Document 4-2

National R&D Agency, Japan Aerospace Exploration Agency Mid to Long-term Objectives Comparative Table (draft)

December 12, 2017

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
This document sets forth the objectives concerning the administration of the operations to be achieved ("mid to long-term objectives") of national research and development agency, Japan Aerospace Exploration Agency ("JAXA"), pursuant to Article 35-4-1 of the Act on General Rules of Incorporated Administrative Agencies (Act No. 103 of 1999, "the Act").	—	
I. Position and role of JAXA in the policy system Pursuant to the Act on the Japan Aerospace Exploration Agency (Act No. 161 of 2002, "Act on JAXA"), JAXA is responsible for promoting academic research in universities, improving the level of space and aeronautical science and technology and conducting space development and utilization in comprehensive management of projects including academic research of space science, basic and fundamental R&D of space aeronautics, and development, launch, tracking and maneuvering of artificial satellites. In regard to the R&D and utilization of space, Article 19 of the Act on JAXA stipulates that mid to long-term objectives of JAXA shall be determined or changed according to the Basic Plan on Space Policy. In regard to the aviation, preferential R&D operations are specified in the Research and Development Plan corresponding to the 5th Science and Technology Basic Plan (February 2017, CST's Subdivision on R&D Planning and Evaluation, Ministry of Education, Culture, Sports, Science and Technology (MEXT), "R&D Plan"). The importance of R&D and utilization of space and aviation in Japan can be summarized as follows: The space is currently used for information gathering, positioning and command and control and plays an important role as the basis of national security, and at the	—	Addition of description for the position and role of the agency in the policy system (unified alteration for institutionalization of national R&D agencies)

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same time, it is also taking hold as the infrastructure of public lives and social and economic activities in such fields as positioning, communication and broadcasting, meteorological observation and disaster management while R&D of space utilization becomes essential to realize a safe, secure and affluent society, and contributes to solving global issues and creating mankind's intellectual properties. As the space development and utilization are increasingly correlated with national growth and development in the future, Japan needs to make efforts for R&D and space utilization more than ever. Aviation is expected to be one of growing industries in Japan, and relevant R&D must be linked with technological progress and creation of innovative technologies useful for improving safety, environmental adaptability and economics to strengthen Japan's international competitiveness and make significant advancement of the aviation industry in Japan. The Japanese government and JAXA have aimed mainly to enhance the standard of space science and technology in the first and second medium-term objective periods. Accordingly, the technological progress has reached to the stage of a wide use of technologies in real term in the third medium-term objective period, and space development and utilization has come to be tied directly with the national growth and development. Throughout this transition, JAXA has attained a great deal of satisfactory results contributing to the development and operation of rockets and satellites, development of manned space and progress of space science and exploration, aviation science technology and aerospace industry as the main player in the aerospace policies of Japan. It has the world's best R&D capability, technology and knowledge. Accordingly, JAXA is expected to take a leading role in a broader range of fields by actively making plans and proposals to society and producing new value in the 4th mid to long-term objective period, in which the government commits itself to		

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further making use of aerospace technology in the national security and private sectors. The role of JAXA in various plans, particularly in the Basic Plan on Space Policy and R&D Plan, can be consolidated as follows according to the above-mentioned definition of JAXA, requirements of R&D and utilization of space and aviation, and expectations for JAXA: **1. Policy scheme to achieve the goals in the space policy (role in the Basic Plan on Space Policy)** In the Basic Plan on Space Policy (decided by the Cabinet on April 1, 2016) based on the Space Basic Act (Act No. 43 of 2008), "Assurance of space security," "Promotion of civilian space utilization" and "Maintenance and strengthening of Japanese space industry, science and technology infrastructure" are three policy objectives specified in the space policy in Japan. Actual approaches and roadmaps for achieving these objectives have been announced. JAXA is defined in the Basic Plan on Space Policy as "the core implementation agency which technically supports the government entirely for space exploration," requiring to improve technological strength through basic R&D, implement relevant projects and disseminate outcomes to society to achieve three policy objectives and roadmap. The subsequent sections describe the role of JAXA to achieve policy objectives for every objective. **1.1. Ensuring national security in space** In an increasingly severe national security environment in Japan, the effective use of space is considered to be essential for strengthening the national security capability. While the importance of space security is increasing, threats and risks against the stable use of space, such as increasing space debris and antisatellite attacks, are		

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also escalating. Assuring the stable use of space is a pressing need. Accordingly, the policy objectives of the Basic Plan on Space Policy include the assurance of stable use of space and strengthening of national security capability using space, with actual approaches and roadmaps. The contributions of JAXA are, therefore, to assure the stable use of space through R&D for improving space situation awareness and take measures against the threats and risks of space debris as well as cooperation with the government for international rulemaking on space utilization. Strengthening of national security capability through R&D is also included in the contribution of JAXA to increase the use of space systems of positioning, communications and information gathering for Japan's foreign and security policies, and the stable operation of space transportation system to help achieve these objectives. **1.2. Promotion of space utilization in the civil sector** As global issues including energy and climate change have become serious, the role of space systems, characterized with its "broadness" and "broadcasting" nature, is increasing for solving these global issues. Advanced space technologies and data are very useful for creating new value across the whole industry in Japan. Accordingly, the use of space is included in the policy objectives of the Basic Plan on Space Policy for solving global issues, realizing a safe, secure and affluent society, and creating related new industries, with actual approaches and roadmaps. Based on these objectives, JAXA will provide support for solving global issues using remote sensing satellites and other space systems more actively, and improving public lives by using these systems in the event of large-scale disasters. It also contributes to creating new services and industries by improving satellite technologies and stable		

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supply of satellite data, managing and supplying big data intended for the use in a wide variety of industries, and making various other efforts to increase space utilization in collaboration with the government and private sectors. For this purpose, coordination with the Geospatial Information Utilization Policy will be considered. **1.3. Maintenance of and enhancement to the platform for scientific technology and the space industry** Public demand constitutes the majority of the space equipment market in Japan, and in such a restricted market, sufficient profits cannot be expected, to say nothing of low international competitiveness and instability of space industry infrastructure. In addition, advanced R&D for forming an organic cycle of application needs and technological seeds and use of outcomes in national security and industrial promotion are also needed. Accordingly, the maintenance and strengthening of the base of space industry and science and technology infrastructure are included in the policy objectives of the Basic Plan on Space Policy to obtain new value, with actual approaches and roadmaps. Based on these objectives, JAXA will contribute to expanding new demand using satellites to maintain and strengthen the space industry infrastructure for self-governing space activity and improving the international competitiveness in the space industry of Japan. For this purpose, it will promote international cooperation with other nations in collaboration with the government and private sectors. It will also contribute to maintaining and strengthening the science and technology infrastructure responsive to the need and perspective of improving national security capability, industrial promotion, living standard, and the development of space science and exploration. **2. Role in regards to aeronautical sciences and technology in the**		

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Research and Development Plan In regard to aviation science technologies, JAXA is expected to play a role of promoting R&D in response to social demand, R&D of advanced technologies that determine the direction of future generations, and R&D of basic technologies allowing the sustainable development of the aviation industry in Japan and improvement of international competitiveness of Japan according to the R&D Plan. (Appendix 1) Policy system chart		
II. The Period for the Medium to Long-term Objectives The mid to long-term objective period is seven years from April 1, 2018 to March 31, 2025.	**I. Medium-term objective period** The medium-term objective period is seven years from April 1, 2013 to March 31, 2018.	
III. Detailed program to achieve the goals in the aerospace policy Detailed program to achieve the goals in the aerospace policy	**II. Matters concerning improvement of quality of services and other duties rendered to the public**	
"The maximization of R&D achievements and quality improvement of the other operations" are stipulated in Article 35-4-2 of the Act. III.1 and III.2 describe environmental changes and policies in regard to the efforts made for the matters specified in III.3 and subsequent sections. The evaluation of the agency is, therefore, made after III.3. This section covers the space projects to achieve space policies, cross-cutting R&D, and aviation science technologies, respectively, as the major projects of JAXA according to the "Guidelines on Objectives Formulation of the Incorporated Administrative Agencies" (decided by the Minister of Internal Affairs and Communications, September 2, 2014). Evaluation is based on the relevant evaluation criteria and indicators listed in Appendix 2, in consideration of international standards and social situation, etc.	The Act on the Japan Aerospace Exploration Agency (Act No. 161 of 2002, "Act on JAXA") pursuant to, the Act for the Partial Revision of the Act for Establishment of the Cabinet Office (Act No. 35 of 2012), was revised, and incorporated administrative agency Japan Aerospace Exploration Agency ("the Agency") was positioned as the core implementation agency which supports the entire space development and utilization by the government through technologies. With this revision, the objectives defined in Article 4 of the Act are based on the basic philosophy on the peaceful use of space stipulated in Article 2 of the Space Basic Act (Act No. 43 of 2008). According to Article 19-1 of the Act concerning the Agency, the medium-term objectives should be based on the Basic Plan on Space Policy, in addition to sufficient collaboration with related policies including the National Security Strategy, National Defense Program	Recent changes of situation surrounding JAXA and resulting approaches of JAXA in the 4th mid to long-term objectives were covered.

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Changes of situation surrounding JAXA and a resulting comprehensive direction JAXA sets out to promote these projects are described in these sections, and the objectives of individual projects follow according to the defined direction. **1. Changes in the environment surrounding JAXA** Changes of situation surrounding JAXA are listed below according to the position and role of JAXA in the policy system, summarized in Chapter I. ● Space is used as the security platform for information gathering, positioning and command and control. Space systems are an essential part of the modern security. As the importance of space in security increases, an increasing number of nations have become active in space, making space congested and threats and risks of space debris heightened. The need for assuring the stable use of space is, therefore, increasing. As globalization advances and economic activities across the world become more vigorous, solutions for emerging global issues as backlashes, including energy, climate change, environment, food and large-scale disasters, and efforts for tackling international challenges such as sustainable development goals (SDGs), are critically important. To realize a safe and secure society, countermeasures for frequent disasters of late and efforts of disaster management and mitigation are essential. ● Public demand accounts for the majority of the space equipment industry in Japan, and the scale of operation is not large enough for international competitiveness compared with overseas companies which take a lead. In the West, new ventures have entered into the market and rapidly grown using their advantages like prompt business judgment, short development cycles and cost-competitiveness while receiving public support for	Outline, Basic Plan for the Advancement of Utilizing Geospatial Information, and Science and Technology Basic Plan. The Agency should also conduct its activities according to the budget determined from the strategic budget allocation policies (policies of estimating expenses) presented every fiscal year by the Cabinet Office for the direction of focus and efficiency put on measures of space development and utilization. According to the above related acts and plans, the Agency will closely work together with related ministries and agencies, other incorporated administrative agencies and research institutes and private business operators, etc., while making efforts to enhance academic research in universities, and levels of space science and technology, and aviation science technology as well as promoting space development and utilization.	

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technological transfer. These emerging players have made severe international competition severer. Furthermore, a number of business operators in the space using industries have emerged in the West, and they use the information and communication technologies such as artificial intelligence (AI), Internet of Things (IoT), and big data to provide solutions using satellite data for issues in various fields. In contrast, there are few such business operators in Japan. As satellites are getting more compact and cheaper, some business operators start new businesses on communication and earth observation networks using several small satellites. Another business operators plan nonconventional, totally new businesses such as orbit services to remove space debris, or space journey and space resource exploration. In Japan, two space acts were enacted in November 2016 according to the progress of space activity in private sectors. “Vision 2030 for the Space Industry” was launched in May 2017 with the aim of expanding the space industry and market as a whole. The environment for private business operators to start space operations as the primary players is being put into place. The space industry is expected to be more active in the future, suggesting that it is important for JAXA to meet international demand, in addition to domestic demand, by further promoting the space industry and strengthening international competitiveness for developing new markets. According to the Science and Technology Basic Plan, national R&D agencies are increasingly expected to transfer their R&D outcomes and realizing social implementation by improving open innovation systems. JAXA is also required to meet these needs. ● In the field of space science and exploration, developing nations like China and India, as well as private enterprises, have increasingly gained power, posing a threat to Japan for its		

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presence and technical superiority in this field. Under such circumstances, the international presence of Japan should be maintained by continuously producing the world's best research outcomes in this field. In this regard, it is also effective for Japan to participate in the next large international joint program, in which cooperative international space exploration plans are under discussion, and out of key technologies essential to build the space exploration infrastructure, strategically select a target technology which potentially gives Japan advantages, or a technology having a large propagation effect and required to be developed in the future. ● In the field of aviation science technology, the international aircraft markets have dramatically grown, and in Japan, the aviation industry is an important growing industry, and the aviation science technology is regarded as one of critical technologies for national strategy. In regard to the present private aircraft, improvements are required in safety, environmental adaptability including low noise, and economics such as fuel efficiency. Also required is to maintain and strengthen advanced technologies to improve aviation science technology over a long period of time as well as basic technologies required for sustainable development of the aviation industry. Accordingly, JAXA needs to contribute to promoting the aviation industry and strengthening international competitiveness by immediately obtaining technologies that make Japan superior to other nations. **2. Policy on programs of JAXA** According to changes of situation surrounding JAXA, four policies are specified based on the objectives of aerospace policies indicated in the Basic Plan on Space Policy and R&D Plan in addition to continuous implementation of actual measures suggested in the Basic		

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Plan on Space Policy and R&D Plan during this mid to long-term objective period. (1) **Realization of a secure and safe society and ensuring security** JAXA should take the lead and promote international efforts to assure the stable use of space. This includes comprehensive efforts that meet the needs in the field of security including the contribution to the assurance of space system function (mission assurance), and efforts for maintaining and strengthening R&D and infrastructure for realizing a safe and secure society. Specifically, support will be provided for the government to accomplish mission assurance in the whole space systems and make international rules for space utilization in collaboration with the Ministry of Defense and other security related agencies for the stable use of space systems, and efforts are made to ensure and improve space situation awareness, and tackle space debris measures. Efforts for promoting the use of space systems for positioning, communications and information gathering in security include: R&D of satellite positioning fundamental technology for the development of worldwide satellite positioning technology, R&D for enhancing satellite communications including optical inter-orbit communications technology useful for improving survivability and transmission of large amount of data, R&D of advanced earth observation satellites and satellite data utilization for maritime domain awareness, disaster preparedness and management, and solutions for global issues, and consistent R&D (commissioned projects) of information gathering satellites. Consistent operation of core rockets and development of new core rockets (H3 rocket) are promoted for continuously ensuring and improving self-sustaining space transportation capability. Also promoted are the efforts of establishing a system for continuous and		

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stable exchange of expertise and sharing of information to strengthen ties with the Ministry of Defense and other security related agencies. (2) **Growth in space utilization and promotion of industry** JAXA should take the lead in improving space utilization including new business creation in cooperation with private sectors and by giving technical support and advice. Also, JAXA should promote R&D for strengthening international competitiveness of the space industry. Specifically, efforts are made to increase space utilization and industrial promotion by reinforcing joint projects with private business operators, promoting open innovation, providing opportunities for space demonstration, and expanding the use of Japanese Experiment Module "KIBO." Extensive use of data is also intended for creating new services and industries and finding solutions for global issues by delivering satellite data that meets the needs of users, and improving the usability of data. Efforts to strengthen international competitiveness in space industry and maintain and strengthen the industrial infrastructure include the R&D of H3 rockets and next-generation communications satellites in addition to the cooperation with the government to provide space related measures. In light of reinforcing human resources infrastructure in the space industry in Japan, efforts to improve the mobility of personnel such as personnel exchange with private sectors are promoted. (3) **Producing the world's highest results as well as maintaining and improving Japan's global presence in space science and exploration fields** JAXA should promote space science for creating the world's best		

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scientific outcomes, and improve the international presence of Japan through space exploration and manned space activities. Specifically, holding a leading position in international space exploration is aimed for by conducting the projects specified in the Basic Plan on Space Policy in collaboration with other agencies, and R&D required for space exploration while using open innovation for international space exploration. The science and technology infrastructure is also maintained and strengthened in light of a long-term view with proactive R&D for creating innovative technological seeds. (4) **Promoting the aviation industry and enhancing our global competitiveness** JAXA should promote R&D in response to social demand for improving the safety, environmental adaptability and economics of aircraft including next-generation models to promote the aviation industry in Japan and strengthen international competitiveness, and R&D of basic technologies leading to advanced technologies that determine the direction of future generations and sustainable development of the aviation industry. Specifically, support is provided for expanding the aviation industry in Japan and strengthening international competitiveness through R&D of next-generation engine technologies and low-noise airframe technologies, R&D of silent supersonic aircraft integration technologies for the future, and improvement of basic technologies including numerical simulation. JAXA intends to lead society with science and technology, change organizations to produce new value and contribute to achieving the objectives of aerospace policies by taking specific measures indicated in the Basic Plan on Space Policy and R&D Plan, and contribute to		

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achieving the objectives of aerospace policies making above-mentioned efforts and policies, and actively planning and proposing with outcomes kept firmly in mind. To achieve the objectives, the outcomes must be maximized by suitable role sharing and cooperation with inside and outside organizations including the financial aspect. Actual objectives are set forth based on four policies in the subsequent sections.		
3. Implementation of space projects to achieve the goals in the space policy scheme	**1. Assurance of space security** **2. Promotion of civilian use of space** **3. Maintenance and strengthening of Japanese space industry, science and technology infrastructure** **5. Cross-sectoral matters**	
3.1. Satellite positioning systems Satellite positioning largely contributes to security and has gained significant importance for supporting public lives in addition to social and economic activities. Because of its importance, major nations including Japan have developed, improved and upgraded satellite positioning technologies of their own, making international competition fiercer. Now it is an important social infrastructure, but threats and risks like jamming are also on the increase. Stronger survivability is required for providing stable positioning information. Quasi-zenith satellite systems developed in Japan also cover Asia and Oceania. Strategic and continuous upgrading of positioning technologies is essential to extensively leverage the technologies inside and outside Japan with technological trends and internal and external needs taken into consideration. JAXA will contribute to fostering the positioning system in Japan through R&D of satellite positioning fundamental technologies which will lead to the upgrading of positioning systems and implementation	**1. (1) Satellite positioning** QZS-1 “MICHIBIKI” will be transferred to the Cabinet Office as soon as the Cabinet Office is ready to operate this working quasi-zenith satellite system. As worldwide satellite positioning technology grows, support will be provided for the expansion and convenience of space utilization and the overseas deployment by the government and private sectors, and at the same time, R&D will be continued for positioning satellite related technologies including application technology and indoor positioning using “MICHIBIKI” and interference preventive measures. * II. 2. (1) Omitted.	

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of high-precision positioning services while taking into account the worldwide development of satellite positioning technologies, needs of public and private sectors and necessity of overseas operations for ensuring national security and contribution to industrial promotion.		
3.2 Satellite remote-sensing Various social issues may be addressed by conducting, operating and using R&D on advanced remote sensing satellites. The objectives of maritime domain awareness and early warning capacity using satellites are defined in III.3.6. Quick delivery of accurate satellite data that meets the need for disaster management and responses to disaster prevention agencies and local government as information directly tied to disaster mitigation and useful for judgment, such as the issue of evacuation call, contributes to realizing a safe and secure society in addition to saving human lives and protecting properties. Use of satellite data for land management and marine observation also contributes to realizing a safe and secure society. Delivery of appropriate satellite data overseas will help reduce damage from disasters in that region and build mutual support and reciprocal relation with other nations. Satellite data is intended to be used as judgment or evaluation criteria for the action to counter climate change by delivering suitable satellite data to internal and external users as a part of measures for solving global issues including climate change and promoting cooperation for climate change remedies and international cooperation based on the government policies. Use of satellite data will be promoted by improving its usability through R&D of satellite data processing and analysis using AI and other innovative technologies in proactive collaboration with private sectors and government, with future contributions such as the addition of value to existing businesses and creation of new services and	**1. (2) Satellite remote sensing** Support will be provided for the government investigation into the utilization of satellite remote sensing to reinforce national security, and based on investigation results, the Agency will develop remote sensing satellites. It will also develop advanced optical satellites and advanced radar satellites using technological advantages of Japan. Using various satellites on the trial basis, support will be provided for the government investigation into the application of space technologies to maritime domain awareness (MDA) in terms of the combination of aircraft and ship or ground infrastructure, and comprehensive approaches including collaboration with the U.S. Appropriate data delivery policies will be determined according to data policies of the government for handling image data. In light of survivability and quick reaction capability of space infrastructure in Japan, support will be provided for survey and study of operational needs and initiatives by the government for quick reaction type small satellites, etc. useful for frequent observation of specific areas. **2. (2) Satellite remote sensing** Support will be provided for the government investigation into the utilization of satellite remote sensing for strengthening disaster management and response, land management and marine observation, promotion of remote sensing satellite data utilization, maintenance and improvement of space industry infrastructure through overseas	

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industries in mind, to promote industries and expand public use of satellite utilization. Various data, obtained from satellites, will be managed and delivered as big data in an appropriate manner for use in a variety of industries in collaboration with the public and private sectors according to the government policies and overseas trends. R&D of advanced satellite related technologies including the integration of satellite functions will be conducted based on the government policies. These efforts will contribute to expanding space utilization and industrial promotion.	deployment of space systems of Japan, and international cooperation including the enhancement of disaster management capability of ASEAN nations and human resources development and problem solutions of various nations. Based on the investigation result, the Agency will develop remote sensing satellites. In this task, advanced optical and advanced radar satellites will be developed using technological advantages of Japan with a focus on the seamless development of satellites for improving the "foreseeability" of investment by the industry with the continuous data delivery, and maintaining and strengthening related technology platform. To increase the use of satellite data, public-private collaboration will be actively promoted for efficient operation of satellites, and satellite data utilization technologies will be developed and demonstrated. Sentinel Asia is included in the expected contribution of remote sensing satellites. Development of satellites under development relating to the "Global Earth Observation System of Systems (GEOSS) 10-year Implementation Plan" will be continued for monitoring, modeling and improving prediction precision of global environmental issues such as climate change, water cycle/ecological system change. Investigation into the development of new remote sensing satellites and improvement of sensor technology will be continued with the clear exit, such as solutions for global issues or improvement of daily lives while considering the investigation into the GEOSS New 10-year Implementation Plan. In this task, integration of bus technologies for multiple satellites, international joint development, inclusion of mission equipment in satellites, mutual utilization of data in collaboration with other nations, integration of satellite data and observation data, and cooperation with researchers of universities in relevant fields will be implemented to make efforts effective and efficient.	

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	* II. 1. (2) Omitted.	
3.3 Satellite communication While the importance of satellite communications in security is increasing as a means of information sharing effective for prompt judgment and command of security related agencies, threats and risks of interception and jamming of communication are also swelling. To ensure stable communication, confidentiality and survivability of communication are indispensable. Satellite communication has become a necessity in public lives and social and economical activities, and upgrading of satellite communication technologies is demanded to cope with recent large capacity communication. Commercial communication satellite markets account for the majority of international satellite markets, and are expected to grow due to increasing demand in developing nations. Overseas deployment of communication satellite systems can largely contribute to the economic growth of Japan, but Japan lags behind western nations when it comes to international competitiveness in the development of large capacity communication satellite technologies, and its market share of commercial communication satellite is small. The trend of new businesses using small satellite communication networks may need to be kept under close observation. Advanced R&D of satellite communication technologies will be conducted from the perspective of national security and industrial promotion. In an attempt to understand world-class technical development, business trends and utilization needs, such R&D will be managed under suitable role sharing of public and private sectors including National Institute of Information and Communications Technology (NICT) in collaboration with not only manufacturers but satellite communication service providers, who are end users. These efforts for establishing a leading-edge and innovative satellite	**1. (3) Satellite communications and broadcasting** R&D of optical satellite communication technologies will be conducted for bulk data transmission in the future. Specifically, R&D will be focused on optical data relay satellites having a high survivability and adaptability to increased amount of remote sensing data and scarce frequencies in the future. **2. (3) Satellite communications and broadcasting** Support will be provided for the government investigation into engineering test satellite according to future trends and needs of ICT in terms of strengthening the international competitiveness of the space industry of Japan, and necessary measures will be taken according to the results. R&D and demonstration of element technologies will be conducted for communication and broadcasting satellites to improve communication technologies and the international competitiveness of the space industry in Japan with future needs of utilization taken into account the tendencies of larger communication and broadcasting satellites while communication in a time of disaster is noted in the light of the Great East Japan Earthquake. * II. 1. (3) Omitted.	

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communications system and improving international competitiveness in satellite communication technologies will contribute to boosting the share of private business operators in Japan in the international commercial satellite markets in the 2020s. Large-capacity data transmission will be put into practice through R&D and demonstration of optical inter-orbit communication technologies with the confidentiality of data transmission in mind for assuring national security and contributing to industrial promotion.		
3.4 Space transportation system In terms of assuring national security, space transportation systems are indispensable for self-governing launching of requisite satellites at the time of need. Space transportation capability must be maintained in a seamless way by continuously maintaining and developing core rockets and relevant industrial infrastructure. In regard to the present H-IIA/H-IIB rocket, the world's highest level launch success rate and on-time launching rate should be maintained by continuously increasing reliability, maintaining basic technologies, and managing launch facilities and equipment, and satellite launch demands inside and outside Japan should surely be met. Development of H3 rocket meets more diversified user needs and requires lower costs for launch and facility management compared with the present H-IIA/H-IIB rocket. Prompt transition to private satellite launch services may enhance self-governing launching capability and improve international competitiveness. Even after the development is completed, JAXA will manage launch facilities and equipment properly to continue successful launch. In parallel with the development of H3 rocket, R&D will be conducted for the continuous improvement of space transportation technologies in Japan. This contributes to maintaining the independence of the space industry in	**1. (4) Space transportation system** The space transportation system is indispensable for the independent launch of required satellites at the light time. Self-controlling space transportation capability will be maintained by maintaining and operating core rockets of Japan, H-IIA and H-IIB rockets and Epsilon Launch Vehicle, and developing "new core rockets." (1) Core rockets a. Liquid fuel rocket system To improve the self-controlling launch and strengthen the international competitiveness in launch services in Japan, a "new core rocket" will be steadily developed as a comprehensive system that integrates the rocket and ground system with the aim to lunch the initial model in FY 2020. Support will be provided for the government investigation into smooth transfer from the present H-IIA/B rocket to the "new core rocket." The reliability of H-IIA and H-IIB rockets will be further improved in parallel with the maintenance and improvement of technology platform to keep the world's best lunch success rate. In regard to H-IIA rocket, international competitiveness in launch	

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Japan, strengthening international competitiveness and improving economics. Continuous and consistent launch of Epsilon launch vehicle, a solid fuel rocket system critical as the strategic technology, is maintained by continuously improving reliability, maintaining basic technologies, and properly managing launch facilities and equipment. Launching costs will be reduced by improving synergy effects in development and flight demonstration, such as the use of common parts with H3 rocket. These efforts will strengthen international competitiveness and promote transition to private launch services allowing flexible and efficient response to diversified internal and external launch demands. In parallel with these efforts, private business operators engaged in rocket development will be supported from the perspective of industrial promotion.	services will be strengthened. b. Solid fuel rocket system R&D of Epsilon Launch Vehicle, which is characterized with low-cost, innovative operation capable of accommodating launch demand flexibly and efficiently, and viewed as a critical solid fuel rocket as a strategic technology, and R&D for the sophistication of launch technologies to meet the future launch demand are planned. The form of future solid rockets that meet various needs for launching satellites such as security, earth observation, and space science and exploration, have synergy effects with solid rocket booster of the “new core rocket” and enables seamless transfer from H-IIA/B rocket to the “new core rocket” without interrupting operation will be examined. * II. 3. (1) Omitted.	
3.5 Space situational awareness From the perspective of maintaining public lives and social and economic activities and assuring national security, the Basic Plan on Space Policy stipulates the implementation of a space situational awareness (SSA) operational system by around early 2020s based on the recognition of sustainable and stable use of space as a critical issue and increasing space debris. New topics such as SSA-based space traffic management (STM) have also arisen. Accordingly, R&D will be conducted for further enhancing SSA capability to support the construction of an inter-agency SSA operational system by streamlining and operating existing SSA facilities, and promote sharing of JAXA’s technologies and knowledge through cooperation with related agencies. This contributes to assuring national security through sustainable and stable use of space in the fields of security and private sectors.	**1. (5) Other efforts** To ensure the safe and stable space development and utilization, support will be provided for the government investigation into the space situational awareness (SSA) required for protecting the International Space Station (ISS), satellites and astronauts from space debris. Support is also given to establish the operation system that integrates the SSA related facilities and government agencies required for accomplishing the situational awareness based on the Japan-US cooperation. The space technologies and knowledge owned by the Agency will be offered to the Ministry of Defense for the use of space in national security with the aim of strengthening mutual ties. * II. 2. (4) Omitted.	

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3.6 Maritime Domain Awareness and early warning functions A variety of man-caused and natural maritime threats and risks, such as illegal operation of foreign fish boats in the territorial sea and exclusive economic zones of Japan, worsening climatic hazards, sea area earthquakes and tsunamis, and marine pollution, have become obvious. Mitigating these threats and risks with the maritime domain awareness (MDA) is the pressing issue in the ocean policies and national security of Japan. JAXA will make the following efforts to assure national security in collaboration with the Ministry of Defense, the Japan Coast Guard and other security related agencies: Support will be provided for the government to investigate into the MDA in collaboration with security related agencies, and detailed ocean situations will be obtained by operating advanced earth observation satellites and automatic identification system (AIS) for obtaining information on vessels from satellites, R&D of related data processing and analysis technologies, and using satellite data. In regard to the early warning capacity, support will be provided for the government to prove the effectiveness of element technologies in collaboration with security related agencies, and R&D of element technologies, required in the future, promoted based on the government investigation into future systems including the potential use of a wide range of technologies such as commercial technologies for assuring early warning capacity of Japan. R&D to meet the space utilization needs in the future security will be promoted by deepening collaboration with security related agencies.	**1. (2) Satellite remote sensing** Support will be provided for the government investigation into the comprehensive operation of space including the use of space technologies for the maritime domain awareness (MDA) by using various satellites on a trial basis and combining aircraft, ship and comprehensive approaches including collaboration with the U.S. **1. (5) Other efforts** The space technologies and knowledge owned by the Agency will be offered to the Ministry of Defense for the use of space in national security with the aim of strengthening mutual ties.	
3.7. Enhancement of the overall mission assurance of space systems While dependency on space systems is increasing in security, public	**1. (4) Space transportation system** 2) Investigation into launching sites Support will be provided for the government investigation into the	

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
lives and social and economic activities, threats and risks are also on the increase. Stable use of space is the pressing issue. To prevent negative effects of changes in space on national security, there is an increased need for improving the mission assurance in the whole space systems including satellites and ground facilities. Accordingly, technical support, including the supply of knowledge of the development and operation of space systems in terms of functional assurance, will be provided for the government investigation in collaboration with the Cabinet Office, Ministry of Defense and other security related agencies for enhancing the mission assurance in the whole space systems. Technical support will also be provided for the government investigation into the future form of launching sites and quick reaction type small satellites, which are closely related to mission assurance. Based on the government investigation, vulnerability of space systems owned by JAXA, important for national security, public lives and social and economic activities, will be evaluated and required measures taken.	form of launching sites in terms of the survivability of space systems in Japan, and based on the investigation results, necessary measures will be taken for the launching sites owned and managed by the Agency. * 3. 1. (3) Omitted. 3) Investigation into launching systems for quick reaction type small satellites, etc. Support will be provided for the government investigation into the form of launching systems for quick reaction type small satellites, etc. including the government-led air-launching, in collaboration with survey and study of the needs and scheme of operation for quick reaction type small satellites, etc. **1. (5) Other efforts** Space technologies and knowledge owned by the Agency will be offered to the Ministry of Defense for the use of space in national security with the aim of strengthening mutual ties.	
3.8. Space sciences and exploration Research of space science and exploration will be promoted to create intellectual properties common to humankind, and the world's best outcomes will be produced and the international presence of Japan maintained and improved for exploiting new space development and utilization by obtaining innovative and exploratory technologies potentially expanding the activity range in space. To achieve these objectives, the world's highest level scientific outcomes will be produced in collaboration with other agencies by using opportunities to participate in the "strategic medium missions," "open-type small missions" and "multiple small projects" stipulated in the Basic Plan on Space Policy to develop and operate small flying objects such as satellites, probes, observation rockets and large flying balloons.	**3. (2) Space science and exploration** Original and advanced research of space science will be promoted to obtain worldwide research outcomes, with long time horizons and certain of funds in the fields of astrophysics, solar system science, space flight systems, spacecraft applied engineering and interdisciplinary science by taking advantage of characteristics of Japan for creating innovative and exploratory technologies, which may bring new horizon to the intellectual property of mankind and space development and utilization in Japan. 1) Academic research based on an inter-university system As a world-renowned space science research center, the Agency	

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To accomplish and study space science and exploration missions, research may be programmed and promoted in such a way as to strategically obtain outcomes from a long-term standpoint based on a bottom-up approach via the joint usage system for universities, in consideration of contribution to international space exploration. Collaboration with external organizations including universities will be strengthened under the joint usage system to create and implement relevant projects. An attempt will be made to return R&D outcomes obtained in the above projects to society such as industrial promotion in collaboration with private business operators. A long-term standpoint is required for the research of space science, and necessary measures including human resource development will be taken for proactive and continuous acquisition of human resources responsible for R&D. Cooperation for post-graduate education will contribute to fostering human resources in a wide range of fields including not only space aeronautics but also industries.	will promote academic research based on an inter-university system* by focusing on certain fields of science, and at same time, conduct fundamental research that contributes to future projects, and publish worldwide research outcomes in the form of academic papers and presentation in the academic societies for deepening the wisdom of mankind, while respecting the independent efforts of researchers, and taking into account the nature of academic research, such as the development of new, critical academic disciplines. The fields of science include: Astrophysics for the origin and progress of space; Solar system science for the solar system including the sun and earth; Space flight systems for space flight technologies and space systems; Spacecraft applied engineering for spacecraft technologies, ground system technologies and their application; and Interdisciplinary science that combines multiple fields of space science, or space science and related sciences, and academic research of new fields of space science. * A system, designed by reference to the operation of the Inter-University Research Institute Corporations, and used for encouraging researchers of universities and research institutes across Japan to participate in various research projects and promoting the projects with the total consent of all participating researchers. 2) Space science and exploration projects Creation and dissemination of the first-rate research outcomes reflecting the originality and characteristics of Japan, and data contributing to developing new academic disciplines for the future	

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
	through the projects selected by the inter-university system, while focusing on the fields of science listed in the preceding paragraph including astrophysics, solar system science, space flight systems, spacecraft applied engineering and interdisciplinary science by collaborating with researchers in Japan and abroad via the inter-university system and conducting R&D on science satellites, devices installed in the ISS and small flying objects, and operating them. Space exploration projects will be used in an effective manner. In regard to the solar system exploration, unmanned exploration will be promoted based not only on the bottom-up investigation which allows effective and efficient activities, but also on the programming. The programming will be set forward systematically from academic and comprehensive perspectives while taking into account the development of required human resources because especially long-term efforts are required to accomplish the mission of an unmanned aerial vehicle to land on a gravitational celestial body like the moon and Mars for exploration. There are themes handled in the exploration department within the Agency overlapping with those at the Institute of Space and Astronautical Science (ISAS). The R&D of these themes may be carried out under the initiative of the ISAS if this is the best way. **5. (4) Comprehensive improvement of human resources platform and increase in public awareness** External human resources development and personnel interchange will be promoted to broaden the base of human resources in aerospace science and enhance their capability in collaboration with the government, universities and industries through cooperation for the postgraduate education and educational activities for youngsters. 1) Postgraduate education, etc.	

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	In the course of the Agency's R&D activities, cooperation for the postgraduate education using the inter-university system, etc. will be provided to continue and develop a high degree, postgraduate level educational and human resources development functions for researchers and engineers on the site where advanced aeronautics missions have to be accomplished, as well as the personnel interchange between the industry and universities to contribute to increasing the standard of the aerospace industry and aerospace exploration research in Japan.	
3.9. International Space Station Japan has participated in the International Space Station (ISS) project as a symbol of multilateral international cooperation including Japan-U.S. cooperation and played a core role with the aim of obtaining manned space residency technologies, creating innovation, promoting industry, providing scientific knowledge and improving the international presence of Japan. Considering the direction of expanding manned space activities by a variety of players including private business operators in the coming years, the focus will be placed on the maintenance and improvement of the international presence of Japan by creating innovation, promoting industry, and obtaining internationally competitive manned space technologies, and the following efforts will be made while cost-effectiveness is taken into account: Maximize the outcomes of the ISS project based on the Japan-U.S. Open Platform Partnership Program (JP-US OP3) for strengthening the Japan-U.S. cooperation. Strive to create scientific and academic outcomes using opportunities for experience in a microgravity environment of the Japanese Experiment Module (JEM) "KIBO," and make use and provide opportunities for space demonstration using outboard	**3. (3) Manned space activities** 1) International Space Station (ISS) The Agency will join the ISS program to maintain and strengthen Japan's international cooperative relationships under the Inter Government Agreement for space station cooperation, and contribute to producing the intellectual property of mankind, expanding the areas of human activities, and developing society and economy. In regard to the utilization of space environment in the ISS, in-depth evaluation will be conducted for economic and technological aspects of research outcomes obtained so far, and possibilities of the utilization of space environment in the future to improve efficiency and content of research in the ISS. Technological demonstration of discharging ultra-small satellites from the ISS and international cooperation will be promoted. Manned space activities including the ISS program will be promoted on the condition of contributing to expanding the areas of human activities in the future and effectively and efficiently achieving the strategic implementation of technological accumulation and extensive utilization of them in private sectors to improve cost-effectiveness and continue to maintain Japan's international assertiveness on space.	

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platforms, etc. to contribute to maintaining and improving the international presence of Japan, promoting industry, and improving public lives. Bring into reality of a picture of KIBO that would be widely used in the industry, academy and government as the R&D foundation supporting science, technology and innovation in stronger collaboration with universities and private sectors by 2020. Through these efforts, be sure to make KIBO-based services independent as private businesses in light of expanding space utilization and industrial promotion. Furthermore, investigate the form and possibility of low-earth orbit manned space activities after 2025. Upgrade H-II Transfer Vehicle (HTV) "KOUNOTORI" to improve the capability of transportation to the ISS and reduce operation costs by developing new spacecraft having a high spillover effect for the future, and provide opportunities for technical demonstration using opportunities to transport materials to the ISS for realizing efficient manned space activities and promoting the industry of Japan. Continue to play the core role in the ISS project by operating "KIBO" and "KOUNOTORI" and keeping Japanese astronauts active, and expand opportunities of using the ISS from Japan to overseas. With this, Japan will be highly esteemed by not only nations participating in the ISS project but also Asian nations and United Nations, helping Japan maintain and improve its international presence. Hold a leading position by demonstrating internationally competitive manned space residency and exploration technologies in the ISS and enabling Japan to participate in the future manned space activities based on international cooperation.	a. Operation and utilization of Japanese Experiment Module (JEM) Production of more outstanding outcomes will be promoted by means of the steady operation the Japanese Experiment Module (JEM), sufficient evaluation of outcomes obtained in the ISS so far and prioritization of R&D to the promising fields in light of possible acquisition of outcomes and social needs for more effective and efficient utilization of the JEM. In addition, an attempt to accumulate technologies and knowledge enabling post-ISS, future space exploration will be made. Technological demonstration of discharging ultra-small satellites from the ISS and international cooperation including the sharing of the JEM by Asian nations for mutual benefit. b. Operation of H-2 Transfer Vehicle (HTV) Station replenishment machine, H-II Transfer Vehicle (HTV) will be operated in a positive way.	
3.10. International manned space exploration The leading position and influence of Japan in deep space further than low-earth orbit will be strengthened and Japan will achieve its	**3. (3) Manned space activities** 2) International manned space exploration In regard to the international manned space exploration, support	

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initiative in forming a new international cooperation system and rulemaking by participating in the “International Space Exploration (including unmanned exploration preceding to manned exploration)” for expanding the human activity area with a critical role based on the international cooperation including Japan-U.S. cooperation. With an eye on the participation in the construction of a manned site near the moon, planned by the U.S., and moon landing and exploration through international cooperation, proactive plans of Japan, including technical aspects, will be investigated to put international programs into shape, and efforts made to demonstrate technologies potentially proving the superiority of Japan and having spillover effects (e.g. deep space replenishment technologies, manned space residency technologies, self-gravitational celestial body taking-off and landing technologies and self-gravitational celestial body surface exploration technologies) with a link to unmanned exploration in space science and exploration. These activities will contribute to strengthening the relationship of Japan with ISS partners, maintaining and improving the international presence of Japan, and promoting the industry by disseminating the world’s highest level scientific outcomes and obtained technologies.	will be provided for the careful and comprehensive investigation by the government into the policies and ways of participating in related projects which will be discussed in the international arena in the future by sufficiently taking into account the movement of other nations, and severe financial limitations for maintaining the diplomacy and industrial infrastructure, strengthening industrial competitiveness, and estimating effects on science and technology and required expenses. Based on the investigation results, necessary measures will be taken.	
3.11. Platform technologies to support development and operation of systems including satellites (e.g. tracking and operationtechnology, environment testing technology) Efforts will be made to establish the tracking and maneuvering techniques and environmental test techniques which are basic techniques required for stable operation and reliable development of satellites for contribution to achieving the objectives of space policies in Japan. In regard to tracking and maneuvering techniques, mission accomplishment of satellites will be assured by maintaining and	**II. 5. (3) Improvement of infrastructure facilities and equipment** Facilities and equipment for tracking and controlling satellites and rockets, facilities and equipment for environmental tests and tunnel tests of aircraft, and infrastructure facilities and equipment for aerospace R&D will be improved when the Agency admits the requirement to suitably meet the demand for utilization inside and outside of the Agency without hindering space and aviation activities in Japan. **V. 1. Matters concerning facilities and equipment**	

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operating antennas and other facilities for controlling satellite tracking and data gathering. Higher efficiency of the tracking, controlling and data gathering systems will be achieved by R&D of tracking and maneuvering techniques, contributing to assuring national security and industrial promotion. Approvals and licenses of wireless stations required for JAXA-owned satellites, rockets and aircraft, etc. will be obtained according to international and domestic frequency usage rules, contributing to mission accomplishment. JAXA-owned environmental test equipment will guarantee the mission accomplishment by properly maintaining and operating the equipment for stable operation and reliable development of satellites and by conducting proper environmental tests. R&D of environmental test techniques will raise the efficiency of the tests and improve the efficiency in the development of satellites, contributing to assuring national security and industrial promotion. Extensive use and social return of technologies and equipment will be achieved by expanding acquired environmental test techniques to other industries and promoting sharing in industrial sectors.	An attempt to upgrade and improve the facilities and equipment required for assured launching and operation of satellites and promoting research will be made in a focused and planned manner.	
4. Works in cross-disciplinary research and development	**3. Maintenance and strengthening of Jpapnese space industry, science and technology infrastructure** **5. Cross-sectoral matters**	
4.1. Works to promote the industry and grow space utilization through Public-Private Partnership and the like Endless technological innovation will be accomplished in the field of space by establishing partnerships with private sectors based on a proper role allotment to promote collaborative R&D, promoting open innovation in which technologies in different fields are integrated according to industrial trends, and creating new space related businesses mainly by private business operators while use of private	**5. (1) Comprehensive efforts for expanding utilization** 1) Coordination and collaboration with the industry, related agencies and universities Accelerated technological transfer of satellite operation, rocket launching and so on to private sectors, implementation of utilization demonstration and opportunities for demonstration, proactive application of R&D outcomes by private sectors and related agencies, and utilization of the power of private sectors will be promoted by	

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funds is accelerated from the perspective of extensive use of space and industrial promotion. Proactive promotion of returning JAXA's R&D outcomes to society in collaboration with private sectors will create new businesses including venture businesses and foster human resources who would work for the space industry. Considering the contribution to these efforts, a strategic intellectual property system will be improved flexibly and continuously for more efficient use of intellectual properties of JAXA. Providing opportunities for space demonstration in collaboration with financial institutions or by sharing rockets, taking measures to improve accessibility to satellite data, and offering various supports for creating space businesses and adding high values will extensively contribute to industrial promotion. The opportunities for space demonstration will be provided, aiming for self-governing commercial businesses.	understanding social needs more accurately in terms of the improvement of public lives and industrial promotion, reflecting user needs and developers' technological seeds on space, consolidated by the government, into development, and accelerating the social return of R&D outcomes in the industry-academy-government collaboration. Necessary support will be provided for promoting the utilization of aerospace in Japan and strengthening the industrial infrastructure and international competitiveness. The environment for promoting the utilization of satellites, such as the provision of opportunities of launching or developing ultra-small satellites, will be further improved. Use of intellectual property owned by the Agency and sharing of its facilities and equipment will be promoted by taking into account the proper beneficiaries-pay principle and easy utilization, etc. From the perspective of promoting R&D projects and encouraging the voluntary and proactive participation of research institutes and private sectors in space development and utilization., role allocation and collaboration with other R&D type incorporated administrative agencies, universities and private sectors, as well as the conclusion of cooperation agreements with related agencies and universities will be intended for creating more R&D outcomes. 2) Assistance and advice for private business operators as requested Assistance and advice concerning the development, launch and operation of satellites, based on the technological knowledge of the Agency, will be provided without financial aid to the private business operators as requested.	
4.2. Maintaining and enhancing space industry platforms and scientific technology platforms for creating new value (including platforms to counter space debris and space solar energy generation)	**3. (1) Space transportation system** 2) Development of space transportation and technologies R&D of LNG (Liquefied Natural Gas) propulsion system related technologies will be conducted with a view to conducting	

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Challenging R&D to guide society, such as technologies for space debris measures and reusable space transportation system (low costs and highly frequent space transportation) will be implemented to develop new business arena and achieve continuous technological innovation in consideration of assuring national security, realizing a safe and secure society, accelerating space utilization and industrial promotion, creating the world's best scientific outcomes and maintaining and improving the Japan's international presence. In collaboration with the government, related agencies and private sectors, R&D of element technology, sensors, parts and components, and system development methodology will be conducted to assure independency of system containing satellites, maintain and improve international competitiveness, ensure mission accomplishment, and ultimately maintain and develop the space industry infrastructure in Japan. In cooperation with manned space technology and space science research, R&D of space exploration will also be promoted using technologies in various fields for the development of international space exploration and industry. R&D will be conducted for energy transmission and reception technologies used for space solar power generation systems, which potentially provide solutions for global issues facing humans such as energy, climate change and environment. R&D of liquid natural gas (LPG) propulsion technologies is also conducted for strengthening the international competitiveness of Japan from a long-term view. Extensive use of advanced technologies and commercial products in space systems will be addressed by providing opportunities for space demonstration to maintain and develop science and technology infrastructure and promote the space industry. More sophisticated solutions will be provided for developing new space utilization by investigating, planning new satellite systems and promoting initial R&D and demonstration, in collaboration with	demonstration tests. R&D of future transportation technologies applicable to reusable space transportation systems will be continued. **3. (4) Space solar power generation** Research will be promoted mainly on wireless power transmission and reception technologies based on the prospective of energy demand and supply in Japan and the demands for development of new energy in the future. **3. (5) Measures for strengthening industrial and S&T infrastructures for supporting individual projects** Advanced research will be promoted for improving technology platform with cost reduction in mind according to the mid to long-term perspectives with the aim of contributions to developing economy and society, improving the independence and flexibility of space and aviation activities in Japan, implementing effective and efficient way of doing it and strengthening industrial competitiveness. Extensive support will be provided to private business operators for promoting the utilization and meeting overseas demand to maintain the industrial infrastructure of the private companies responsible for developing and operating satellite systems and transportation systems. Opportunities for space demonstration will be given to private business operators to strengthen their international competitiveness. Specifically, an environment available for timely and inexpensive on-orbit demonstration of core parts and new element technologies using small and ultra-small satellites will be established for universities and private business operators to demonstrate new element technologies using ultra-small satellites as "test beds," and on-orbit demonstration and experiment using Epsilon Launch Vehicle will be planned. An attempt to serialize and commonalize the parts and components	

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public offices and private users of satellites according to changes of situation surrounding JAXA and need for solving societal issues with transfer of R&D outcomes to relevant users in mind.	for the satellites developed by the Agency, and cost reduction in the whole system will be made to support private companies in efficient and stable development and production, and the lump sum purchase of parts will be promoted. Solutions for the exhaustion of parts and increased overseas dependency will be discussed and necessary measures will be taken. Purchase of the technologies and instruments having a high overseas dependency from domestic vendors including small and medium enterprises will be promoted. Contribution will be made to standardizing test methods taken by the government as a whole and providing opportunities for efficient demonstration to promote the application of quality commercial parts and technologies in Japan for space utilization. Effective and efficient implementation of project will be realized by promoting R&D of core space technologies. Technological development in response to the market trends and use of technologies by projects and external organizations will be promoted for strengthening Japan's space industry infrastructure. The research for creating projects in the future or requiring mid to long-term perspectives will be conducted by clarifying the role of the Agency with the ultimate form of utilization in mind.	
5. Aeronautical science and technology Based on the R&D Plan for aviation science technologies, R&D to meet social needs, R&D of advanced technology linking to next generation, and R&D of basic aviation technologies required for sustainable development of the aviation industry will be promoted for the development of aviation industry and improvement of international competitiveness. Using a system for promoting open innovation, collaboration with domestic and overseas related agencies, transfer of technologies to private sectors and dissemination of outcomes will be done, and proactive support will be provided for	**4. Aviation science technology** R&D of core aerospace technologies will be promoted while R&D of advanced and core technologies will be prioritized even for proceeding to R&D focusing on the environment and safety. (1) R&D focusing on the environment and safety Increases in engine efficiency, reduction of noise in the current and next-generation aircraft, and enhancement of air turbulence detection will be studied and results achieved via demonstration and tests. R&D of unmanned aerial vehicle technologies, etc. required for	

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supporting the standardization of aviation technologies and enhancing the standards for the development and promotion of aviation industry. (1) R&D to meet social needs R&D of next-generation engine technologies, noise reduction fuselage technologies, and technologies for expanding aircraft utilization will be conducted in collaboration with private sectors to demonstrate internationally competitive technologies and transfer these technologies to private sectors for assuring environmental adaptability, economics and safety of aircraft. This will ultimately contribute to increasing the share of private business operators in international joint development projects, and developing completed aircraft and appliances businesses in Japan. (2) R&D of advanced technologies determining the direction of future generation Aiming at future development of the aviation industry, propulsion airframe integration design technologies for silent supersonic aircraft which are based on low-sonic boom design technologies will be obtained to improve the international superiority of Japan in aviation science, and actively contribute to establishing international standards. Also addressed is the acquisition of technologies such as more advanced electric aircraft to drastically reduce CO2 emissions caused by aircraft for the innovation of aviation technologies to change society. (3) R&D of basic aviation technologies required for sustainable development of the aviation industry The world's highest level numerical simulation technologies, such as computational fluid dynamics (CFD), of which Japan has the advantage, will be further sophisticated, and basic technologies	disaster management will be promoted in proactive collaboration with related organizations. (2) Promotion of aviation science technology utilization Use of outcomes of external organizations including the industry will be promoted, and R&D themes reaching the level of allowing technological transfer to private sectors will be eliminated in order. Efforts contributing to standardizing aviation technologies and enhancing the standard will be promoted in a positive way from the fair and neutral position and in collaboration with related organizations. (3) Contribution to strengthening technology platform and industrial competitiveness Advanced research will be promoted for improving technology platform with cost reduction in mind according to the mid to long-term perspectives with the aim of contributing to developing economy and society, improving the independence and flexibility of space and aviation activities in Japan, implementing effective and efficient way of doing it and strengthening industrial competitiveness. Projects will be implemented effectively and efficiently by promoting R&D of core aviation technologies.	

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for test, measuring and material evaluation will be maintained and strengthened. These efforts aiming at establishing aircraft design technologies for more prompt and efficient development of aircraft will contribute to continuous development of aviation industry in Japan.		
IV. Important matters to support the achievement of goals in the Basic Plan on Aerospace Policy This section sets forth the "Other Important Matters Concerning the Running of the Operations" in Article 35-4-2 of the Act.	**II. Matters concerning improvement of quality of services and other duties rendered to the public** **III. Matters concerning efficient operation and management** **V. Other important matters concerning administrative operations**	
1. Cross-sectoral matters	**II. 5. Cross-sectoral matters**	
1.1. Promotion of international cooperation and development overseas and research and analysis (1) Promotion of international cooperation and overseas operations High level reciprocal relationships will be established and maintained with major space agencies overseas to promote efficient and effective business operations while diplomatic values like the assurance of national security are taken into account. Space related technologies in Japan and advantages of space utilization will be spread to the world through proactive cooperation with space agencies and space utilization agencies in various nations and international organizations to contribute to expanding space utilization and space markets in ASEAN and other nations. These efforts may be accomplished by fostering human resources in charge of establishing and maintaining mutually beneficial relationships with these nations. Accordingly, expansion of space utilization according to needs of various nations and establishment of space infrastructure as social foundation in these nations will be promoted to maintain and strengthen the industrial infrastructure in Japan and industrial promotion by supporting the government for	(5) Implementation and strengthening of the rule of law in space Active contribution to promoting space development and utilization in the government diplomacy and national security and bilateral and multilateral cooperation will be made. Active contribution to assistance for research of space, information exchange, practical methods of peaceful uses of space and investigation into legal matters in the Committee on the Peaceful Uses of Outer Space (COPUOS) will be made. Support for implementing the International Code of Conduct for Outer Space Activities will be provided to strengthen the sustainability of space activities, and cooperation with related organization in other nations and international organizations will be established. Active support will be provided for the government to establish an international norm for making use of COPUOS and space. From here on, R&D of debris removal technologies, required around the whole world, will be conducted by making the most use of advantages of Japan with international collaboration in mind.	

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public-private collaboration to deploy space infrastructure overseas. In addition, proactive support will be provided for the government to form legal infrastructure required for promoting international investigation into the legal issues of continuous and peaceful use of space, and implementing advanced space activities including space resource exploration and on-orbit services in Japan and overseas to contribute to assuring national security and industrial promotion. (2) Survey and analysis As international situations in space and aviation have drastically changed due to the increasing importance of space security in and out of Japan, changes of situation in space businesses with the entry of new private players, increasingly sever international competition among industrialized nations and rise of developing nations, understanding and analyzing internal and external trends are more urgent needs than ever before. Accordingly, domestic and international trend survey and analysis will be reinforced and attained results will be used for determining JAXA's strategy. JAXA will also proactively supply survey and analysis information as well as making proposals to the government for its strategic and effective policy and business planning.	(6) Strengthening of international space cooperation Cooperation with related organizations of other nations and international organizations will be made for strengthening the sustainability of space activities. Measures required for implementing the agreement of space development and utilization and other international agreements in good faith will be taken and laws concerning international relationships such as import and export will be observed for the administration of the Agency. (7) Promotion of overseas deployment of infrastructure according to needs Close cooperation with related ministries and agencies will be maintained with a view of meeting the needs of host nation, and support of the Japanese government for overseas deployment of infrastructure, including human resources development, technological transfer and the setup of the space agency by the host government, will be provided. (2) Strengthening of survey and analysis and strategy planning functions Function of information gathering and survey and analysis on international and technological trends in the fields of space will be strengthened for planning policies on space development and utilization, and distributing required information to the concerned parties. Domestic networks with universities will be improved and overseas offices of the Agency will be used for establishing collaboration with overseas research and survey institutions and international organizations.	

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1.2. Fostering of understanding by our citizens and contributions to train human resource who will carry the next generation (1) Increasing public awareness Public awareness is essential to promote aerospace R&D projects as citizens are users and sponsors. The obligation of JAXA to deliver timely, appropriate and detail information on the significance of promoting aerospace businesses, outcomes so far and the value and importance of future outcomes will be fulfilled in collaboration with the government and private sectors as required to increase public awareness of JAXA as the core implementation agency for achieving the objectives of national aerospace policies and the national R&D agency to promote aerospace operations businesses. (2) Fostering human resources of next generation Multiple ways of thinking and self-governing, independent, and continuous learning habit are important with globalization, informatization and technological innovation as the background. Accordingly, efforts in this issue include proactive provision of opportunities for a wide range of learners and supporters to study aerospace fields, and recommendations of using educational materials based on outcomes and knowledge obtained from relevant R&D to help foster human resources shaping the future society.	(8) Disclosure and publication of information Aerospace R&D must be useful for improving public lives and industrial promotion. From this perspective, acquisition of understanding from users and investors, i.e., the public, on the projects and outcomes of the Agency is essential. Accordingly, information will be disclosed on the web site of the Agency in a manner that the public and private business operators can easily access and understand. At the same time, PR activities will be promoted by various means such as the web site, e-mail, brochures, facilities and symposiums opened to the public. Means to help improve public understanding of the Agency, such as two-way communications with the recipient of information, may be adapted. Efforts will also be made to focus on Japanese astronauts who play an active role and various projects both of which are indispensable for acquiring broad public understanding and support, and purveying dreams and hope. The Agency's web site in English will be improved for the active disclosure of information overseas, in particular, outcomes of aerospace R&D, which may increase Japan's international presence. (4) Comprehensive improvement of human resources platform and increase in public awareness External human resources development and personnel interchange will be promoted to broaden the base of human resources in aerospace science and enhance capability in collaboration with the government, universities and industries through cooperation for the postgraduate education and educational activities for youngsters. 2) Education of young people Systematic curricula for different age groups will be established by	

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
	effectively combining diversified means including support for school education programs, training of teachers, and local and civil groups, to provide young people opportunities for being interested in aerospace, contributing to human resource development and character formation of youth. Efforts will also be made to focus on Japanese astronauts who play an active role and various projects both of which are indispensable for acquiring broad public understanding and support, and purveying dreams and hope. Development of human resources for aerospace education will be promoted.	
1.3. Project management and ensuring safety and reliability Reliability of projects will be assured and the whole management capability of JAXA improved by completely observing project management rules across JAXA and continuously improving related fields of research and study with an eye on their trends, and at the same time, risks throughout the project will be reduced by sparing sufficient time for initial investigations and trial R&D at the project planning stage for contributing to more effective business creation and mission accomplishment. In the event of a large change or suspension of a project or loss of the mission, recurrence of similar incident will be prevented by means of exhaustive investigation into the cause and sincere efforts to keep public reliability, with the prevention of demotivation for new challenges in mind. Efforts of maintaining and improving safety and reliability will contribute to smooth implementation of JAXA projects, maximized outcomes and improved international competitiveness. Exchange of information and knowledge with outside institutions on project management and assurance of safety and reliability will also be promoted.	**III. 1. Strengthening of internal control and governance** (2) Project management A management system involving top management will be maintained for the projects conducted by the Agency. The project will be subject to objective evaluation by the responsible department and independent evaluation body soon after commencement to clarify risks and reduce them through front loading before the project is well underway, and accurately understand the implementation status and feed the strict evaluation results to the plan, including need for significant revision or cancellation. If need for significant revision or cancellation is obvious, the responsibility of top management will be made clear, and the investigation of the cause and measures for preventing recurrences follow. **V. 3. Matters concerning safety and reliability** A quality assurance system involving top management will be established and maintained for safety and mission assurance, and the review of internal and external audits will be fed back properly to reduce issues and prevent the complete loss of the mission. In the event the mission is completely lost, the responsibility of top management will be made clear, and the investigation of the cause and	

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	measures for preventing recurrences follow. Guidelines on launch, etc., laid down by international agreements, laws and regulations, or the Council for Science and Technology, will be observed to assure safety.	
1.4. Utilization of information systems and ensuring information security (1) Use of information systems Efficiency of clerical work and appropriate working environment will be maintained and improved by installing a common information system within JAXA and proactively improving the system. Collaboration with other research institutes and private sectors will be promoted more effective and efficiently by installing and improving a fundamental information system for sharing JAXA owned data with outsiders, and promoting its utilization.。 (2) Assurance of information security Information security measures will be taken based on information security policies stipulated in the “Common Standards of Information Security Measures for Government Agencies” and according to the advices from audits conducted by the Cybersecurity Strategic Headquarters, and stable operation of JAXA and national security will be ensured by appropriately protecting technological information, and improving security measures for information systems, essential for preventing serious information security incident and operating spacecraft.	**III. 4. Utilization of information technologies** Efficiency of project operation and reliability will be increased by reforming R&D processes and streamlining administration using information technologies and information systems. An optimization scheme will be implemented for major operations and systems relating to finance, accounting and administrative work to increase efficiency based on the scheme. The management department will reduce costs and downsize surplus manpower by making these efforts. **III. 1. Strengthening of internal control and governance** (1) Information security Enhancement measures required for information security, including the review of information security related systems, improvement of internal rules of the Agency and their complete implementation, and proper measures for the contract with related private business operators, will be taken based on the government policies for information security.	
1.5. Matters concerning sites and facilities Facilities and equipment shared within JAXA will be maintained according to medium to long-term plans for upgrading, development, maintenance and operation, including anti-aging and risk mitigation	**II. 5. (3) Improvement of infrastructure facilities and equipment** Facilities and equipment for tracking and controlling satellites and rockets, facilities and equipment for environmental tests and tunnel tests of aircraft, and infrastructure facilities and equipment for	

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
measures for smooth and effective promotion of JAXA projects.	aerospace R&D will be improved when the Agency admits the requirement to suitably meet the demand for utilization inside and outside of the Agency without hindering space and aviation activities in Japan. **V. 1. Matters concerning facilities and equipment** An attempt to upgrade and improve the facilities and equipment required for assured launching and operation of satellites and promoting research will be made in a focused and planned manner.	
2. Contracting intelligence-gathering satellite work from government A necessary system will be established for steadily implementing an information gathering satellite project commissioned by the government.	-	Projects planned to be commissioned according to the "Guidelines on Objectives Formulation of the Incorporated Administrative Agencies" (revised on May 25, 2015) issued by the Ministry of Internal Affairs and Communications were added.
3. Common to agencies	―	
3.1. Internal governance An internal control system that takes JAXA specific operations into account will be built and steadily operated based on the business and service documents under the president's leadership according to the related laws and regulations, by circulating the PDCA cycle for planning, execution and evaluation of operational activities in an efficient manner, to contribute to achieving the objectives of	**II. 5. (9) Project evaluation** Aiming at creating world-class outcomes, collaborating with users for promoting utilization and creating new utilization, maintaining and improving the independency and flexibility of Japan, and implementing effective and efficient projects, major projects implemented by the Agency will be evaluated at the request of the Committee on National Space Policy, and additional evaluations	

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aerospace policies. Especially, approaches effective for preventing research misconduct, including misconduct in research and illegal use of research funds, will be promoted according to the government guidelines. The objectives of the project management that constitutes a part of the internal control system will be covered in IV.1.3.	before, during and after the project will be properly conducted by referring to the external opinion as required, with the result fed back to the project. In particular, the evaluation by experts needs to be reflected in the subsequent projects in aerospace science studies based on the inter-university system. Consideration should be given to the possible contribution of these projects to the goals of the Basic Plan for Space Policy, “assurance of space security,” “promotion of civilian space utilization” and “maintenance and strengthening of Japanese space industry, science and technology infrastructure” during these evaluation. **III. 1. Strengthening of internal control and governance** A system for strengthening the internal control and governance will be established to take measures for information security, project management and appropriateness of contracts, and implement suitable administration and risk management within the Agency.	
3.2. Matters concerning human resource Adequate staffing including mutual personnel exchange with private sectors, and personnel management within JAXA leading to the future with the role of JAXA taken into account will be strategically promoted for steady project implementation and development of leaders who take the lead in new R&D, and at the same time, personnel infrastructure will be formed to create new value by leading society with science and technology. Working environment will be maintained and improved by constantly improving the ways of working, which will, in turn, contribute to promoting activities of a variety of human resources including productivity improvement and female workers.	**V. 2. Matters concerning personnel affairs** Permanent improvement of human resource management including carrier path design, substantial interview of employees and recruitment of external human resources will be promoted to foster researchers and engineers having high degree of professionalism and technological competence, and personnel capable of managing projects with broader perspective, and needs-oriented approaches will be taken to achieve an integrated operation of the Agency. Smooth administration will also be intended.	
V. Matters concerning improvement and raising efficiency in our business operations	**III. Matters concerning efficient operation and management**	

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
Administration of operations will be improved and streamlined to conduct the business operations covered in Chapter III, achieve the objectives of aerospace policies and maximize R&D outcomes. Full attention will be given to business operations so as not to damage R&D capability to achieve the objectives of aerospace policies.		
(1) Establishment of an organization for leading society with science and technology and creating new value A flexible and effective organization will be established for achieving the objectives of aerospace policies of Japan with changes in social conditions in mind by reforming the present organization so as to positively make new proposals to society, lead society with science and technology, and create new value by improving the comprehensive strength of JAXA. (2) Promotion of effective and rational business operations New businesses that meet the needs of policy and society will be created and outcomes returned to society in an effective and rational way by pursuing efficient operations through the investigation into a new organizational model and administrative processes, and streamlining operations and expenses. The efforts for keeping personnel expenses appropriate will be covered in the subsequent paragraph (description of setting numerical objectives for streamlining the administration is under adjustment). Procurement will be streamlines while fairness and transparency are ensured according to the "Policy for Streamlining Procurement by Incorporated Administrative Agencies" (decision of the Minister of Internal Affairs and Communications on May 25, 2015). Effective procurement will be achieved for strengthening international competitiveness according to various aspects of procurement systems in Japan and abroad while consistency with the accounting system is ensured.	**2. Flexible and efficient organizational operation** Research and technological competence will be improved and administrative and management capability will be strengthened by using valuable financial resources efficiently and effectively under the president's leadership to maximize the project outcomes. Flexible and expeditious administration and efficient operation will be achieved with clearly defined responsibility and discretion. **1. Strengthening of internal control and governance** (3) Appropriateness of contracts The contract will be concluded between the Agency and the winner of general competitive biddings in principle according to the "Plans for Streamlining Incorporated Administrative Agencies." Efforts will also be steadily promoted according to the "Policy for Streamlining Procurement by Incorporated Administrative Agencies" (decision of the Minister of Internal Affairs and Communications on May 25, 2015), and streamlined procurement will be promoted with fairness and transparency maintained according to the "Plan for Streamlining of Procurement, etc." The fair implementation of bidding and contracts, including the implementation status of the "Plan for Streamlining of Procurement, etc." will be inspected by the auditor during an audit. The implementation status of the plan will be made publish on the web site of the Agency. When the contract concluded by the Agency is implemented, drastic misconduct prevention measures, such as the review of the contract	Objectives including numerical targets will be determined through the discussion at the Ministry of Finance in the future.

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
(3) Appropriateness of personnel expenses Following the government policies on the pay standard, the allowance of appropriate standard for executives and regular employees will be verified and maintained with the special characteristics of operation taken into account, and verification processes and results will be made public. Allowance will be set as required in a flexible manner for acquiring appropriate human resources, and detailed explanation will be given to obtain understanding of the public.	management system of the Agency including the relationship with the counterparty, will be taken to deter misconduct in the execution of the contract. **3. Streamlining of operations** Efforts will be made to make use of the power of private sectors and increase self-generated income to promote projects effectively and efficiently with the limited financial resources, and information exchange with related ministries and agencies will be promoted to prevent the overlapping of projects. (1) Streamlining of operational expenses The Agency will strive to improve the efficiency of satellite operation by commissioning work to private sectors, and reduce costs for maintaining facilities and equipment including launching sites. Efficiency will be improved by cutting the general administrative expenses by 15% or more, and the other expenses by 5% or more compared with FY 2012 during the medium-term objective period, except for expenses caused by special factors, such as mandatory expenditures incurred due to provisions of various laws and regulations stipulating the corporate management, by reviewing the projects and ensuring an efficient operation system. Similar attempt for improving efficiency will also be made for a new projects or expansion of the existing project. Efficiency of personnel expenses will be achieved as described in the subsequent paragraphs. Idle assets will be disposed according to the purpose of the national reform for assets and liabilities, such as return of Nogi Radar Station to the National Treasury. (2) Streamlining of personnel expenses In light of the pay standard for government officials, the appropriate	

Next mid to long-term objectives (draft)	Current mid to long-term objectives	Remarks (reason)
	pay standard for executives and regular employees including the allowance will be verified and maintained with the special characteristics of operation taken into account, and verification processes and results will be made public. The total personnel expenses will be strictly reviewed based on the government policies on this matter.	
VI. Matters concerning the improvement of the financial conditions	**IV. Matters concerning improvement of financial conditions**	
(1) Improvement of financial conditions Steady operation of JAXA will be guaranteed by taking outstanding obligation of operating expenses grant, etc. into account, implementing budgets in an efficient way, and suitably attaining the composition of finances and publication of financial information according to the "accounting standards of independent administrative agencies" and other standards. The assets recognized as unnecessary will be disposed in a proper way, and critical properties transferred systematically. (2) Promotion of increasing self-generated income In addition to making efforts for implementing policies and meeting social needs using operating expenses grants, increases in self-generated income will be encouraged to create new businesses and return outcomes to society in an efficient way by proactively acquiring external funds in reinforced collaboration with private and public sectors in Japan and abroad for acquiring competitive research funds or offering knowledge of various aerospace technologies owned by JAXA.	Efficient implementation of budgets by reducing fixed costs and expenses, and increasing self-generated income such as competitive funds and income from commission will be promoted for making financial conditions more appropriate. Application of advanced R&D outcomes will be extensively investigated for increasing self-generated income. The total amount of debts for the operating expenses grant will be taken into consideration to estimate the subsidy for operating expenses at each fiscal year.	