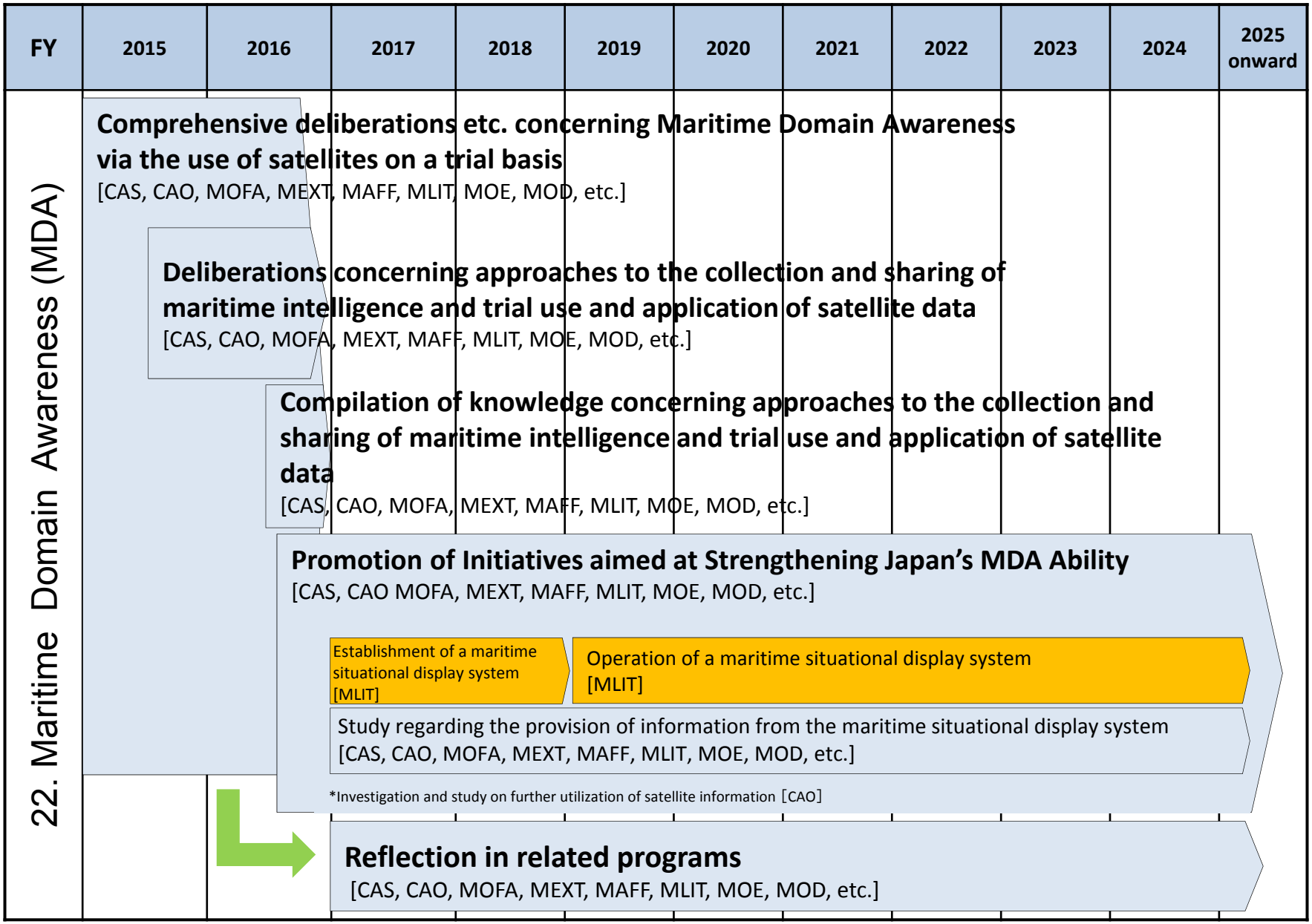
Achievements/status by end of FY2017

- We conducted ongoing discussions concerning the strengthening of partnerships with the U.S. Strategic Command etc. Japan and France signed a technical agreement concerning information sharing related to SSA..
- We completed the detailed designing of JAXA's SSA system.
- MOD will increase the number of personnel as necessary at the Air Staff Office, which has jurisdiction over the development of the SSA operation system.
- Japan started to work on the basic design of the operational system and sensors necessary for the development of MOD's space surveillance system. Japan also plans to establish a unit responsible for operating this system as a new ASDF unit.
- In order to promote effective cooperation between MOD and JAXA, a cooperation agreement was concluded. In addition, technical knowledge possessed by JAXA was reflected in the development of the space surveillance system through personnel exchange.
- In order to obtain knowledge that contributes to the establishment of the SSA operation system, MOD participated in a multilateral SSA tabletop exercise organized by the U.S. Strategic Command.

Initiatives in FY2018 and beyond

- We will implement the design work necessary for the establishment of MOD's space surveillance system. At the same time, we will work out the specifics of the guidelines for operating this system and conduct deliberations concerning the guidelines for cooperation with the United States and JAXA.
- We will continue participation in the multilateral SSA tabletop exercise and effectively promote the establishment of the SSA system through the dispatch of SDF personnel, etc. to the U.S. Strategic Command and other organizations.
- We will conduct detailed design and carry out manufacturing of JAXA's SSA-relevant facilities.
- Concerning the integration of concerned ministries, agencies, and organizations into one SSA system, we will continuously carry out studies based on strengthened cooperation with the U.S., ensuring Japan's stable use of space, and contributing to the strengthening of the Japan-U.S. alliance.
- We will continuously advance the study of cooperation with every country in SSA, beginning with France.
- With a view to starting the system operation in or after FY2023, three relevant government organizations (Cabinet Office, the Ministry of Education, Culture, Sports, Science and Technology and MOD) will conduct deliberations on the specifics of the maintenance and operation of the system from FY2018.
- We will gather information on the overseas trend concerning space traffic management in FY2018.

4. (2)①vi) Maritime Domain Awareness (MDA)



22. Maritime Domain Awareness (MDA)

Target

[Security/civil sector] Relevant ministries and agencies will work together on deliberations concerning the use of space technology in MDA via the trial use of Japan's satellites, among others, taking into account a comprehensive range of perspectives, including the use of satellites in combination with aircraft, ships, and terrestrial infrastructure, as well as partnerships with the USA, and we will take the requisite measures.

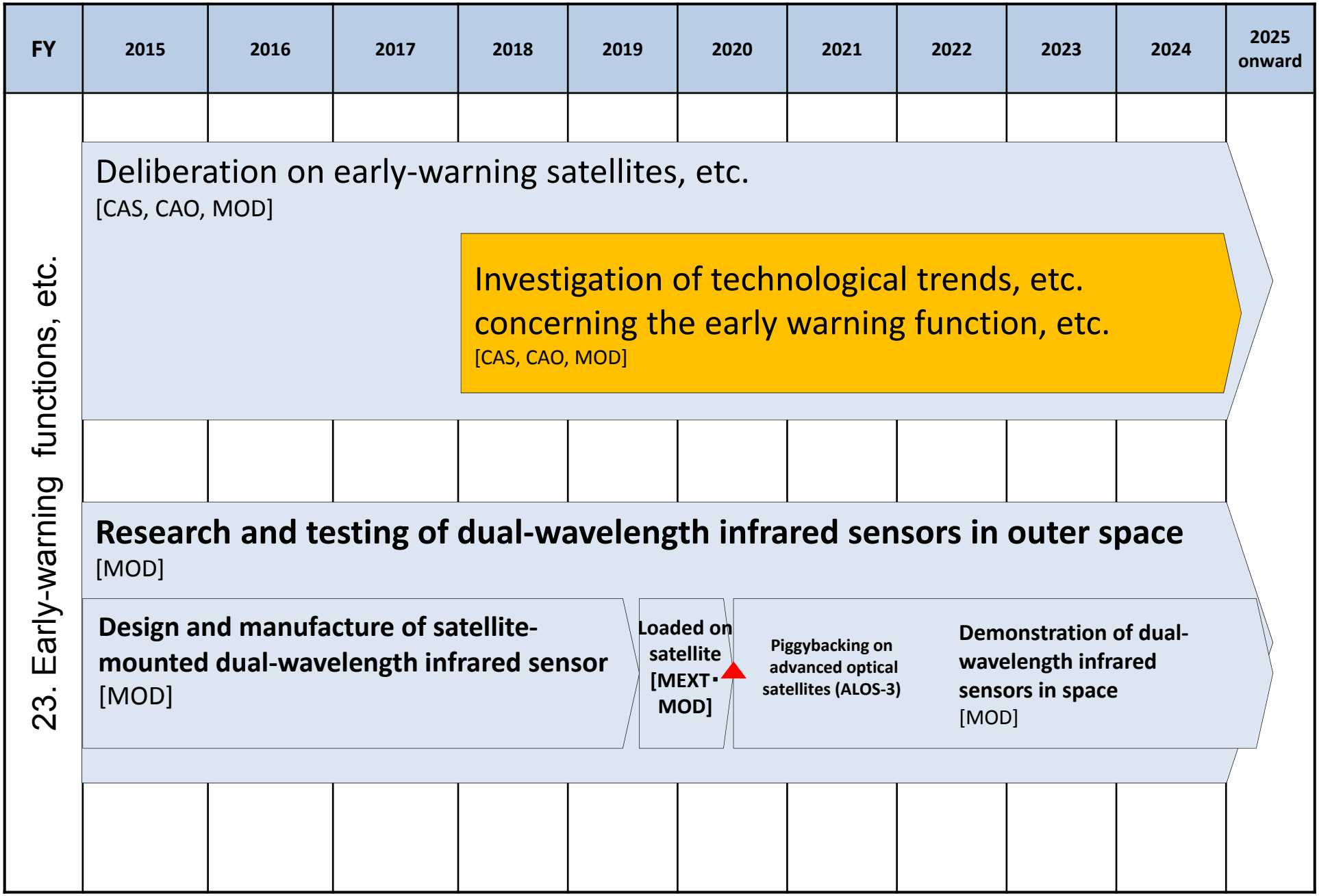
Achievements/status by end of FY2017

- In space consultations and dialogue with the United States and France, we will exchange information about MDA and discuss the possibility of cooperation. We will also continue to explore opportunities for the whole of the government to engage in cooperation.
- We implemented the designing of the Maritime Situational Display System as an effort to establish a system to effectively collect, share and provide maritime information.
- We analyzed maritime environment data captured by satellites and communicated the data domestically and internationally.

Initiatives in FY2018 and beyond

- We will steadily establish the Maritime Situational Display System and other systems to effectively gather, share, and distribute information. We are also promoting the strengthening of infrastructure related to efforts to strengthen maritime information gathering and observation, including the use of earth observation satellites such as ALOS-2.
- We will continue to study, investigate and deliberate further measures to utilize satellite information in order to grasp the maritime situation. In addition, we will continuously strengthen collaboration with the U.S., France and other countries.

4. (2)①vii) Early-warning functions, etc.



23. Early-warning functions, etc.

Target

[Security] As part of its initiatives focused on early-warning functions etc., Japan will consider necessary measures while amassing technical knowledge through investigations and research, including experimental studies of infrared sensors in outer space.

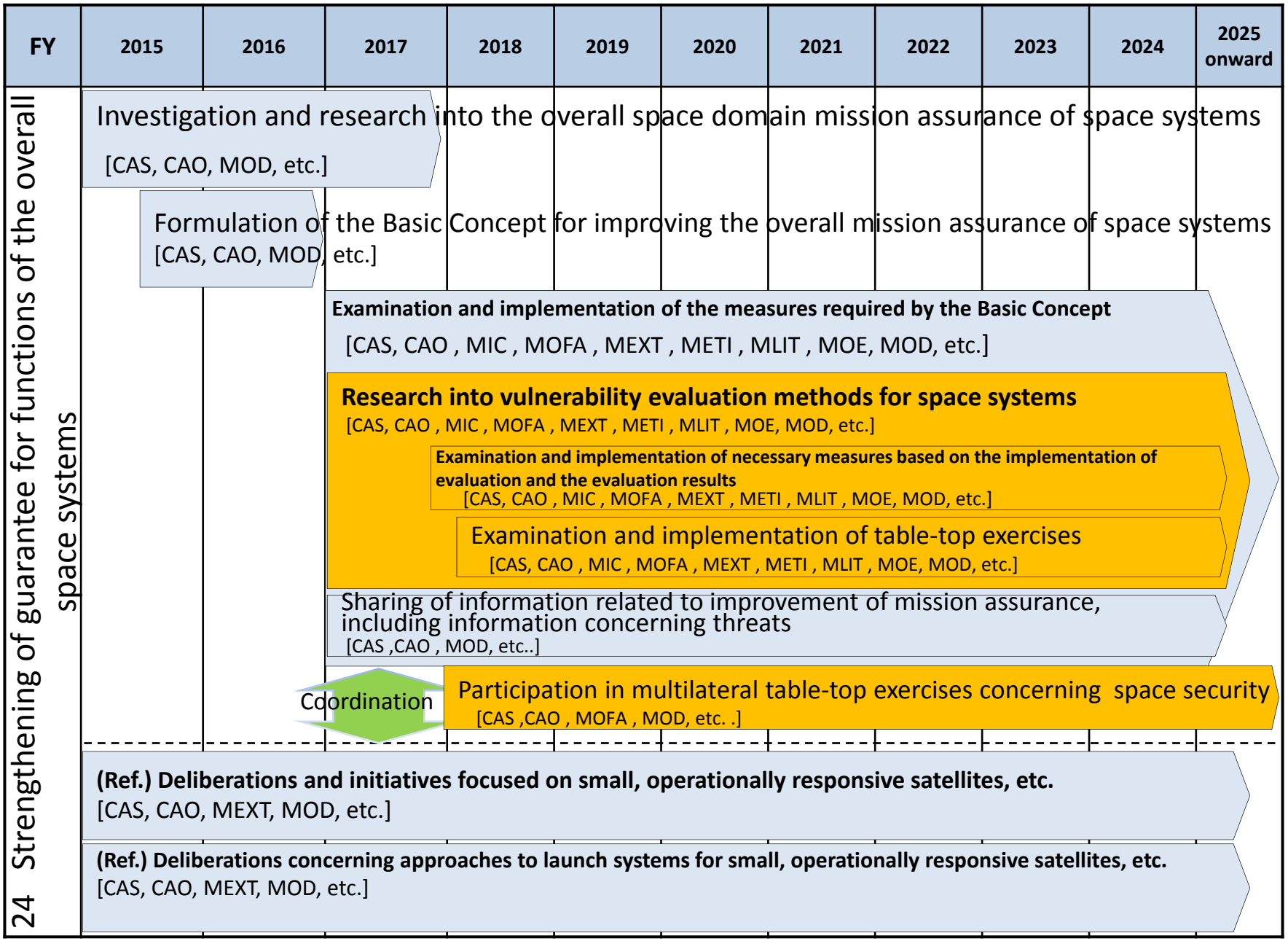
Achievements/status by end of FY2017

■ The Ministry of Defense started research into satellite-mounted dual-wavelength infrared sensors, to amass technical knowledge via experimental studies of infrared sensors in outer space in FY2015.

Initiatives in FY2018 and beyond

■ Japan will promote measures concerning the piggybacking of infrared sensors on the advanced optical satellites (ALOS-3) due to be launched in around FY2020.
■ The Cabinet Office, in cooperation with relevant ministries and agencies, will investigate and study technological trends, etc. concerning the early warning function, etc.

4. (2)①viii) Improving the overall resiliency of space systems



24 Enhancement of the overall mission assurance of space systems

Target

[Security] Japan will proceed with deliberations concerning comprehensive, ongoing measures to maintain and enhance the overall mission assurance of the space systems of Japan and its allies (including systems operated for civilian purposes) and will take necessary measures.

Achievements/status by end of FY2017

- Japan established a liaison council of relevant ministries and agencies concerning the strengthening of the stability of space systems, thereby developing a deliberation system within the government.
- We formulated the basic concept for strengthening the overall resiliency of space systems, and we are deliberating the method of assessing the vulnerability of space systems based on the concept.

Initiatives in FY2018 and beyond

- We will implement necessary measures based on future initiatives indicated in the basic concept for strengthening the overall resiliency of space systems, which was formulated in FY2016. In addition, we will share information concerning threats and risks concerning space systems among relevant ministries and agencies and will continuously deliberate the method of assessing the vulnerability of space systems and conduct vulnerability assessment through the method.
- In order to improve mission assurance, we will deliberate matters indicated in the “Measures related to Improvement of Mission Assurance of Space System (draft)” and the specifics of initiatives to be conducted in and beyond FY2018.
- Japan will for the first time participate in the Schriever Wargame, a multilateral tabletop exercise in the space field, in FY2018.
- We will deliberate and implement a tabletop exercise that contributes to improvement of the overall mission assurance of space systems.

Numbers in【】are numbers assigned to respective measures.

Measures related to Improvement of Mission Assurance of Space System

Positioning of this reference material: Explanation of the relevance between each measure in the Implementation Plan and the improvement of mission assurance

Before the incident (Defense activities)

Strengthening of warning and

- Establishment of the SSA operation system and strengthening of cooperation with other countries

At the time of the establishment of the system (Strengthening of resiliency)

Strengthening of protection of individual satellites (measures for individual satellites)

- Development of the third unit of the X-Band satellite (2nd unit)【15】
- Deliberation on measures to address disruptions of positioning satellite signals【48】

Duplication of measures (increasing the number of satellites, etc.)

- Initiative toward establishing a 7-satellite constellation of Quasi-Zenith Satellites【1】
- Initiative toward establishing a 10-satellite constellation of information gathering satellites【45】

Dispersion of equipment (increasing the number of satellites and strengthening the launch system)

- Operation of the 2-satellite system comprised of Himawari 8 and 9【9】
- Development of the H3 and Epsilon Launch Vehicles【17,18】
- Deliberation on launch range【19】

After the incident (Restructuring)

Strengthening of the recovery capability

- Investigation and research of the operational concepts of operationally responsive small satellites and the launch system【6,20】

Use of alternative functions

- Promotion of utilization of the Quasi-Zenith Satellite system, etc.【2】

Fundamental efforts

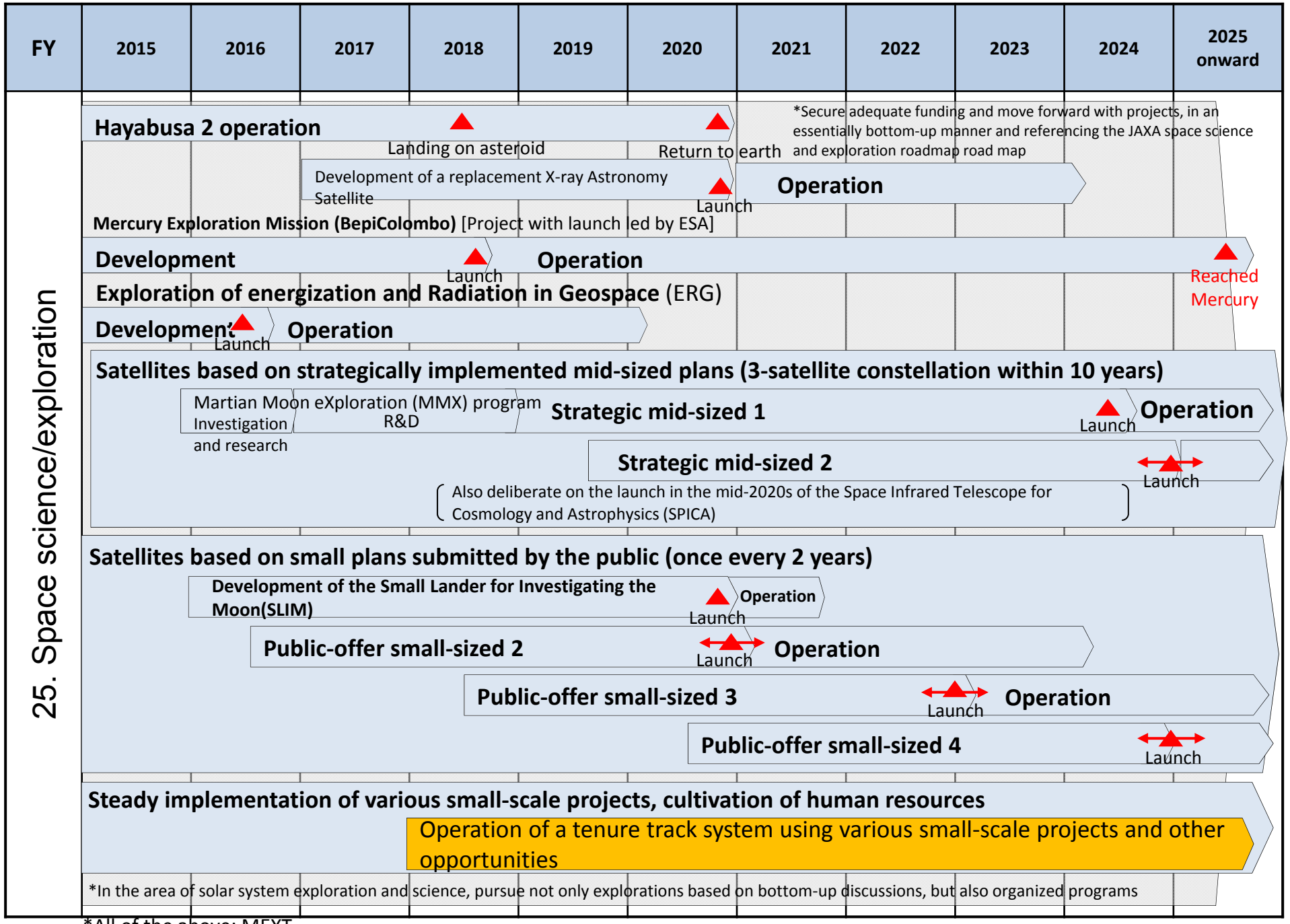
International cooperation, etc.

- Strengthening of cooperation with allied and partner countries【46】
- Realization and strengthening of the rule of law in outer space【45】
- Promotion of international cooperation through participation by industry, academia and government【48,49】

Strengthening of space technology and industrial infrastructure

- Initiatives concerning the early warning function【7, 23】 (Accumulation of knowledge through demonstration of dual-wavelength infrared sensors in space and piggybacking on advanced optical satellites)
- Deliberation on preferential use of core rockets and the procurement system【16, 44】
- Formulation of tech strategies related to components, etc.【30】
- Reinforcement of domestic human infrastructure【39】
- Development of engineering test satellites and optical data relay satellites【13,14】
- Active discovery and development of private-sector technology【28,29,31,53】
- Development of launch-related technologies【33,34】
- R&D concerning space debris【53】

4. (2)①ix) Space science/exploration and manned space missions



*All of the above: MEXT

25. Space science / exploration

Target

[Infrastructure] As well as contributing to the creation of intellectual property for the whole of humankind through the development of world-class research output in the field of space science and exploration, Japan will cultivate personnel capable of undertaking academic research and the development and use of space for our nation.

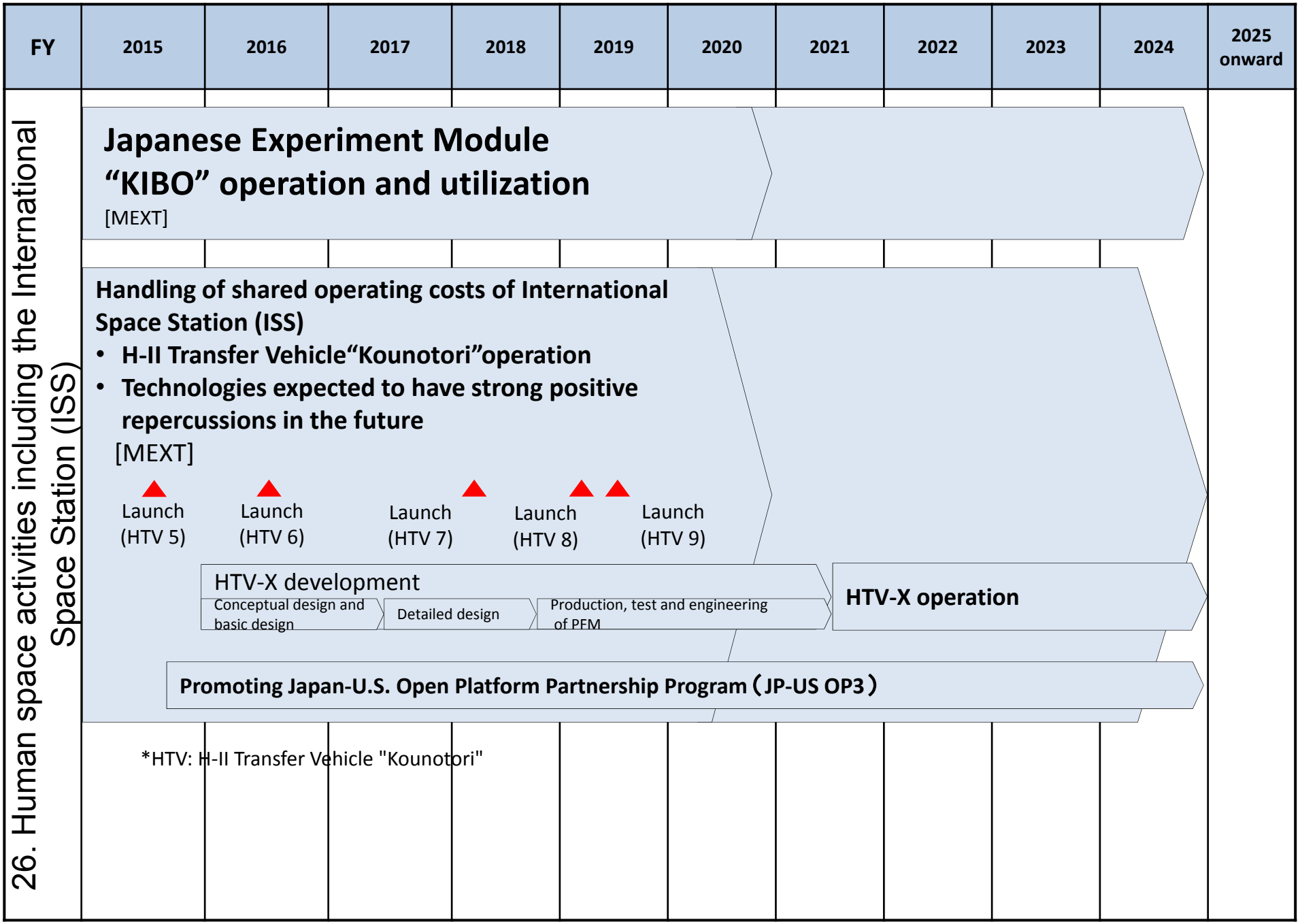
Achievements/status by end of FY2017

- We started the development of the replacement X-ray Astronomy Satellite after applying the lesson from operational abnormalities of ASTRO-H.
- We started R&D on the Martian Moon eXploration (MMX) program, a candidate plan for the Strategic Mid-sized 1 satellite. Concerning a candidate for the Strategic Mid-sized 2 satellite, we conducted a technical review in preparation for the selection of the candidate for FY2019.
- Concerning the Small Lander for Investigating the Moon (SLIM), we switched to a launch by a H-IIA rocket in FY2020, conducted a review intended to enhance the satellite's scientific significance and implemented basic design.
- We selected the candidate for the Public Small Plan 2 and started accepting applications for the Public Small Plans 3 and 4, aiming for the launch in FY2022 and FY2024.
- From the perspective of human resource development, we conducted deliberations on a tenure track system using participation in international projects and opportunities for small and micro projects.

Initiatives in FY2018 and beyond

- We will continue the development of the replacement X-ray Astronomy Satellite with a view to its launch in FY2020.
- Concerning the Martian Moon eXploration (MMX) program, a candidate plan for the Strategic Mid-sized 1 satellite, we will continue development research, aiming for the start of development in FY2019 and launch in FY2024. We will also conduct a technical review study on the candidate mission for the Strategic Mid-sized 2 plan and make the selection in FY2019 in consideration of the mission significance and viability.
- Concerning the Public Small Plan, we will proceed with the development of the Small Lander for Investigating the Moon (SLIM) with a view to its launch in FY2020. We will also proceed with development research to work out the specifics of the plan.
- We will introduce a tenure track system in FY2018 by making use of opportunities for participating in such programs as the Jupiter Icy Moon Explorer (JUICE), which is implemented by the European Space Agency, and developing small satellites and probes.

4. (2)①ix) Space science / exploration and manned space missions



26. Human space activities including the International Space Station (ISS)

Target

[Infrastructure] As well as helping to expand the realm of humankind's activities in space in the future, Japan will strategically amass technologies and expand private sector usage, improving cost-effectiveness, while continuing to maintain our nation's international influence in the field of space. Japan will undertake comprehensive deliberations from a variety of angles concerning the advisability of continuing our nation's participation in the ISS mission (which has been extended from 2021 to 2024) and what form this should take, if any, and will reach a conclusion by the end of FY2016.

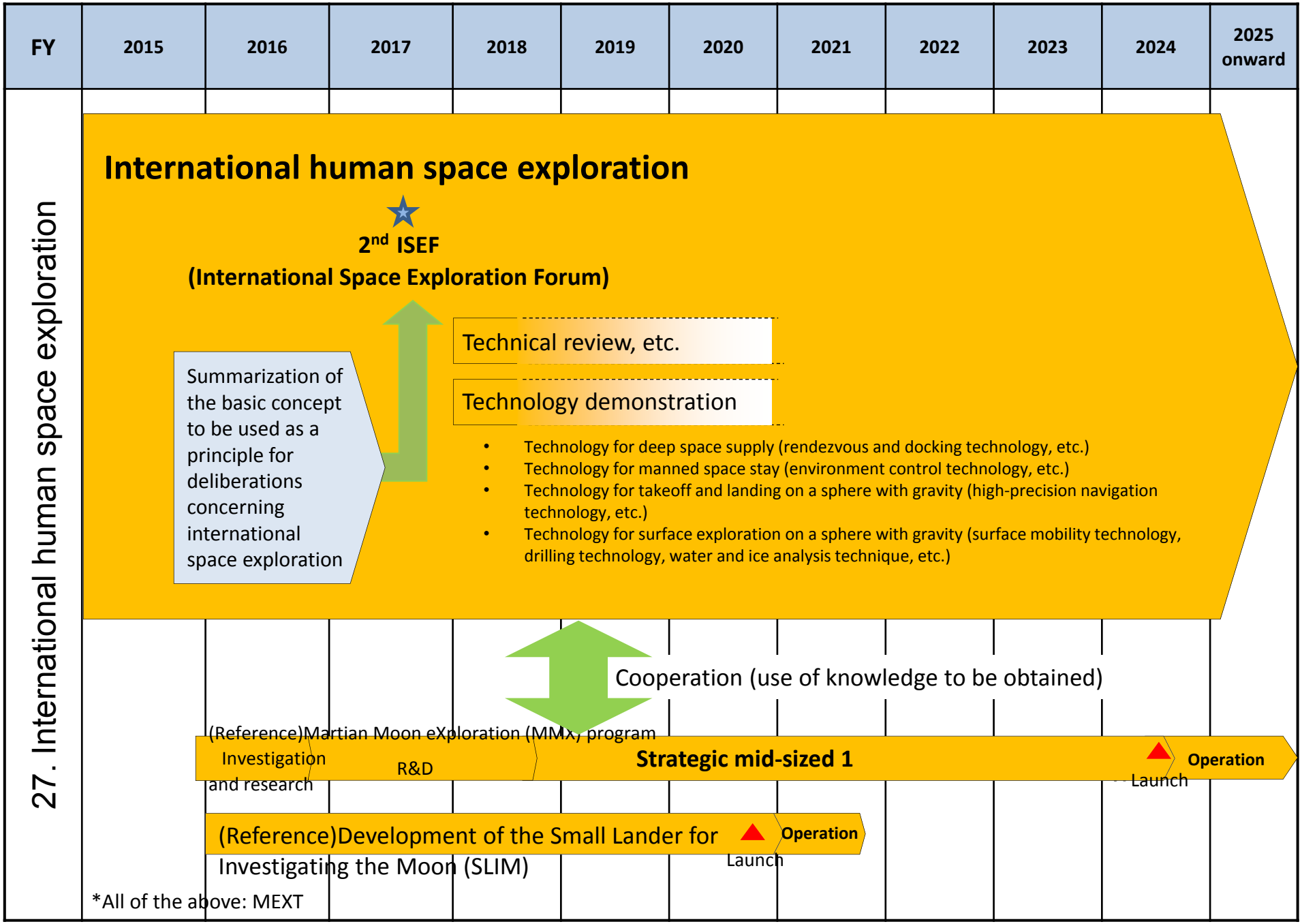
Achievements/status by end of FY2017

- Based on the "Japan-U.S. Open Platform Partnership Program (JP-US OP3)," we continuously held joint workshops involving ISS users in Japan and the United States in order to promote the utilization of the ISS and maximize the achievements. We also expanded cooperation through exchange of experiment samples in research projects using mice.
- Concerning the use of "Kibo," we enhanced activities to expand use by concluding strategic partnership contracts with drug-developing ventures and by requesting the provision of information in order to commercialize the microsatellite release business.
- For the HTV successor, we began detailed designing.

Initiatives in FY2018 and beyond

- Operate and utilize Japanese Experiment Module "KIBO" and launch H-II Transfer Vehicle "Kounotori," and maximize the achievements of ISS by promoting "JP-US OP3."
- We will implement detailed designing of "HTV-X" with a view to the launch of the first unit in FY2021.

4. (2)①ix) Space science / exploration and human space missions



27. International human space missions

Target

[Infrastructure] Japan will cautiously and comprehensively examine measures and approaches to participation, giving full consideration to trends among other countries.

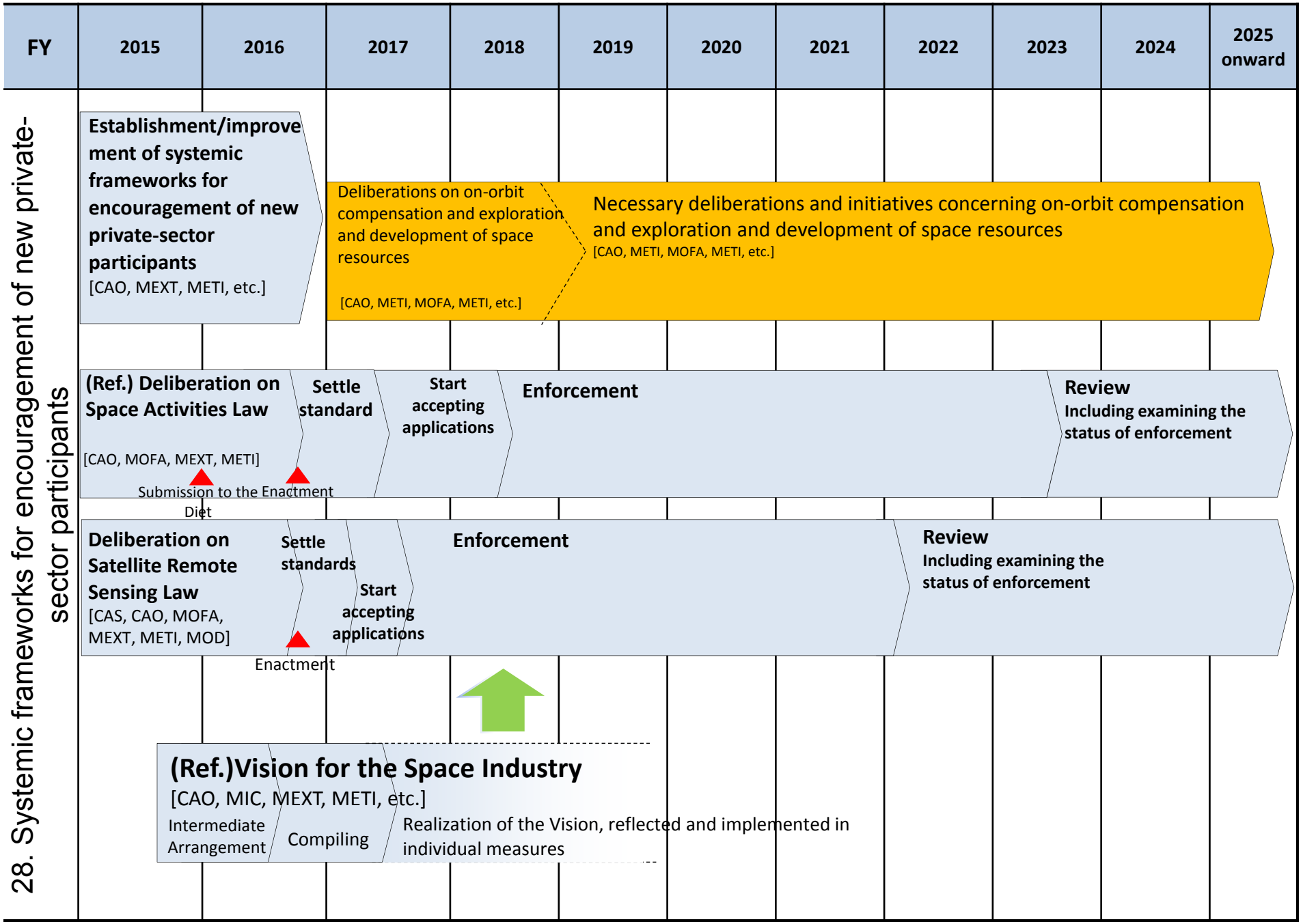
Achievements/status by end of FY2017

- We summarized Japan's principles and basic concept for international space exploration in consideration of other countries' trends.
- We will host the 2nd International Space Exploration Forum (ISEF2) in Tokyo in March 2018 and exchange opinions with participating countries about future international space exploration in consideration of the abovementioned concept.

Initiatives in FY2018 and beyond

- Keeping in mind possible participation in the U.S. initiative to establish a manned base near the moon and possible implementation of landing and exploration activity on the moon through international cooperation, we will proactively conduct deliberations on technical aspects and a new framework for international cooperation so that the specifics of international programs can be worked out.
- Before working out the specifics of international space exploration programs, Japan will conduct demonstration of technologies in which it has a competitive edge that are expected to have spinoff effects in coordination with unmanned exploration as part of space science exploration.

4. (2)②i) Comprehensive initiatives aimed at encouraging new entrants to the field and expanding space utilization



28. Systemic frameworks for encouragement of new private-sector participants

Target

[Infrastructure] In conjunction with the space operations bill and the remote sensing bill, which are due for submission during the ordinary session of the Diet in 2016, Japan will put in place the full range of systems needed to encourage new participants and expand the utilization of space.

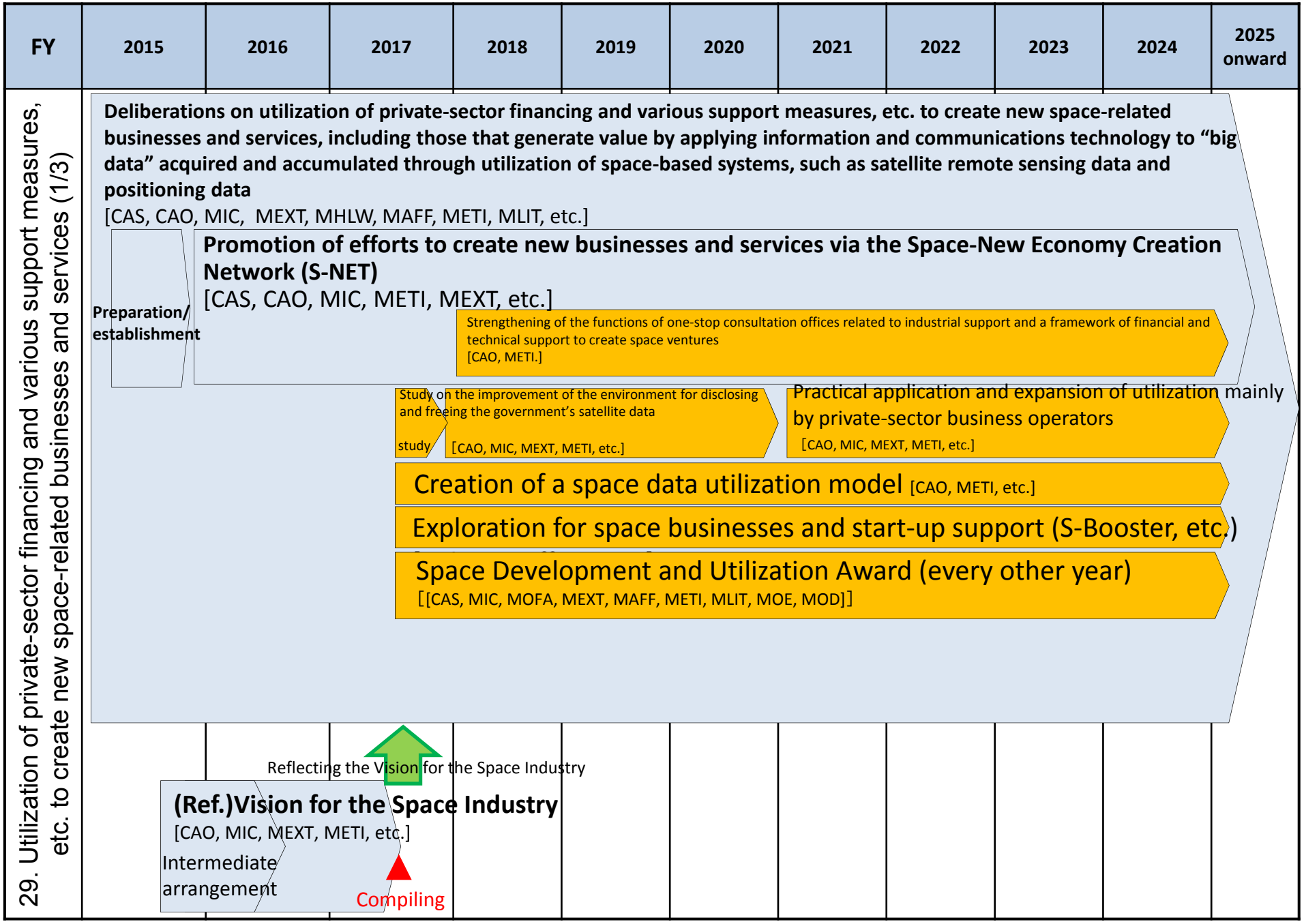
Achievements/status by end of FY2017

- Concerning the Space Activities Law and the Satellite Remote Sensing Law, we developed cabinet orders and ministerial ordinances in consideration of the viewpoint of new entry by private-sector business operators and started accepting applications for permission in FY2017 (concerning the Satellite Remote Sensing Law, we granted permission and approval).
- We will conduct deliberations on issues related to the treatment of compensation concerning collision between satellites in orbit and related to the exploration and development of space resources and summarize the points of debate.

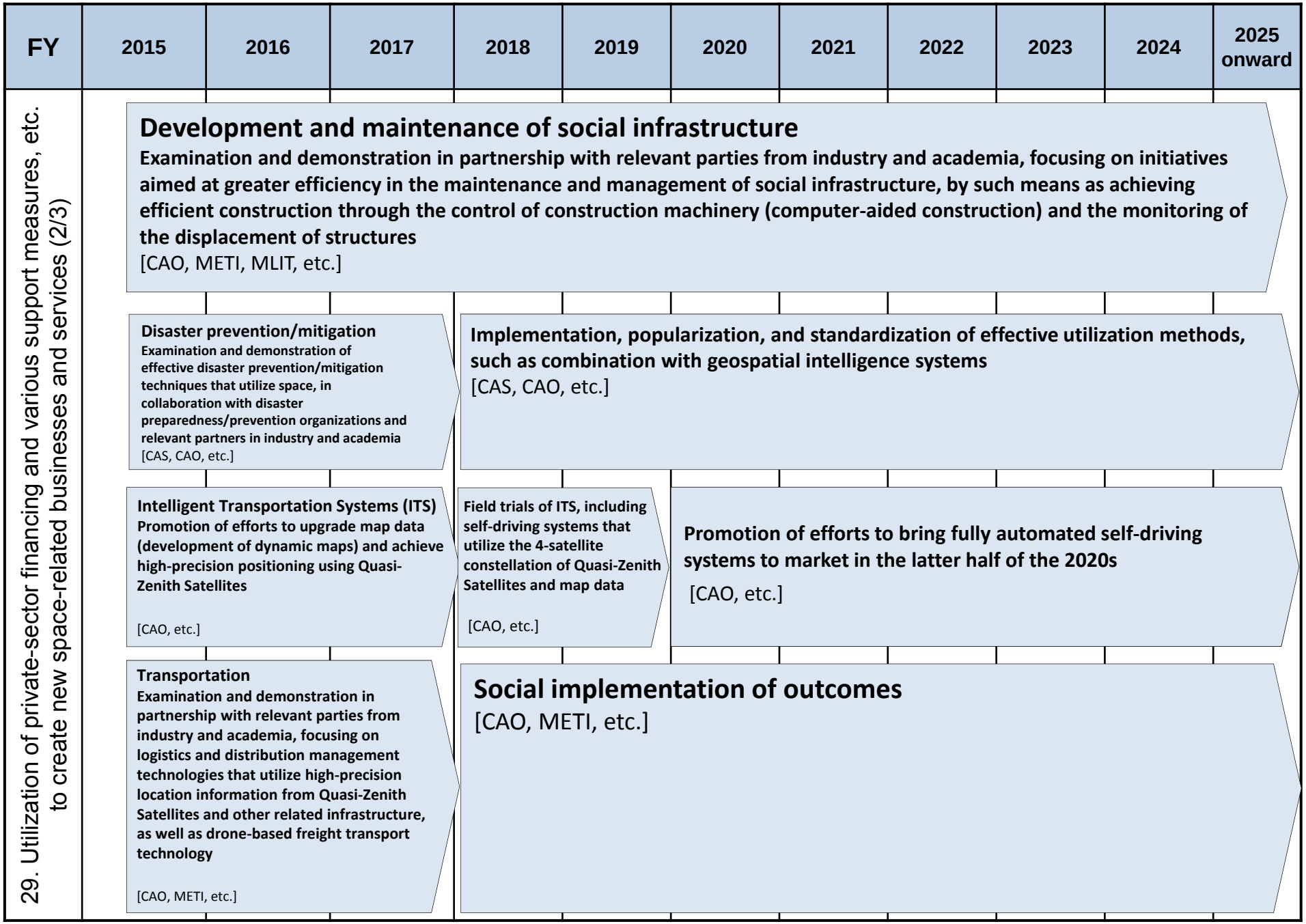
Initiatives in FY2018 and beyond

- Before putting into force and enforcing the Space Activities Law and the Satellite Remote Sensing Law, we will hold a briefing around three times a year and provide prior consultations as a measure to promote the development and use of space by private-sector business operators. We will also take care to ensure quick examination of applications and flexible and highly transparent enforcement of the laws.
- Concerning on-orbit compensation and exploration and development of space resources, we will conduct necessary deliberations and initiatives in consideration of the results of the summarization of the points of debate.

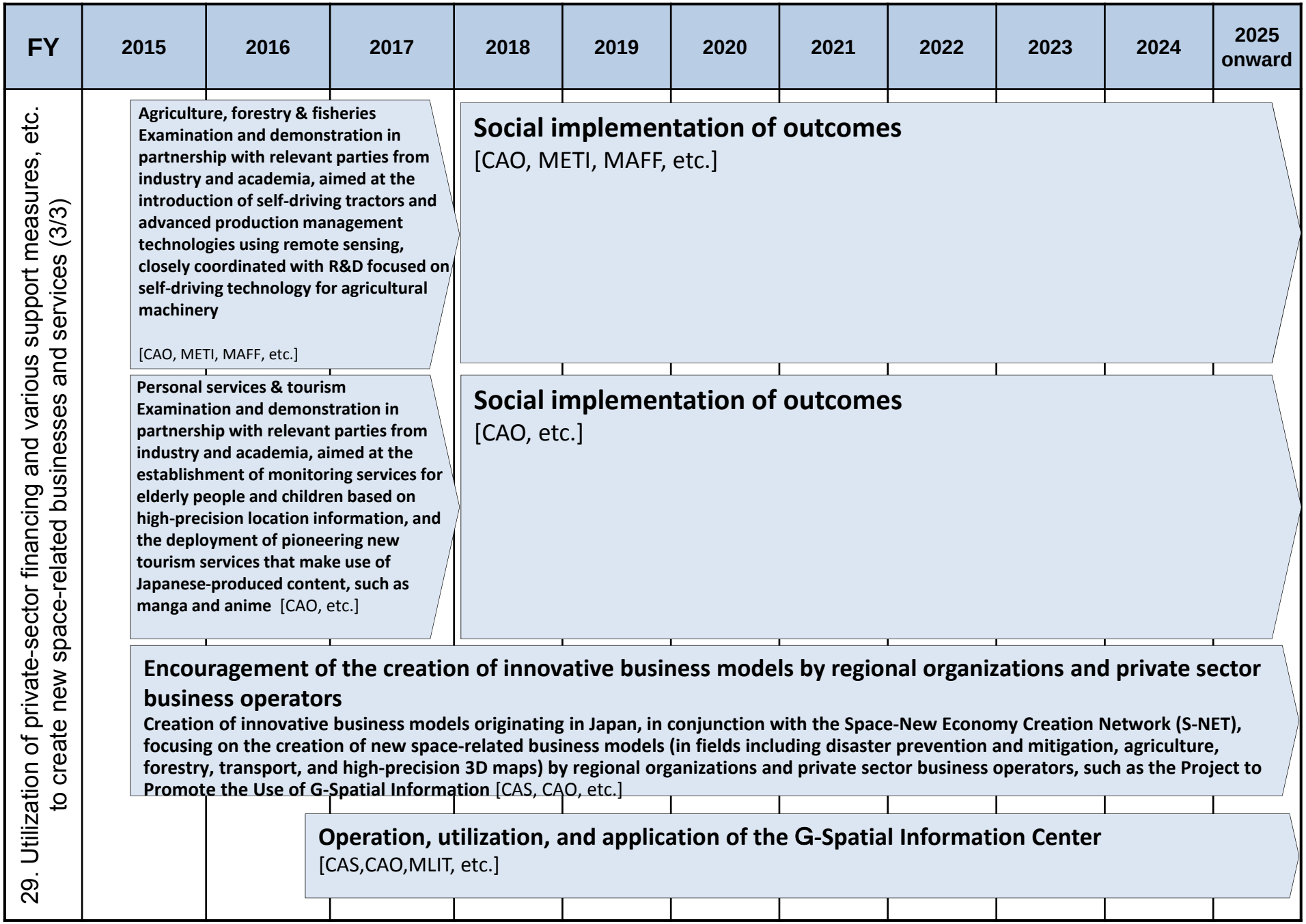
4. (2)②i) Comprehensive initiatives aimed at encouraging new entrants to the field and expanding space utilization



4. (2)②i) Comprehensive initiatives aimed at encouraging new entrants to the field and expanding space utilization



4. (2)②i) Comprehensive initiatives aimed at encouraging new entrants to the field and expanding space utilization



29. Utilization of private-sector financing and various support measures, etc. to create new space-related businesses and service

Target

[Civil sector] Japan will consider the use of private sector finance and various support measures to facilitate the creation of new space-related businesses and services involving G-spatial information, and will take the requisite measures.

Achievements/status by end of FY2017

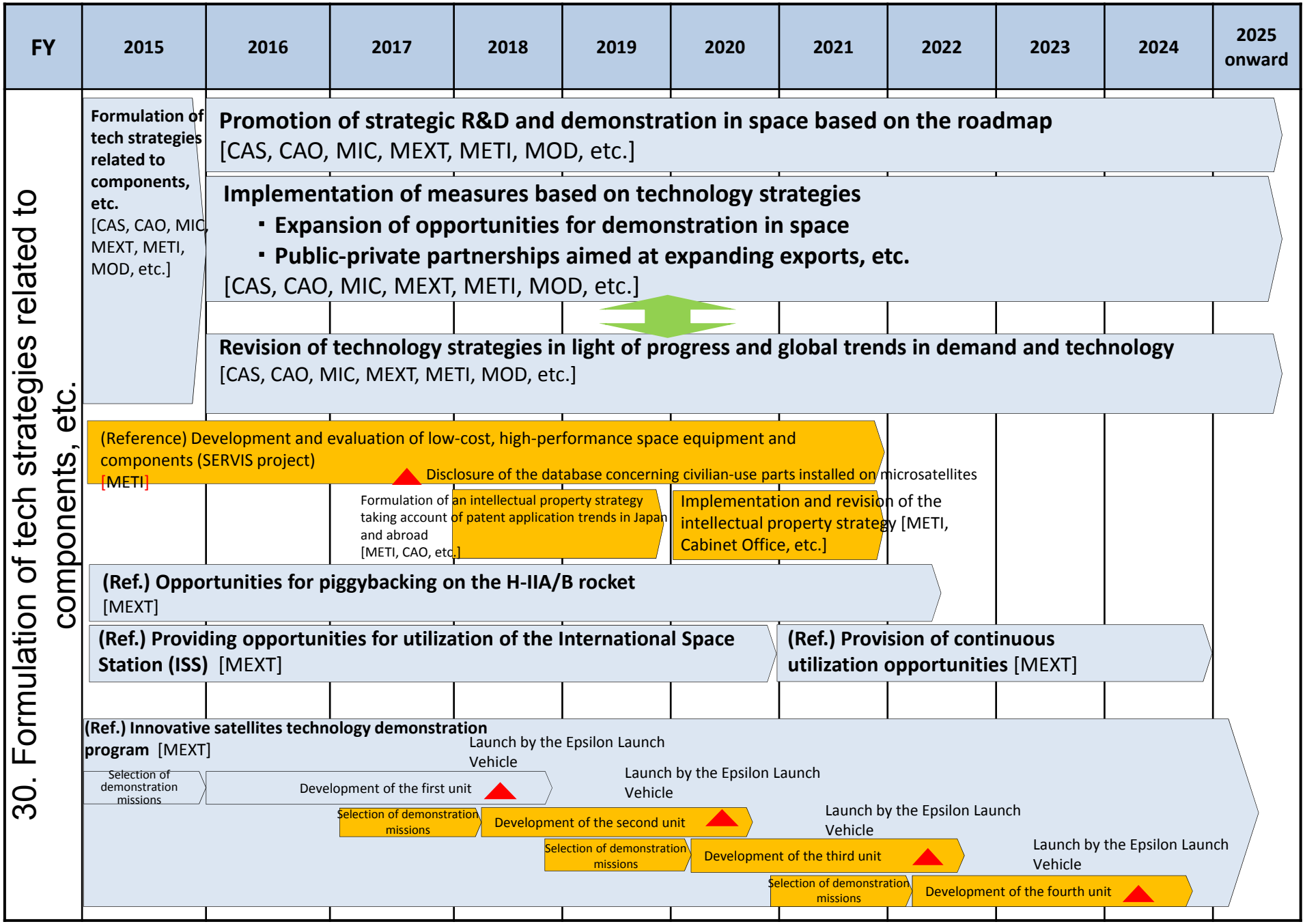
- In FY2017, the Space-New Economy Creation Network (S-NET) held meetings in which participants and experts considered how to create new business projects. In addition, working group meetings were held in various locations (Hokkaido, Fukui and Okinawa) in order to consider space businesses that contribute to revitalization of local economies. Moreover, we will develop a framework of financial and technical support for industry, including development of ventures, through cooperation among relevant ministries, agencies and other organizations, including the Development Bank of Japan (DBJ) and JAXA.
- In FY2017, the DBJ and Innovation Network Corporation of Japan provided risk money to space venture companies, including for the DBJ's provision of capital for the establishment of Innovation Network Corporation of Japan.
- In consideration of the Vision for the Space Industry 2030, we conducted initiatives to explore space business opportunities and support business startup (S-Booster) on a trial basis. We also actively evaluated excellent initiatives conducted by venture companies through the Space Development and Utilization Award and also created an award in the name of the minister of agriculture, forestry and fisheries.
- In order to develop infrastructure that contributes to the utilization of satellite data, we established the study group on opening and freeing of governmental satellite data and the improvement of the utilization environment and conducted deliberations on the specifics.
- Under the Strategic Innovation creation Program (SIP), we developed technologies and conducted demonstration in such fields as "infrastructure maintenance/updating management technology," "strengthening resilient disaster prevention/reduction functions," and "next-generation agriculture, forestry and fisheries creation technology."
- Under the "G-Space Information Center" platform to consolidate the G-Space information of the government and private sector, we provided data possessed by ministries, agencies and private-sector companies. In addition, in order to develop a showcase for data utilization, we established mechanisms to create and provide data with high value added through the combination of various data.
- Through the implementation of demonstration projects in various fields, including agriculture and ITS, we improved the environment for social implementation of the results obtained through the utilization of the Quasi-Zenith Satellite system.

29. Utilization of private-sector financing and various support measures, etc. to create new space-related businesses and service

Initiatives in FY2018 and beyond

- Concerning the S-NET's activities, in FY2018, we will provide space-related policy information, promote business exchange, and expand and strengthen the functions of one-stop consultation offices related to support for space business ideas. In addition, by establishing a framework of financial and technical support for industry, including the development of ventures and expanding membership, we will continue efforts to expand the supply of risk money, with government-affiliated financial institutions, including the JDB and Innovation Network Corporation of Japan, as well as public-private funds as the core organizations.
- We will also consider how to create stable domestic demand through active utilization by governmental and public organizations of data collected by private-sector remote sensing satellites (so-called anchor tenancy). (Described above)
- In FY2018, we will make earnest efforts to seek space business ideas and support business startup (S-Booster) and deliberate and implement follow-up measures, such as assisting recipients of the S-Booster support and the Space Development and Utilization Award.
- In FY2018, we will implement demonstration of a model of advanced utilization of space data (space data utilization model project) in earnest. In the project, demonstration teams must set clear targets for such matters as the timing of commercialization and the acquisition of market share as a requirement for adoption. We will also improve business schemes through a follow-up review of the initiatives conducted in the previous fiscal year.
- Based on the results of deliberations by the study group on opening and freeing of governmental satellite data and the improvement of the utilization environment, we will start developing a satellite big data platform in FY2018. We will promote the development of a satellite data center in consideration of the viewpoint of the revitalization of local economies. We aim to promote utilization of space data.
- In FY2018 as well, we will develop technologies and conduct demonstration in such fields as "infrastructure maintenance/updating management technology," "strengthening resilient disaster prevention/reduction functions," and "next-generation agriculture, forestry and fisheries creation technology under the Strategic Innovation Program (SIP), with a view to future commercialization and social implementation.
- Aiming to contribute to safe and secure lifestyles, revitalize regional industries, and create new industries and services through cooperation among industry, academia, public and private sectors, including researchers, local governments, private users, etc., we will promote further distribution of geospatial information by creating data with high value added through the combination of various data in 10 fields and starting to provide the data through the G-Space Information Center by FY2019.
- We will promptly conduct deliberations on strengthening of the government's control tower function and the development of necessary systems to promote the G-Space Project by making use of high-accuracy positioning information that will become available as a result of the start of the operation of the constellation of four Quasi-Zenith Satellites in FY2018
- In FY2018, we will implement demonstration projects in various fields, including agriculture and ITS, under the space data utilization model project and create a model of advanced utilization of the Quasi-Zenith Satellite system in Japan and abroad. We will also improve the environment for social implementation of the results obtained through the use of the Quasi-Zenith Satellite system.

4. (2)②ii) Organization of environment geared toward stable supply of core components, etc. for space systems



30. Formulation of tech strategies related to components, etc.

Target

[Infrastructure] Through the formulation of technology strategies related to components and measures based on those strategies, Japan will promote the development of competitive parts and components, and the utilization of outstanding components developed for civilian purposes, thereby maintaining and strengthening the nation's infrastructure for manufacturing space-related equipment.

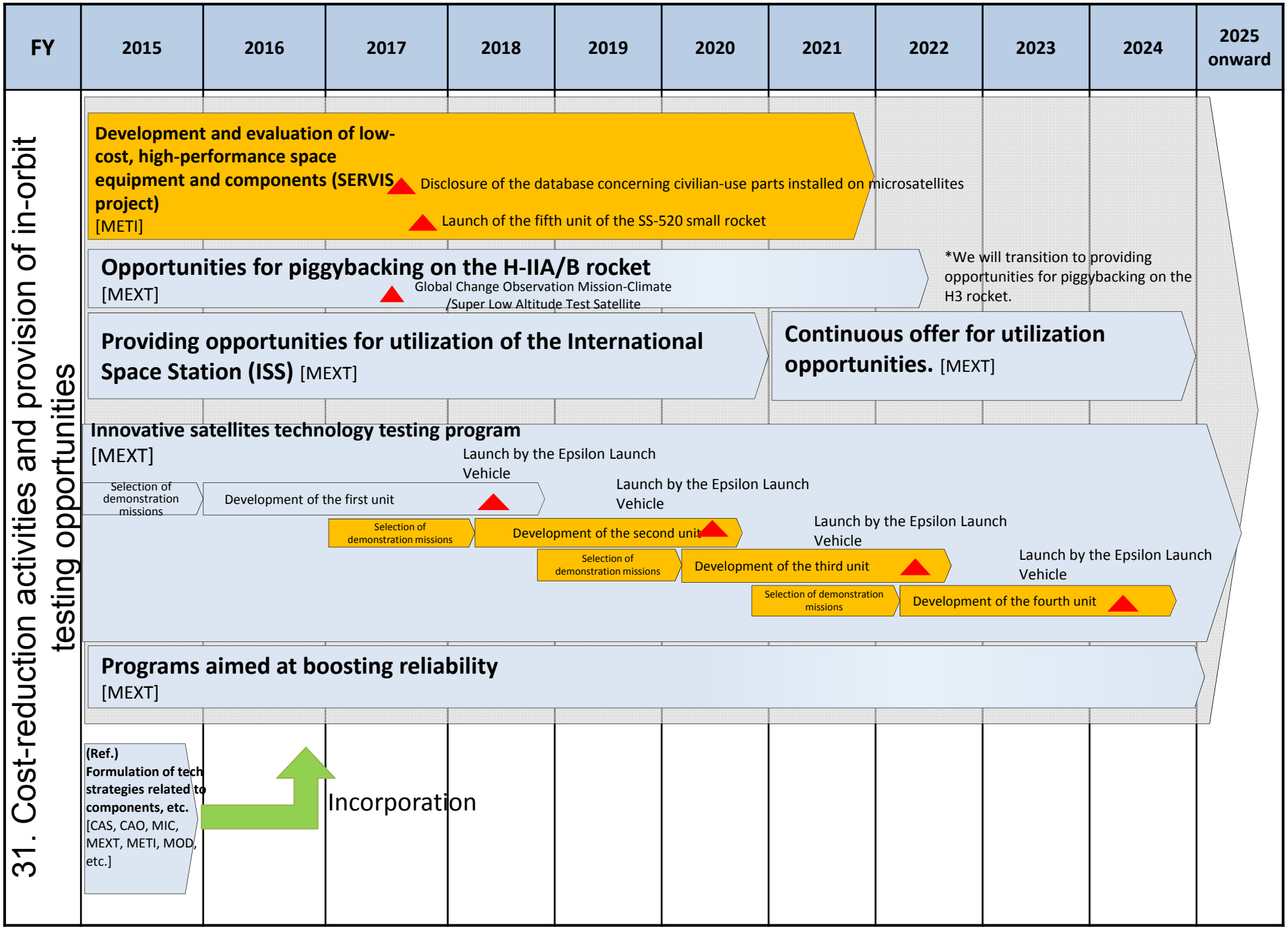
Achievements/status by end of FY2017

- We will consider problems and policies concerning the development of parts and components related to microsatellites and rockets and revise the technology strategy and roadmap in consideration of global trends.
- Based on the technology strategy for parts and components, we steadily conducted R&D and established a new framework for risk sharing between the public and private sectors as a subsidy program under the SERVIS project.
- As an initiative to promote the use of civilian-use parts in satellites, we developed and disclosed the database concerning civilian-use parts installed on microsatellites and the records of their operation in orbit.

Initiatives in FY2018 and beyond

- We will update the technology strategy for parts and components, including the roadmap, and revise it as necessary. In order to enhance the industrial infrastructure for parts and components, we will also implement necessary measures, including steadily conducting R&D and subsidy programs, and conduct annual follow-up reviews.
- We will transfer the implementation of subsidy programs related to space parts under the SERVIS project to the New Energy and Industrial Technology Development Organization (NEDO) starting in FY2018. We will further promote support for small and medium-size venture companies by making use of knowledge concerning R&D project management, which is an area of strength for NEDO, for space parts.
- Starting in FY2018, we will identify and analyze trends concerning intellectual property related to space systems in Japan and abroad and conduct deliberations with a view toward formulating an intellectual property strategy.

4. (2)②ii) Organization of environment geared toward stable supply of core components, etc. for space systems



31. Cost-reduction activities and provision of in-orbit testing opportunities

Target

[Infrastructure] With the aim of substantially reducing costs associated with the development, deployment, launch, and operation of satellites by private sector business operators, etc., Japan will work on developing and evaluating low-cost, high-performance space-related equipment and components. In addition, to ensure the ongoing provision and expansion of opportunities for the demonstration of new elemental technology, Japan will undertake in-orbit testing using the ISS and Epsilon rockets, as well as piggybacking on H-II A/B rockets.

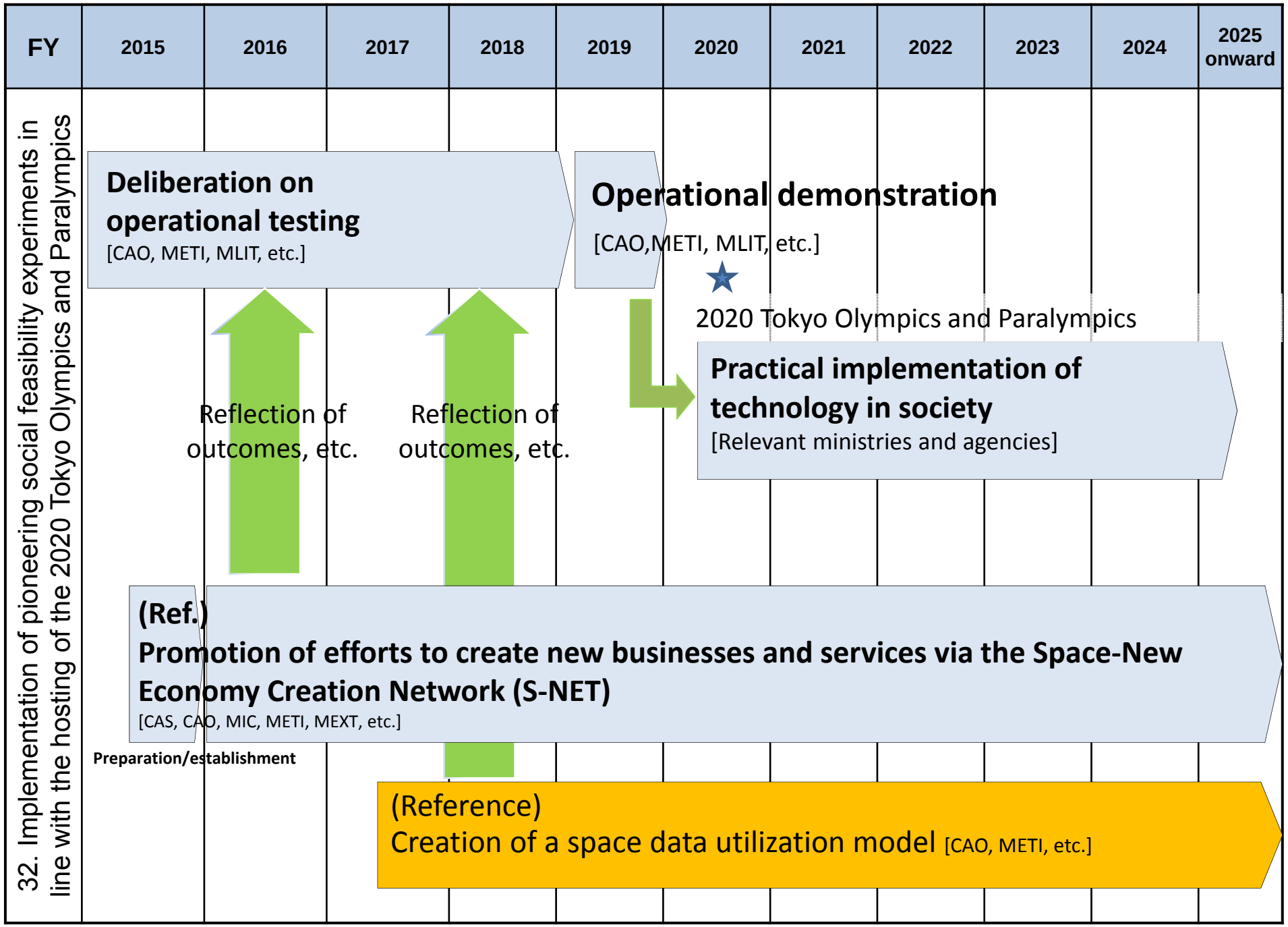
Achievements/status by end of FY2017

- We developed space demonstration themes related to components and parts in preparation for the launch of the first innovative technology demonstration satellite. We also completed detailed designing concerning the modification of the Epsilon Launch Vehicle for the purpose of adding the piggybacking function and started manufacturing and testing.
- Under the SERVIS project, we continued to develop and evaluate low-cost, high-performance space equipment and components. In FY2017, we started a program to partially subsidize the development cost of space parts and components to which Japan should devote efforts based on the technology strategy for parts and components. In addition, we held seminars concerning the safety of autonomous flight and conducted deliberations with a view to realizing autonomous flight.
- In order to conduct on-orbit demonstration of space equipment using civilian-use parts, we will launch the fifth unit of the SS-520 small rocket.

Initiatives in FY2018 and beyond

- Japan will steadily implement the plans to launch the first unit under the innovative satellite technology demonstration program in FY2018, the second unit in FY2020, the third unit in FY2022 and the fourth unit in FY2024.
- Japan will promote initiatives to provide opportunities for the use of the ISS (release of microsatellites, material exposure testing, and equipment and sensor demonstration) and opportunities for piggybacking on the H-IIA/B rockets.
- Japan will continue the SERVIS project and develop and evaluate low-cost, high-performance satellite components. In addition, Japan will continue the development of low-cost small satellites using civilian-use parts, and starting in FY2018, it will conduct technology development and flight demonstration in order to establish an autonomous flight safety system at an early time.

4. (2)②iii) Initiatives to expand utilization of space in the future



32. Implementation of pioneering social feasibility experiments in line with the hosting of the 2020 Tokyo Olympics and Paralympics

Target

[Civil sector] Japan will consider and implement model projects aimed at implementing advanced social feasibility experiments focused on space technology during the Tokyo Olympics and Paralympics, in partnership with local governments and companies.

Achievements/status by end of FY2017

- In order to realize a society in which anyone, including foreigners and people with disabilities, can smoothly move and participate in activities without stress by the time of the Tokyo Olympics and Paralympics, we conducted indoor-outdoor seamless navigation demonstration tests in the areas between the competition venues and the nearest train stations in cooperation with private-sector business operators. We also conducted deliberations concerning the enhancement of services for people with disabilities and the method of continuously collecting information on barrier-free facilities.
- With the aim of creating an advanced space data utilization model to be showcased at the Olympics and Paralympics, we will conduct a demonstration of a space data utilization model in the field of sports under the space data utilization model project.

Initiatives in FY2018 and beyond

- Ahead of the 2020 Tokyo Olympics and Paralympics, we are undertaking deliberations aimed at undertaking field trials in such areas as social infrastructure, disaster prevention and mitigation, ITS, logistics, agriculture, forestry and fisheries, and personal services and tourism, in partnership with interested parties from industry and academia, as well as relevant ministries and agencies and organizations with control tower functions associated with related measures.
- Concerning indoor-outdoor seamless navigation, we will conduct a demonstration test using facilities related to the Tokyo Olympics and Paralympics in 2020 as a model case by FY2019.
- Under the space data utilization mode project and the Space-New Economy Creation Network (S-NET), we will conduct deliberations and demonstration in FY2018 for a space data utilization model to be showcased at the Tokyo Olympics and Paralympics.

4. (2)②iii) Initiatives to expand utilization of space in the future

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
33. LNG propulsion system-related technology	**R&D on LNG (Liquefied Natural Gas) propulsion systems (including operational testing)** [MEXT] Basic technology research via element tests using constituent elements of actual engine configurations										

LNG: Liquefied Natural Gas

33. LNG propulsion system-related technology

Target

[Infrastructure] Japan will promote R&D and amass technology, taking into account rocket technology trends in other countries.

Achievements/status by end of FY2017

- For the purpose of improving the design technology of the LNG propulsion system and acquiring further high performance engine technology, we conducted an element test using an engine closer to an actual engine that was comprised of engine parts used for the element test conducted in FY2016 and engine parts used for other element tests. We also promoted a flight demonstration plan for a propulsion system in cooperation with external organizations.

Initiatives in FY2018 and beyond

- In FY2018, we will conduct a comprehensive combustion test using an engine closer to an actual engine that was tested in FY2017 in preparation for a flight test.
- In FY2019. We will conduct an in-flight demonstration test on a small experimental rocket in cooperation with an external organization and accumulate data in order to develop more advanced technology.
- In consideration of the status of activities related to the LNG propulsion system in other countries, we will conduct in-depth deliberations concerning inter-orbital transportation using an LNG propulsion system and reflect the results in R&D in and beyond FY2018.

4. (2)②iii) Initiatives to expand utilization of space in the future

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
34. Reusable space transportation systems											

R&D on reusable space transportation systems
[MEXT]

Partially reusable system
・Study etc. of an experimental vehicle for the purpose of carrying out demonstration of new technologies after 2020

Air Breathing Engine system
・Efficient acquisition of key technologies in cooperation with relevant organizations etc.

Realization of an R&D plan based on studies

(Ref.) April 3, 2014: Committee on National Space Policy, “Long-Term Vision on Space Transportation Systems”

34. Reusable space transportation systems

Target

[Infrastructure] Japan will promote R&D aimed at establishing the next generation of space transportation technology, such as the New-Type Core Rocket, and will amass the requisite technology.

Achievements/status by end of FY2017

- We conducted analysis and tests concerning elemental technologies essential to the realization of a partially reusable system. We also made preparations for a small experimental vehicle in order to acquire knowledge concerning system-level technologies (guidance and control technology, propellent management technology, etc.).
- Concerning air breathing engine systems, we conducted deliberations with a view to acquiring major technologies in cooperation with relevant organizations.

Initiatives in FY2018 and beyond

- In view of the possibility of a drastic global change in the situation surrounding space transportation systems, we will conduct deliberations on internationally competitive future transportation systems, R&D concerning elemental technologies and flight tests of small experimental vehicles. We will also continue deliberations and development with a view to establishing a future space transportation technology that will succeed the H3 rocket.
- For air breathing engine systems, we are aiming for the efficient acquisition of key technologies, including through cooperation with relevant organizations.

4. (2)②iii) Initiatives to expand utilization of space in the future

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
35. Initiatives etc. linked to using the potential of space to enrich our lives on earth and create a dynamic future	**Initiatives linked to using the potential of space to enrich our lives on earth and create a dynamic future*** [MEXT, METI, MOE, etc.]										
	R&D on space-based solar power system technology and promotion of spinoffs of the technology to other industries. [MEXT, METI]										
	Research on flying route of migratory birds, etc. [MOE]										
	※Collaborate on policies and research in energy, climate change, the environment, and other fields, and take initiatives on even further application of technology and knowledge in the space field so as to contribute to solving problems in every field.										
	Research studies on measures to address the effects on Japan's satellites of changes in the outer space environment such as solar activity [MIC, MEXT, etc.]										
	Contributions to international initiatives related to the provision of space weather information [MIC]										

35. Initiatives etc. linked to using the potential of space to enrich our lives on earth and create a dynamic future

Target

[Civil sector] With the aim of conserving diverse ecosystems, Japan will use satellite tracking technology to understand the flight paths of migratory birds, thereby helping to resolve global issues.

[Infrastructure] Japan will amass technology and promote initiatives aimed at using the potential of space to enrich our lives on earth and create a dynamic future, as well as initiatives that will enhance our ability to address changes in the space environment.

Achievements/status by end of FY2017

- Concerning the space solar power system (SSPS), we conducted R&D activities to raise the efficiency of signal transmitting and receiving parts related to microwave wireless transmitting and receiving technology and improve the accuracy of the beam direction control technology based on the R&D roadmap formulated in FY2016. We also conducted deliberations on the possibility of applying these elemental technologies to other industries.
- We will investigate the arrival routes of migrant birds carrying the avian influenza virus through satellite positioning and conduct a basic survey on the preservation of the natural environment based on remote-sensing satellite data.
- We will improve the performance of an ionospheric model in order to realize high-accuracy prediction of ionospheric turbulence. We will also verify the accuracy of magnetosphere simulations using observation data obtained on the ground and in the magnetosphere.

Initiatives in FY2018 and beyond

- Concerning space solar power systems (SSPS), we will make progress toward realizing future technology for long-distance, high-power wireless transmitting and receiving by raising the efficiency of transmitting and receiving parts related to wireless transmitting and receiving of electric power and by conducting vertical-direction demonstration tests using drones. In addition, we aim to spread spinoffs of this technology to other industries while reviewing problems that should be overcome to realize the technology.
- We will contribute to the effective and prompt implementation of disease prevention measures by local governments and ensure safe living for the people by continuing to centrally collect and review information concerning the arrival time of migrant birds carrying the avian influenza virus.
- To increase Japan's ability to address changes in the space environment, we will seek to forge international partnerships in our efforts to build systems for ionospheric, magnetospheric, and solar monitoring. We will also develop more advanced forecasting systems through the development of simulation technology using observation data. In addition, we will contribute to international initiatives related to the provision of space weather information.
- We will collaborate on policies and research in energy, climate change, the environment, and other fields, and we will take initiatives on even further application of technology and knowledge in the space field so as to contribute to solving problems in every field.

4. (2)③i) Comprehensive reinforcement of space policy implementation frameworks

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
36. Implementation of measures by the government of Japan based on the Basic Plan on Space Policy in a unified manner	**Implementation of measures based on the Basic Plan on Space Policy, under the jurisdiction of the Strategic Headquarters for Space Development.** [CAO] • Relevant ministries and agencies will secure the necessary budget and personnel for implementation of the Basic Plan on Space Policy and will promote private-sector activities. • Revision of administrative organizations etc. will be carried out when required for the implementation of the Basic Plan on Space Policy. ☆ Integration of all control tower functions regarding space strategy into the Cabinet Office (Secretariat for National Space Policy)										

36. Implementation of measures by the government of Japan based on the Basic Plan on Space Policy in a unified manner

Target

[Infrastructure] (Security/civil sector) With the aim of achieving the three goals of the Basic Plan on Space Policy, the Cabinet Office and the rest of the government will work together to promote measures based on the Basic Plan, under the guidance of the Strategic Headquarters for Space Policy.

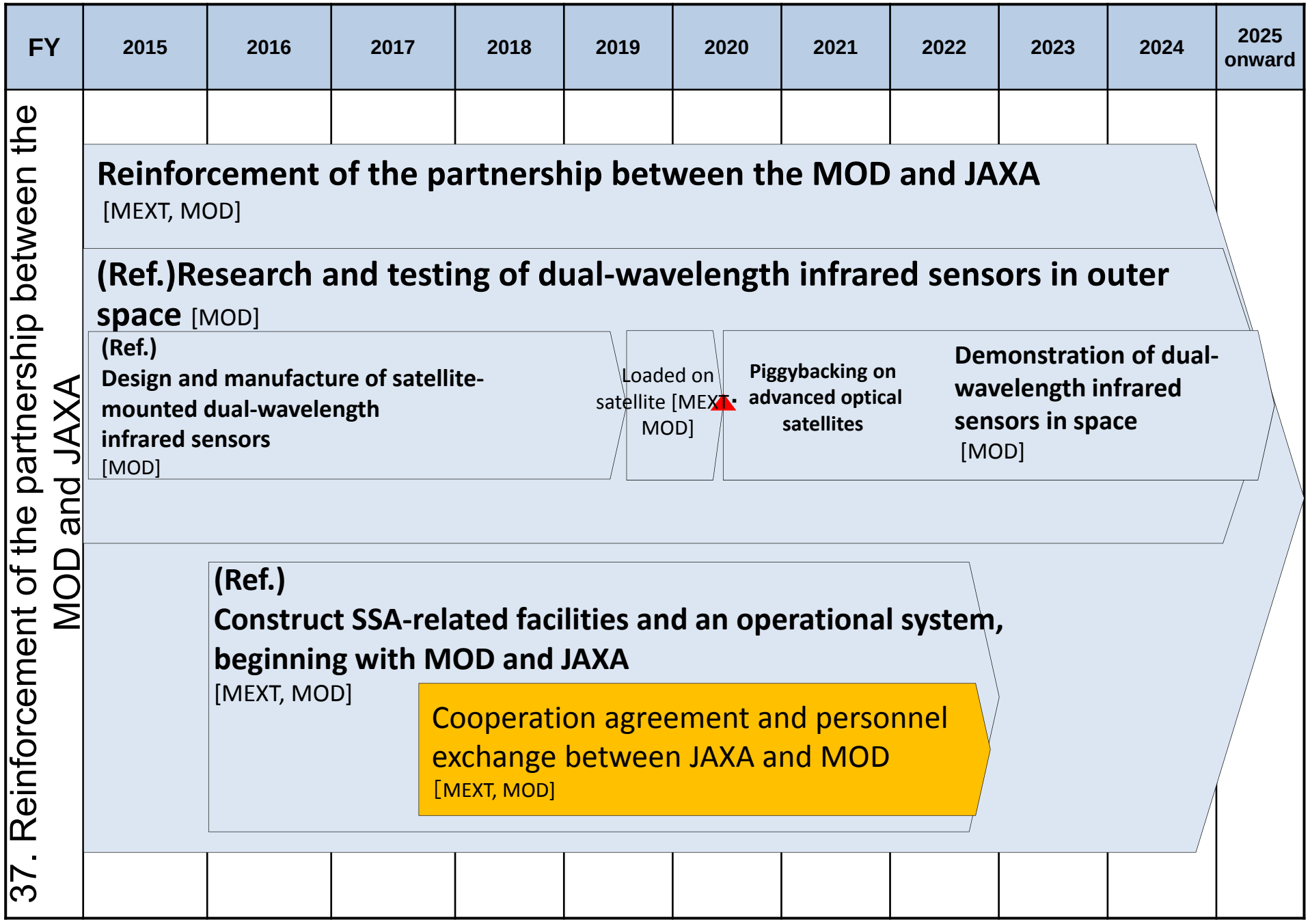
Achievements/status by end of FY2017

- In accordance with the revised Implementation Plan of the Basic Plan on Space Policy of December 2016, the government promoted the measures of the Basic Plan on Space Policy and made further progress on collaboration among ministries, with the National Space Policy Secretariat serving as the control tower.

Initiatives in FY2018 and beyond

- Under the guidance of the Strategic Headquarters for Space Policy, the Cabinet Office and the rest of the government will together strive to achieve the goals listed in the Basic Plan on Space Policy, taking into account discussions by the Committee on National Space Policy.
- We will strengthen collaboration not only with ministries implementing satellite projects but also with user ministries.

4. (2)③i) Comprehensive reinforcement of space policy implementation frameworks



37. Reinforcement of partnership between the MOD and JAXA

Target

[Security] Japan will achieve progress in the use of space for national security purposes by strengthening collaboration between JAXA and the Ministry of Defense.

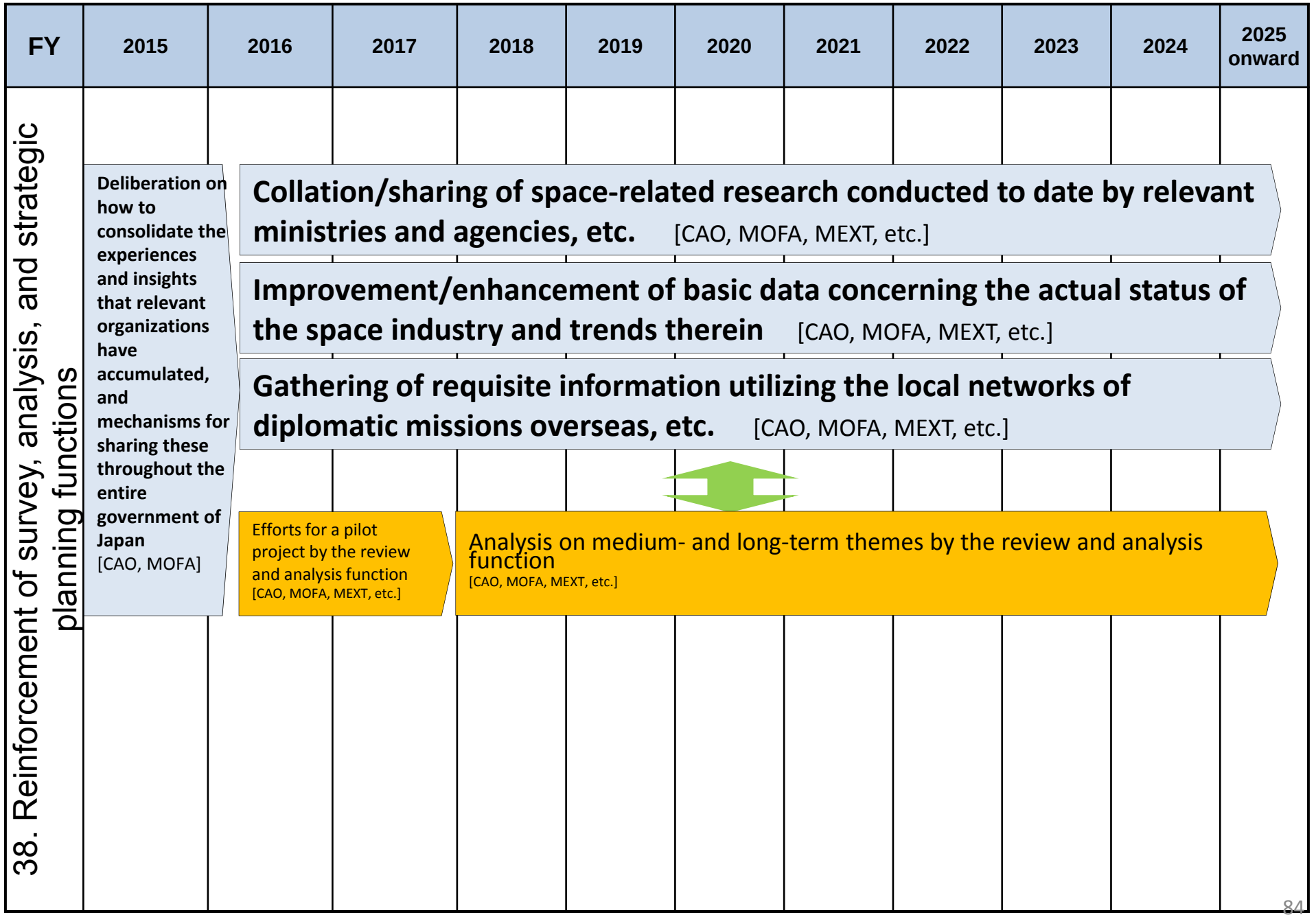
Achievements/status by end of FY2017

- Based on agreements that they have concluded regarding research cooperation, JAXA and the Ministry of Defense are seeking to enhance collaboration and the sharing of information regarding JAXA's space technology and knowledge, with a view to the use of space for national security purposes. In addition, they are promoting research cooperation focused on such areas as satellite-mounted infrared sensors.
- JAXA and MOD conducted deliberations on how to collaborate with each other in relation to SSA and concluded a cooperation agreement, and they also promoted personnel exchange.

Initiatives in FY2018 and beyond

- JAXA and the Ministry of Defense will further enhance collaboration and the sharing of information based on research cooperation agreements, etc.
- We are planning to equip a prototype dual-wavelength infrared sensor created by the MOD on a JAXA advanced optical satellite (ALOS-3) scheduled to be launched in FY2020.
- We will continue to make necessary adjustments concerning collaboration between JAXA and the MOD on the SSA system.

4. (2) ③II) Reinforcement of survey, analysis, and strategic planning functions



38. Reinforcement of survey, analysis, and strategic planning functions

Target

[Infrastructure] Through collaboration among relevant ministries and agencies, JAXA, and diplomatic missions overseas, etc., Japan will conduct surveys at home and overseas to gather the information needed to effectively and efficiently implement measures based on the Basic Plan on Space Policy, thereby strengthening the planning functions required in order to examine the strategies that our nation should adopt from a long-term perspective.

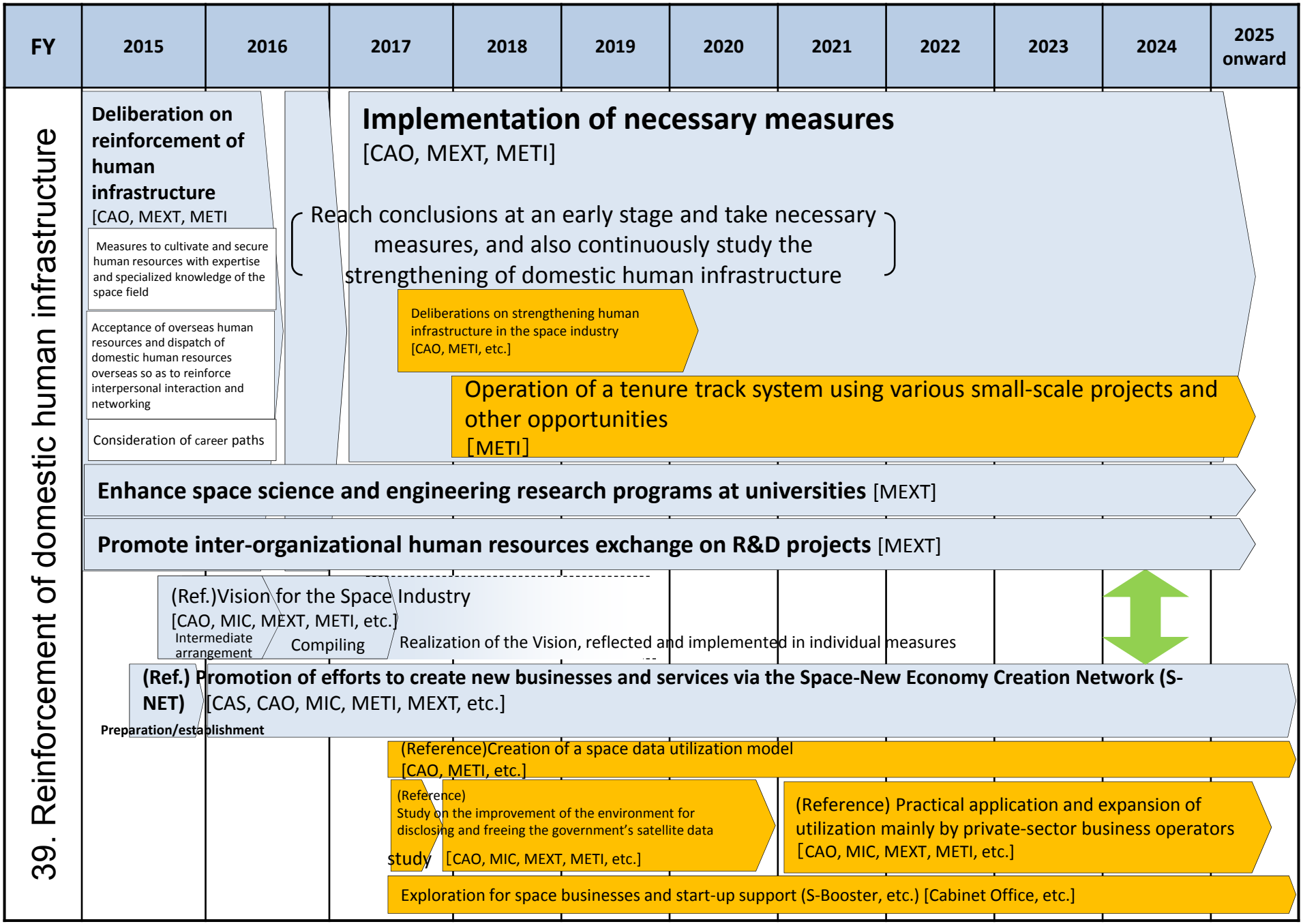
Achievements/status by end of FY2017

- We will continue to work on strengthening and expanding basic data concerning the true state of the space industry and trends. We will also conduct deliberations on information that should be obtained continuously in the remote sensing field and examples of activities that should be conducted as a pilot project.

Initiatives in FY2018 and beyond

- We will continue to work on strengthening and expanding basic data concerning the true state of the space industry and trends.
- Starting in FY2018, we will promote initiatives to strengthen institutional systems for the investigation and analysis functions in consideration of the results of pilot projects implemented by FY2017. We will also conduct investigation and analysis concerning medium- and long-term themes using these functions.

4. (2)③iii) Comprehensive reinforcement of domestic human infrastructure, furtherance of public understanding



39. Reinforcement of domestic human infrastructure

Target

[Infrastructure] Japan will comprehensively strengthen human infrastructure in order to help to maintain and enhance space industry and science and technology infrastructure.

Achievements/status by end of FY2017

- As well as seeking to strengthen people-to-people exchanges and networks by hosting overseas personnel and sending domestic personnel to other countries, we made progress with various initiatives, putting in place new systems such as a cross-appointment system.
- We sought to raise awareness and promote people-to-people exchanges through such opportunities as conferences on space-related business, including ISEF2, in which a variety of people from within Japan and overseas took part. We will also conduct surveys on trends related to human resources in the space industry and deliberations on how to enhance human infrastructure in the industry in consideration of the Vision for the Space Industry.

Initiatives in FY2018 and beyond

- In order to increase the mobility of space-related human resources, we will strengthen networking through S-NET activities and promote the utilization of elderly workers in industry, academia and government while taking account of the results of surveys. In addition, in order to attract human resources from different fields, we will use S-Booster, the space data utilization model project and joint research and other opportunities. In order to secure space-related human resources in the future, we will also promote initiatives to form career paths for next-generation personnel and stimulate interest in space.
- In order to promote human resource development in the fields of space science and exploration, we will introduce a tenure-track system using such opportunities as international projects and small-scale projects, starting in FY2018.

4. (2)③iii) Comprehensive reinforcement of domestic human infrastructure, furtherance of public understanding

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
40. Furtherance of public understanding	**Initiatives to raise public interest in space and contribute to expansion of the next generation of human resources** [CAO , MEXT] Provision of interactive educational opportunities in elementary and junior high schools, etc. In particular, promotion of initiatives that leverage the value of activities by Japanese astronauts, etc.										

40. Furtherance of public understanding

Target

[Infrastructure] Japan will make a wide-ranging contribution to efforts to broaden the base of the personnel who will lead the next generation, by boosting the public's interest in space.

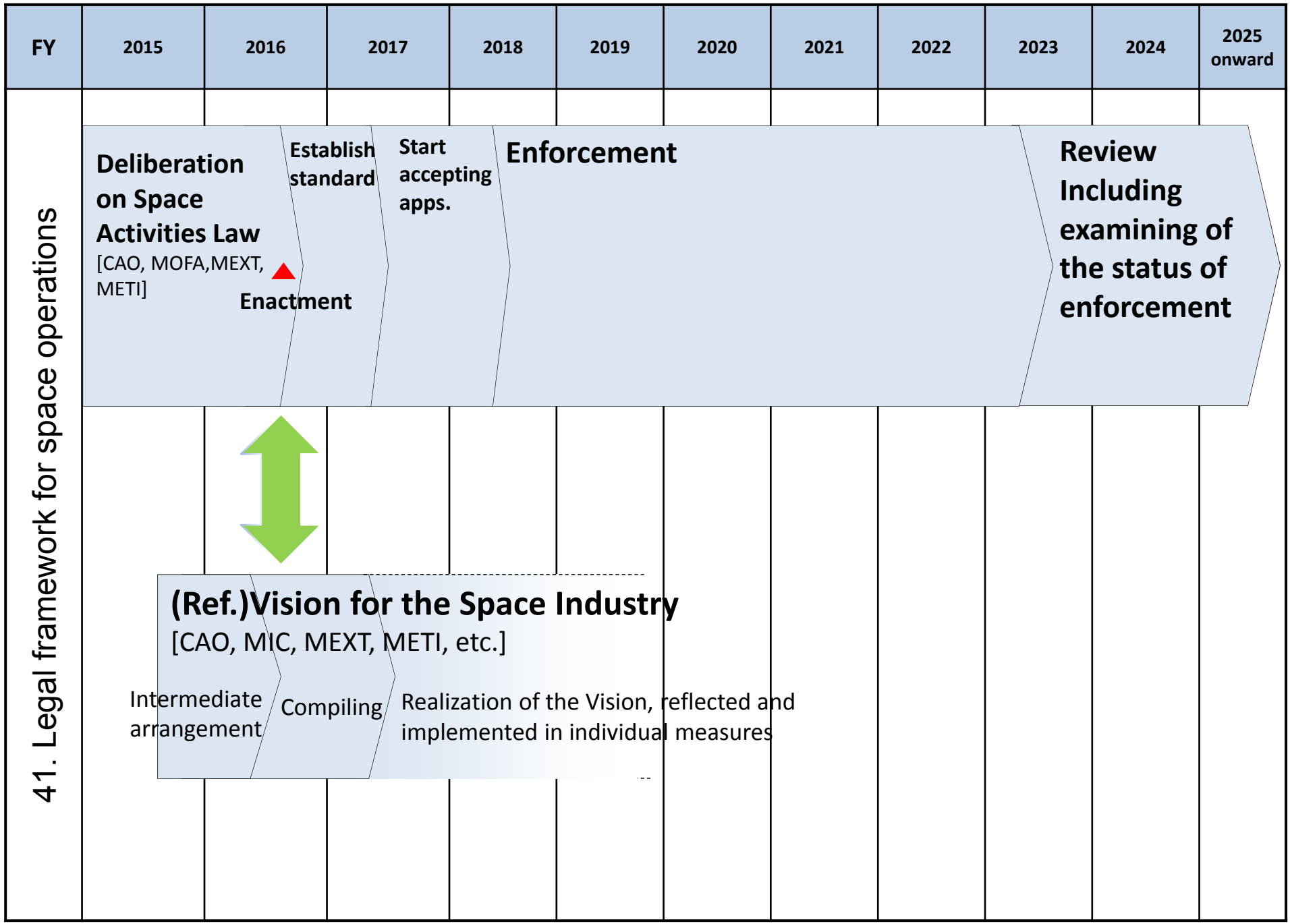
Achievements/status by end of FY2017

- Leveraging the opportunity offered by a Japanese astronaut's long stay on the ISS, we organized live communication events and undertook timely dissemination of information via the web. In addition, we undertook educational activities focused on space, striving to enhance understanding effectively through systematic curriculum development appropriate to each age range.
- We proactively explained the status of R&D on satellites and rockets and the status of external collaboration and strived to disseminate information to the public through the media by publicly exhibiting a Quasi-Zenith Satellite before its launch and by broadcasting the launch live.
- We promoted career formation for next-generation personnel and networking and stimulated interest in space by holding Y-ISEF (ISEF for Young Professionals), at which domestic and foreign students and young professionals from various fields gathered to actively exchange opinions and by conducting S-Booster and other initiatives.

Initiatives in FY2018 and beyond

- We will promote partnerships between JAXA, relevant organizations, and private sector companies in order to boost the public's interest in space more efficiently and effectively.

4. (2)③iv) Amendment of legal frameworks etc.



41. Legal framework for space operations

Target

[Infrastructure] (Security/civil sector) We will put together a bill on space operations, aiming to submit it to the ordinary session of the Diet in 2016, in order to ensure that we can fulfill our obligations under various space-related treaties and support space activities by private sector business operators.

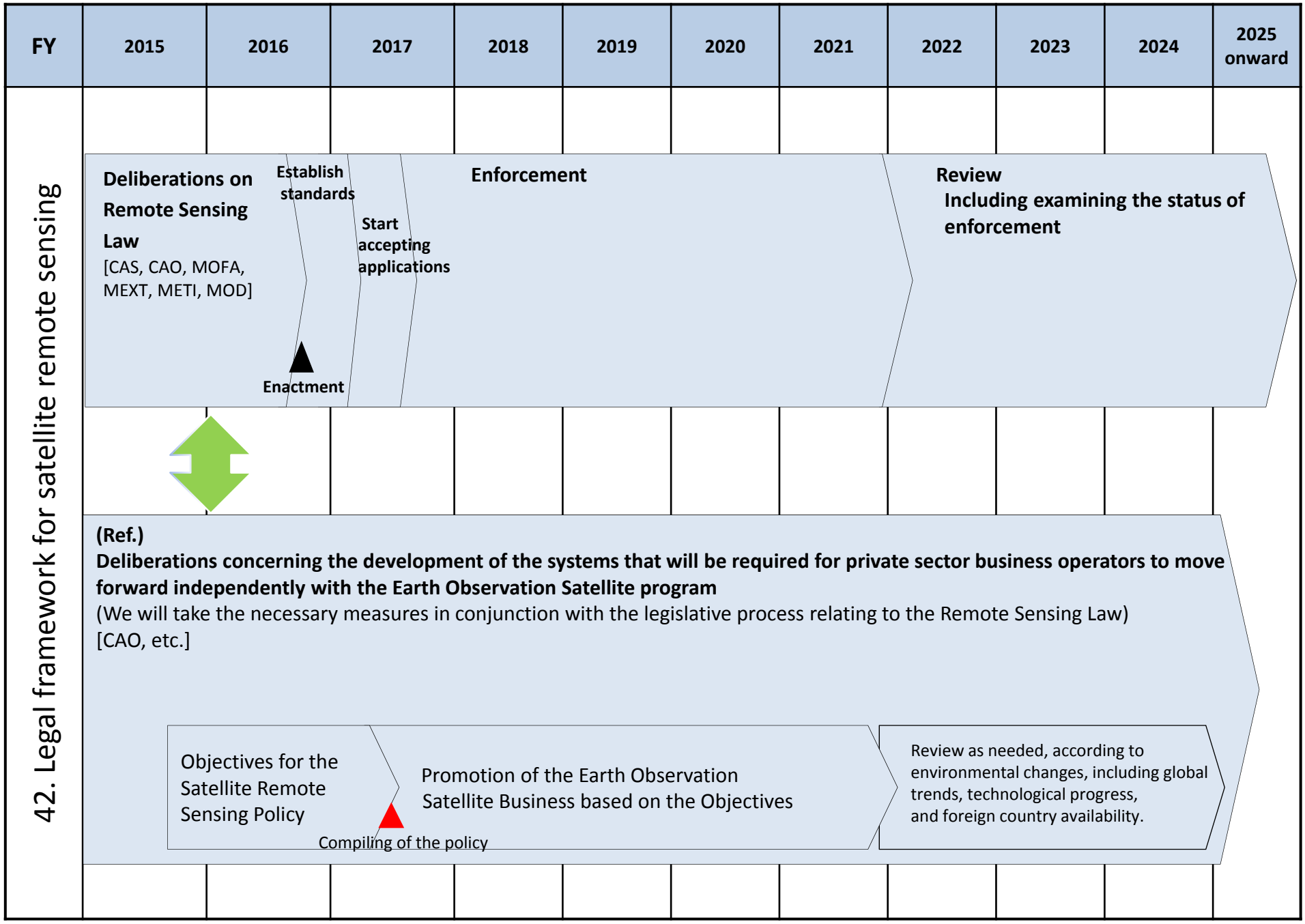
Achievements/status by end of FY2017

- To put into force the Space Activities Bill (a legislative bill concerning the launching of satellites and the control of satellites), we developed cabinet orders, ministerial ordinances, guidelines and applications manuals, and in November, we promulgated the law and started accepting applications for permission.
- In May 2017, we adopted the Vision for the Space Industry 2030, presented measures to promote the space industry and considered how to put the measures into practice.

Initiatives in FY2018 and beyond

- In order to put the law into force in 2018 and enforce it, we will continue to improve cabinet orders, ministerial ordinances, guidelines and applications manuals. In addition, we will take measures to ensure smooth implementation of business, such as holding relevant briefings and providing relevant advance consultations.
- After the law's entry-into-force, we will enforce it promptly with a high level of transparency, and when 5 years have passed since the entry-into-force of the law, we will review the enforcement situation and, if required, take necessary measures based on the results.
- We will work out the specifics of the measures indicated in the Vision for the Space Industry," reflect them in individual measures and promote steady implementation of the measures.

4. (2)③iv) Amendment of legal frameworks etc.



42. Legal framework for satellite remote sensing

Target

[Infrastructure] (Security/civil sector) We will draw up the bill required to promote business initiatives by private sector business operators using remote sensing satellites, taking into account trends in other countries, with the aim of submitting the bill to the ordinary session of the Diet in 2016.
In considering this bill, we will remain conscious of the need to achieve a balance between the our nation's security interests and efforts to expand the use of and markets for remote sensing satellites.

Achievements/status by end of FY2017

- Concerning the law concerning ensuring the proper handling of satellite remote sensing data (Satellite Remote Sensing Law), we developed necessary cabinet orders and ministerial ordinances, partially put the law into force on August 15 (started accepting prior applications), and fully put it into force on November 15.
- As objectives for the policy concerning satellite remote sensing (objectives concerning regulation and promotion), in November, we developed standards for equipment and records under the Satellite Remote Sensing Law and a basic concept concerning the promotion of the utilization of satellite remote sensing data.

Initiatives in FY2018 and beyond

- We will appropriately enforce the Satellite Remote Sensing Law, and when five years have passed since the entry-into-force of the law, we will review the enforcement situation and, if required, take necessary measures based on the results.
- Based on global trends, technological progress, changes in business models, foreign country availability, and other subsequent environmental changes, we will review the basic concept as needed.

4. (2)③iv) Amendment of legal frameworks, etc.

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
43. Steps to address disruption of positioning satellite signals	**Survey and deliberations on positioning satellite signals** [CAO, MIC, MOFA, METI, MLIT]			**Implementation of necessary measures** [CAO, MIC, MOFA, METI, MLIT]							

43. Steps to address disruption of positioning satellite signals

Target

[Infrastructure] (Security) Japan will consider and take the necessary measures, giving full consideration to trends in measures to address the disruption of positioning satellites taken by other countries, such as those adopted by the U.S. in regard to GPS.

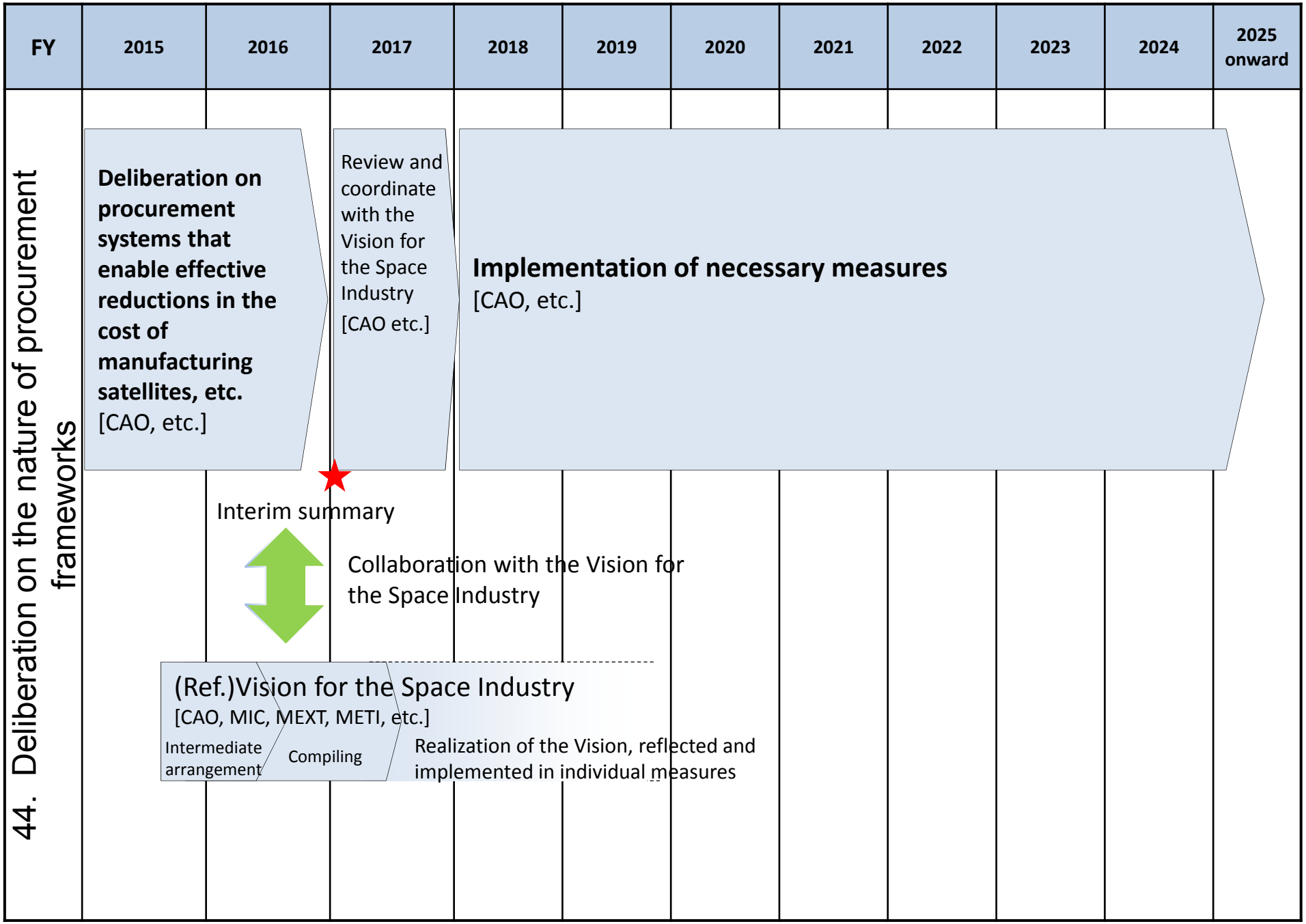
Achievements/status by end of FY2017

- We conducted a survey of the actual status of the disruption of positioning satellite signals, the status of measures under existing legislation, the risk of disruption, and the measures that can be taken to combat it.
- We continued considering response measures based on the results of this survey.

Initiatives in FY2018 and beyond

- Japan will consider and take the requisite measures, taking into account the outcomes of deliberations during FY2017.

4. (2)③iv) Deliberation on the nature of procurement frameworks



44. Deliberation on nature of procurement frameworks

Target

[Infrastructure] Taking into account trends in other countries, we will examine approaches to procurement frameworks that will enable reasonable cost reductions to be achieved in such areas as the manufacturing of satellites, while still ensuring that the business is profitable for private sector business operators.

Achievements/status by end of FY2017

- We will investigate and study the trends in procurement frameworks in foreign countries, the effects of innovation creation in the space field and sharing of responsibilities. We will also promote the introduction of finalized contracts and conduct deliberations on a system to appropriately calculate prices to be used as a premise for appropriately and rationally considering the cost ratio.

Initiatives in FY2018 and beyond

- From FY2018 onward, we will continue to deliberate how to establish a procurement system that allows private business operators to rationally reduce the cost of satellite manufacturing while maintaining healthy business performance and will take necessary measures.

4. (2)④i) Realization and reinforcement of the rule of law in outer space

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
45. Realization and reinforcement of the rule of law in outer space	**Promotion of initiatives aimed at the formulation of the International Code of Conduct for Outer Space Activities (ICOC) and the Guidelines for the Long-term Sustainability of Outer Space Activities, etc.** **Proactive participation in discussions, outreach, etc.** [MOFA] ★ **Partial agreement on "Guidelines"**										
	Proactive participation in and contribute to discussions in international conferences such as the United Nations COPUOS Committee on the Peaceful Uses of Outer Space (COPUOS) [CAO, MOFA, MEXT, etc.] -Attendance at relevant committees, coordination with UN space agency -Dispatch of specialists to space-related symposiums and seminars ★ **UNISPACE＋50**										
	Proactive utilization of bilateral and multilateral space cooperation as opportunities for rule formulation [MOFA, MEXT] – Actively utilize regional cooperative frameworks such as the ASEAN Regional Forum (ARF) and opportunities for bilateral and multilateral policy dialogue – Utilization of opportunities to welcome visitors from overseas, including at Japan's invitation										

45. Realization and reinforcement of the rule of law in outer space

Target

[Infrastructure/Security] Through various initiatives, Japan will ensure the stable use of outer space by playing a bigger role in efforts to promote the creation of international rules concerning the use of outer space, with a view to establishing and strengthening the rule of law in outer space.

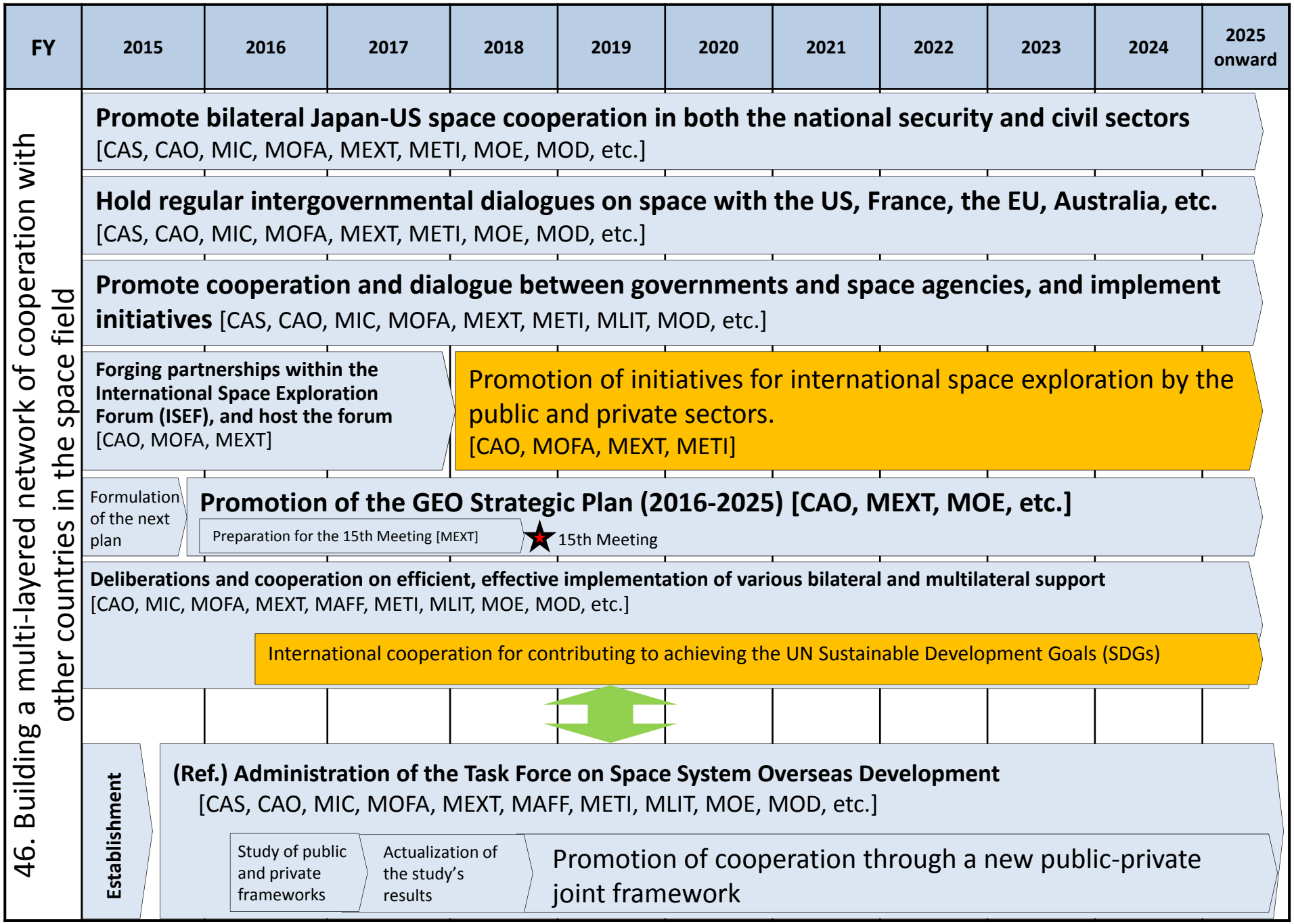
Achievements/status by end of FY2017

- At the U.S.-Japan Comprehensive Dialogue on Space in May 2017, Japan and the United States reaffirmed the importance of the rule of law in outer space. The two countries also confirmed the current situation under multilateral frameworks of cooperation, such as COPUOS and G7, and reieterated the importance of continued cooperative pursuit of transparency and confidence-building measures.
- At the June 2017 COPUOS Plenary Meeting, we participated in discussions on the Guidelines for the Long-term Sustainability of Outer Space Activities and contributed to the work toward an international agreement. In addition, concerning the recommendations in the report by the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities at the United Nations, Japan reported the status of its measures and called for other countries to implement the recommendations.

Initiatives in FY2018 and beyond

- Japan will continue to participate in international discussions undertaken by such bodies as COPUOS, thereby contributing to the creation of rules for the international community, including the Guidelines for the Long-term Sustainability of Outer Space Activities.
- We will aim to formulate norms for the regulation of both civil and security, utilize opportunities of bilateral and multilateral dialogues on space, closely coordinate with countries sharing Japan's position, as well as encourage every county to implement them.

4. (2)④ii) Strengthening of international space cooperation



46. Building a multi-layered network of cooperation with other countries in the space field

Target

[Infrastructure] (Security/civil sector) Japan will strengthen space cooperation with the USA via various initiatives. In addition, Japan will build multilayered cooperative relationships with various other countries through its efforts to help resolve the development challenges faced by developing countries, contribute to building an international earth observation network, and facilitate the strengthening of partnerships in the field of space exploration.

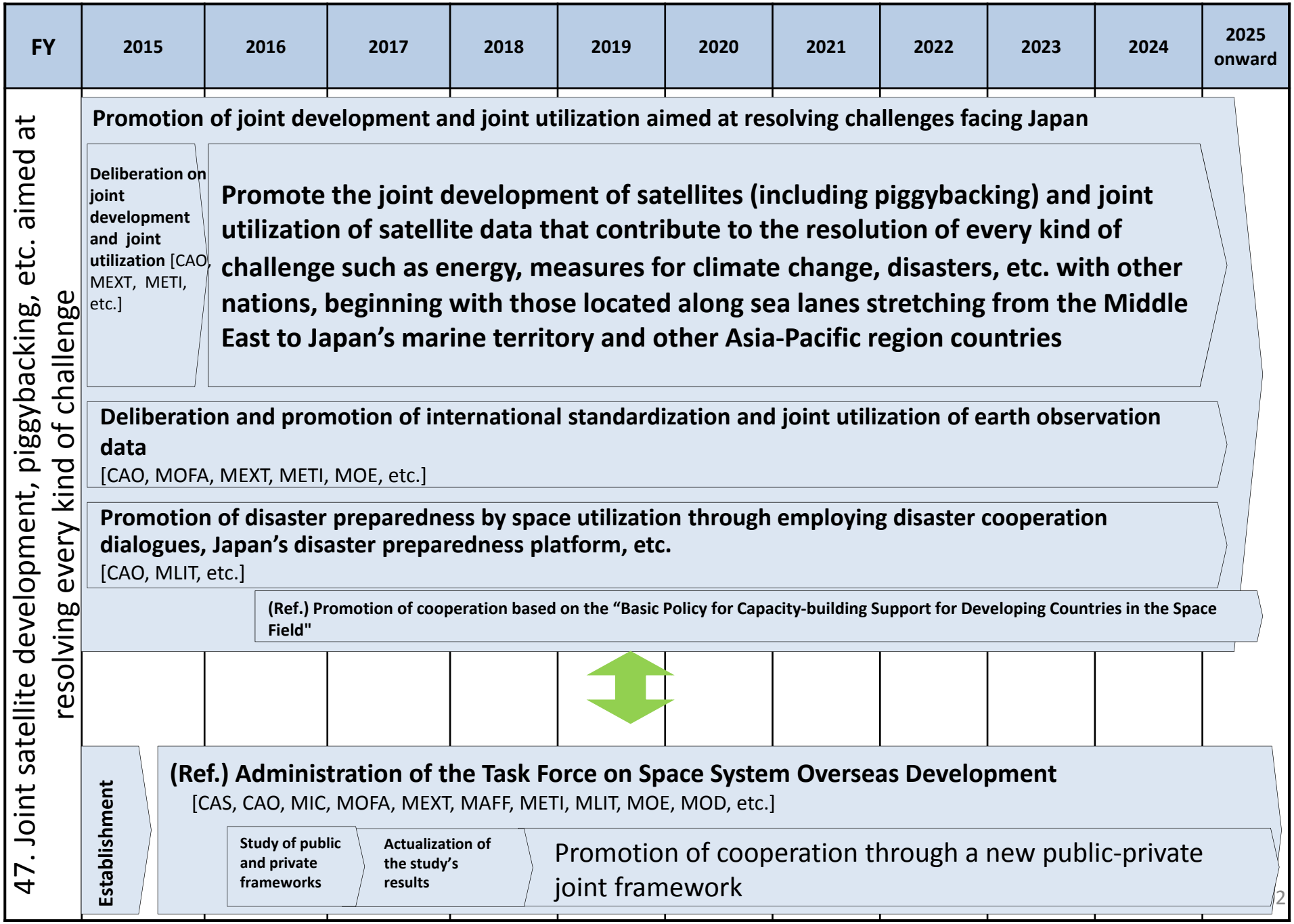
Achievements/status by end of FY2017

- In May 2017, the Japan-U.S. Space Policy Consultation (civilian and commercial utilization) and the U.S.-Japan Comprehensive Dialogue on Space were held, and in October, the Japan-EU Space Policy Dialogue was held. In addition, the Japan-France Comprehensive Space Policy Dialogue will be held, and Japan will continue to promote concrete cooperative activities.
- In close collaboration with international outreach activity, we held intergovernmental consultations on civilian and scientific cooperation with the UAE, Turkey, Thailand, Indonesia and Australia, and we also promoted cooperation among space agencies.
- The Japan-UK Joint Declaration on Security Cooperation, which was issued at the Japan-U.K. summit meeting in August 2017, specified space as an area of cooperation between Japan and the United Kingdom in the field of security cooperation. In addition, the Japan-UK Joint Declaration on Prosperity Cooperation called for the start of industry policy dialogue between the two countries and specified space as a specific area of cooperation.
- In March 2018, Japan will host the Second International Space Exploration Forum (ISEF2). At the same time, Japan will hold a side event targeted at young personnel and industry.

Initiatives in FY2018 and beyond

- From FY2018 as well, we will continue dialogues with the United States, Australia, the United Kingdom, France, the EU, etc. as well as various foreign countries' defense authorities, promote concrete cooperation, and continuously strengthen international space cooperation.
- Based on the achievements of the Second International Space Exploration Forum (ISEF2), Japan will promote initiatives for international space exploration by public and private sectors.
- We will further promote Earth observation initiatives beginning with the "GEO Strategic Plan 2016-2025" through the hosting of the "15th Meeting of the Intergovernmental Meeting on Earth Observations (GEO)" in FY2018 in Japan.
- Japan will promote international cooperation in contributing to the Sustainable Development Goals (SDGs) of the United Nations with space technologies.

4. (2)④ii) Strengthening of international space cooperation



47. Joint development and piggybacking of satellites for solving various problems

Target

[Infrastructure] (Security/civil sector) Japan will explore the possibility of cooperation with other countries, including those located along sea lanes from the Middle East to Japan's coastal waters and other countries in the Asia-Pacific region, and will take the necessary measures, thereby strengthening relationships with these countries and helping to resolve the challenges faced by our nation in such areas as energy, climate change, and disaster preparedness.

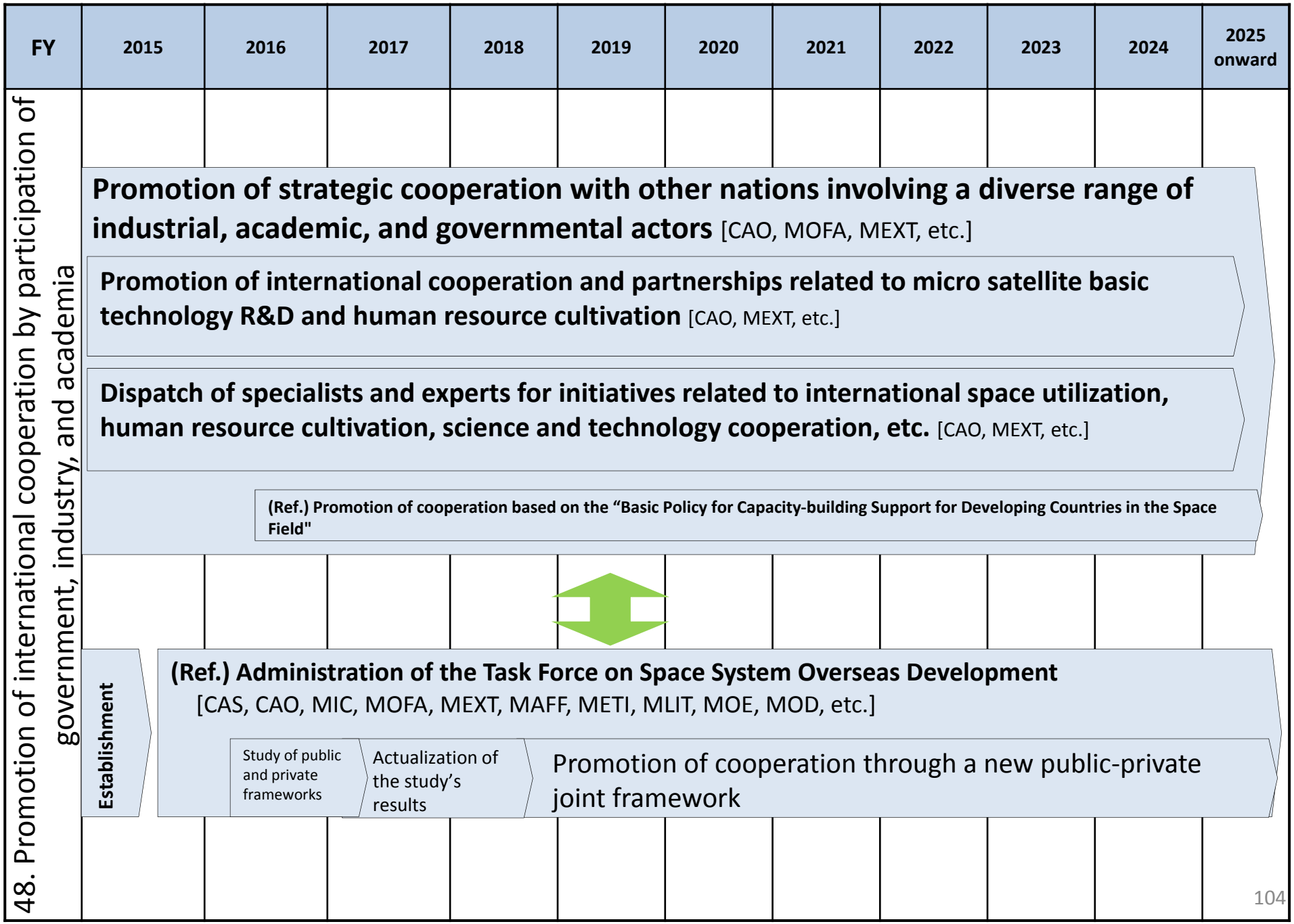
Achievements/status by end of FY2017

- At the Task Force on Space System Overseas Development, Japan started deliberations on cross-regional cooperation schemes and the dissemination of the schemes with respect to contributions to the resolution of global challenges with space technologies, contributions to the management of marine and fishery resources, human resource development and the establishment of human networks, among other matters.

Initiatives in FY2018 and beyond

- Through international cooperation with the United States, European countries, etc., Japan will promote joint R&D activities, including climate change observation, which are intended to resolve global challenges.
- Based on deliberations at the Task Force on Space System Overseas Development, we will develop tools that can be practically applied with respect to cross-regional themes. We will also conduct deliberations on the specifics of joint development and utilization with other countries, including Asian countries, based on the Basic Policy for Capacity-building Support for Developing Countries in the Space Field."
- ■ We will establish the long-term and stable operation of a data integration and analysis system for the government, study the ways that such an operation system should be carried out with the aim of beginning to provide service, and steadily upgrade the data integration and analysis system.

4. (2)④ii) Strengthening of international space cooperation



48. Promotion of international cooperation by participation of government, industry, and academia

Target

[Infrastructure] (Security/civil sector) Japan will conduct more in-depth initiatives aimed at maintaining and strengthening infrastructure associated with the space industry and maintaining and strengthening science and technology infrastructure that will create value, reflecting appropriate initiatives in each work schedule.

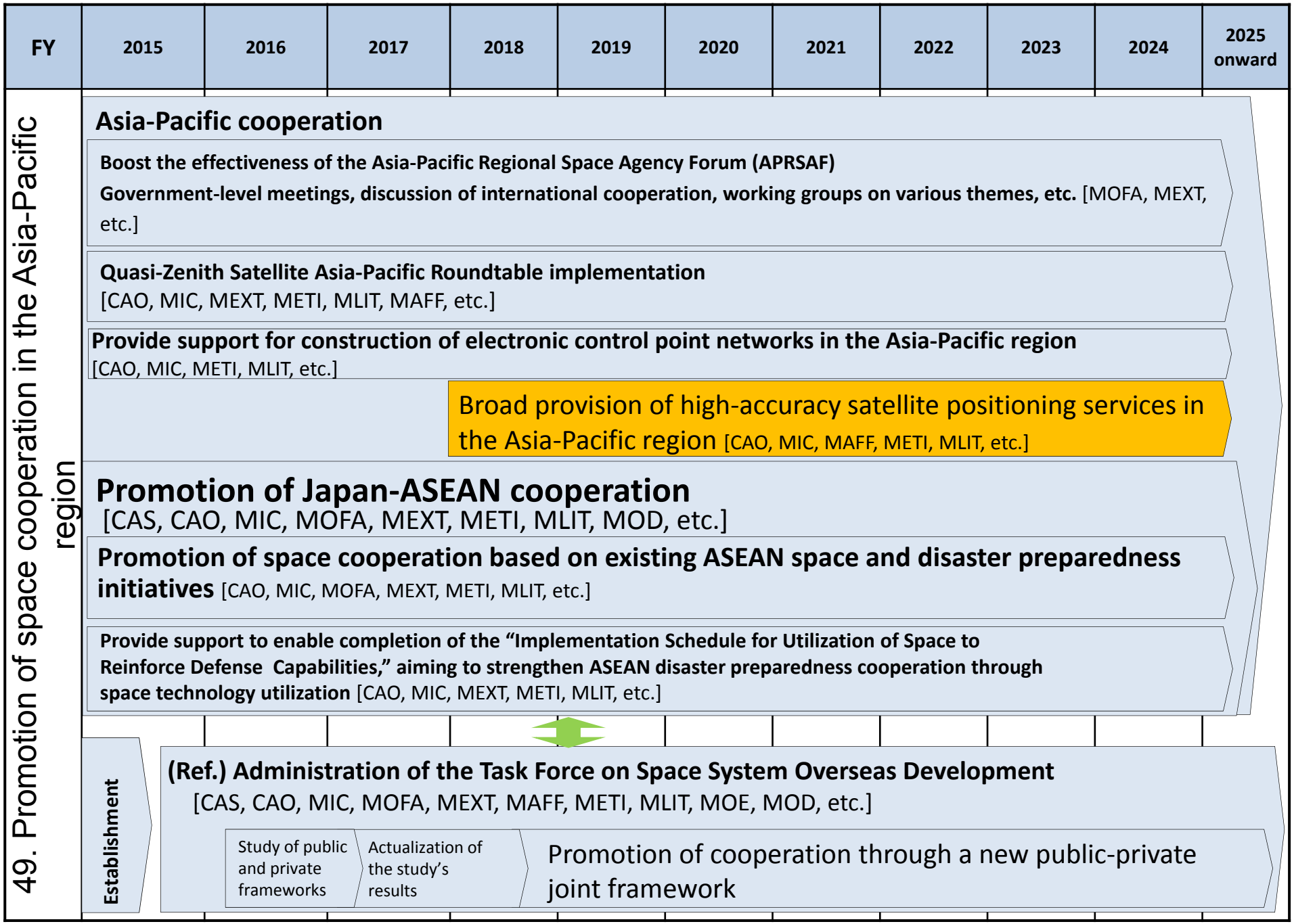
Achievements/status by end of FY2017

- Based on a memorandum of cooperation with the Turkish Ministry of Transport, Maritime Affairs and Communications, Japan transported samples of materials for Turkish satellites to the International Space Station and started an environmental exposure experiment.
- In cooperation with the Task Force on Space System Overseas Development, Japan started a survey with a view to developing international cooperation projects in Africa and South America.
- In collaboration with the promotion of the G-space society, we established a consultation system of industry, academia, and the government, and we promoted correspondence on concrete international cooperation matters.
- Through international cooperation with the United States, Australia and other countries, Japan conducted joint R&D concerning advanced space technologies, including optical satellite communication.

Initiatives in FY2018 and beyond

- We will cooperate with the Task Force on Space System Overseas Development and furthermore promote concrete international cooperation to deal with human resource development and global challenges based on the “Basic Policy for Capacity-building Support for Developing Countries in the Space Field.” In particular, we will start consultations with Africa and South America, whose cooperative relationships with Japan have until now been weak, about the formulation of international cooperation projects.
- Japan will promote international cooperation involving industry, academia, and government through the use of the ISS Kibo module.
- In order to promote the utilization of satellite data integrated with terrestrial data, Japan will promote demonstration projects abroad.
- Through cooperation with the United States, Australia and other countries, Japan will continue to promote R&D concerning advanced space technologies.

4. (2)④ii) Strengthening of international space cooperation



49. Space cooperation in the Asia-Pacific region

Target

[Infrastructure] (Security/civil sector) As well as further strengthening space cooperation frameworks in the Asia-Pacific region, we will contribute to the development of the ASEAN region and seek to strengthen Japan's relationship with ASEAN.

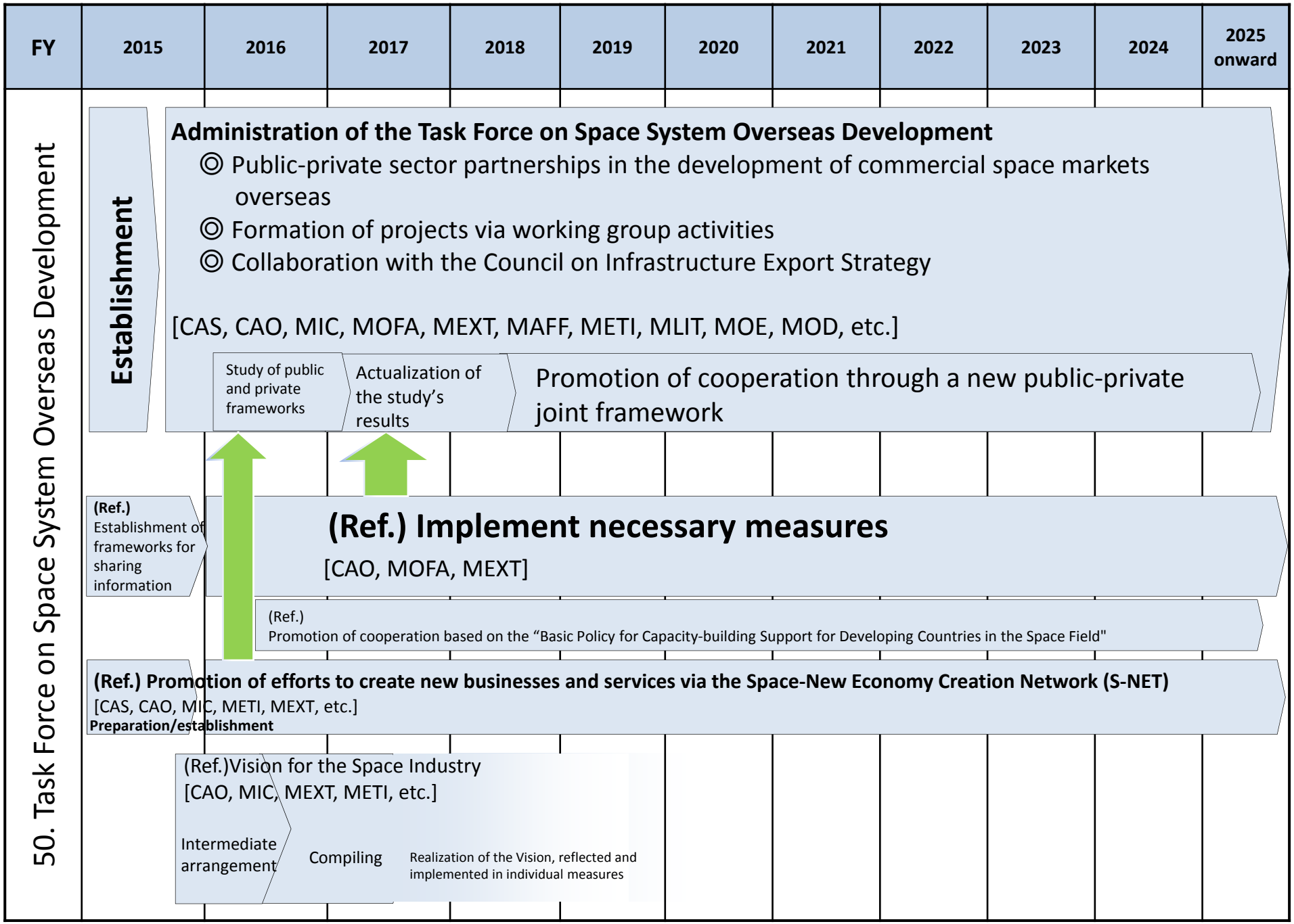
Achievements/status by end of FY2017

- At the 24th APRSAF Meeting held in India (Bengaluru) in November 2017, Japan established a new space policy session and promoted the formation of a policy-level community in the Asia-Pacific region.
- In cooperation with the East Asia-ASEAN Economic Research Center (ERIA), Japan published a research report intended to promote joint use and development of space systems and data in the ASEAN region and confirmed how to implement projects to enhance Japan-ASEAN connectivity.
- In order to promote a pilot project of ASEAN cooperation in the future, Japan signed a cooperation agreement with Indonesia concerning the space and maritime fields and started a survey with a view to developing concrete projects. Japan also signed a cooperation agreement with Thailand concerning the development of a network of electronic reference stations using satellite positioning technology, conducted a demonstration test of a satellite positioning service, and established a consultation council responsible for continuously promoting Japan-Thailand cooperation in the next fiscal year and beyond.
- Japan started exchange with satellite user government agencies in Asian countries in order to identify needs.
- In order to promote the utilization of Quasi-Zenith Satellites, Japan started a demonstration of a navigation system to avoid traffic congestion in Thailand and a survey on the needs related to the field of traffic in Vietnam.

Initiatives in FY2018 and beyond

- We will continue to promote concrete space cooperation in the Asia-Pacific region through collaboration with APRSAF, ERIA, and others.
- We will steadily promote pilot projects for ASEAN cooperation beginning with Thailand and Indonesia as mentioned above, and will also continuously promote development, strengthening Japan-ASEAN connectivity in space utilization, promotion of territorial resiliency, and cooperation in the economic field in space utilization via cooperation with ERIA and the Asia Development Bank (ADB).
- In cooperation with the Task Force on Space System Overseas Development, Japan will promote cooperation in establishing networks of electronic reference stations in the Asia-Pacific region. In addition, Japan will promote broad provision of high-accuracy satellite positioning services in the Asia-Pacific region by utilizing such opportunities as the Quasi-Zenith Satellite Asia-Pacific Roundtable.

4. (2)④iii) Establishment of the Task Force on Space System Overseas Development (provisional name)



50. Task Force on Space System Overseas Development

Target

[Infrastructure] In the first half of FY2015, Japan will establish the Task Force on Space System Overseas Development (tentative name), composed of parties from the government and the private sector involved in the space field. This Task Force will examine specific overseas expansion measures from a strategic perspective, taking into account Japan's strengths, the situation and needs in counterpart countries, and comprehensive infrastructure packages, and will seek to develop commercial space markets that bring the public and private sectors together.

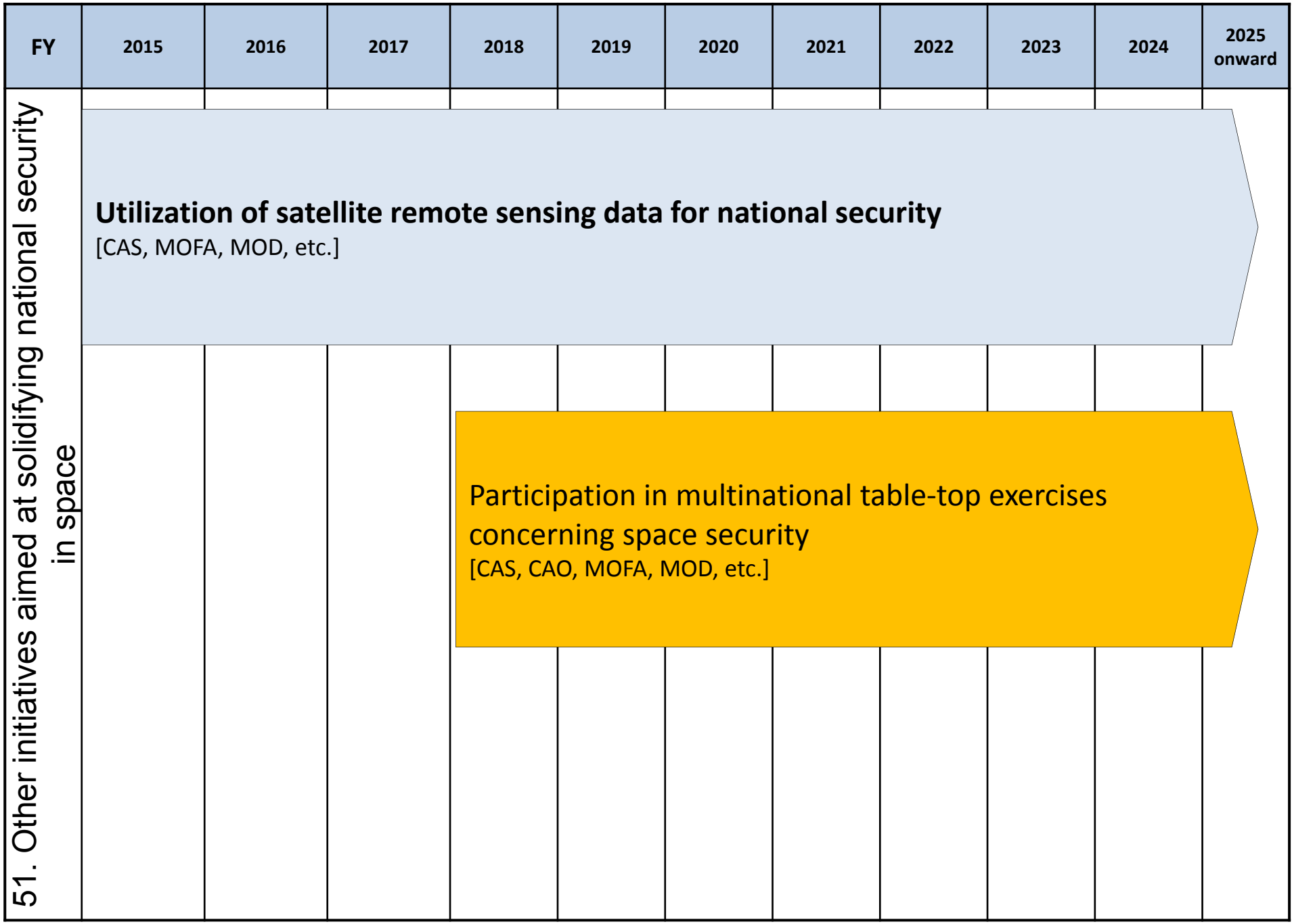
Achievements/status by end of FY2017

- At the Task Force on Space System Overseas Development, Japan implemented initiatives under 13 working groups divided by issue and region. Japan held consultations with the UAE, Thailand, Indonesia, Myanmar and Australia about cooperation. As a result, it made progress in formulating strategic projects.
- Japan implemented cooperation in human resource development with Vietnam, the UAE, Turkey and other countries.
- Japan started deliberations on cross-regional cooperative schemes, including contributions to global challenges with space technologies, contributions to the management of marine and fishery resources, human resource development and the establishment of human networks.
- Under the Vision for the Space Industry 2030, it was proposed that a system for long-term, sustainable support should be established by assigning project managers who will continuously play the central role in promoting projects.

Initiatives in FY2018 and beyond

- In consideration of the Basic Policy for Capacity-building Support for Developing Countries in the Space Field, Japan will promote international outreach activity in coordination with international cooperation activities. In consideration of the Vision for the Space Industry 2030, Japan will seek to develop a commercial space development market through cooperation between the public and private sectors with respect to the space utilization industry in addition to the space equipment industry.
- Japan will formulate concrete projects in order to contribute to the Sustainable Development Goals (SDGs) of the United Nations.
- Japan will establish the function of continuous support coordination with the project managers as its core by the end of FY2018 and continue to formulate projects through working groups under the new system.

(Other) Other initiatives aimed at achieving space policy objectives



51. Other initiatives aimed at solidifying national security in space

Target

[Infrastructure] Japan will conduct more in-depth initiatives aimed at maintaining and strengthening infrastructure associated with the space industry and maintaining and strengthening science and technology infrastructure that will create value, reflecting appropriate initiatives in each work schedule.

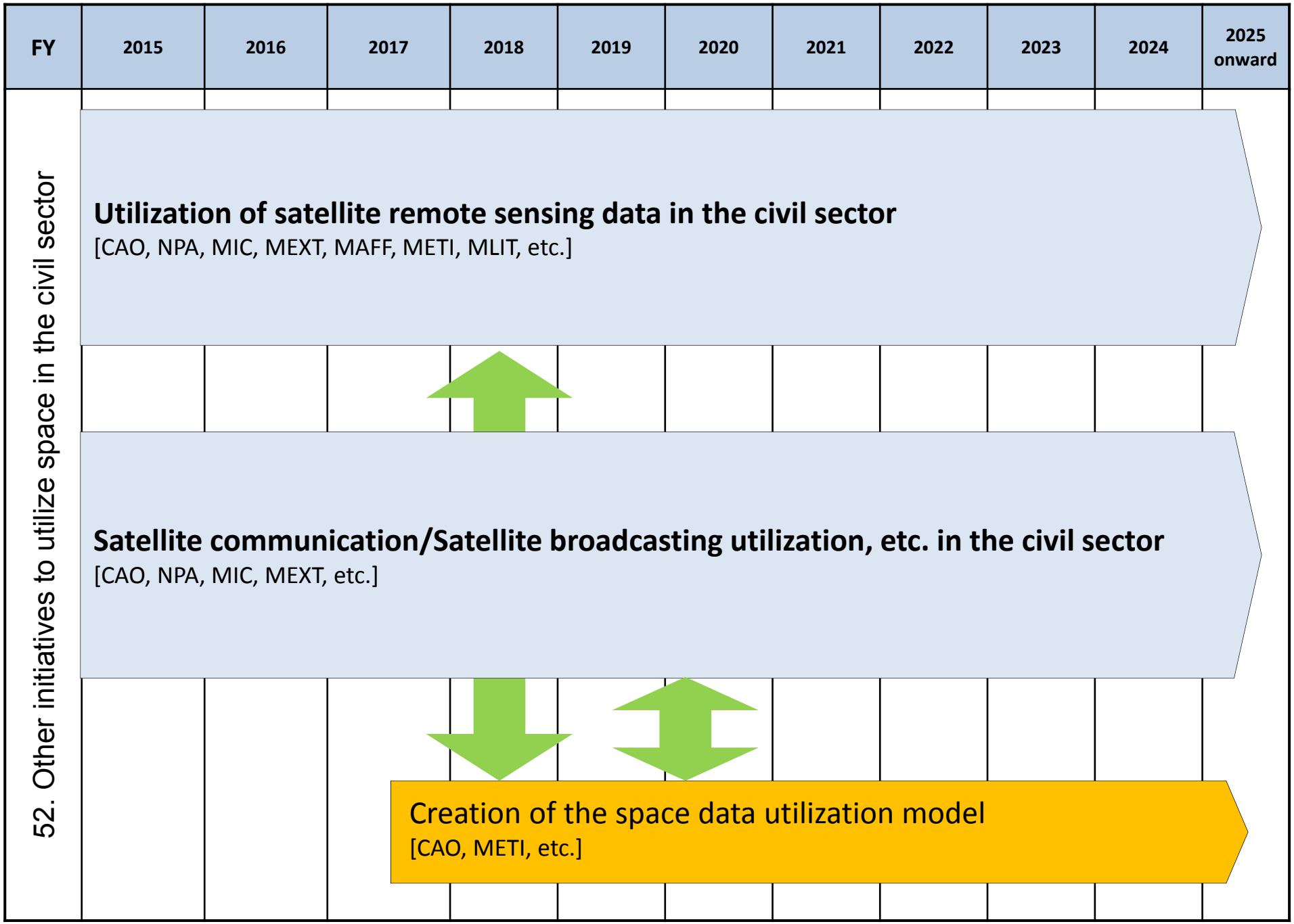
Achievements/status by end of FY2017

- We will implement initiatives such as the introduction of intergovernmental terminals for satellite image data, support for the interpreting and analysis of satellite images, and the use of commercial imaging satellites and weather satellite data.
- MOD is promoting space cooperation through participation in the SSA multilateral desktop exercise and the dispatch of personnel for training programs provided by the U.S. forces, among other measures. (Described above)

Initiatives in FY2018 and beyond

- We will continue to implement initiatives such as the introduction of intergovernmental terminals for satellite image data, support for the interpreting and analysis of satellite images, and the use of commercial imaging satellites and weather satellite data.
- Japan will for the first time participate in the Schriever Wargame, a multilateral tabletop exercise in the space field, in FY2018. (Described above)

(Other) Other initiatives aimed at achieving space policy objectives



52. Other initiatives to utilize space in the civil sector

Target

[Civil sector] Japan will undertake more in-depth initiatives aimed at utilizing space to resolve global issues and create a safe, secure, affluent society, as well as creating new industries in this area, reflecting appropriate initiatives in each work schedule.

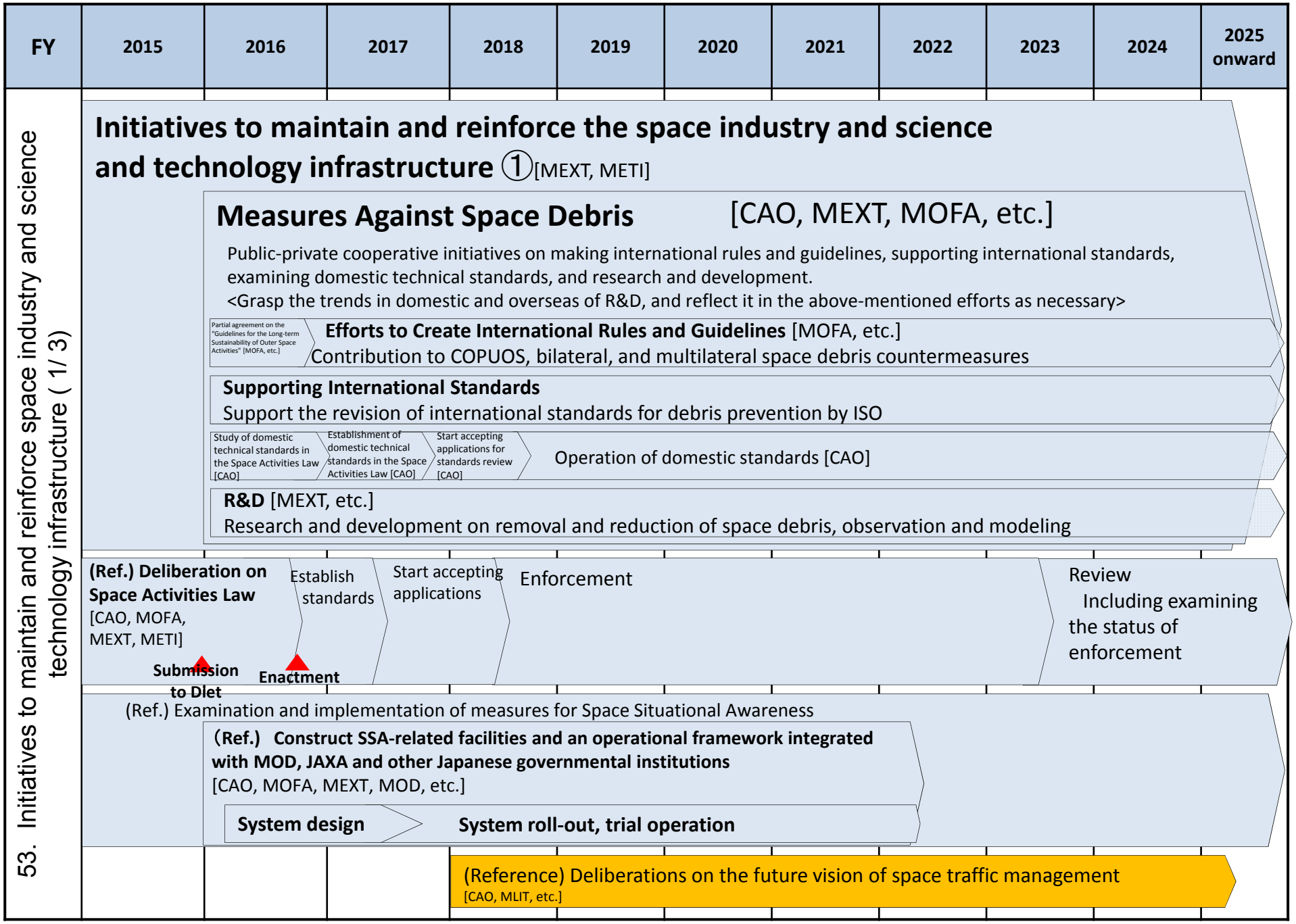
Achievements/status by end of FY2017

- We used Japan's communications satellites, remote sensing satellites, and other space systems to implement such initiatives as realizing broadband communications, grasping the marine environment (including the occurrence of red tides) and seismic and volcanic activities, improving map information and promoting agriculture, forestry and fisheries.
- Through the space date utilization model project, etc., Japan expanded the utilization of space in various fields for the purpose of resolving global challenges, realizing a safe, secure and affluent society and creating related new industries.

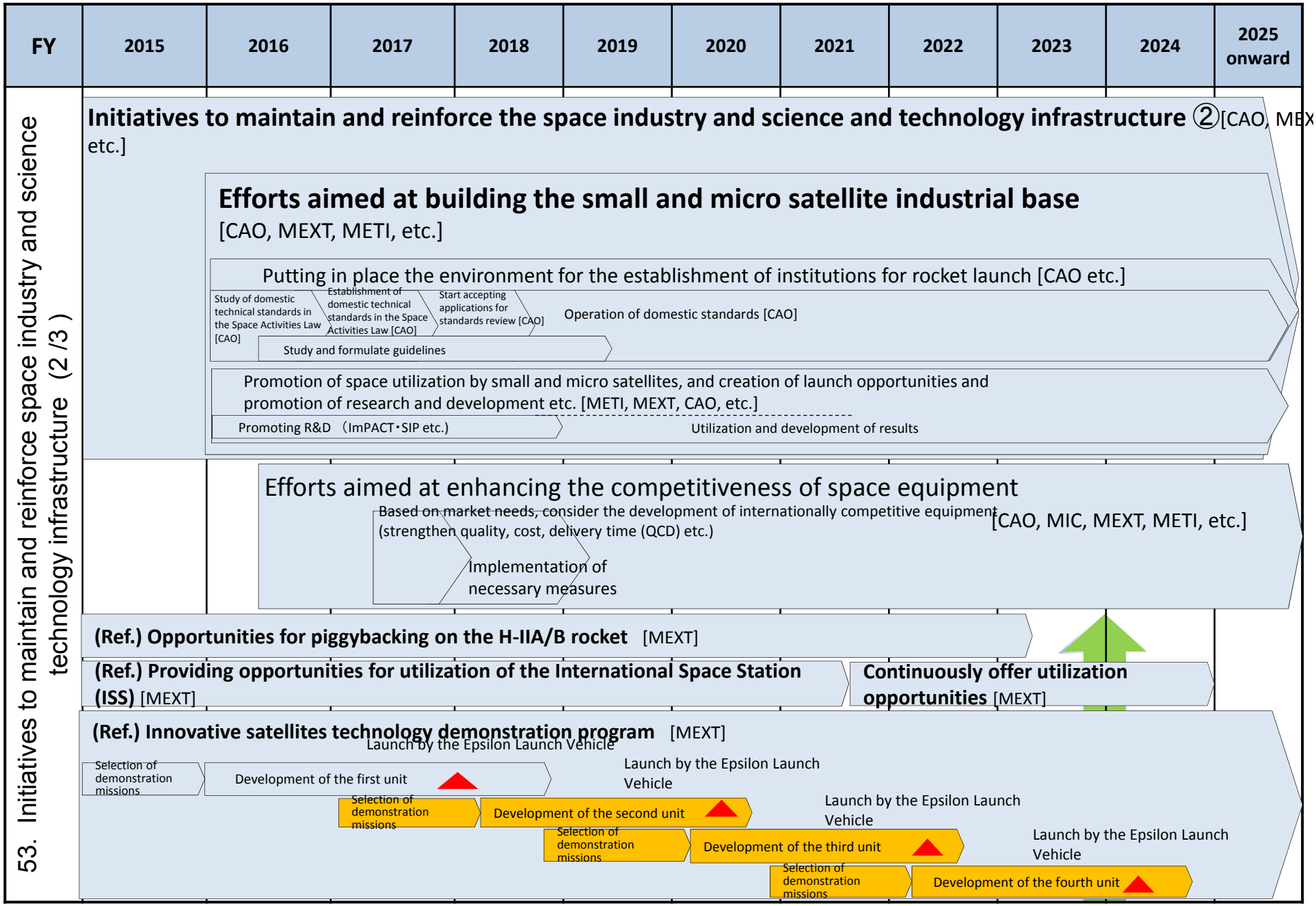
Initiatives in FY2018 and beyond

- Through the space date utilization model project, etc., Japan expanded the utilization of space in various fields for the purpose of resolving global challenges, realizing a safe, secure and affluent society and creating related new industries.
- We will continue to use Japan's communications satellites and remote sensing satellites, etc. in our efforts to resolve global issues and create a safe, secure, affluent society.

(Other) Other initiatives aimed at achieving space policy objectives

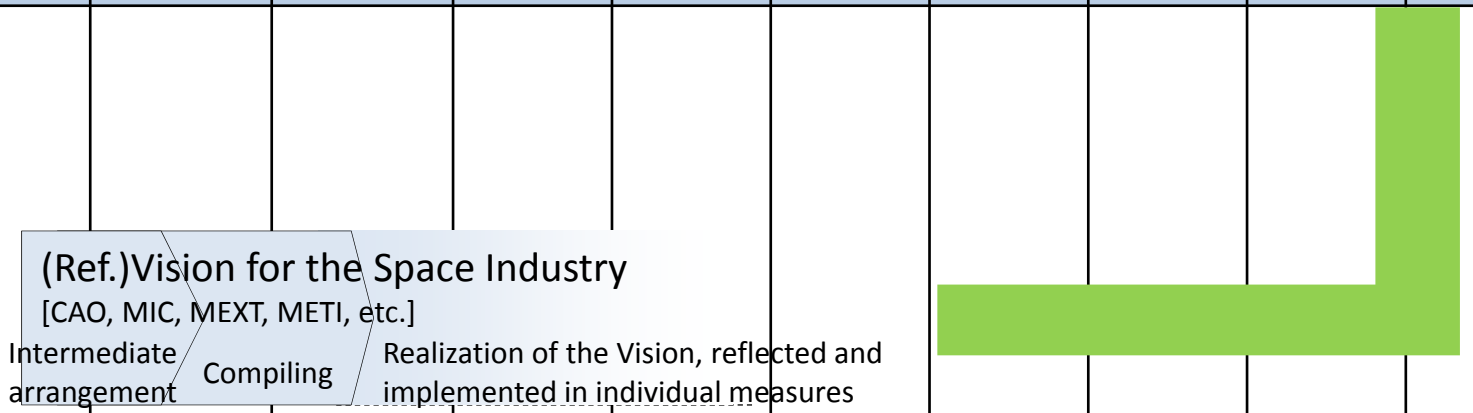


(Other) Other initiatives aimed at achieving space policy objectives



(Other) Other initiatives aimed at achieving space policy objectives

FY	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025 onward
53. Initiatives to maintain and reinforce space industry and science technology infrastructure (3 / 3)											



53. Initiatives to maintain and reinforce space industry and science technology infrastructure

Target

[Infrastructure] Japan will conduct more in-depth initiatives aimed at maintaining and strengthening infrastructure associated with the space industry and maintaining and strengthening science and technology infrastructure that will create value, reflecting appropriate initiatives in each work schedule. At the same time, by clarifying common objectives and directions, we will promote cooperative efforts between the public and private sectors.

■ By promoting countermeasures against space debris, we will support the stable use of outer space, strengthen our technological base, and contribute to collective international rulemaking.

■ For small and micro satellites, we will put in place the environment for the establishment of institutions for rocket launches, promote research and development, and create launch opportunities etc. to promote the utilization of space by small and micro satellites.

Achievements/status by end of FY2017

■ We conducted such initiatives as developing and operating infrastructure facilities and equipment that will enhance infrastructure in the space industry and science and technology as a whole, supporting IT system projects, and implementing programs to increase reliability and countermeasures against space debris. In addition, in relation to small and micro satellites, we studied technical standards, guidelines and application manuals concerning the Space Activities Law, and the operations of launch ranges, and conducted such activities as international coordination and R&D.

Initiatives in FY2018 and beyond

■ We will continue to strive to maintain and strengthen space industry infrastructure and science and technology infrastructure that will create value, by undertaking initiatives in such areas as the deployment and operation of infrastructure and equipment, support for IT system projects, and programs to increase reliability.

■ Concerning countermeasures against space debris, Japan will continue to actively participate in and contribute to discussions at the Committee on the Peaceful Uses of Outer Space (COPUOS) and other international meetings and promote initiatives concerning international rule-making with respect to the reduction and prevention of space debris.

■ In addition, focusing mainly on countermeasures against space debris which is derived from Japanese activities and which have a high probability of collision, Japan will gradually develop technologies to establish a removal system from FY2018 onwards. Japan will also continue to develop technologies related to the prevention of debris, observation and modeling.

■ Concerning technical standards based on the Space Activities Law, we will enforce them promptly with a high level of transparency, and when 5 years have passed since the entry-into-force of the law, we will review the enforcement situation and, if required, take necessary measures based on the results.

■ We will gather information on the overseas trends concerning space traffic management in FY2018.