Basic Plan on Space Policy

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Established by Strategic Headquarters for Space Policy,
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Table of Contents

Introduction

This plan* is the first of its kind since the establishment of a system for prompting Japan's space policy in an integrated manner, including the establishments of the Office of National Space Policy and the Committee on National Space Policy in the Cabinet Office.

National and international circumstances of space development and exploitation have considerably changed since the establishment of the previous version of the Basic Plan on National Space Policy in 2009.

Overseas, for example, the space activities in Europe and the U.S. have increasingly shifted to the private sector due to financial stringency, while China has constructed its own navigation satellite system and space station. In addition, more and more emerging countries are trying to have their own satellites.

In addition to maintenance and reinforcing the industrial base, Japan has been faced with increasing demands for safety and security in light of the recent international situation, as demands for security including recovery from the Great East Japan Earthquake, establishment of a social and economic structure that can deal with huge risks, and strengthening of disaster management and mitigation.

Japan’s space policy should change from the measures that focus on technological development to those that emphasize space utilization and make the objectives more specific in order to deal with these environmental changes.

The previous version of the Basic Plan on National Space Policy was laid out on the assumption of a budget of up to 2.5 trillion yen in five years from both the government and the private sector. In reality, however, financial stringency kept the governmental share of the space-related budget to about 300 billion yen per year. The private sector has been unable to find sufficient private or foreign demand.

Amid the situation where it is unlikely for Japan’s financial state to significantly improve in the near future, Japan should aim at becoming a more sophisticated and efficient society through space utilization and maintain and strengthen its industrial base to realize this purpose. In order to do so, the space industry is required to respond to global needs, such as space development in the Asian and other emerging markets and international cooperation in disaster prevention, breaking away from the current overdependence on governmental demands.

Based on these situations, the government should promote the space policy under which going forward it focuses on the areas with high priority, instead of deeming every project as essential, in order to achieve maximum effectiveness under limited resources.

* The English text is an unofficial translation for non-native readers of Japanese.

Chapter 1 Status of the Basic Plan on Space Policy and the New Structure to promote the development and utilization of space

1.1 Status of the Basic Plan on Space Policy

The Basic Plan on National Space Policy is established as the plan at the most fundamental level for Japan's development and utilization of space according to Article 24 of the Basic Space Law (Law No. 43, 2008) in order to promote integrated and systematic measures for Japan's development and utilization of space.[1]

1.2 Period covered by the Basic Plan on Space Policy

The Basic Plan on National Space Policy covers a five-year period starting from FY2013 with the next decade taken into account.

The plan will be reviewed 5 years after its formulation. However, it should be reviewed as needed based on follow-ups.

1.3 Organizational structure to promote space development and utilization

The Cabinet Office has been assigned a commanding role in Japan's space policy by an amendment of the act (Law for Partial Amendment of the Law for Establishment of Cabinet Office) in July 2012. This enables the government to promote Japan’s space policy in a more integrated and systematic manner.

The Cabinet Office is now responsible for coordination between agencies concerned, e.g. promotion of the development and utilization of space, and estimation of expenditures for the development and utilization of space. It is also responsible for administrative work of the development, maintenance and operation of satellites for public or official utilization in a variety of sectors, such as Quasi-Zenith Satellite System.

Japan Aerospace Exploration Agency (JAXA) has been positioned as the core organization that provides technical support for the entire governmental development and utilization of space projects. It is stipulated in law that JAXA’s Mid-Term Goal should be based on the Basic Plan on Space Policy[2]. JAXA is therefore supposed to make necessary contributions to the governmental space policies specified in the Basic Plan. On this basis, the Prime Minister, as the head of the Cabinet Office which is responsible for the administrative work for the promotion of space utilization, has now become one of the competent ministers of JAXA.[3] In addition, JAXA has begun to do support work, such as giving advice to private enterprises upon their requests. Now the Prime Minister and the Minister of Economy, Trade and Industry play a major role in promoting industry through JAXA in cooperation with the Minister of Education, Culture, Sports, Science and Technology and the Minister of Internal Affairs and Communications.[4]

[1] See Article 24, Basic Space Law.
[2] See Article 19, Law concerning the Japan Aerospace Exploration Agency
[3] See Articles 18 and 26, Law concerning the Japan Aerospace Exploration Agency
[4] See Articles 18 and 26, Law concerning the Japan Aerospace Exploration Agency

Chapter 2 Basic Policy to Promote the development and utilization of space

2.1 Current circumstances

[Recent status in space development and utilization in world]

Following activities led by the U.S., Russia, Europe and Japan, some emerging countries have recently moved into space development and utilization. In particular, China is accelerating such activities as seen in the construction of its own space station and making active efforts to develop its space system overseas. India has announced its Mars exploration and manned space activity projects as well as starting a rocket launching business, increasing its global presence. Several other countries are planning to possess their own satellites for disaster management or national security.

Space utilization enables us to provide services covering an area beyond national borders and detect phenomena in a global scale. Due to such characteristics, space utilization is actively prompted across the globe both in national security and civil activities, particularly in the fields such as satellite navigation, communications/broadcasting, and remote sensing. It has become widespread in the society to considerable extent as an important social infrastructure.

Since the 1990s, the space industry has experienced reorganization and rapid commercialization as a result of the decrease in military demands after the end of the Cold War. The utilization of space has expanded in the private sector, and the private-sector services are increasingly adopted to fulfill the demands of national security and other government-driven sectors. For example, Europe pioneered in public-private partnerships in the commercialization of space technology, while the U.S. decommissioned its Space Shuttles and now purchases commercial services for the transportation of crews and materials to the International Space Station (ISS).

[Status of space development and utilization in Japan]

Japan's space programs have so far focused on the acquisition of technologies, resulting in its own space transportation (rockets), discoveries in space science and acquisition of the technologies for manned space activities through the experiences in the ISS. Meteorological, communications/broadcasting and other satellites were developed based on specific users' needs, resulting in their commercialization.

The governmental investment for space development has been more focused on research and development since 1990. As a result, the industry became over-dependent on the governmental investment in R&D, and there is a concern that may undermine the industry base, as seen in the withdrawal of some enterprises.

Space utilization should be promoted hereafter in fields of critical importance to the industry and human life such as meteorological and communications/broadcasting satellites. For this purpose, government-supported research and development should be conducted in a manner that outcomes of such research and technology contribute to sophistication and improved efficiency of the industry, administration and people's lives.

When the Great East Japan Earthquake occurred in 2011, satellite communications made a considerable contribution to ensuring a means of communications in the affected area where the landlines failed. Satellite imaging allowed for observation on the nuclear power plants that

had become inaccessible due to the high radiation level. These cases demonstrate that a space system unsusceptible to changes in the ground environment is very useful for disaster response.

Before the enactment of the Basic Space Law, the utilization of space for national security was restricted to general applications. This new law is expected to further the utilization of space, such as satellite communication and information gathering in the security arena.

2.2 Basic Policy

The basics of Japan's space policy are designed to achieve the following through the utilization of space in accordance with the idea of the Basic Space Law: (1) advancement and efficiency of the industry, human life and the administration, national security in a broad sense, and economic development (expanding the utilization of space); and (2) maintenance of Japan's capacity of autonomous space-related activities by preserving and strengthening the industrial base based on generated demands from the private sector (ensuring autonomy).

(1) Expanding the utilization of space

An important purpose of space utilization is to create new services and products for the improvement in quality of the people's lives, such as meteorological forecast, communications/broadcasting, or car navigation. In particular, it is expected that the space technology offers effective measures for disaster management in Japan prone to natural disasters, and for ensuring its national security.

The government should enforce projects in the fields such as communications/broadcasting, satellite positioning and remote sensing, since these are key technologies expected to improve and streamline the industry, the administration and people's lives in future.

With respect to satellite communications/broadcasting, private companies have already provided their services, and the utilization on this field has expanded.

Japan is one of the heaviest users of GPS. A project to build a Quasi-Zenith Satellite System (QZSS) is ongoing, which will complement and strengthen GPS.

As for remote sensing, it is important to ensure constant and instant access to the data which meet the demands of the industry and the administration, as well as to explore new demands for further utilization of space technology.

In moving to the implementation, cooperation with the private sector and international collaboration, such as joint operation and space system sharing among Asian countries, are key factors.

(2) Ensuring autonomy

Since space activities are indispensable for Japan's national security and its socioeconomic benefit, ensuring the capability of autonomous space activities is the core concept of Japan's space policy.

The minimum requirements are the self-sustaining capacity of manufacture, launch and operation of satellites for navigation, remote sensing (including meteorological observation and information gathering) and communications/broadcasting, along with

maintaining, strengthening and developing of the domestic industrial base that supports those activities.

The current large share of governmental demands for the Japanese space industry should be reduced by satisfying demands from the private sector and overseas in order to maintain and strengthen the industrial base. This requires R&D to increase the industry's competitiveness and human resources development to train personnel who will support the industry.

2.3 Prioritization of measures and three priority subjects

Promotion of utilization of space requires plenty of national funding and a long period of time. Japan’s current financial stringency necessitates prioritization in order to yield the best results with limited resources.

As Space development programs, aimed at expanding the utilization of space and ensuring autonomy, are financed by the national treasury, priority should be placed on the most efficient and effective measures with national interest, cost benefit ratio and policy objectives taken into account, and funds and resources should be allotted to such measures.

Space science for the wisdom of all people, and manned space activities/exploration for enlarging the scope of human activities in future are and will remain important. Therefore, in addition to securing the necessary and sufficient resources for the expansion of utilization of space and securing autonomy, as well as allotting a certain amount of resources to space science (including space exploration for academic purposes) based on bottom-up proposals by the academic community, resources should also be provided to space exploration (both manned and unmanned) and manned space activities.

Large-scale space exploration should be based on international collaboration and be considered from various aspects, including diplomacy, national security, sustainment of industrial base, enhancement of competitiveness, science and technology, etc.

In view of the above, the following three issues thus take the highest priority: "national security and disaster management," "industrial development," and "progress in frontier areas including space science." In addition, it is vital to maintain and improve the technological capabilities and industry base to support development and utilization of space. The government identifies key policy targets to make this possible. Prioritization and efficiency enhancement of specific measures for attaining the goals will be provided each year in the budget estimation guidelines regarding development and utilization of space.

2.4 Six basic pillars for Japan's development and utilization of space

Implementation of the policies concerning development and utilization of space under the principles described above should comply with the six fundamental pillars presented in the Basic Space Law:

(1) Peaceful use of space
Utilization of space is one of the most important means to strengthen the capabilities of continuous surveillance of sea and air surrounding Japan, the detection of signs of events, and the prompt delivery/sharing of obtained information. Based on this idea, the

Ministry of Defense is making steady progress to enhance C4ISR[5] capabilities using space, developing a new communications satellite for the Japan Self Defense Forces (JSDF), which is planned to be in operation from FY2015. Other research projects for our national security are also being conducted even in the time of financial constraint.

The Information Gathering Satellite, which was decided to be introduced in FY1998, has been making considerable contributions to gather information necessary for national security and crisis management. It is necessary, therefore, to continue the improvement and reinforcement of its capabilities.

Amid the advancement of utilization of space for defense around the world, its future trends should be carefully monitored. It is also necessary to sustain and strengthen the industrial base by applying national security-related technologies to consumer use after a set period of time, insofar as the application does not compromise national security.

For our sustainable space development, establishing the space situational awareness (SSA) system for the purpose such as to protect satellites from possible collision with space debris (junk in outer space, hereinafter called debris) has been gaining importance as utilization of space is extended for both civil and military purposes. In addition to the countermeasures by the government, relevant agencies have to take appropriate measures from the standpoint of civil use, diplomacy and national security.
The space development and utilization for national security are conducted in accordance with the Basic Space Law, international agreements concluded by Japan and principle of pacifism enshrined in the Constitution of Japan, in the light of the situation in Northeast Asia. Their main purpose is the enhancement of information gathering, surveillance and communications capabilities that will contribute to Japan's national security.

It is important for JAXA to make contributions to the utilization of space for national security, because its objectives were updated in the 2012 amendment of the act (Law of Partial Amendment of the Cabinet Office Establishment Law).

(2) Improvement of people's lives

The development and utilization of space in Japan have already become common as an indispensable basis for everyday life. Examples include: weather forecast with meteorological satellites; data communications/broadcasting via dedicated satellites; cartography, resource survey, agriculture, forestry, fisheries, and disaster monitoring in conjunction with land/ocean observation satellites; car navigation and geographical survey with GPS.

However, applications other than those examples are still in the first stage. It is an urgent issue to exploit the maximum potential of the utilization of space in order to upgrade and streamline the industry, human life and the administration as well as to improve disaster management etc.

[5] Stands for: Command, Control, Communication, Computer, Intelligence, Surveillance and Reconnaissance.

The Great East Japan Earthquake has raised much public awareness of disaster management and response in Japan. Space-based systems have advantages in disaster management/response in that they are unaffected by the events on the ground and their services cover a wide area. Among those worthy of consideration are QZSS for detecting crustal land deformation or tsunami, remote-sensing satellites for surveying disaster-affected areas, and satellite communication networks useful for emergency situations.

The important points are to enhance the usability of the systems for both satellites and ground facilities, to expand both professional utilization and potential public utilization, and to facilitate the utilization of satellite data.

(3) Development of industry

Space industry[6] is an important base for the national space activity. It is a promising source of innovation due to its aggregation of cutting-edge technologies and the wide range of supportive industries, which is expected to bring about far-reaching spin-off effects on the whole industry and significant economic effects.

The space industry also has connections with the service industry through communications/broadcasting, map services using satellite imaging and positioning services, such as navigation.

The current financial stringency limits the government to support the space industry with sufficient procurement orders. Some private surveys indicate that the sales and number of employees of the Japanese space industry is currently about 260 billion yen and 7,000 workers, respectively, down from over 350 billion and nearly 10,000 in the latter half of the 1990s.

A key factor for sustaining and strengthening the industry base of Japan is the growth of the Japanese space industry through satisfying the private and overseas demands in global competition.

Although Japanese enterprises have recently received orders of satellites from Turkey and Vietnam in addition to Japanese meteorological satellites, they are not yet sufficiently competitive in the international market. Most of the satellites operated by Japanese companies are imports; Japanese telecom carriers operate only about 20 satellites. Japanese launching service providers have won only one order from the Republic of Korea for commercial satellite launching. Private companies have just begun their efforts to spot demands in the civil market, and need governmental support for overseas development of their space infrastructure system.

The global satellites market is dominated by U.S. and European companies, which have won the trust of customers in the private sector through their performance of on-orbit operation of government-ordered products. In contrast, Japanese firms have suffered from smaller governmental demand and insufficient R&D for commercialization and industrial promotion since the 1990s. They have limited experience of on-orbit

[6] "Space industry" includes "spacecraft manufacturing" producing satellites, rockets, ground facilities, etc., "space-based services" providing positioning, remote sensing, satellite communication/broadcasting and other services, "space-related civil equipment manufacturing" providing GPS terminals, car navigation systems, BS receivers and other user terminals, and "user industry" utilizing those equipment or services.

operation and failed to achieve a certain share of the global market. The same applies to the rocket launching service: Europe and Russia are dominant in the world market, followed by China and India.

Materials and components for spacecraft are still unprofitable items for the industry due to small outlet and lack of versatile applications, and many companies have ceased production. On the other hand, imported materials and components have risks of defects or unexpected suspension of production.

Limited on-orbit operation performance and high prices have prevented Japan-made components and materials from securing a visible share in the world market. Some products, including earth sensors, transponders, lithium ion batteries, heat pipe panels and solar cell panels, are internationally competitive as a system component. Export of these components should be encouraged individually rather than rigidly insisting on expert of the total systems. As for other uncompetitive items, the government should identify products of which the sustainment of domestic production capacity is important, and provide technology development assistance and opportunities for effective demonstration in conjunction with the government as a whole.

Testing and launching facilities for satellites and rockets should be maintained so as not to affect the development schedule including measures against aging of such facilities.

Another step for sustaining and expanding Japan's industry base is to encourage entrance into space industry of new entrepreneurs or established businesses with high technological levels in other fields. The government should create an environment favorable to such entry.

These businesses should also be encouraged to provide not only space-related products but also problem solving (providing solution) services.

(4) Prosperity of human society

Space is the last frontier for humankind. It offers limitless possibilities in many ways, such as accumulation of the intellectual heritage, expansion of human activities, and new form of energy utilization in space. Advanced scientific and technological research and development are indispensable for challenging the severe space environment and achieving the potential for practical and tangible utilization of space.

Such advanced R&D activities will also prompt new technological breakthroughs, which will, in turn, contribute to a better lifestyle and dynamic future.

Modern space science integrates astronomical science (study of the solar system, origin of the universe, origin of life, etc.) with leading-edge engineering for probe vehicles that permit the scientific studies. Japanese space science, conducted on the basis of bottom-up consensus in the scientific community, has been successful and made a number of cutting-edge breakthroughs, as exemplified by the sample from Asteroid "Itokawa", brought home by the asteroid explorer HAYABUSA (MUSES-C).

Japanese astronauts have contributed to the ISS project by developing the technologies that support manned space activities. Experiments on ISS are expected to contribute to the advancement of people's lives. For example, the formation of high-grade protein

crystals in lab module “Kibo” completed in 2009 may lead to the development of novel pharmaceuticals.

As for large-scale space exploration (both manned and unmanned), a top-down decision based on a long-term prospect taking into account various aspects including diplomacy, national security, industrial capacity and competitiveness and science and technology is essential. Implementation of projects, including the manned space activity mentioned above, should be in accordance with a clear order of priority.

Japan’s position on space science and space exploration should be that of a leading country with accumulated experience and technology, and Japan should be engaged in space science research and exploration as a quest for scientific truth and as efforts to expand the realm of mankind.

(5) Promotion of international cooperation

Japan has been active in addressing international issues through Group on Earth Observations (GEO), Asia-Pacific Regional Space Agency Forum (APRSAF), Sentinel Asia, and the Charter on Cooperation to Achieve the Coordinated Utilization of Space Facilities in the Event of Natural or Technological Disasters. For example, data from the Japanese satellites Himawari and DAICHI etc., have been provided for meteorology, disaster monitoring or climate change projection in Asia. Along with the participation in the ISS project and other space science and space exploration activities, Japan has built strong ties with other leading countries in space development and these performances have contributed to securing Japan's presence in the international scene.

Japan’s contribution has been highly regarded by the international community, and it should utilize such recognition as a diplomatic asset in order to conduct “space diplomacy”. Japan's international activities should not be limited to responding to requests from other countries but should involve efforts to build frameworks for mutually beneficial cooperation with partner countries, including support for overseas expansion of Japan’s space-related businesses and industrial cooperation.

Development and utilization of space require a considerable amount of funds for developing and launching satellites. Since it is not realistic for Japan solely to cover the entire cost of such expensive programs, international cooperation and role sharing, as in the ISS project, are very important in order to cultivate a good international relationship that will realize effective utilization of space.

For example, the Japanese remote-sensing satellite systems can be introduced to Asian and other emerging countries where disaster management and monitoring are highly needed. A harmonious relationship beneficial to both Japan and a partner can be established through the joint operation of satellites and data sharing.

Projects of this kind will not only be helpful to the partner countries in improving their capacity to handle disasters, but also to Japan in maintaining and strengthening the industrial base. The government should cooperate closely with the private sector in infrastructure export under the public-private partnership (PPP) framework, as practiced in other countries where private companies gain overseas orders with strong support by the governments.

Specifically, the government should learn the needs in other countries by taking the following measures: bilateral cooperation agreements, export financing, trade insurance, financial aids through Official Development Assistance (ODA), and activities via diplomatic establishments abroad. A good example of overseas development of the Japanese space system infrastructure is the response under inter-ministry collaboration to the request by the Vietnamese government for the construction of a space center, introduction of space systems and staff training. It also demonstrates a new scheme of international cooperation in space development. Such efforts will contribute to the establishment of concept "Disaster Management Network for ASEAN Region"[7] which was proposed in November 2011 and obtained high praise from the ASEAN countries.

Emerging countries, especially Asian countries, are highly interested not only in a simple introduction of space systems but also in nurturing their own human resources and industry, as well as solving specific problems through them. The government should always be aware of such requirements and strengthen the ties with them through cooperation programs with shared space systems.

An important issue on the global level is the establishment of international rules concerning utilization of space in order to ensure stable and sustainable space environment. In addition to the discussions at the Committee on the Peaceful Uses of Outer Space (COPUOS) and Conference on Disarmament (CD) in Geneva, Japan has to make a major contribution to the establishment of appropriate rules on utilization of space in both civil and national security sectors, such as an International Code of Conduct for Outer Space Activities proposed by EU.

(6) Consideration for the environment

In addition to improving convenience of people’s lives and efficiency of industry and the administration, utilization of space offers potential for solving global energy and environment problems. In promoting the development and utilization of space, such activities themselves should be environment-friendly and also friendly to that of outer space.

From the viewpoint of friendliness to the global environment, space programs for effective and efficient solution of global environmental problems, such as climate change, are important.

From the viewpoint of friendliness to space environment, prevention and reduction of space debris are important issues for space development and utilization. Some upper stages of launchers and fragments of decommissioned satellites remain on their orbits as space debris and may collide with satellites to cause heavy losses.

A large amount of debris was produced due to the experimental destruction of a man-made satellite with a ballistic missile by China in January 2007 and the collision between U.S. and Russian satellites in February 2009. It is expected that the number of debris particles will increase in a chain collision between the particles.

[7] Japan has proposed this concept to ASEAN countries in 2011 in order to enhance disaster response capabilities of the region through sharing disaster risk information obtained with satellites. Japan contributes to disaster monitoring and response in the whole ASEAN region via cooperative operation of satellites.

Addressing the debris problem appropriately is an urgent necessity for sustainable space development and utilization.

Chapter 3 Measures that the Government should take comprehensively and systematically for the development and utilization of space

As for space development and utilization, the Government promotes measures that it should take comprehensively and systematically, in the light of the basic policies and priorities mentioned in the previous chapter.

The chapter 2 describes three priority subjects: “national security and disaster management”, “industrial development”, and “progress in frontier areas including space science”. In exploring these issues, Japan works on the following four measures: “four social infrastructures to expand space utilization and preserve autonomy (A through D)”, “three programs to pursue the potential of the future development and utilization of space (E through G)”, “eight cross-sectional measures to promote the strategic development and utilization of space”, and “approaches for efficient and effective promotion of policies and measures for outer space”.

3-1. Four social infrastructures for expanding the utilization of space and ensuring autonomy

A. Positioning satellites

(1) Current status

In this field, the U.S., Russia, Europe and China have built their Global Navigation Satellite System (GNSS) and India is constructing a Regional Navigation Satellite System. In conjunction with an augmentation function that improves accuracy in positioning, the utilization of navigation satellite system is expected to widen.

QZSS has the functions of complementary and augmentation[8] of GPS operated by the U.S., therefore it will strengthen industrial global competitiveness and make industry, daily life, and public administration more sophisticated and efficient. QZSS will also contribute to the welfare of the Asia-Pacific region, an enhancement of Japan’s presence there, strengthening the Japan-U.S. partnership, and a broad range of security including the improvement of the capacity to respond to natural disasters. The Government aims to establish four satellites constellation by the late 2010s and complete seven satellites constellation in the future, which enables sustainable positioning (q.v. Basic policy on the promotion of the operational QZSS project, Cabinet Decision on September 30, 2011). Toward this goal, technical and operational validation tests with the first QZSS satellite “MICHIBIKI” are ongoing at present. The development of the operational system started in FY2012.

(2) Issues

1) Increasing the utilization and overseas expansion of QZSS

It is necessary to advance field validation tests with MICHIBIKI in operation, in order to expand the utilization of QZSS and enhance its convenience.

In addition, thanks to its orbital characteristics, QZSS covers the Asia-Pacific region. From a viewpoint toward the greater international competitiveness of Japan’s industry, international contributions to the Asia-Pacific region, and substantial presence in the

[8] A complementary function expands the coverage of a satellite navigation system in terms of time and space. An augmentation function improves the precision and reliability of a satellite navigation system.

region, it is necessary to encourage international cooperation to deploy QZSS overseas under a PPP scheme[9].

In order to increase the utilization and overseas expansion, considering the potential application in various fields, such as personal navigation system, survey, agriculture or construction with the information technology, it is necessary to cooperate among related ministries and the industry. Also, it is necessary to establish a community of QZSS users in the Asia-Pacific region.

2) R&D of the technologies for the next-generation navigation satellite system
The U.S adds new GPS signals about every five years to make its GPS convenient for users and continues its technological innovations. Japan also needs to conduct R&D of far-sighted technologies related to next-generation navigation satellite system.

Furthermore, R&D for the expansion of utilization and improvement in the convenience of navigation satellite system takes and will take on continued importance. The public and private sectors should cooperate on the development of application programs which take advantage of Indoor MEssaging System (IMES), or QZSS signals.

3) Assessment and countermeasure of interference to positioning signals
The signals from navigation satellites are considerably weak and susceptive to interference from other radio stations. In order to make use of the navigation satellite system with a sense of security, it is necessary to examine and develop countermeasures to interference to positioning signals.

4) Response to national security issues
QZSS carries specific signals intended for public use, mainly by governmental organizations, and it dramatically improves the precision in positioning. Therefore, from a viewpoint of national security, the system must not be misused even in emergency situations.

The U.S. is taking the policy of Regional Denial, which could lead the U.S. forces to restrict the use of GPS services by emitting jamming waves within a limited part of the inside or outside of the U.S. in emergency situations, while it keeps providing GPS services. QZSS also is required to have a certain degree of survivability against external factors, in order to ensure steady service.

(3) Goals for the next 10 years
Four satellites constellation shall be established by the late 2010s. New equipment and services that take advantage of QZSS will be provided all around the Asia-Pacific region, including Japan.

(4) 5-year development and utilization plan
1) Steady progress of the project
The Government steadily promotes the development and maintenance of QZSS in order to establish the four satellites constellation by the late 2010s. Since the Cabinet

[9] The global market of navigation satellites is expected to increase from 7 trillion yen in 2005 to 56 trillion yen in 2025, according to the research by EU in 2006.

Office has a key role in the development, maintenance, and operation of QZSS, it will comprehensively operate the system including the first QZSS satellite MICHIBIKI which is currently operated by JAXA.

2) Increasing the utilization and overseas expansion
The government steadily promotes utilization expansion, overseas deployment and convenience enhancement of QZSS through the continued efforts to carry out operation test projects and other projects needed for overseas expansion by making use of MICHIBIKI.

Since navigation satellite technologies have potential in various fields, it is necessary to build an industry-academic-government framework for cooperation and a similar community in the Asia-Pacific region. In addition, a research center for the research and education related to navigation satellite will be set up in Japan in order to enhance R&D for utilization techniques of navigation satellites and cooperation with overseas research centers.

3) International cooperation
The government promotes expansion of the utilization of navigation satellites under the cooperation with International Committee on GNSS (ICG), an international framework of countries operating their own navigation satellite system.

4) R&D support
The government continues to conduct R&D for utilization techniques with MICHIBIKI, and next-generation satellite system with the aim of keeping up with the global progress in navigation satellite systems, expanding its utilization, and improving its functions and convenience. The research also investigates the countermeasures against the impact of interference and survivability in the case of an emergency.

5) Links to Geospatial Society promotion
The government will discuss the treatment of personal information collected via QZSS and acceptable standards needed when the government uses it. In addition, it will reinforce links to Geographic Information System (GIS) based on the Basic Act on the Advancement of Utilizing Geospatial Information to substantiate Geospatial Society where such geographical information can be utilized at a higher level.

B. Remote sensing satellites

(1) Current status
Some remote sensing satellites are developed and used for specific purposes: national security, climate observation, global environment observation, etc. They are also used for mapping, local monitoring, information gathering at the time of disaster, resource exploration, etc.

Governmental entities played an important role in the development of land/ocean observation systems, such as Landsat in the U.S.. Recently, however, in many cases, systems including SPOT (Europe), WorldView (U.S.), Geoeye (U.S.) are developed under the scheme of PPP. Although they are mainly used for public services, private sector developers and operators are involved in satellite business under a long-term contract (anchor tenancy) or PPP scheme.

On the other hand, public agencies such as the National Aeronautics and Space Administration (NASA) of the U.S and the European Space Agency (ESA) maintain and operate the satellites in the field of global environment observation that are used for academic or public purposes in many cases.

In Japan, the Government leads the development and operation of the Information Gathering Satellite, Advanced Land Observing Satellite DAICHI, Meteorological Satellite Himawari-6 and -7, Greenhouse Gases Observing Satellite IBUKI (GOSAT), etc. Efforts to operate satellites based on the scheme of private finance initiative (PFI) are now expanding as is the case for the next Meteorological Satellites Himawari-8 and -9.

With respect to issues related to the global environment, such as climate change, Japan plays a key role in the establishment of the GEO and is implementing the Global Earth Observation System of Systems (GEOSS) plan under the international partnership, by providing the data collected by IBUKI and Global Change Observation Mission Water satellite SHIZUKU (GCOM-W).

In the response to the request for funds by the Vietnamese Government, the Japanese and Vietnamese governments concluded an Exchange of Notes in October, 2011 to provide ODA loan for two small remote sensing satellites (radar satellites) developed in Japan and the establishment of the space center. (The first and second satellites are planned to be launched in 2017 and 2020, respectively.)

In addition, the development of “the Earth Observation Data Utilization Promotion Platform” started in FY2012 to expand the utilization of data collected by the satellites operated by each ministry.

(2) Issues

Since satellite data is widely used in the administration, industry and research institutes, utilization needs to be increased from the viewpoint of more sophisticated and efficient administration. In Japan, however, insufficient efforts are being made for comprehensive utilization expansion and industry promotion policies, such as more efficient utilization of satellites via PPP and development of application industry, which creates added value through analyzing and processing data.

To promote the wider utilization of satellite data, it is necessary to build a system and define the specifications of satellite and sensors based on needs, such as continuous data and increased imaging frequency. Currently, while the Ministry of Education, Culture, Sports, Science and Technology (MEXT) is working to develop large satellites for research, the Ministry of Economy, Trade and Industry (METI) is working to develop small commercial satellites. In such a process, cooperation between them is necessary for orbit allocation, shared operation of satellites, and comprehensive management of imaging capacity. They should employ private sector activities and ultra-small satellites to streamline their system to provide images and cut costs. Cooperation is also needed for the data utilization and technology succession.

From the viewpoints described above, Japan’s development of remote sensing satellites has to be more systematic and effective in order to realize more efficient and effective

development and utilization. Because users place much value on the continuous data collection by the same or same type of sensor, it is necessary to decide which area to focus on under limited budget, taking users' needs for performance into account, and then design the project so that data is collected without interruption.

Especially, with regard to the satellites for global environment observation, international cooperation and many other projects including those in the conceptual phase, are designed. With Japan's contribution to the environment policies in mind, selection and prioritization of the projects are important.

The Government should establish rules (data policies) on handling of image data for the business operators dealing with satellite data, in order to promote the utilization by the private sector and the operation under PPP of satellites developed by the government.

(3) Goals for the next 10 years

It is indispensable to provide continuous data acquired with the same or the same type of sensor and improve the frequency of imaging (once a day or more) to expand utilization of remote sensing technologies. Since the effective way to ensure the frequency is an integrated operation of multiple satellites, a satellite constellation, the government will efficiently develop and share such a system with multiple satellites with other Asian countries under the project "Disaster Management Network for ASEAN Region project", aiming to build a framework which collects satellite data with only minimal costs shared by the participants. In order to further lower the operation cost of this system the government bears, the PPP framework is employed to streamline the management system.

The government continues to operate the Information Gathering Satellites and Meteorological Satellites, because these satellites play an important role in national security, disaster management, and climate forecasting. Remote sensing satellites will be continuously utilized in mapping, resource exploration, agriculture, forestry and fisheries, disaster monitoring, ocean observation, etc. Simultaneously, more sophisticated and efficient industry and administration will be realized by expanding the satellite data utilization.

(4) 5-year development and utilization plan

1) Promotion of satellite data utilization in broader fields

The market size of satellite data is approximately 100 billion yen globally and 10 billion yen in Japan. It is necessary to expand the market by accelerating the development of applications for data analysis and processing, promoting it via PPP and inter-Ministry cooperation etc.

In order to expand the utilization of satellite data stored by the government, the government will steadily develop the Earth Observation Data Utilization Promotion Platform, which allows users to process multiple types of data in an integrated manner. The government will support industry, administrative bodies, universities, etc. to perform empirical researches that may lead to new applications of satellite data. It also plans to build a community of users related to remote sensing technologies.

2) Systematic construction of satellite system
For wider utilization of remote sensing, requests from the public/private sector and overseas are summarized to be reflected in the specifications of satellites. The development, maintenance, and operation with high efficiency and effectiveness are promoted through PPP, long-term contracts (or anchor tenancy), and other policies.

In concrete terms, the government will develop a constellation of remote sensing satellites with other Asian nations who support the project “Disaster Management Network for ASEAN Region” that makes utilization of Japan’ advantages in satellite technology, and expand the utilization of remote sensing satellites in the whole of Asia. Addition of the Advanced Satellite with New system Architecture for Observation (ASNARO) 1 & 2, etc. under development to the constellation will be discussed.

The R&D is promoted as mentioned, since it is necessary to sophisticate the satellite system as a social infrastructure.

3) Designing standard data policies
The government will discuss the standard data policies, such as the regulations imposed upon satellite data dealers and the pricing.

4) Links to Geospatial Society promotion
Based on the Basic Plan for the Advancement of Utilizing Geospatial Information, efforts will be made to substantiate Geospatial Society by applying space-related technologies to mapping and disaster management.

C. Communications/broadcasting satellites

(1) Current status
Communications/broadcasting services using satellites have several advantages: they do not require any complicated networks on ground; they are insusceptible to disasters; their service areas are extensive. Business operators in the private sector provide services under the current scheme and the commercially-based market has already been established on a global scale. The global demand for communications/broadcast satellites demonstrates an upward trend and the market is expected to grow.

The development of communications/broadcasting satellites should basically be led by the private sector. The local governments utilize satellite communications services provided by private operators as a communications infrastructure among them. At present, the development of a satellite communications network using PFI is being carried out by the Ministry of Defense.

In Japan, JAXA and the National Institute of Information and Communications Technology (NICT) have carried out validation tests of several technologies: geostationary satellite bus and large deployable reflectors on KIKU 8 (ETS-VIII), ultrahigh-speed data communications via satellite with KIZUNA (WINDS). These technologies served as communications lines during the Great East Japan Earthquake in the affected areas where other communications are largely disrupted. Based on the lessons learned from the disaster, the Ministry of Internal Affairs and Communications (MIC) is developing the technologies to use satellite communications effectively in time of disaster.

The Data Relay Test Satellite (DRTS) currently operated by JAXA is expected to retire around 2013 or 2014.

(2) Issues

The international competitiveness of Japan's space industry is insufficient. So far, Japanese satellite manufacturers have received only five orders. One was domestic (SUPERBIRD 7) and the other four were international (OPTUS C1, ST-2, Turksat-4A and 4B). Considering this situation, it is necessary to enhance the competitiveness, and maintain and reinforce the industrial bases.

For this purpose, based on R&D and technology validation so far, it is necessary to examine the way of validating technologies.

As a result of the R&D conducted by the Government so far, a technology for the standard satellite bus was established and it enhanced the international competitiveness at the component level during the development of KIKU 8 and other satellites. Also the low noise amplifier utilizing the high frequency Ka band, which was used in KIZUNA, is currently commercialized.

Since the governmental R&D projects in the 1990s or later tend to focus on the development of the latest technologies, it is important to undertake more efforts to analyze the market needs, costs, time-to-market, in order to link R&D to better international competitiveness.

Also, R&D are necessary to develop the satellite communications network technologies effective in the time of disaster based on the lessons learned from the Great East Japan Earthquake, while considering the utilization in ordinary situations.

With regard to the subsequent satellite that will replace DRTS, at present, no project plan is likely to yield enough benefits to cover the costs. However, it is necessary to consider factors such as future needs and services provided by the private sector.

(3) Goals for the next 10 years

The international competitiveness of Japanese space industry is to be strengthened through the development and validation of component technologies that meet future needs.

(4) 5-year development and utilization plan

1) Technology validation for strengthening international competitiveness

To strengthen the international competitiveness of Japan's space industry, the government will validate component technologies as described below, paying attentions to future needs.

a) Technologies for high-powered (25 kW class) geostationary satellite bus in the light of the global trend of increasing communications/broadcasting satellites in size.

b) Technologies for adjustment functions which enable the response to the change in the demands after launching to cope with longer satellite lifetime and diversified needs. (e.g. digital beamforming, digital channelizer.)

The governmental project related to the large deployable reflector should be carefully reviewed, because U.S. companies have strong competitiveness and the demand is limited to about one satellite a year.

2) Communications satellite infrastructure necessary for national security and disaster management ensured by the government
The Ministry of Defense will complete the communications network of high-performance X-band satellites, utilizing PFI framework, since it is important for national security.

Satellite communications in time of disaster among the government and local governments are established without fail by the utilization of private-sector services. The system is not only for the disaster response. It should be designed to be useful in usual conditions.

3) R&D aimed at ensuring robust communications infrastructures in time of disaster based on the lessons learned from the Great East Japan Earthquake
The development of the technologies for a flexible satellite communication network which enables on earth station of the network can flexibly accept multiple communication will be accelerated to increases the disaster response capacities.

4) Replacement of DRTS
Since a satellite replacing DRTS may contribute to the data relay services among the domestic and international remote sensing satellites, its necessity is examined based on the number of the satellite projects that need data relay. Effective implementation via shared use or service purchase is one option. The development of the free-space optical communications technology contributing to high capacity data communications is to be explored for the future.

D. Launching Vehicle system

(1) Current status

1) Rocket development and launching service system in Japan
Japan has developed and operated a series of liquid fuel launchers or H-IIA/B as a core launching system. The rockets have been used to launch the Government's satellites including the Information Gathering Satellites and H-II Transfer Vehicle KOUNOTORI (HTV), which supplies the ISS with various goods. Twenty-three rockets of H-IIA/B series out of twenty-four successfully completed its missions. The success rate of 95.8 % was among the top in the world.

In addition, solid fuel launchers (Epsilon Rocket) succeeded to the technologies of M-V Rocket (Its development ended in 2006), and the development of Epsilon is ongoing to establish a small rocket system taking full advantage of Japan's technologies toward the first launch of the rocket in FY2013.

The government transferred the control of rocket launching business with H-IIA to Mitsubishi Heavy Industries (MHI) in 2007. It won a contract to launch ARIRANG 3 (KOMPSAT-3) with the Republic of Korea, offering a competitive price due to other piggy-back satellites. The satellite was successfully launched in May 2012, but this is the only contract with other operator than the Japanese government. The competitiveness of Japanese rocket launching business is limited in the international

market. In addition, the operation of H-IIB launching service was also transferred to MHI in September 2012.

2) Rocket development and launching service in the world

In the last 10 years, about 68 rockets are annually launched all over the world on average. Two-thirds of them are based on government-led demand and one-third are based on demand from the private sector. Japan launches about 2.5 rockets per year, contributing to about 4 % of the global total.

The global commercial market of launching large satellites is dominated by two giants: Ariane (Europe) and Proton (Russia). Russian rockets are highly competitive in terms of cost and achievement in the market of small or middle-sized satellites.

The U.S. and Russia launch more than 20 rockets per year and both of them have abundant experience in manned missions with their rockets. China has already completed its own manned rocket. India is planning the development of such rocket.

The U.S. has demonstrated its policy for purchasing services from private providers, such as SpaceX, for the transportation of cargo and crew to the ISS. For this purpose, the U.S. is designing a new platform of PPP, including provision of assistance for R&D and having made a service contract several times on transportation of cargo.

Private operators, mainly those based in the U.S., are engaged in development related to flight that does not reach the Earth's orbit (sub-orbital flight) on a commercial basis, aiming to provide space travel, etc. An air-launch system utilizing sub-orbital flight is also under review. Since a space port is necessary for launching and landing in the operation of sub-orbital vehicles and this must be different from existing airports and rocket launching sites, the construction of space port is planned in the U.S and other countries all around the world. The current legal system is not fully equipped to respond to the issues related to such services, so legislative measures are also needed.

(2) Issues

The space transportation system is indispensable for Japan to independently launch necessary satellites when needed and it is important to maintain the system in order to secure the autonomy of Japanese space activities. For the space transportation capability in autonomous space operations in the future, it is necessary to maintain, enhance and develop the industrial base, including human resources and facilities.

To maintain the industry base for space launching, it is necessary to ensure a constant number of opportunities to launch a rocket on a yearly basis. So far, the government's satellites mainly provide such opportunities. From now on, Japan should also seek for international and domestic commercial satellites to ensure the number of opportunities.

The following problems are emerging in the competition to win the opportunities to launch a rocket.

1) Gaps between rocket capacity and commercial market needs

For a remote sensing satellite system, there is a tendency that small satellites are launched with frequent launching. By contrast, communications/broadcasting satellites

and other geostationary satellites on commercial basis are becoming larger. A gap appears between the capability of Japanese rockets and the needs from market.

2) Insufficient international competitiveness
In the global market of space transportation where there are more and more entrants, Japan cannot compete well since it has a poor record in the business. Also, the currency exchange rates work against it, making Japanese space launching service less cost-competitive.

3) Reviewing space transportation system including the lineup of rockets
It is necessary to create a comprehensive policy to demonstrate how the space transportation system should be, such as a system with a lineup of large and small rockets, etc.

4) Effective development and maintenance of infrastructure including launching sites
The infrastructures related to the space transportation system, such as launching sites, have become older and it costs considerably large amount of funds to maintain every year. It should be examined from a long-term standpoint.

(3) Goals for the next 10 years
The government maintains, enhances and develops its capability to launch necessary satellites when necessary in an autonomous and effective manner.

(4) 5-year development and utilization plan
1) Prioritizing Japanese rockets
To ensure the autonomy in the space transportation system, Japanese rockets are basically prioritized when the government launches a satellite. Private companies are recommended to use Japanese rockets to launch their satellites.

2) Continued upgrading technologies related to space transportation system
Taking the importance of technologies related to solid fuel rocket into consideration, the ongoing projects related to Epsilon will be advanced.

The R&D of the air-launch transportation system will lead to a system for launching of small satellites in the future, which will also continue to be advanced.

In order to upgrade H-IIA, the capacity to launch satellites will be improved and the impact of the separation of a satellite from the rocket will be reduced. These measures will increase the international competitiveness of Japan’s space launching services.

The Tanegashima Space Center and other facilities will be steadily renovated and upgraded, to prevent old facilities from causing limitations or increase in costs to the launching services.

3) Comprehensive discussion
To retain space transportation capability in an autonomous manner for the long term, it is necessary to deal with various challenges: ensuring sufficient opportunities to launch a rocket or to develop technologies, improvement of international competitiveness, building and maintaining the launching sites and other infrastructures.

Experiences gained in past rocket development should be sufficiently evaluated. Comprehensive discussion centered on our space transportation system, including core rocket, cargo transportation and re-entry, sub-orbital flight, hypersonic transportation, manned activities, reusable rocket, etc., should take place immediately from a medium- and long-term viewpoint. Measures should be taken based on the result of the discussion.

3-2. Three programs for pursuing the possibility of the development and utilization of space in future

E. Space science and space exploration program

(1) Current status

1) Status of space science and space exploration

Since space science and space exploration aims to accumulate intellectual properties and to achieve academic results for all people, their properties are different from the R&D to maintain and improve industrial bases.

In particular, space exploration has a significant aspect as a competition among nations, as in the space race between the U.S. and Russia in the Cold War era. It should be noted that, if only one country conducted space exploration and it keeps all the economically/technologically significant knowledge related to space, stars, and planets to itself, the knowledge would be a considerably large advantage in space exploration in the future.

2) Global trend

In the nations that are leading the utilization and R&D of space, including Japan, U.S., Europe, Russia, etc., the ongoing space exploration focuses on the space science research related to space physics/astronomy and planetary exploration in the solar system.

With respect to Mars exploration, in particular, the U.S. is very active. For example, the Obama administration announced a manned exploration plan in 2010, and Curiosity, a Mars Exploration Rover, successfully landed on the planet in August 2012. The U.S. also announced a plan to send an unmanned probe to investigate the internal structure and crustal deformation of the planet in March 2016.

On the other hand, China successfully launched their own manned spacecraft and completed the docking between Shenzhou 9, a manned spacecraft, and Tiangong 1, a Chinese space station, in June 2012,.

Space agencies from fourteen countries and regions worldwide[10] established the International Space Exploration Coordination Group (ISECG) in 2007, aiming to exchange information and collaborate with each other toward space exploration under

[10] Participants (14 space agencies): ASI (Agenzia Spaziale Italiana, Italy), CNES (Centre National d'Etudes Spatiales, France), CNSA (China National Space Administration), CSA (Canadian Space Agency), CSIRO (Commonwealth Scientific and Industrial Research Organization, Australia), DLR (Deutsche Forschungsanstalt fur Luft und Raumfahrt, Germany), ESA(European Space Agency), ISRO (Indian Space Research Organization), JAXA (Japan Aerospace Exploration Agency), KARI (Korea Aerospace Research Institute), NASA (National Aeronautics and Space Administration, US), NSAU (National Space Agency of Ukraine), Roscosmos (Russian Federal Space Agency), UKSA (UK Space Agency)

international cooperation. JAXA took on the position of chairman in August 2011 and summarized the Global Exploration Roadmap (GER) in September 2011, which aims at manned Mars exploration as an immediate goal.

3) Efforts in Japan

Japanese space science and space exploration programs are highly appreciated in the world, leading research on space physics, astronomy, and planetary science of the solar system. In recent years, the following projects received a high reputation: The world's first successful sample return from asteroid in the HAYABUSA project, lunar exploration via KAGUYA (SELENE), observation of the magnetic field reversal in the solar pole area by HINODE (SOLAR-B), publication of all-sky survey infrared source catalogue obtained in AKARI (ASTRO-F) project, observation of the collision between galaxy clusters by SUZAKU (ASTRO-EII).

The Institute of Space and Astronautical Science (ISAS) has been in charge of the space science field as a core implementer. The Committee for Space Science and Space Engineering Committee, which is composed of scientists, reviews and selects projects with the theme, "the origin of space and life, the history of the solar system" and "Further and more freely".

(2) Issues

In 2008, JAXA Space Exploration Center (JSPEC) was established as a part of JAXA and some pointed out the overlapping with ISAS in terms of the research areas related to space exploration.

In the past, ISAS has established a framework under which projects are evaluated and selected through a fierce competition among researchers all over Japan, and they cooperate with each other to conduct research after project selection. Therefore, it is indispensable to maintain the position of ISAS as an independent decision maker in the field. In addition, close collaboration within JAXA is necessary in the implementation of space science projects.

For this reason, it is necessary to promulgate an understanding of the positioning of "space exploration for academic purpose" and "space exploration conducted for various policy targets" among those who get involved in the government, research, industry, etc. In addition, an appropriate system for implementation is needed.

The large-scale projects related to space science and space exploration are difficult to carry out for purely academic purposes. On planning or selecting a project, academic community members and policy makers should examine the project together to link it to various policies, including international cooperation and the enhancement of international competitiveness.

(3) 5-year development and utilization plan

In space science and space exploration as an academic field, Japan has made world-class, excellent achievements and contributed to the accumulation of intellectual assets for human beings. Furthermore, an effective scheme for the management of scientific research has already been established under the cooperation among ISAS, universities, and other institutes. It is necessary to make full use of the scheme and ensure a constant amount of funds, in order to achieve cutting edge breakthroughs.

Close collaboration within JAXA is needed to implement projects by bringing together the wisdom of academic community centered on ISAS, consisting of scientists and engineers, without reducing the vitality of the bottom-up community.

Since there are overlapping research areas between JAXA's exploration section and ISAS, consideration will be given to the future control of scientific projects within JAXA. This includes the possibility of complete transfer of the projects to ISAS. With regard to the space exploration projects conducted for various policy purposes, they are examined from various viewpoints of diplomacy, national security, enhancement of industrial competitiveness, improvement of levels of science and technology, etc. There should be discussion on manned vs. unmanned, cost-effectiveness, significance as a part of national strategy, and it is necessary to take measures based on the results of the discussion.

In order to ensure constant funds, flexible responses to the latest progress and the schedule of satellite development are required. In recent years, space science and space exploration projects tend to be greater in scale. Therefore, the projects should be promoted in an efficient manner in relation to other policy purposes,.

F. Human space activity program

(1) Current status

The ISS is an international project under the cooperation of 15 countries or 5 poles: the U.S., Russia, Europe (11 countries), Canada, and Japan.

In 1988, Japan signed the "Agreement among the Government of the United States of America, Governments of Member States of the European Space Agency, the Government of Japan, and the Government of Canada on Cooperation in the Detailed Design, Development, Operation, and Utilization of the Permanently Manned Civil Space Station" to officially join the project.

Japan is the sole Asian Partner to the ISS project, and eight astronauts from JAXA have experienced manned space missions. It increases the international presence of Japan, and activities of Japanese astronauts bring education and edification effects.

Each Partner has designed plans ending in 2015. The U.S. proposed an extension to 2020 to other Partners. Subsequently, Russia, Europe, and Canada have decided to extend the operation to at least 2020.

In Japan, the Strategic Headquarter for Space Policy in August 2010 described its policy as "Based on the plan to participate in the ISS project after 2016, Japan will promote necessary efforts to coordinate with other countries, in consideration of industrial promotion and other factors". What the operation after 2016 should be is now in review among the countries.

In the ISS project, each Partner can execute the right of utilization corresponding to the implementation of the necessary work and the facility construction.

Japanese projects related to ISS are as follows:

1) Approximately 40 billion yen per year as ISS-related expenses. Approximately 710 billion yen was spent by FY2010. The funds are used to cover the operational costs of ISS by supplying the station using HTV launched by H-IIB rocket. It is planned to launch 7 HTVs by 2015 (Three have been launched).

2) Corresponding to the construction of Japan's Kibo laboratory and the transportation of supplies, Japan has acquired the right to use 51% of the Kibo laboratory and 12.8% of resources (electric power and crew's operation time).

Japan has built the Kibo laboratory and conducted various experiments with regard to material sciences, life sciences, space medicine, etc., taking the full use of the properties of outer space, such as microgravity and cosmic radiation. Great achievements are expected in the future.

As for the further utilization of the Kibo laboratory, it is necessary to devise ways of conducting research and demonstrating concrete achievements, for example, by taking advantage of manned activities.

(2) Issues

A manned space mission gives citizens a dream and an important opportunity to develop the latest technologies through the cooperation with other leading nations in space activities. As part of international cooperation activities, it not only contributes to enhancing Japan's presence, but also is significant from the viewpoint of science education. At present, however, it is not clear if the utilization of the Kibo laboratory can yield results that will make Japanese industry more competitive in the global market. Since it requires a large amount of funds, its cost-performance should be sufficiently assessed, with consideration of severe fiscal constraints.

With regard to the extension of ISS operation and Japan's participation after 2016, its cost-performance should be thoroughly examined and it is necessary to review the scheme for participation.

(3) 5-year development and utilization plan

As for ISS, its cost-effectiveness should be constantly reviewed and continuous efforts should be made to cut costs.

Specifically, Japan will strive to cut costs and streamline the operation of the entire project with the partners after 2016 and promote the utilization of the Kibo laboratory, which generates profits for Japan and other Asian countries, in order to reduce the costs.

The results of the research on utilization of outer space environment in the ISS are thoroughly evaluated from economical and technological standpoints. Also, industrial, academic, and public bodies will evaluate the potential in the utilization of space environment, in order to perform more effective and fruitful research. Validation tests for releasing ultra-small satellites from ISS and international cooperation will be supported.

As for the Japanese response to future human space activities carried out under the scheme of international cooperation, discussion should consider various aspects of such

activities as diplomacy, national security, maintenance of industrial bases, industrial competitiveness, science & technology, etc.

G. Space solar power system R&D program

(1) Current status

In a space solar power system (SSPS), a large-scale solar power system is placed in outer space and the power is transmitted to the ground in the form of microwave or laser, to serve as a power generator, which has a potential to be an infrastructure for power supply in the future. For power generation of 1 million kW, it is expected a solar power and transmission unit in outer space that covers 2 square kilometers, and a ground receiver with the diameter of 3 km would be required.

In Japan, JAXA has collaborated with METI to perform research on SSPS using microwave since FY2004. Both agencies have been conducting validation tests of power transmission on the ground since FY2009. JAXA carries out the validation of the technologies to control the direction of the microwave beam, while METI is engaged in the demonstration of electric power transmission with microwave. JAXA's ongoing research covers power transmission with laser and construction of large-scale structures.

Great achievements have been made in JAXA's transmission experiment with laser, and METI's thin semiconductor for highly-efficient power transmission intended for the use in outer space.

JAXA is examining the following to evaluate the potential of SSPS for practical application: laser and microwave power transmission, construction of large-scale structures, building a prototype of light condenser and its validation tests on the orbit. METI aims to conduct microwave transmission experiments on the ground together with JAXA.

Currently, Japan has the world-leading SSPS technologies. Although some validation tests of SSPS components are ongoing in the U.S. and Europe, Japan is the only nation that is carrying out the experiments in consideration of actual use in outer space.

(2) Issues

For the practical use of SSPS, it is necessary to solve challenges, which can be categorized into three groups as follows:

1) Technology (Transportation of large-scale structure to outer space, construction, operation, maintenance, highly-efficient and safe power generation, transmission, access to power)

2) Safety (Effects on human body, atmosphere, ionized layer, aircrafts, electronic devices, etc.)

3) Economic performance (Cutting the cost of transportation to space is the biggest challenge)

(3) 5-year development and utilization plan

As for SSPS, the research focusing on wireless power transmission technologies will be conducted steadily, in light of the energy demand and supply situation, and the need for

the development of new energy sources. Regarding the validation test in outer space, issues including its cost-effectiveness are reviewed to perform the test.

3-3. Eight cross measures to promote the strategic development and utilization of space

(1) Promotion of comprehensive measures to expand the utilization of space

1) Current status and issues

Conventionally, satellite development in Japan has been primarily government-funded. Recently, however, the range of space-related industry has been expanding as exemplified by satellite development funded by PFI involving the utilization of space industry and user industry, and the development of ultra-small and low-cost satellites led by small and medium-sized businesses or venture companies.

For expansion of utilization of outer space, it is essential to further promote the movements and encourage the close cooperation between the developers and users from the very beginning of satellite development, thereby facilitating the efficient utilization of outer space after development. In addition, it is required to link the utilization of new applications of outer space by the utilization of space industry and user industry to more advanced and more efficient administration, industry and human life.

2) 5-year development and utilization plan

The most effective approach for expanding the practical application of space is to commit the relevant governmental ministries and the users of outer space to management and promotion of the projects relating to the development and utilization of space. Then the users of outer space should try to become project-implementing bodies. In order to encourage the relevant ministries to promote utilization of space, necessary actions should be taken.

For satellite development under the governmental initiative, involvement of users should be increased by setting up technical specifications in cooperation with users from the R&D stage, commissioning operation of satellites to private enterprises and establishing efficient development and operation systems to facilitate the widespread utilization of satellites.

For implementation of a series of projects, the Cabinet Office is responsible for assessing the projects from the viewpoints of the users. In addition, the Cabinet Office creates a better environment to promote collaboration between manufacturers and users or between different industrial sectors. The Cabinet Office also promotes the arrangement of appropriate establishments for the utilization of satellites by the field of practical application, the acceptance of overseas human resources, and other management and operation tasks.

To ensure that services using outer space are continuously available, social demonstration studies will be carried out based on the proposal from private enterprises. In addition, for expansion of the range of users, efforts are to be made to decrease the sizes of satellites (including ultra-small satellites) depending on intended purposes and applications and to reduce costs by using commercial off-the-shelf.

Furthermore, it is essential to encourage the industries in a variety of fields and municipalities and other relevant administrative agencies to understand and disseminate the government policy through symposium, seminar and other opportunities as parts of

educational activities for convenience and best practice of the development and utilization of space. Additionally, an awarding system is to be established for excellent programs and achievements relating to the development and utilization of space.

(2) Building a strong industrial base and promoting effective R&D

1) Current status and issues

a) Status of the space industry

The space industry is essential for improving the quality of human life, economic and social development, securing of national security, advancement of science and technology and other factors, and it provides a foundation for autonomous conduct of space activities. In addition, for the expansion of space utilization, such a business model is required, in which industrial companies are allowed to consistently supply the equipment and services to consumers and, thus, the sound growth of space industry is indispensable.

The worldwide space industry (including spacecraft industry and space utilization service industry) has a value of approximately 13 trillion yen per year. It is growing rapidly at a rate of approximately 14% every year, and an increasing demand is expected in emerging countries in particular.

b) Competitiveness of the Japanese space industry

The Japanese space industry (spacecraft industry and space utilization service industry) in FY2010 achieved a value of approximately one trillion yen per year, and the spacecraft industry accounted for 258.4 billion yen of the market of the entire space industry. Adding the entire range of space related consumer appliance industry and user industry to this, the total amounts to approximately 9.2 trillion yen.

Japan has the competence to manufacture and operate satellites and rockets on its own, but it is not competitive enough internationally. The cumulative commercial acceptance of orders for satellites is only ten satellites, even including the recent successful contracts with Turkey and Vietnam (two satellites for each nation). In addition, the order acceptance for commercial launching service is only one, from the Republic of Korea.

Also for parts and components, Japan possesses the technical potential and boasts a high market share for earth sensor, transponder, lithium ion battery, heat pipe panel, and solar panel. However, due to the limited opportunity for demonstration in outer space, internationally competitive fields in Japan are limited.

In recent years, government-wide overseas expansion of space system infrastructure has been promoted, while the industry-led move to acquisition of private-sector demand has just started.

c) Vulnerability of the industrial base

The spacecraft industry achieved the sales of more than 350 billion yen in the late 1990s. However, the current revenues are around 260 billion yen, declining by nearly 25% compared to the peak levels, and 90% or more of the sales are relying on the governmental demand. (Dependence on the governmental demand in Europe is about 50%.)

This is indicative of the industrial structure specific to Japan, in which corporate management greatly depends upon the governmental demand. The workforce supporting the spacecraft industry has changed to about 7,000 at present from approximately 10,000 in the 1990s.

In addition, parts and raw materials used for spacecraft are manufactured in relatively small numbers and are peculiar in terms of specifications. Thus, it is difficult for domestic manufacturers to maintain the profitability due to limited sales, and the withdrawal from the business is increasing. (In eight years to FY2011, 54 companies involved in the H-IIA/B rockets withdrew from the business.)

2) 5-year development and utilization plan

a) Promoting R&D

The insufficient international competitiveness of the Japanese space industry may be explained by the following context. In Japan, especially since 1990, government-led R&D investment with a focus on commercialization or industrialization has been insufficient. As a result, cost-reduction efforts required for entry in the international market and accumulation of achievements of in-orbit demonstration experiments are lacking. The results of government investment have not been adequately contributing to market creation and the improvement of industrial competitiveness through expansion of utilization of space. In addition, the space industry has not been active in R&D spending. In Europe and the U.S., real achievements of in-orbit operation based on governmental demand have been accumulated and linked to the acquisition of commercial demand.

Based on the above understanding, Japan addresses R&D for purposes other than scientific purposes with emphases placed on expansion of space utilization and industrialization.

Furthermore, for continuous enhancement of industrial competitiveness, importance is placed on new fields.

b) Strengthening the industrial base

Private companies involved in the development and operation of satellite systems and space transportation systems constitute the key industries that are expected to govern Japanese autonomous space activities. In order to maintain the industrial base, government support should be reinforced to encourage private enterprise to exploit domestic demand and acquire foreign demand. To ensure that private enterprise becomes more competitive internationally, the government should provide opportunities for demonstration experiments in outer space and adequate support for R&D projects, while achieving reliability enhancement and cost reduction by consistently maintaining and advancing the state-of-the-art in technologies. In this process, the government should consider making the most of engineering research associations or other appropriate schemes to facilitate the private sector and the government to work jointly for overseas business expansion and effective promotion of R&D projects.

For the present, the foreign demand to be acquired includes commercial communications/broadcasting satellites and the earth observation satellites currently in growing demand particularly in emerging countries.

The communications/broadcasting sector accounts for approximately 75% of the commercial satellite market and thus, penetration into this market is important for maintaining the industrial base. For the communications and broadcasting satellites, an emphasis is placed on the upsizing of bus, and the development and verification of such technologies that are flexible enough to keep up with changing demands. In addition, for the earth observation satellites, the government should implement development and verification of those technologies based on the public-private partnership initiatives that can meet market needs, such as reduced cost, higher resolution sensors, and cooperative operation of several satellites.

The government actively promotes the overseas expansion of infrastructure by private enterprise. Especially in Asian and other emerging countries, there is an increasingly growing interest in fostering their own engineers and industrial businesses. Based on the needs, cooperative relationships with individual countries are to be deepened by promoting capacity building, technical cooperation and other programs.

The government should make the best use of various policies and measures in a flexible manner, such as through public-private partnership initiatives for satellite development, subsidy payments, and securing demand to maintain and strengthen the industrial base. In addition, to support the overseas business expansion, the government should take efficient and effective approaches, including utilization of ODA and/or policy-based finance.

To assist private companies in the efficient and consistent development and production, the government will take the initiative in drafting a mid- and long-term satellite development and utilization plan, parts and components size reduction/commercialization of various sizes, standardization, series of satellites, and blanket purchases of parts for government-developed satellites. The government will investigate possible solutions for such problems as exhaustion of parts and increasing dependency on parts from foreign countries.

For technologies and equipment, which should be made consistently available , the government encourages the involvement of domestic companies in Japan, including small and medium-sized businesses. In addition, the government ministries and agencies act as one body on the standardization of testing methods, provision of efficient opportunities for outer space demonstration experiments and other challenges, thereby promoting the appropriation of Japanese excellent commercial devices and civil technologies to spacecraft.

MEXT, METI and other relevant ministries, JAXA and other research institutions, and both industries and academic society should strengthen their partnership more than ever, and promote maintaining and reinforcing the industrial base in a unified and well-planed manner through R&D efforts including drafting of roadmap for engineering development and enhancement of industrial competitiveness.

(3) Reinforcement of foreign and national security policies by utilizing space

(3-1) Promotion of Space Diplomacy

1) Current status and issues

The development and utilization of space by Japan have been promoted based on the partnership with the U.S.. Since the introduction of technologies for space transportation systems and satellites under the Agreement concerning cooperation in space activities for peaceful purposes(1969) , a steady relationship has been established and maintained in the both fields, civil use and national security.

For multilateral cooperation, discussions have been held on the establishment of the rules for sustainable space activities including implementation of the Transparency and Confidence-Building Measures (TCBMs) for peaceful utilization of outer space and responsible conduct of act in outer space in the international for a such as COPUOS and the Group of Governmental Experts (GGE) on Transparency and Confidence-Building Measures in Outer Space Activities. The debate about the International Code of Conduct for Outer Space Activities also contributes to establishing such rules. Japan will continue to actively participate in such discussions. In addition, Japan is the only Partner in the ISS Program, a multilateral cooperation program, among the Asian countries.

In space cooperation with developing countries, in order to meet the needs of individual countries, JAXA, Japan International Cooperation Agency (JICA) and other organizations have been actively promoting human resources development, joint research for space utilization technologies and other programs as well as the provision of Japanese space infrastructure. In supporting developing countries, Japan has been providing the aid befitting its status based on the concept of “human security,” one of its key diplomatic pillars, aiming to facilitate the advancement of the development and utilization of space in individual countries.

In addition, in response to the rapidly increasing needs in emerging countries, especially in Asia, for space infrastructure intended for disaster management, land management and other purposes, it is necessary to utilize the Japanese space systems and know-how as a tool for diplomacy with careful consideration given to the specific needs of individual countries.

As the development and utilization of space involve a variety of fields, including civil use and national security, an increasing number of countries are undertaking the development and utilization of space. Therefore, it is important to expand and deepen multinational communication and cooperation utilizing the United Nations and other frameworks, and bilateral dialogue and partnership referring to the entire basic policy.

2) 5-year development and utilization plan

a) Active promotion of “space diplomacy” with ASEAN countries and other emerging countries

Through the promotion of the establishment of a “Disaster Management Network for ASEAN Region,” APRSAF, utilization of Sentinel Asia and other frameworks, and cooperation with Asian Development Bank and other institutions, the government will consistently promote partnerships with Asian and other emerging countries under the initiative of the central government.

b) Steady promotion of multilateral cooperation

The government will make active contribution to discussions about assistance to outer space research programs, information exchange, and practical approaches and potential legal problems for peaceful utilization of outer space, which are addressed in the COPUOS.

For enhanced sustainability of space activities, the government actively participates in the establishment of the International Code of Conduct for Outer Space Activities and works together to encourage the participation of as many countries as possible.

Furthermore, the government carefully observes the progress of the debate in the GGE on TCBM in Outer Space Activities, and works on making Japan's view properly reflected through the participating nations.

The government also continues to actively participate in the discussions about important issues, such as the Prevention of an Arms Race in Outer Space (PAROS) in the CD in Geneva.

c) Reinforcement of bilateral relationship with advanced countries in terms of space cooperation

Japan will strengthen strategic space policy dialogues with the U.S. in both fields, civil use and national security. On the other hand, the government will reinforce bilateral space dialogue with the other advanced countries, thereby enhancing the cooperative relations concerning the entire space policy.

d) Promotion of international standardization for the development and utilization of space

In the course of realization of the development and utilization of space, the government will take the initiative in promoting international standardization for methods for design, quality and evaluation of space technologies.

(3-2) Reinforcement of national security policy by utilizing space

1) Current status

a) Current status of outer space and national security in the international community

The Outer Space Treaty (formally the Treaty on Principles Governing the Activities of States in the Exploration and Utilization of Outer Space, including the Moon and Other Celestial Bodies, 1967 Treaty No. 19) states in Article 3 that States Parties to the Treaty shall carry on activities in the exploration and use of outer space, "in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.[11]"

b) History of the space utilization for national security in Japan

Utilization of outer space for national security in Japan has been following the view of the Diet Resolution concerning Peaceful Utilization of Space adopted in 1969, limiting the utilization of outer space by JSDF to "the satellites that have come into general use

[11] Article 4 "States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.
The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes."

and the functionally equivalent satellites (excerpts from the government standpoint dated February 6, 1985)," namely, communications satellites, meteorological satellites, navigation satellites and the Information Gathering Satellites and other satellites that have been generally used.

In Article 1 (The Purpose of the Law) of the Basic Space Law, Japan's the development and utilization of space was defined as being promoted "by reflecting the principle of pacifism enshrined in the Constitution of Japan." In addition, in Article 14 of the Law, one of the basic measures were defined by the statement that "The Government shall take necessary measures to promote the development and utilization of space that contribute to the ensuring of peace and security of international community and security of Japan."

In the revised Law concerning JAXA enacted in July 2012 with an intent to ensure the consistency of its Article 4 (Objectives of the Agency) with the Basic Space Law, the activities of JAXA is defined to be conducted in accordance with the principles of pacifism enshrined in the Constitution of Japan.

2) Issues

a) Increasing trend of taking into consideration the utilization of outer space for national security in foreign countries

In major countries of the world, information gathering based on remote sensing, satellite communications, satellite navigation and other practical applications of outer space for national security has been widely adopted and therefore, Japan should also consider proper measures.

b) Construction of space infrastructure based on cooperative relations between relevant countries

In every country, there is an active effort toward establishment of cooperation with other countries despite severe finance constraints. Thus, the government should also take part in the discussions about measures against debris, Space Situational Awareness (SSA) and other programs.

3) 5-year development and utilization plan

For the national security of Japan, utilization of space serves as an effective means, and it is especially essential for the enhancement in interpretation of information, information sharing, and command and control means. Courses of action planned for individual fields are summarized below.

a) Interpretation of information

Based on technological and other trends in the field of outer space, the government investigates a comprehensive patrol and surveillance system covering a wide range, and conducts the best possible effort to make available and renew as appropriate the facilities, equipment and systems for information gathering, and to enhance their capabilities.

With regard to the Information Gathering Satellites, Japan will maintain four-satellite constellation in a sustainable manner. Japan will also aim to continue gathering required information by improving and reinforcing the capabilities of Information

Gathering Satellites especially in the following areas: to increase the amount of information by a higher frequency of image-taking; to improve the quality of information through enhancement of the resolution of satellites to exceed the level of commercial satellites; and to provide products to the related ministries in a more timely manner through reducing the time to transmit increasing volumes of mission data as well as speedy imaginary analysis.

For remote sensing, in addition to cooperation in ordinary times, the government will promote a satellite maintenance and improvement system based on bilateral or multilateral cooperation to prepare for identification of the extent of disasters. At the same time, Japan seeks the standard data policy for regulations and price setting on the satellite data service providers.

In addition, Japan will consider effort to realize SSA as the entire government efforts and to implement Maritime Domain Awareness utilizing space, and to conduct sustentative experiment in outer space for infrared sensor system.

b) Information sharing, command and control, etc.
JSDF's enhanced X-band satellite communication network will be built for information sharing, command and control, and other purposes.

In addition, investigations are conducted for optimum utilization of satellite navigation, including enhancement of interoperability between QZSS and GPS.

c) Promotion of national security policy by utilizing space based on the National Defense Program Guidelines
Development and utilization of space for the national security in the future should be promoted based on the results of review on the "National Defense Program Guidelines for FY2011 and beyond."

(3-3) Action plans by country

1) United States
The ISS program is promoted with the participation of Europe, Canada and Russia in addition to the U.S. and Japan.

In the field of satellite navigation, based on the Joint Statement announced at the Japan-U.S. Summit in September 1998, Japan and the U.S. are discussing the utilization of global navigation systems at the Japan-U.S. GPS Plenary Meeting.

In November 2008, the Japan-U.S. Civil Space Dialogue was established and the both countries are holding exchanges of opinions at the government level on the entire space cooperation (excluding the field of national security).

In the field of national security, fostering of security and cooperation relating to outer space was arranged as a part of the approach for deepening the Japan-U.S. Alliance at the Japan-U.S. Summit held in November 2009. Since September 2010, Japan-U.S. Space Security Dialogue has been taking place on a regular basis, exchanging opinions on a variety of topics such as cooperation in space policy, situational analysis, and cooperative operation.

Furthermore, in order to deepen the Japan-U.S. space security partnership, in the Joint Statement of the Security Consultative Committee in June 2011, the areas of future cooperation were identified.

In the "Fact Sheet: –Japan-U.S. Cooperative Initiatives," the outcome document of the Japan-U.S. Summit held in April 2012, the pursuit for further cooperation in the civil use and national security fields and the establishment of opportunities for comprehensive dialogue on space were reaffirmed. Based on this, Japan-U.S. Space Cooperation would be promoted steadily.

"Fact Sheet: Japan-U.S. Cooperative Initiatives" (excerpts), the outcome document of Japan-U.S. Summit in April 2012

○ Civil Space Cooperation
Japan and the United States have committed to deepen civil space cooperation through early conclusion of the negotiation of a Framework Agreement on the peaceful exploration and use of outer space and by pursuing the following specific activities:
- Cooperation, including with regard to interoperability and improved regional navigation, between GPS and the Japanese Quasi-Zenith Satellite System (QZSS) for multiple purposes;
- Collaboration on satellite-based earth observation missions such as greenhouse gases observation satellites, including coordination on promoting the utilization of satellite-based remote sensing data for environmental, scientific, and disaster monitoring purposes; and
- Continuation of the International Space Station operations beyond 2016.

○ Space Security Cooperation
Japan and the United States are to deepen our security partnership in space through various cooperative measures, including the pursuit of voluntary and pragmatic transparency and confidence building measures in space, including an International Code of Conduct for Outer Space Activities, and development of a framework for sharing space situational awareness services and information.

○ Comprehensive Dialogue on Space
Japan and the United States are to enhance our space dialogue with the engagement of all the relevant Ministries and Agencies to ensure a whole-of-government approach to space matters and space cooperation addressing environmental research, scientific discovery, national and international security, and economic growth.

2) EU, Canada, and United Kingdom

a) EU

Based on the Joint Press Statement of the Japan-EU Summit held in May 2011, EU and Japan decided to explore the possibility of establishing a cooperation framework on satellite navigation at governmental level. In addition, EU submitted "the Draft International Code of Conduct for Outer Space Activities" to promote the TCBM for outer space activities, asking Japan and other countries to participate in this international code of conduct. Japan has been extending a welcome to the initiative of

EU, and expressing its willingness to actively take part in the discussions on the establishment of an international code of conduct for outer space activities.

For cooperation on satellite navigation, collaboration for the Japanese technologies, QZSS and Galileo, should be promoted.

For the Draft International Code of Conduct for Outer Space Activities, Japan will actively work toward establishment of an international code of conduct in which as many countries as possible would take part.

In addition, Japan will carry on a space policy dialogue and explore the feasibility of cooperation.

b) Canada

On March 26, 2012, a Memorandum for Promotion of Space Cooperation was concluded between Japan and Canada with the Secretariat of Strategic Headquarters for Space Policy, MEXT, JAXA and Canadian Space Agency (CSA) defined as the participants.

The areas of cooperation include earth observation, space exploration, space science, and space education. For implementation of the cooperative agreement, the Joint Meetings will be held with the participation of relevant parties in Japan and Canada, promoting the exchange of information and cooperation between Japan and Canada through establishing working groups and reviewing the status of the bilateral cooperation.

In the future, the Joint Meetings will be held to select the programs in the areas of cooperation, which are considered mutually beneficial to both countries, thereby promoting the bilateral cooperation.

c) United Kingdom

On April 10, 2012, a memorandum was developed to jointly explore, plan and promote cooperative programs between Japan and the UK in the space field with the Secretariat of Strategic Headquarters for Space Policy, Ministry of Foreign Affairs of Japan, the UK Space Agency (UKSA) and the Foreign and Commonwealth Office of UK defined as the participants.

The specific fields of cooperative programs include (i) civil use earth observation, (ii) Navigation Satellite Systems and applications, (iii) industrial cooperation in the field of space technology, (iv) development of new services or applications that make use of space infrastructure, (v) cooperation in the area of international norms for the utilization of outer space etc. For implementation of the memorandum, the Joint Committee will be held with the participation of the relevant parties.

In the future, the Joint Committee will be held to select the specific cooperative programs in the above-mentioned fields, which are considered mutually beneficial to both countries, thereby promoting bilateral cooperation.

3) ASEAN and other emerging countries
Japanese satellite data and other space technologies are to be practically applied as effective tools to resolve the issues, such as disaster management, with which ASEAN countries are faced.

Focusing on ASEAN and other emerging countries, the government will expand the utilization of QZSS. In addition, the establishment of a Disaster Management Network for ASEAN Region will be carried out, thereby contributing to the development in the region and reinforcing the Japan and ASEAN partnership.

Japanese space technologies that are expected to meet the needs of emerging countries are supplied through the overseas expansion of infrastructure, thereby building a relationship that benefits both nations.

(4) Promotion of Japan's infrastructure system overseas in response to partner countries' needs

1) Current status and issues
The international competitiveness of the Japanese space industry is still insufficient. Overseas orders accepted to date for satellites include a total of two (2) in 2008, one each from Singapore and the domestic market, and a total of four (4) in 2011, two each from Turkey and Vietnam. For launching services, Japan won a contract for launching a South Korean satellite in 2009.

In the emerging countries, especially in the Asian region, there are increasing needs for communications satellites and remote sensing satellites and their launching services for transportation of the satellites to keep up with the needs for communications/broadcasting and disaster management. In addition, the utilization of navigation satellite systems is also in the spotlight. In practice, however, recipient countries hope that not only the provision of satellites but also human resources development, technology transfer and other services are supplied as a total package.

Based on the above understanding, it is important to actively support the export of Japanese infrastructure at the government level. In September 2010, a task force was established with participation of relevant ministries and interested organizations under the overall coordination by the Cabinet Secretariat based on the "About present status of promotion of basic policy relating to space activities" (established in August 27, 2010 by the Strategic Headquarters for Space Policy) to promote overseas business expansion of space systems.

To date, overseas business expansion has been focused on supplying satellites. However, among the emerging countries, especially in the Asian countries, there is a high level of interest in also developing their own engineers and creating industries not merely supplying satellites. This suggests that the government must meet a wide variety of needs in those countries including provision of proper solutions.

2) 5-year development and utilization plan
In satellite development and engineering development led by the government in the future, the government will place emphasis on contributing to enhancement of the international competitiveness of the Japanese space industry.

As exemplified by the establishment of a Disaster Management Network for ASEAN Region and Comprehensive Disaster Management and Warning System in Chile, the government will work toward planning the “solution proposal-based strategies” for resolving the problems with which the individual countries concerned are faced, thereby addressing potential needs.

In order to cover the specific needs of recipient countries, the relevant government ministries and agencies further strengthen the cooperation with each other, and provide support for human resources development, technology transfer, and space agency establishment by the central government in recipient countries in addition to supplying of satellites in the form of a total package.

In conjunction with these efforts, the top-level sales by the high-ranking government officials and the utilization of diplomatic establishments abroad will be promoted. Capturing overseas markets will be pursued at various levels, including subsystems and parts, not only the entire system of spacecraft.

(5) Reinforcement of information gathering, research and analysis functions that contribute to effective space policy planning

1) Current status and issues

The space policy is closely related to diplomatic and national security policies, industrial policy, and science and technology policy. Thus, when planning Japanese space policy, it is indispensable to establish and maintain a comprehensive information gathering and analysis system addressing the political, economic, industrial and science and technology trends both at home and abroad.

For the Cabinet Office and relevant ministries to enhance their planning capabilities, it is essential to improve the information gathering and research and analysis capabilities relating to the development and utilization of space in the domestic and overseas organizations, including diplomatic establishments abroad.

2) 5-year development and utilization plan

To facilitate the planning of policy relating to the development and utilization of space, the Committee on National Space Policy and JAXA are encouraged to enhance the information gathering, research and analysis capabilities.

Domestically in Japan, the network with universities and other organizations is to be reinforced, while abroad, close contact with overseas research institutions and international organizations and also persons well-informed in foreign affairs will be maintained, by using the most of diplomatic establishments abroad and JAXA overseas liaison offices.

In addition, the results of information gathering and research and analysis, will be provided on a regular basis to facilitate the information sharing between relevant parties.

(6) Promotion of human resources development and space education that will support the development and utilization of space

1) Current status and issues

The spacecraft industry's working population in Japan is approximately 7,000, declining to less than 70% of the largest workforce around 1995, corresponding to approximately one-tenth of the figure in the U.S. and approximately one-fifth of the figure in Europe. In recent years, student quotas for universities and graduate schools relating to space aeronautics in Japan have been increasing and the number of master's degree holders is also on the rise. However, among those with master's degrees, only 10% to 20% find a position in the aerospace industry and research institutions.

In the future, human resources required to support Japan's development and utilization of space include not only those who are engaged in the spacecraft industry, but also researchers who lead the expansion of space utilization and the manpower that is competent to comprehensively get a perspective of the development and utilization of space and plan projects. In addition to the technical experts, the personnel resources that are familiar with international legislation relating to space and national security are required.

To develop and secure those human resources, it also becomes important to enhance the educational functions in universities and reinforce the elementary and secondary education levels related to space. In addition, from the viewpoint of constructing efficient space infrastructure through international contribution and cooperation, human resources development and space education in the emerging countries interested in introduction of Japanese space systems are also necessary.

2) 5-year development and utilization plan

a) Development and securing human resources that make up the foundation of the development and utilization of space

In addition to those who lead the R&D of the overall development and utilization of space including space science for academic pursuits and the spacecraft industry's workforce, there are human resource needs for those who are involved in the utilization of space service industry and user industry supporting the expansion of space utilization and those who have the overall ability to organize projects are required. For this reason, government, municipalities, universities, JAXA, industries and other involved parties should work together to develop and secure human resources, including those in the fields of human and social sciences, and reinforce the space education.

In addition, for the enhancement of scientific and technological literacy, outer space is an area in which adolescents and young adults are likely to be interested, and it can be useful in enhancing their motivation for learning. Thus, using space education as important means, elementary and secondary education programs for science and technology are to be enhanced.

b) Support for human resources development in emerging countries

Emerging countries promoting the development and utilization of space are highly interested in the development of human resources involved in the space policy and industry, and there are high expectations for Japan in this regard primarily among countries in the Asia-Pacific region.

To meet the needs, government support for accepting students from emerging countries to Japan will be reinforced. In addition, through implementation of Japanese projects for the development and utilization of space, such as ultra-small satellite development projects at the university level and ISS Program, Japan will assist emerging countries in the development of their own human resources.

(7) Consideration for the environment with a view to sustainable development and utilization of space

1) Current status and issues

To realize the development and utilization of space, in addition to consciousness about the global environment, concern for the environment in outer space through the entire development and utilization of space is indispensable, including reduction of debris generation resulting from launching and satellites, and removal of debris.

In January 2007, China conducted an experiment of destroying its own satellite with a ballistic missile (anti-satellite weapon (ASAT)). In February 2009, U.S. and Russian satellites collided with one another on the circling orbits, generating a lot of debris. In the future, the number of debris is expected to further increase due to possible chain reaction of collision between debris.

For preservation of the space environment, prohibition of any harmful activities in outer space is stipulated in the 1967 Outer Space Treaty.

Since the late 1980s, the necessity of international cooperation in coping with debris has been recognized. In 1993, the Inter-Agency Space Debris Coordination Committee (IADC) was established, and in 2002 the IADC Space Debris Mitigation Guidelines was adopted. In response to this, in 2007 the Space Debris Mitigation Guidelines was adopted in the COPUOS. At present, discussions are ongoing about the Long-term Sustainability of Outer Space Activities including precautions for debris.

In addition, in the United Nations, in 2012, GGE on TCBM in outer space was formed, and discussions about ensuring consistent and sustainable space environment are underway.

Also in the International Organization for Standardization (ISO), in response to the movement in the United Nations and IADC, the standard for methods for designing and operating spacecraft and rockets to prevent generation of debris (ISO-24113) was established by the Technical Committee ISO/TC20, Aircraft and Space Vehicles, Subcommittee SC-14, Space Systems and Operations.

2) 5-year development and utilization plan

a) Preservation of space environment

i) Fostering international dialogue

In order to ensure the stable and sustainable space environment, the government will actively participate in the COPUOS and the establishment of international norms for utilization of outer space, thereby making international contributions.

ii) Space Debris Mitigation Guidelines
Taking into consideration the United Nations Space Debris Mitigation Guidelines and other international recommendations, ISO standards and other norms, the government will promote its own development and utilization of space.

iii) Space Situational Awareness (SSA)
In order to ensure safe and stable development and utilization of space in Japan, consideration will be given to the SSA system which would become necessary for protecting the ISS, satellites and astronauts from possible collision with debris and other hazardous situations. In addition, the space weather forecast system will be improved and strengthened, which is designed to observe, analyze and forecast natural phenomena such as solar activity and space environment change having effects on the space and the ground infrastructure.

iv) Development of technologies for debris removal
In the future, maintaining international cooperation and taking advantage of Japan's strength, the government will steadily achieve development of debris removal technologies and other technologies that will be needed globally.

b) Consciousness about the global environment
The development and utilization of space have the potential to help improve human life, make industries and administration more sophisticated and efficient, and further provide solutions for global energy and environmental issues. In such development and utilization of outer space, consideration should be given to possible effects that the development and utilization themselves could cause to the global environment.

(8) Development of laws related to the space activities

1) Current status and issues
In the U.S., France and other major nations, enactment of legislation for space activities is in progress to define government authorization, its supervision and the scheme of compensation for damage caused by space objects, and the space activities by the private sector are subject to such legislation. In Japan, rocket launching by private enterprises, procurement of launching in another country, and operation of artificial satellites have been realized.

The Basic Space Law stipulates the enactment of legislation in order to implement treaties and other international agreements with regard to regulations on space activities as well as other the development and utilization of space, and also in order to enhance national interests of Japan's benefit in the international community and contribute to the promotion of the development and utilization of space by the private sector.

In addition, currently, discussion is underway though multilateral consultations about the International Code of Conduct for Outer Space Activities to enhance the safety and sustainability of space activities and then, appropriate attention should be paid to the progress of the discussion when a legal framework for space activities is investigated.

2) 5-year development and utilization plan
In the research and review of legal frameworks for space activities in the future, consideration should be given to the sound involvement of the government with a view

of encouraging the private sector to smoothly promote their space activities and the industry to develop.

In the specific research and review on the legislation for space activities, consideration should be given to definition of space activities, code of practice required for government authorization and supervision, measures for protection of victims of accidents, and proper responsibility assignment between the government and the private sector for compensation to the victims, while making reference to the industry protection measures in Europe and North America as appropriate.

3-4. The method of promoting space related measures efficiently and effectively

(1) Elimination of redundancy

For the efficient and effective promotion of projects with limited financial resources, it is essential to eliminate possible redundancy of projects and their research and development details.

In addition, for the small-sized satellite verification project currently in progress, the demonstration experiment projects in outer space for enhanced reliability of equipment and parts, and other programs, the government should promote them efficiently and effectively based on cross-sectional cooperation between relevant ministries.

(2) Use of capabilities of the private sector

For implementation of satellite development projects led by the government, involvement of private enterprises in the space business should be promoted and cost reduction realized through PFI and other public-private partnership initiatives. In addition, the projects should be efficiently implemented with private-sector participation including adoption of commercial devices, acceptance of private-sector funds for satellite development, and introduction of private funding based on subsidy for satellite development.

(3) Reinforcement of cooperation between related ministries

1) Reinforcing collaboration for remote sensing satellites

For land- and ocean- observing satellites and other similar projects that are currently in progress at several ministries, reinforcement of cross-sectional cooperation is essential.

Specifically, for the remote sensing satellites, their operations should be made more efficient by accomplishing the adjustment of satellite injection orbits, interoperation of satellites, unified management for requests for image capturing and other operations based on cooperation between the involved ministries.

In addition, Japan has been spending approximately 10 billion yen per year on the purchase of overseas commercial-satellite images. Keeping these needs in mind, satellite development and improvement are to be achieved.

For the improvement of the governmental-satellite operating environment, the Platform for Promoting the Utilization of Satellite Data is to be established in close collaboration between concerned government ministries.

2) Effectively implementing the launching of government satellites
The government-wide operations for satellite development and launching are adjusted as a whole for efficient implementation of operations by jointly undertaking the mission, such as adopting the dual launching.

3) Disaster management and preparedness for accidents
For the space utilization technologies for disaster management and preparedness for accident, their effective and efficient application should be promoted through close cooperation between relevant ministries and agencies.

(4) Cooperation measures to support overseas deployment
In the emerging countries in which the need for utilization of space is expanding, the promotion of their own space technologies and advancement of the space industry are often included in the order requirements for the introduction of space systems from overseas.

For this reason, in the overseas expansion of Japan's space systems, in addition to the reinforcement of the nation's industrial competitiveness, provision of export finance and other finances, assistance to developing countries through ODA, utilization of APRSAF and ISS, linkage between ongoing R&D and human resources development projects, utilization of government top-level sales and diplomatic establishments abroad, and other possible government support should be effectively combined for the successful promotion of overseas expansion.

(5) Cooperation between related ministries in research and development projects and thoroughgoing project evaluation
MEXT, METI, and JAXA should cooperate with each other more than ever to promote the maintenance and reinforcement of industrial base in a seamless and well-planned manner through the advancement of R&D and reinforcement of industrial competitiveness.

Business operations related to the development and utilization of space often require an extended period of time and considerable expenses. To ensure efficient implementation of business operations, thorough assessment (including before, during and after implementation of projects) and enhancement of business management are to be carried out.

(6) Rationalization of operating and maintenance costs
Operating expenses for satellites and relevant equipment are to be streamlined by entrusting the operation of several satellites on block to private enterprises, or applying the profit from data sales to operating cost with utilization of private sector activities for commercially valuable satellite data.
In addition, efforts are to be made to reduce the maintenance cost for facilities and equipment for the development and utilization of space including the launch sites.

Chapter 4 Promotion of Measures Based on the Basic Plan on Space Policy

The measures and policies listed below will be promoted in order to promote the development and utilization of space comprehensively and systematically.

(1) Implementation of the measures based on the Basic Plan on Space Policy

1) Developing the JAXA's Mid-Term Goal based on the Basic Plan on Space Policy
A new JAXA's Mid-Term Goal, which will come into effect in FY2013, will be developed based on the Basic Plan on Space Policy in accordance with the provisions in Article 19 of the Law concerning Japan Aerospace Exploration Agency.

2) Policy to estimate the expenses for the development and utilization of space
The Cabinet Office will draft the Policy to Estimate the Expenses relating to the development and utilization of space through discussions in the Committee on National Space Policy to accommodate the budget requests for each fiscal year and present it to concerned government ministries and agencies. The concerned government ministries and agencies make the budget requests in accordance with the Policy.

The Cabinet Office will implement follow-up of the Policy as needed and evaluate the details of the requests.

3) Evaluating the measures relating to space
The space-related measures by the involved offices and ministries must be implemented in an efficient and effective manner. The space-related measures require a long period of time and huge costs, and significant changes in policy are difficult to implement in most cases once the projects have been launched.

Therefore, major projects are assessed rigorously in the Committee on National Space Policy before initiation of the projects.

In addition, even after start of the projects, interim assessments are conducted to allow modifications of projects as appropriate. Furthermore, ex post facto assessments are implemented to make use of the results for the improvement of other projects and reflection for the future projects.

4) Holding the communication and coordination meetings between relevant offices and ministries, focusing on the development and utilization of space
The Cabinet Office properly coordinates the entire space policy through communication and coordination meetings with relevant offices and ministries, and collects the demands and needs of users and the technical seeds of developers to incorporate them into the development of space and achieve efficient and effective planning and comprehensive coordination of basic policy.

(2) Follow-up of implementation status and public announcement
The progress of implementation of individual measures and policies based on the Basic Plan on National Space Policy will be assessed, and the results publicized as needed.

(3) Linkage with policies in other areas
To implement the Plan, the government will ensure adequate linkage with political measures other than the space-related policies, such as major economic policies,

National Defense Program Guidelines, Basic Plan for the Advancement of Utilizing Geospatial Information, and Science and Technology Basic Plan.

Outline of Basic Plan on Space Policy

(Appendix 1)

Chapter 1. Status of the Basic Plan on Space Policy and New Structure to promote the development and utilization of space

- Five-year plan from JFY 2013 (foreseeing the next 10 years).
- The Office of National Space Policy (Cabinet Office) is positioned to be a headquarter for Japanese space policy. Japan Aerospace Exploration Agency (JAXA) is defined as a core implementing agency to support with its technology the government's development and utilization of space.

Chapter 2. Basic Policy to promote the development and utilization of space

Expanding the utilization of space

-Achieve through the utilization of space (1)advancement and efficiency of industry, human life and the administration (2)national security in a wide sense and (3)development of economy.

Ensureing Autonomy

-Retain Japan's ability to pursue autonomous space activities by maintaining and reinforcing the industrial base through private-sector demand.

Prioritization of measures and <u>three priority subjects</u>:

-Secure necessary and sufficient resources for further utilizing space and ensuring autonomy, and allocate certain amounts of resources to space science, including space exploration and human space activities.

-Give priority to the following three subjects; "<u>National Security and Disaster Management</u>", "<u>Industrial Development</u>" and "<u>Progress in frontier areas including space science</u>", bearing in mind the importance of maintaining and improving the scientific and technological capabilities and industrial base.

《 Six Basic Pillars for Japan's development and utilization of space 》

Peaceful use of space	Improvement of people's lives	Development of industry	Prosperity of human society	Promotion of international cooperation	Consideration for the environment

Chapter 3. Measures the Government should take comprehensively and systematically for the development and utilization of space

Four social infrastructures for expanding the utilization of space and ensuring autonomy

A. Positioning satellites

-Establish four satellites constellation by the late 2010s and aim to archive seven satellites constellation in the future, which enables sustainable positioning.

-Promote the expansion of use and overseas deployment.

-Work on the research and development of next generation positioning satellite technologies

B. Remote sensing satellites

-Promote public - private cooperation for a plan to establish Disaster Management Network for ASEAN Riegion.

-Establish standard data policy to clarify the rules on providing data.

C. Communications/Broadcasting satellites

-Promote technology testings that meet future needs(including high power geostationary satellite bus, and response to change in demand after launch) to strengthen international competitiveness of Japan's space industry.

-Develop technology for securing communication infrastructure in case of disaster, based on the lessons from the Great East Japan Earthquake.

D. Launch Vehicle System

Conduct comprehensive examinations, and take necessary measures to maintain, strengthen and develop the nation's ability over the long term to launch satellites, as deemed necessary, both independently and efficiently.

Three programs to pursuing of the development and utilization of space in future

E. Space science and space exploration program

- Given the remarkable achievements worldwide to date, secure certain amounts of funds and carry out the program by gathering wisdom of the academic community of the physical science and engineering fields with a focus on the Institute of Space and Astronautical Science (ISAS).

F. Human space activity program

-With regard to International Space Station (ISS), constantly strive to reduce costs and, after 2016, aim to reduce costs by making the operation more efficient.

G. Space solar power system R&D program

-Conduct tests on potential future energy sources such as electrical power transmission tests on the ground.

Eight cross-sectional measures to promote the strategic development and utilization of space

(1) Promotion of comprehensive measures to expand the utilization of space	(2) Building a strong industrial base and promoting effective R&D	(3) Reinforcement of foreign and national security policy by utilizing space	(4) Promotion of Japan's infrastructure system overseas in response to partner countries' needs	(5) Reinforcement of information gathering, research and analysis functions that contribute to effective space policy planning	(6) Promotion of human resources development and space education that will support the development and utilization of space	(7) Consideration for the environment with a view to sustainable development and utilization of space	(8) Development of laws related to space activities

The method of implementing space related measures efficiently and effectively

(1) Elimination of redundancy (2) Use of the capabilities of the private sector (3) Reinforcement of cooperation between related ministries (4) Cooperation measures to support overseas deployment (5) Cooperation between related ministries in R&D projects and thoroughgoing project evaluation (6) Rationalization of operating and maintenance costs

Chapter 4. Promotion of Measures Based on the Basic Plan on Space Policy

(1) Implementation of measures based on the Basic Plan on Space Policy (2) Follow-up of implementation status and public announcement (3) Linkage with policies in other areas

Keys in Basic Plan on Space Policy

(Appendix 2)

[National security & Disaster management] | [Industrial development] | [Progress in frontier areas including space science]

(National security) | (Disaster management) | (Utilization expansion) | (Industrial base sustainment/enhancement) | (Sustainment/enhancement of capabilities in science & technology)

Four Social Infrastructures

Quasi-Zenith Satellite system

- Establish four satellites constellation by the late 2010s and aim to achieve seven satellites constellation in the future, which enables sustainable positioning.

A. Positioning Satellites

- National emergency response
- Japan-US cooperation
- Improve disaster management capability
- Service deployment in Asia-Pacific region
- R&D for next-generation technologies
- Validation for wider use
- Promotion of Geospatial society

Disaster Management Network for ASEAN Region

- Develop remote sensing satellites constellation enabling continuous data provisions and improvement in frequency of image acquisition (once a day or more), using the same or same type of sensor.

B. Remote Sensing Satellites

Information Gathering Satellites
- Ensure constant operations to cope with security issues, large-scale disaster, etc.

- Solution for disaster management, etc.
- Stronger Japan-ASEAN ties
- Promote international deployment of infrastructures
- PPP
- Expand utilization of data
- Support value added industry of data analysis and processing

Meteorological Satellites

- Continuous operations

C. Communications/Broadcasting Satellites

Defense communication
- Secure reliable communication tools, such as X band communications satellites

Disaster communication
- Develop technologies to secure disaster communication infrastructures based on lessons learned from the Great East Japan Earthquake

Communications/Broadcasting Satellites

- Validate technologies that will meet future needs for strengthening international competitiveness of the nation‘s space industry

D. Launching Vehicle System

- Conduct expeditious examinations into the nation’s launching vehicle system in a comprehensive manner, and take necessary measures to maintain the ability of the autonomous system over the long term.

Three programs to pursue the potential for the future

E. Space science and space exploration program
- Secure a certain amount of funds

F. Human space activity program
- Steady cost cuts
- Streamline research and refine research contents

G. Space solar power system R&D program
- Conduct steady demonstration tests

Basic Plan Roadmap

(Appendix 3)

Roadmap	Significance and Aim	Outline	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
	the scales of Japanese space industry		10 - 11 trillion yen							14 - 15 trillion yen		
A. Positioning Satellite	- Strengthen international competitiveness in industry - Upgrade and streamline industry, human life, administration - Contribute to Asia-Pacific region and increase presence of Japan - Strengthen Japan-US ties - Improve national security in a broad sense, including disaster management capability	-Establish four satellites constellation including MICHIBIKI by the late 2010s and aim to complete seven satellites constellation in the future, which enables sustainable positioning. - Expand utilization and overseas deployment - Promote international cooperation - R&D of the technologies for the next-generation positioning satellite system - Promote Geospatial Society	Develop and launch satellites and develop ground system to establish four satellites constellation including MICHIBIKI					Operate four satellites system steadily Aim to complete seven satellites constellation in the future, which enables sustainable positioning.				
			Expand utilization and overseas deployment R&D of next-generation satellite related technology. Promote Geospatial Society							Economic Impact: 4 trillion yen in Japan and Asia		
B. Remote Sensing Satellites	- Upgrade and streamline disaster management, mapping, land management, etc. - Strengthen international cooperation in industry - Build satellites constellation for a Disaster Management Network for ASEAN Region - Strengthen Japan-ASEAN ties	- Collect data continuously and frequently with the same or same type of sensor - Integrate operations of multiple satellites (Constellation) - Effectively develop and operate through PPP and international cooperation - Foster recipient industries that use data - Upgrade satellites system as social infrastructure	Disaster Management Network for ASEAN Region									
			Utilizing ASNARO-1,2, for continuous and more frequent data acquisition with same or same type of sensor, build and operate satellite constellation under PPP and international cooperation							Target: Receive 2 or more overseas orders per year, especially from Asian nations		
			Expand utilization and foster recipient industry demands							Target: Expand satellite data market size to 100 billion yen (One third of global market)		
	- Gather necessary information for national security and risk management	- Steadily maintain, add functions to, and reinforce the four satellites system with 2 optical satellites and 2 radar satellites	Steadily maintain, add functions to, and reinforce the four satellites system with two optical satellites and two radar satellites									
	- Provide weather forecast with high precision	- Continuously develop and operate meteorological satellites, and provide their data	Continuously develop and operate meteorological satellites, and provide thier data									
	- Resolve global environmental problems	- Promote international cooperation and contribute to environmental policies in Japan	Select and concentrate on policies with a view to contributing to environmental policies									
C. Communication/ Broadcasting Satellites	- Enhance international competitiveness of industry	- R&D and validation tests in outer space of component technologies to enhance international competitiveness of space industry.	R&D and space validation of component technologies to enhance international competitiveness of space industry							Target: Receive 3 or more orders per year		
	- Establish satellite telecommunications for national security and disaster management - Enhance C4ISR function with using space	- Ensure requisite communication regarding national security - Ensure communication between the central and local governments in the time of disaster - R&D for ensuring communication infrastructure in the time of disaster	Develop, build and operate a system comprised of 2 X-band communication satellites									
			Develop technologies to ensure communication infrastructures during disasters									
D. Launching Vehicle System	- Use Japanese rockets preferentially		Use Japanese rockets preferentially to launch Government's satellites									
	- Maintain and improve solid fuel launchers technologies - Enhance performance of H2A	- Develop Epsilon, a series of solid fuel launchers - R&D to improve performance of H2A	Upgrade and operate H2A							Target: Receive 1 or more order(s) per year from outside Japanese public agencies		
			Develop and operate Epsilon rockets and reduce related costs									
	- Space transportation strategy	- Ensure autonomy - Review the Japanese space transportation system in a comprehensive manner from medium- and long-term viewpoint	Comprehensive Review	Take necessary measures in accordance with the comprehensive review								
E. Space Science and Space Exploration Program	- Accumulate common intellectual properties of humankind, and pursue academic achievements	- Ensure a certain amount of funds, and select and implement projects in a bottom-up competition system with ISAS at the center - Consider space exploration for various policy targets	- Ensure a certain amount of funds for space science and space exploration for academic purposes, and aim for cutting-edge breakthroughs - With regard to the space exploration projects conducted for various policy purposes, they are examined from various viewpoints of diplomacy, national security, enhancement of industrial competitiveness, improvement of levels of science and technology, etc. There should be discussion on manned vs. unmanned, cost-effectiveness, significance as a part of national strategy, and it is necessary to take measures based on the results of the discussion.									
F. Human Space Activity Program	- Acquire technologies related to human space activities - Promote space education	- Reduce operational costs of ISS - Review the scheme of participation in ISS project after 2016 - Streamline researches and refine contents					As for the Japanese response to future human space activities carried out under the scheme of international cooperation, discussion should consider various aspects of such activities as diplomacy, national security, maintenance of industrial bases, industrial competitiveness, science & technology, etc.					
			Constantly assess cost-effectiveness and reduce costs									
G. Space Solar Power System R&D Program	- Develop future energy sources	- Carry out studies about wireless power transmission and reception technology, etc.	Steadily conduct studies, mainly those related to wireless power transmission and reception Review plan and cost-effectiveness of validation tests in outer space toward implementation									

Prime Minister's Instruction
(Regarding Basic Plan on Space Policy)

January 25, 2013

In response to the establishment of the Basic Plan on Space Policy, Cabinet ministers concerned should commit themselves to smooth and steady implementation of the Plan, and, in particular, promptly address the items listed below under the initiative of the Minister of State for Space Policy.

1. To give careful consideration to the best possible allocation of resources including through prioritization of budget allocation, and take required measures in order to ensure that the Cabinet Office can function more effectively as the command center and that the Basic Plan on Space Policy will be implemented efficiently and effectively. To facilitate the involved ministries and agencies to work together and strongly promote space policies for the sake of economic growth and industrial revitalization.

2. For the competent ministers of the Japan Aerospace Exploration Agency, Independent Administrative Institution (JAXA) to establish a Mid-Term Goal and a Mid-Term Plan to implement the programs based on the priorities specified in the Basic Plan on Space Policy, since the recent amendment to the relevant law stipulates that JAXA is an institution that supports the government-wide space development and utilization including in the area of national security. For the Cabinet Office to examine the Mid-Term Goal on its conformity with the Basic Plan on Space Policy.

3. To ensure implementation of the Basic Plan on Space Policy in conformity with the national security policy based on the review of the "National Defense Program Guidelines for FY 2011 and beyond."