JAPANESE LAW AND REGULATIONS CONCERNING REMOTE SENSING ACTIVITIES

Setsuko Aoki[*]

I. INTRODUCTION

Currently, Japan does not have any national laws to directly regulate remote sensing activities. However, more than two decades of experience operating remote sensing satellites[1] have produced established national practices on the data distribution of government-owned remote sensing satellites. Additionally, the first comprehensive space policy of Japan, Basic Plan for Space Policy,[2] contains an outline of the satellite-based image data policy to be formulated within one or two years from the time of this Policy was publicized.[3] In addition, in May 2010, a new space policy was released reflecting the change of government in September 2009. That policy contains the measures to make a remote sensing data distribution an established industry as well as a diplomatic tool for better contributing to international society. The concept of the "Guardian of the Environment" is newly articulated as an important function of remote sensing satellites in that policy.[4]

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[*] Professor of International Law, Faculty of Policy Management, Keio University, Japan, aosets@sfc.keio.ac.jp.

[1] Japan has launched and registered in the UN registry seven remote sensing satellites. In addition, Japan has been participating in three international programs. As of 2010, four such satellites are in operation. Japan Aerospace Exploration Agency (JAXA), *Satellites and Spacecraft, Earth Observation Satellites*, http://www.jaxa.jp/projects/sat/index_e.html (last visited Jan. 23, 2011).

[2] Strategic Headquarters for Space Policy, *Basic Plan for Space Policy: Wisdom of Japan Moves Space* 35 (June 2, 2009), *available at* http://www.kantei.go.jp/jp/singi/utyuu/basic_plan.pdf [hereinafter *Basic Plan for Space Policy*]; *see also*, Setsuko Aoki, *Current Status and Recent Developments in Japan's National Space Law and Its Relevance to Pacific Rim Space Law and Activities*, 35 J. SPACE L. 363, 389-90, 415-38 (2009).

[3] *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

[4] Strategic Headquarters for Space Policy [hereinafter Strategic Headquarters], *Uchübunya nikansuru jütenshisaku nitsuite- wagakuni no seichö o motarasu senryaku-*

This article explains Japanese laws, regulations, and policies concerning remote sensing activities and tries to explore the implications in a broader perspective of Pacific Rim space law and activities. Annexed to this article is the latest space policy of Japan, "Important Measures in the Space Policy: Strategic Space Policy to Promote Japan's Growth." It was translated into English by the present author.

II. JAPAN'S CURRENT POLICIES CONCERNING REMOTE SENSING SATELLITES

A. Basic Plan for Space Policy

Article 24 of the Basic Space Law,[5] Japan's first national space legislation, adopted on 21 May 2008, provides that Strategic Headquarters for Space Policy (hereinafter Strategic Headquarters),[6] newly established by that law, shall formulate a basic space plan concerning space development and use to fulfill the purposes and principles of the Basic Space Law including scientific research; civil application to accomplish safe and secure society; enhancing national and human security; and space diplomacy.[7] The Basic Plan for Space Policy was approved on June 2, 2009.[8]

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teki uchüseisaku no suishin [Important Measures in the Space Policy: Strategic Space Policy to Promote Japan's Growth] May 25, 2010, *available at* http://www.kantei.go.jp/jp/singi/utyuu/kettei/100525/sisaku.pdf [hereinafter *Important Measures*]. English translation by the present author is appended at the end of this article. *See* Appendix, *infra* at 350 [hereinafter Appendix].

[5] Uchü kihonhö [Basic Space Law] Law No.43 of May 28, 2008, *available at* http://law.e-gov.go.jp/announce/H20HO043.html, *see* unofficial English translation of the Basic Space Law*, Fundamental Act of Outer Space (*Law No. 43, 2008), 34 J. SPACE L. 203, 471 (2008).

[6] In this author's previous articles, this author translated the Japanese name for that Headquarters into English as "Strategic Headquarters for Space Development." However, since the Strategic Headquarters started to use "Strategic Headquarters for Space Policy" as its official English name since June 2009, this author also uses the same English name in this article. *See, e.g.*, Aoki, *supra* note 2, at 389-90.

[7] Basic Space Law, *supra* note 5, at art. 24.

[8] *Basic Plan for Space Policy* was discussed at the Experts Research Committee on the Space Development Strategy [hereinafter Expert Research Committee] established by the Strategic Headquarters based on the Cabinet Order on September 12, 2008. *Uchükaihatsusenryaku senmon chösakai ni tsuite* [Decision on the Experts Research Committee on the Space Development Strategy], Sept. 12, 2008, *available at*

Satellite-based image data policy is found in Action Plan 1, one of the seven action plans enumerated in the Basic Plan for Space Policy. Action Plan 1 refers to the promotion of space use to contribute to making a safe, secure, and affluent society through the establishment of an effective space-based data use system.[9] Three points are highlighted in Action Plan 1: 1) the collection of the users' opinions; 2) construction of a user-friendly data use system; and 3) creation of a standardized data policy. A "Coordination Committee" consisting of data suppliers and various users will be established to figure out the current status of data utilization and to identify the areas to be improved in the methods of operation and functions of satellites and sensors. Users' opinions will be duly reflected in the future design, manufacturing, and use methods of satellites and sensors.[10] Relating to the third point, the Basic Plan noted that a standard data policy on the distributable resolution, pricing, and other matters should be made in a manner that strikes a good balance in the distribution methods between the data collected through the use of the public funds, aiming at distributing them as widely as possible for the public interest, and data produced by the commercial entities to obtain proceeds.[11]

It is specified in the Basic Plan that the distribution system of the value-added image data and information has to be created in line with the "Basic Plan for the Advancement of Utilizing Geospatial Information"[12] and other relevant guidelines. The Basic Plan for Space Policy makes it clear that the data policy should be made within one to two years from the time this Policy is publicized.[13]

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http://www.kantei.go.jp/jp/singi/utyuu/pdf/1.pdf. *See also*, Aoki, *supra* note 2, at 386. The author was a member of the Experts Research Committee from Sept.12, 2008 to Sept.11, 2010.

[9] *Basic Plan for Space Policy*, *supra* note 2, at 34-36; Aoki, *supra* note 2, at 389-90, 424-46.

[10] *Basic Plan for Space Policy*, *supra* note 2, at 35-36; Aoki, *supra* note 2, at 425.

[11] *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

[12] *Chiri kükanjöhoö katsuyö suishin kihonkeikaku* [*Basic Plan for the Advancement of Utilizing Geospatial Information*], Apr. 15, 2008, *available at* http://www.spacelaw.olemiss.edu/library/space/Japan/policies/2008-4-15-GIS.pdf; *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

[13] *Basic Plan for Space Policy*, *supra* note 2, at 36; Aoki, *supra* note 2, at 425.

Further, Action Plan 2 is aimed at space use for the national security and also stipulates the data management plan for commercial users including "shutter control" or restrictions on the distribution of the commercial data in a certain area during a certain period of time, as a method which is usually maintained in spacefaring nations with or without the specific law. It is reported in Action Plan 2, that given that Research and Development (R & D) for high resolution imaging satellites will be developed in Japan in the future, the government should formulate necessary rules on satellite image distribution in terms of national security in cooperation.[14]

However, as of June 30, 2010, it seems little progress has been made with respect to Action Plans 1 and 2 due mainly to the first real change in government in about fifty-five years. This occurred in September 2009 and the political turbulence continued reflecting a second change of the Prime Minister, or three Prime Ministers in one year, as of June, 2010.[15]

B. GOSAT Data Policy

Although there is no comprehensive data policy of remote sensing satellites, the growing recognition of the importance of such policy resulted in a data policy on the latest remote sensing satellite for Japan, Greenhouse gases Observation SATellite, *GOSAT (Ibuki)*.[16] Since *GOSAT* data policy has become the standard for the distribution of data produced from the govern-

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[14] *Basic Plan for Space Policy*, *supra* note 2, at 37; Aoki, *supra* note 2, at 426.

[15] After the completion of this article, the Working Group (WG) to Study a Remote Sensing Policy was established under the Experts Research Committee. The mandates of this WG include the study on the following items: (1) the promotion of remote sensing industry; (2) strengthened coordination between the satellite operators and data users; (3) data distribution policy; (4) coordination with the data use for security purposes; (5) strengthened international cooperation; and (6) other items necessary to comprehensively promote remote sensing activities. The present author is one of the eight members of this WG. *Rimöto sensingu seisaku kentö Working Group no secchi ni tsuite* [*Decision on the Establishment of a Working Group to Study a Remote Sensing Policy*], Dec. 20, 2010, *available at* http://www.kantei.go.jp/jp/singi/utyuu/senmon/dai10/siryou6.pdf.

[16] JAXA, *Greenhouse gasses Observation SATellite "Ibuki" (GOSAT),* http://www.jaxa.jp/projects/sat/gosat/index_e.html (last visited Dec. 27, 2010).

mental satellites in Japan, it will be briefly mentioned in this section.[17]

GOSAT data policy was made among Japan Aerospace Exploration Agency (JAXA), the National Institute for Environmental Studies (NIES), and Ministry of the Environment (MOE) on 11 November 2008, prior to the launch of *GOSAT*, and revised on 16 April 2009.[18] *GOSAT* data policy is made on the premise that the *GOSAT* data will be distributed on a "non-discriminatory" basis as provided for in the UN Principles Relating to Remote Sensing of the Earth from Space (1986).[19] Purposes of the use of the *GOSAT* data are categorized into two groups in the Policy. The first is the development of Earth-observing systems and Earth science research, or non-commercial purposes, and the second is for commercial purposes.[20] For the former purpose, only actual expenses for reproduction of the data are charged. In principle, the data will be provided on-line and, in such cases, is free of charge.[21] For commercial purposes, users will be charged usage fees in accordance with certain conditions including the number of products provided aside from the actual expenses necessary for reproduction.[22] Data shall not be used in opposition to peaceful uses or for any other purposes than the agreed use. Redistribution of data to any third party is also prohibited.[23]

Different categories of users are given different treatment on the timing and priorities of distribution as well as the types and the quality of data to be provided. GOSAT data products are categorized, depending on the processing level, from Level 1 to Level 4, or from raw data to more processed data, and to information added data. Further, each level of such data products

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[17] *See, supra* note 15.

[18] JAXA, NIES, & MOE, *Greenhouse gases Observing SATellite (GOSAT) Data Policy* (Revision Apr.16, 2009), *available at* http://www.gosat.nies.go.jp/eng/technology/download/GOSAT_Data_Policy_en.pdf [hereinafter GOSAT Data Policy].

[19] *Id.* at 1, para. 2.; GA Res. 41/65, U.N. Doc. A/RES/41/65 (Dec. 3, 1986), at principle XII, *available at* http://www.oosa.unvienna.org/oosa/en/SpaceLaw/gares/html/gares_41_0065.html.

[20] GOSAT Data Policy, *supra* note 18, at 2, para. 6 (1), (2).

[21] *Id*. at 2, para. 8 & at 8, para. 12 (1).

[22] *Id.* at 8, para.12 (2).

[23] *Id.* at 8-9, para.14 (1)-(3).

is classified into three types: (i) standard, (ii) research products, and (iii) internal products. Standard products are to be distributed to all users, research products are available to a limited community of users, and internal products are for further limited research investigators and research organizations.[24] *GOSAT* data policy will be basically maintained in the prospective comprehensive satellite-based data policy to be adopted in about a year.[25]

III. JAPAN'S SPACE LAW IS RELEVANT FOR THE REMOTE SENSING ACTIVITIES

A. Prospective Space Activities Act

Article 35 of the Basic Space Law,[26] Japan's first national space legislation adopted on 21 May 2008, provides that Strategic Headquarters, which is newly established by that law, shall further enact space law or laws for the following purposes: (i) to implement Article VI of the Outer Space Treaty;[27] (ii) to ensure public health and safety; (iii) to guarantee third party liability for potential victims arising out of space activities; (iv) to promote private space activities; and (v) to ensure that Japan plays an active role in fulfilling international responsibility for the sustainable development of space.[28] Likewise, Article 6 of the Diet resolutions relating to the Basic Space Bill adopted on 13 May 2009[29] and 20 May 2009,[30] respectively, by the House of

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[24] *Id*. at 2-8, paras. 7, 9-11.

[25] *See*, *supra* note 15.

[26] Basic Space Law, *supra* note 5, at art. 35.

[27] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205.

[28] Working Group (WG) to study a Space Activities Act, *Chükantorimatome [The Final Report]*, (March 5, 2010), 3-5 *available at* http://www.kantei.go.jp/jp/singi/utyuu/katudo/houkokusho.pdf.

[29] *Uchü no kaihatsu oyobi riyö no suishin ni kansuru ken* [*Issues Concerning the Promotion of Development and Use of Space*], Cabinet Standing Comm., House of Representatives (May 13, 2009), *available at* http://www.soranokai.jp/pages/kihonhouA_ketsugi.html.

[30] *Uchü kihonhöan ni taisuru hutaiketsugi* [*Attached Resolution Concerning Basic Space Bill*] Cabinet Standing Comm., House of Councilors (May 20, 2009), *available at* http://www.soranokai.jp/pages/kihonhouA_080523b.html.

Representatives and the House of Councillors request that efforts be made to adopt a law to regulate space activities in accordance with international agreements within two years from entering into force of the Basic Space Law.

Strategic Headquarters, established under Chapter IV of the Basic Space Law, is responsible for drafting a law to regulate space activities.[31] Substantial work was conducted at a Working Group (WG) to study a Space Activities Act, set up on 1 October 2008[32] under the Expert Research Committee on the Space Development Strategy (Expert Research Committee).[33] The Interim Report of the prospective Space Activities Act was adopted on 24 August 2009 by that WG.[34] After public comments were invited for the Interim Report from 2 October to 23 October 2009,[35] the Final Report was publicized on March 5, 2010.[36] Final Reports provided for the scope of application of the prospective Space Activities Act, different types of authorization, conditions for obtaining authorization, third party liability, compulsory insurance, etc., but it did not contain the necessary legal frameworks on operating remote sensing satellites and a data distribution system for remote sensing satellites.[37]

For the purposes of the Final Report, authorization is needed for the following activities: (i) launch of a space object; (ii) procurement of a foreign launch; (iii) reentry of a space object; (iv) general operation of satellites; and (v) launch and reen-

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[31] The Strategic Headquarters consists of all Ministers, with the Prime Minister as the Director-General. Basic Space Law, *supra* note 5, at arts. 24-34.

[32] That Working Group was formed on October 1, 2008, by the decision of the Experts Research Committee under the Strategic Headquarters. *See Uchü katsudö ni kansuru hösei kentö working group no secchi ni tsuite* [*Decision on the Establishment of a Working Group to Study a Space Activities Act*], Oct. 1, 2008, *available at* http://www.kantei.go.jp/jp/singi/utyuu/pdf/7.pdf. *See also* Aoki, *supra* note 2, at 391. The author is a member of the Working Group to Study a Space Activities Act.

[33] *Supra* note 8.

[34] Minutes of the six meetings are *available at* http://www.kantei.go.jp/jp/singi/utyuu/kaisai_before090916.html (last visited Jan. 26, 2011).

[35] Secretariat of the Strategic Headquarters, *Uchükatsudö ni kansuru hösei WG hökokushoan (chükantorimatome) ni taisuru ikennoboshü (paburikku komento) no kekka ni tsuite [Result on the Public Comment on the Interim Report by the WG to Study a Space Activities Act]* (Mar. 5, 2010), *available at* http://www.kantei.go.jp/jp/singi/utyuu/katudo/pabcomme.pdf.

[36] *The Final Report*, *supra* note 28.

[37] *Id.*

try site operation.[38] The general operation of satellites means control of the position and posture of a satellite, or so called "station-keeping" as well as the control of the temperature and pressure, etc. within a satellite to maintain the normal function thereof, or so-called "house-keeping." "Station-keeping" includes de-orbit and re-orbit to mitigate space debris.[39] In other words, operation of a satellite as a system is the scope for the required application of a Space Activities Act, but not a specific mission management, such as the control of remote sensing sensors to collect land and ocean images or positioning data on board a satellite.[40] The exclusion of the operation of a remote sensing satellite and a navigation satellite from the scope of the authorization system mainly stems from the fact that there has been no such privately owned satellites until now.

B. Proposals by the Aerospace Industry to Promote Remote Sensing Data Distribution Business

Under such circumstances, on behalf of the aerospace industry, the Society of Japanese Aerospace Companies (SJAC), presented a "Request to a Space Activities Act to Promote Space Industry" (Request) at the second meeting of the WG to Study a Space Activities Act in January 2009.[41] The SJAC requested that a separate law be drafted at the same time as a Space Activities Act to solely promote the space industry in which the regulations on remote sensing activities will be included. That law was tentatively named by the SJAC as Space Industry Promotion Act (SIPA).[42] SJAC maintained that the government shall formulate a basic policy on data management to advance private business.[43]

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[38] *Id*. at 7-8.

[39] *Id.* at 8.

[40] *Id.*

[41] Society of Japanese Aerospace Companies (SJAC), *Uchükatsudöhö eno yöböo uchüsangyö shinkö no kanten kara [Request to a Space Activities Act to Promote Space Industry]* (Jan. 26, 2009), *available at* http://www.kantei.go.jp/jp/singi/utyuu/housei/dai2/siryou5.pdf.

[42] *Id.* at 4.

[43] *Id.* at 12. The SJAC's requests include the establishment of a consultative commission to discuss the conditions for private sectors to use satellite-based data and in-

Additionally, the SJAC Request provides that the government should archive satellite-based raw data because it is beyond the capability of the private entities, and alternatively, the government should consign such archiving for the private operators.[44] Since matters which are not suitable for the subject of law can be a key to the successful industrialization of remote sensing business, the SJAC requested that the government shall also make a remote sensing policy included in a comprehensive Space Industry Promotion Policy (SIPP) (tentative name by the SJAC).[45] In the SIPP, the SJAC proposed that the privatization of the management of public facilities and Private Finance Initiative (PFI), as well as long-term purchase guarantee by the governmental users, or a so-called "anchor-tenancy" contract, should be realized.[46]

At the time when the SJAC submitted such request to the WG to Study a Space Activities Act, the Basic Plan for Space Policy was under discussion at the Experts Research Committee, and therefore, some of the requests by the SJAC were included in Action Plans 1 and 2 of the Basic Plan for Space Policy, released on June 2, 2009.[47] Still unsatisfied, the SJAC continued to submit its proposals to the WG at its third and fourth meetings held in May and July of 2009, urging the WG to include the items not adopted in the Basic Plan such as "anchor tenancy" in a future SIPA or SIPP.[48]

It turned out in the Final Report of the WG, however, that none of the SJAC proposals were expressly adopted. The Report

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formation produced by the government, the adoption of a comprehensive national data policy, and a confirmation that only a Cabinet Order will regulate matters limiting the exports of satellite-based data, information, and value-added products. *Id.*

[44] *Id.*

[45] *Id.* at 2.

[46] *Id.* at 22.

[47] *See* II.A. of this Article.

[48] SJAC, *Uchükatsudöhö eno yöböo sono 2 uchüsangyö shinköhö uchüsangyöshinköseisaku [Request No.2 to a Space Activities Act, the Enactment of Space Industry Promotion Act and Space Industry Promotion Policy]* (May 25, 2009), at 14-15 & 30, *available at* http://www.kantei.go.jp/jp/singi/utyuu/housei/dai4/ho4_shiryo3.pdf; SJAC, *Uchükatsudöhö eno yöböo sono 3 uchüsangyö shinköhö uchüsangyöshinköseisaku Shüseiban [Modified Version of Request No. 3 to a Space Activities Act, the Enactment of Space Industry Promotion Act and Space Industry Promotion Policy],* (July 6, 2009), at 14-15, 30, *available at* http://www.kantei.go.jp/jp/singi/utyuu/housei/dai5/ho5_siryou3.pdf.

concludes that a drafting of a SIPA requested by the SJAC will be decided depending on the results of the implementation of the Basic Plan for Space Policy, and that only a continued study will be conducted at the WG as to whether SIPA is urgently needed.[49]

IV. RECENT DEVELOPMENT ON THE REMOTE SENSING DATA POLICY: IMPORTANT MEASURES APPROVED IN MAY 2010

A. Background

The landslide victory of the Democratic Party of Japan (DPJ) on August 30, 2009, in the national election led to an historic change of government. Although the Basic Space Law is a bipartisan law, and therefore, the Basic Plan for Space Policy should not be influenced by the election result, a new government was not active enough to promptly take measures to implement the seven Action Plans in the Basic Plan. On the contrary, the new Minister for Space, Mr. Seiji Maehara, made a new "Expert Commission to Study a Future Space Policy" on February 23, 2010,[50] irrespective of the continued existence of the Expert Research Committee set up in September 12, 2008.[51] After the seven meetings, the report of the Expert Commission,[52] Important Measures in the Space Policy: Strategic Space Policy to Promote Japan's Growth (Important Measures)[53] was approved May 25, 2010, at the fourth meeting of the Strategic Headquarters which consisted of all Ministers.[54]

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[49] *The Final Report*, *supra* note 28, at 29.

[50] Cabinet Secretary, *Kongo no Uchüseisaku no arikata ni kansuru yüshikishakondankaino kaisai ni tsuite [Establishment of the Expert Commission to Study a Future Space Policy]* (Feb. 23, 2010), *available at* http://www.kantei.go.jp/jp/singi/tyuuseisakukaigi/dai1/gijiyoushi.pdf.

[51] The term of the membership of the Expert Research Committee is two years from the day of the appointment, or until September 11, 2010.

[52] Minutes of the seven meetings are *available at* http://www.kantei.go.jp/jp/singi/utyuu/kaisai.html (last visited Dec. 29, 2010).

[53] *Important Measures*, *supra* note 4. *See also* Appendix, *supra* note 4.

[54] Strategic Headquarters, *Daiyonkai kaigö gijiyöshi* [*Summary of the Fourth Meeting*], 2 (May 25, 2010), *available at* http://www.kantei.go.jp/jp/singi/utyuu/honbu/dai4/gijiyoushi.pdf.

The status of the Important Measures is slightly ambiguous, partly because the Expert Commission is a private advisory group to the Minister for Space, not a formal committee as is the Expert Research Committee made by the Cabinet Order,[55] and partly because the Important Measures is not scrutinized by public comment. Thus, Important Measures should be read as a complimentary document to implement the Basic Plan. However, it should be noted that the preamble of the Important Measures states, "in accordance with the progress of such Measures, 'Basic Plan for Space Policy' (decided by the Strategic Headquarters for Space Policy on June 2, 2009) will be reviewed for the possible amendment by the Strategic Headquarters for Space Policy."[56] Additionally, the DPJ enjoys a large margin in the more important House of Representatives. Therefore it is not unreasonable to think that the Important Measures will virtually replace the Basic Plan for Space Policy if the contents of the Measures conflict with those of the Basic Plan for Space Policy.

B. Remote Sensing Satellite Policy in the Important Measures

The Important Measures refers to remote sensing satellites as having the potential to boost industrialization of space as well as being able to establish a "Guardian of the Environment."[57] The latter purpose highlights the use of satellites for the public interest, rather than directly for economic gain. However, it is stipulated in the Important Measures that use of remote sensing satellites as the "Guardian of the Environment" is useful for Japan to play an important role in international society, and is thus more important from the standpoint of space diplomacy.[58]

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[55] Strategic Headquarters, *Uchükaihatsusenryaku honburei heisei 20nen seirei dai 251 gö [Cabinet Order No.251 of 2008 on the Strategic Headquarters]*, (Aug. 27, 2008), *available at* http://www.kantei.go.jp/jp/singi/utyuu/pdf/2.pdf.

[56] *Important Measures*, *supra* note 4, at 1.

[57] *Id.* at 10.

[58] *Id*.

i. Conditions of Commercialization of Satellite Data Distribution

For commercialization and marketing of the remote sensing industry, Important Measures underlines the conditions of i) real-time data acquisition and distribution; ii) data provision to users on a continuous basis; and iii) user-friendly data distribution, affordably priced data, and information so as to be able to adequately respond to various user needs.[59] To establish the first condition, the Measures suggest specific steps:

> [t]he present situation lacks, however, real-time provision of data needed for business, because there is currently only one observation satellite "Daichi" (*ALOS*) operating in Japan and it revisits the same place about twice a week (every 3 days). It is pointed out, in the Measures, that the lack of timely data gathering restricts the growth of satellite data market in Japan. High frequency of the data gathering of revisiting the same spot every 3 hours is required to enter the international market. For that purpose, it is important to construct and operate an Earth observation satellite network consisting of the *Daichi*-series satellites, from 4 to 8 small satellites named "*ASNARO* (tentative name)" in addition to micro satellites. By acquiring such satellites, a growth of the satellite imaging market will be expected for a wide variety of purposes, centering on disaster monitoring and advancement of agriculture, fisheries and other industries, and also for the purposes of diplomacy and security.[60]

The ultimate goal, according to the Important Measures, is to construct a near real-time satellite imagery market in the entire Asian region. It is assessed that such an Earth observation satellite constellation will only be made possible through cooperation among Asian countries. It is recommended, therefore, that a Public Private Partnership (PPP) be used to construct a new satellite constellation among these countries in

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[59] *Id.* at 5. *See* Appendix, *supra* note 4, at 1 (1) (2).

[60] *Important Measures*, *supra* note 4, at 5-6; Appendix, *supra* note 4, at 1 (1) (3).

addition to integrating the respective satellites of Asian countries currently operated.[61]

The second condition will be satisfied by promoting the serialization of satellites and sensors. This supports the necessity of evolving Japan's space activities from being R & D driven to being utilization and application driven, one of the reasons for passing the Basic Space Law.[62]

The third condition will be addressed by making an easy to handle platform to promote the use of satellite data. As Japan's portion of the responsibility, the construction of such a platform is strongly urged. The Important Measures states as follows:

> Space utilization will grow into a big industry by making an integrated utilization platform of satellite-based data and information and by establishing an infrastructure through which not only images, data and information, but also positioning information and communication functions could also be simultaneously distributed. These are indispensable to better serve the data and information users. More specifically, an example is the setting up of a utilization platform in which data acquired by a series of the Earth observation satellites system, consisting of "*Daichi*", "*ASNARO* (tentative name)", "*Himawari*" (MTSAT-X), "*Ibuki*" (GOSAT), etc., and information obtained from other sources, or information from the Earth-, sea- and air-based apparatus will be integrated. (---) "[T]he Utilization Promotion Platform Council (tentative name)" will be established and the Council meetings shall be held for about a year to come to consider "the data policy" including standardization of the integrated data, a system, data distribution guideline and the operation principles, so that an operation of that utilization platform will be able to start in FY 2012.[63]

> As for the third condition, it is emphasized that the government shall take the initiative in establishing a borderless plat-

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[61] *Important Measures*, *supra* note 4, at 5-6; Appendix, *supra* note 4, at 1 (1) (3).
[62] *See, e.g.,* Aoki, *supra* note 2, at 366-68.
[63] *Important Measures*, *supra* note 4, at 6; Appendix, *supra* note 4, at 1 (1) (4).

form through the cooperation with not only other players in Japan but also with Asian countries which own satellites.[64]

ii. Satellites as "Guardian of the Environment"

"The New Growth Strategy" in December 2009 declared that Japan shall become an environment and energy power through "green innovation," a developing field in which Japan has an advantage.[65] One of the important "green innovation" measures is spreading renewable energy, and from the viewpoint of satellite use, an application satellite to measure the concentration distribution of greenhouse gases. For example, in the case of Japan, *GOSAT* is an effective tool to verify the effect of renewable energy on concentration distribution.[66] Currently there are only about 280 Earth-based observation spots. Since it is possible to drastically augment the number of observing spots by space-based systems, and since Japan plans to launch the *Global Change Observation Satellite - Water* (*GCOM-W*) and *Global Change Observation Satellite - Climate* (*GCOM-C*),[67] it seems to be a promising area for contributions from Japanese satellites. Even today, *GOSAT* has attained about 56,000 observing spots. Doubling the number of spots for observation is said to be possible in the future.[68] Japan has to take an initiative to build an environmental observation satellite network, not only for exploiting the space industry, but more importantly, for being equipped with a verification tool to countermeasure global environmental challenges.[69]

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[64] *Important Measures*, *supra* note 4, at 6; Appendix, *supra* note 4, at 1 (1) (4).

[65] Prime Minister of Japan and his Cabinet, *Shinseichösenryaku (kihon höshin) ni tsuite*[*The New Growth Strategy*] (Dec. 31, 2009), *available at* http://www.kantei.go.jp/jp/kakugikettei/2009/1230sinseichousenryaku.pdf.

[66] *Important Measures*, *supra* note 4, at 10; Appendix, *supra* note 4, at 3 (2).

[67] JAXA, *Satellites and Spacecrafts: Under Development*, http://www.jaxa.jp/projects/sat/index_e.html (last visited Jan. 24, 2011).

[68] *Important Measures*, *supra* note 4, at 10; Appendix, *supra* note 4, at 3 (2).

[69] *Important Measures*, *supra* note 4, at 10; Appendix, *supra* note 4, at 3 (2). *Id*.

V. CONCLUSION

In Japan it seems rather difficult to see a robust remote sensing data distribution business in the near future. However, it may be possible to construct a remote sensing satellite network in cooperation with Asian-Pacific countries to better address the global and regional agenda. The Asian-Pacific region must recognize the common challenges from global warming and natural disasters such as earthquakes, tsunami, forest fires, and volcano eruptions. The region must also recognize human-created threats such as piracy and the illicit trafficking of people and goods. Making a usable data platform of satellites in this region, increasing the number of mutually interoperative remote sensing satellites, and preparing an effective data policy can lead to an Asia-Pacific satellite network that helps tackle these common challenges. Among the Asian-Pacific countries, nearly ten of them already have a remote sensing satellite or satellites.[70] In the era of small satellites, the number will be drastically increased in the next decade. Thus, in addition to the hardware aspect of efforts to make a financing scheme such as PPP, prompt action is expected to prepare a legal framework as a software aspect. The newly introduced concept in the 2010 space policy of a satellite as a "Guardian of the Environment" can be a key phrase to construct a new regime in the Pacific Rim in the future.

[70] In Asia-Pacific, at least Brazil, Canada, China, India, Korea, Malaysia, Thailand, U.S., and Japan own and operate remote sensing satellites.

Appendix

Important Measures in Space Policy: Strategic Space Policy to Promote Japan's Growth, decided on May 25, 2010 by the Strategic Headquarters for Space Policy[71]

In line with the "New Growth Strategy (Basic Policies)," decided by the Cabinet Meeting on December 30, 2009, a space policy to be implemented with particular emphasis was established in the document below by the title of the "Important Measures in Space Policy" so as to contribute to the prospective growth of Japan.

As a result of the adoption of the "Important Measures in the Space Policy," in accordance with the progress of such Measures, "Basic Plan for Space Policy" (decided by the Strategic Headquarters for Space Policy on June 2, 2009) will be reviewed for the possible amendment by the Strategic Headquarters for Space Policy.

Attachment

"Important Measures in the Space Policy: Strategic Space Policy to Promote Japan's Growth"

Research and Development (R & D) of space brings about the innovation, breakthrough in the state-of-the-art science and technology (S & T) and the nurturing of the capable human resources. Thus, space R & D is placed in the New Growth Strategy (Basic Policies), decided by the Cabinet Meeting on December 30, 2009, in the new frontier fields in the S & T, or a platform to support the growth of Japan, and therefore, the New Growth Strategy declares that the space exploration shall be promoted.

Looking at the world trends, in case of the United States of America (U.S.), a U.S. Budget Message released in February 2010 announces the increase of the budget of the National Aeronautics and Space Administration (NASA) by approximately $6 billion over the next 5 years (FY 2011-2015), considering the contribution of the space policy to the industrial devel-

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[71] *Supra* note 4, at 1. This is an unofficial translation by the present author. It is being offered to the readership of the JOURNAL OF SPACE LAW as a convenience.

opment, as well as to the potential of an innovation engine and security. (A total of the increase of the 5-year U.S. space budget amounts to $100 billion.)[72] A big budget is to be allocated to the exploration of the solar system through robots for preparing for the future human space activities and scientific fields including the environmental observation, although the manned exploration of the Moon was reconsidered. Likewise, the released U.S. space budgets indicate that measures will be taken for the increasing use of the private enterprises and the enlarging the circle of the space industry, taking note of the matured space industry.

In addition to the U.S. measures aiming at enlarging the circle of private-sector activities and growing use of private enterprises, etc. mentioned just above, space utilization has been rapidly expanding in the E.U., China, India, and other countries. Considerable growth of the space utilization industry is recognized world-wide as it becomes twice the size in the past 5 years (an annual 14.2% growth was recorded on the average from 2003 to 2008). International Society has entered into the "era of space utilization." This trend also applies to the space-emerging countries in Asia and other regions, where the new types of satellite uses and their demonstration tests have begun. Examples are the use of satellite images for disaster monitoring, tele-medicine, and tele-education via high-speed internet.

In contrast, in case of Japan, most of the about 230 billion yen (FY2007) earned by the space equipment industry including satellites and rockets depend on the governmental procurement. (True that the governmental procurement is needed for the space equipment industry in the U.S. and Europe, but the private-sector demands amount to approximately 40% in Europe because of the successful space policies for the market acquisition such as the EGAS policy.)[73] Finally, in Japan as well, a va-

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[72] Space-related budgets of the U.S. include those of Department of Defense (DoD) and other departments and agencies in addition to that of NASA. The space-related budget of Japan is approximately one thirteenth that of the U.S., and less than one half of that of Europe. *See Important Measures*, *supra* note 4.

[73] EGAS means European Guaranteed Access to Space, which is the policy that European Space Agency (ESA) takes responsibility for a part of the fixed expenses for manufacturing and operation relating to Ariane rockets.

riety of space-based service business, e.g., broadcasting & telecommunication, car navigation, ship, and aircraft navigation support, and weather information provision, are under development. The total amount of the entire space industry, including the space utilization industries mentioned just above, amounts to more than 7 trillion yen, or about 30 times as big as the profits of space equipment industry.[74] The problem lies in the present situation that most of the satellites and rockets used in such space utilization industries are foreign-made (19 out of 20 broadcasting and telecommunications satellites are foreign made), or the increasing profits of space utilization industries do not contribute to the development of the space equipment industry. International competitiveness in that space equipment industry should be strengthened through technology development satisfying the users' needs by the public and private cooperation. Also, space utilization industry should be further enlarged through the basic infrastructural system and other environmental development. If such conditions are realized, it is expected that such space industries will greatly contribute to the economic growth of both Japan and Asia.

Considering a drastic change the world is now going through, the space policy to decide for the future is of critical importance. While international cooperation with the U.S. and other countries is important in promoting Japan's space activities, however, it is essential that Japan retain the independent capability in exploration and use of space as well as establish its own clear and firm space strategy. By so doing, Japan's space policies will not be susceptible to the space policies of other spacefaring nations. Having recognized the importance of the national space policy, the present document has selected some of the measures upon which the whole government, as the Strategic Headquarters being a linchpin for the time being, shall place a special emphasis. Such selected important measures will be conducted aiming at developing space equipment industry by strengthening the international competitiveness, etc. and expanding the circle of space utilization industries so as to con-

[74] SPACE INDUSTRY DATABOOK 2008 (The Society of Japanese Aerospace Companies ed., Mar., 2009).

tribute to the economic growth of Japan by doubling the size of the space industry, or making a 14 - 15 trillion yen market, in 10 years.

1. Create a World Top Class Space Utilization Community: Growth Brought by Space Uses (in the Fields of Science, Public Service, Education and Business)

(1) Realize Space Development and Use to Duly Reflect Users' Needs and to Have Competitiveness

Japan put more efforts on R & D in its space development, because its main goal was to catch up with the advanced space-faring nations such as the U.S., European countries, and Russia. The importance of R & D in space development and use will never be diminished because space R & D is the center of the state-of-the-art S & T and the international competitiveness comes from such R & D. However, in the era of the full-scale space utilization, it is urgently required to transform Japan's space policy into a user-driven, demand-side one as a part of the growth strategy of Japan. "The Space Activities Promotion Committee Conference (tentative name)" comprised of the industry-academia-government experts involved with R & D, utilization and application of space shall be established. Measures 1) to 4) presented below shall be taken:

1) Create a New Market by Small Satellites (including Micro Satellites) and Small Rockets

Space Equipment Industry of Japan has been greatly dependant on the results of the R & D by the Japan Aerospace Exploration Agency (JAXA). Finally, small and medium-sized enterprises (SMEs) and universities are gradually entering into the space business as seen in examples of a small enterprise in Higashi-Osaka city and a private weather forecast company. Another trend is that the smaller but high-quality mission equipment on board spacecraft and small satellites, which is soon-to-be used for the practical operation of telecommunications and Earth observation purposes. Less expensive small satellites, made in a shorter period, have a great potential to create a new market provided that certain conditions will be met such as the standardization of satellite equipment, larger number of

manufactured equipments, and the reduction of the price of equipments as a result of the increased production.

Growing the number of new players in Japan's space business is strongly needed to vitalize spacecraft industry in Japan, which will be accomplished by accelerating the trends mentioned above.

Making an environment preferable for the SMEs and universities is essential for that purpose, and the following measures shall be taken to make Japan's space industry more competitive in addition to the relevant financial policies such as the long-term risk money supply:

(a) support the development and use of small satellites to realize an easier and less expensive access to space;

(b) develop a launch vehicle to effectively and economically launch a small satellite (small solid propellant rocket, air launch, etc.);

(c) develop telecommunications equipment to efficiently transmit the satellite-acquired data to the ground stations;

(d) standardize parts and components of spacecraft.

2) Promote to Serialize Satellites and Sensors

Manufacturing satellites for the purpose of R & D as taken by the Japanese space practices has inevitably resulted in an expensive and small number of satellites that Japan owns, for R & D aiming at a satellite with cutting-edge technology requires high-cost. Full-scale use of satellites in continuation has thus been hampered, and that situation has not satisfied the users' needs. To better promote space utilization, it is extremely important that satellite-based data and information be provided on the frequent and continuous basis and as inexpensively as possible so as to adequately respond to the users' needs in coming years when a growing number of satellites will be used.

In order to expand the use of data and information derived from Japan's satellites, a series of the identical type of, but gradually added the advanced quality, satellites and sensors shall be continuously manufactured, duly taking note of the needs of the users, instead of continuing the current Japanese practice of basically making one satellite from one specific R & D. That goal can be accomplished by pursuing "economies of scale" (international competitiveness to be strengthened by the

larger number of satellites made and, as a result, reducing the development cost per satellite) in satellite manufacturing and the "continuity" of data and information provision.

3) Construct a Real-Time Earth Observation Satellites Network

Earth observation is used in a variety area of civilian uses including public safety (e.g., disaster monitoring), land preservation and management, and enhancing agriculture and fisheries, etc., and plays an important role in information gathering for the security purposes. Thus, the expanding satellite-based Earth observation is strongly expected to be one of the most promising fields in space utilization which can contribute to the industrial growth and higher living standard of the citizenry in Japan.

The present situation lacks, however, the real-time provision of data needed for the business, because there is currently only one Earth observation satellite, "*Daichi*" (*ALOS*), operating in Japan, and it revisits the same place about twice a week (every 3 days). It is pointed out that the lack of the capability of timely data collection restricts the growth of satellite data market in Japan. High frequency of data gathering of revisiting the same spot every 3 hours is required to enter the international market. For that purpose, it is important to construct and operate Earth observation satellites network consisting of *Daichi*-series satellites, from 4 to 8 small satellites named "*ASNARO"* (tentative name), in addition to micro satellites. By acquiring such satellites, a growth of the satellite imaging market will be expected for a wide variety of purposes, centering on disaster monitoring and advancement of agriculture, fisheries, and other industries, and also for the purposes of diplomacy and security.

In the future, efforts will be made for the more frequent data collection throughout the entire Asian region by means of cooperation such as the effective use of the Public Private Partnership (PPP) with Asian space emerging countries. The ultimate goal is to construct an Earth observation satellites network using also the satellites owned by such Asian countries and create a market of near real-time satellite images provision.

4) Construct a Platform to Promote the Utilization of Satellite Data

Space utilization will grow into a big industry by making an integrated utilization platform of satellite-based data and information and by establishing an infrastructure through which not only images, data, and information, but also positioning information and communication functions could also be simultaneously distributed which are indispensable to better serve the data and information users. More specifically, an example is the setting-up of a utilization platform in which data acquired by a series of the Earth observation satellites system, consisting of "*Daichi*", "*ASNARO"* (tentative name), "*Himawari*" (*MTSAT-X*), "*Ibuki*" (*GOSAT*), etc., and information obtained from other sources, or information from the Earth-, sea- and air-based apparatus will be integrated. Such utilization platform will make it possible to provide value-added services to the users based on the positioning information of such users concerning the information which is mainly obtained by navigation satellites. For that purpose, "the Utilization Promotion Platform Council" (tentative name) will be established and the Council meetings shall be held for about a year to come to consider "the data policy," including standardization of the integrated data, a system, data distribution guideline, and the operation principles, so that an operation of that utilization platform will be able to start in FY 2012.

Note has to be taken to improve users convenience through various measures including developing a user-friendly software, because the purpose of the platform is to expand the users from the current ones as mostly experts in the space-related field to companies and private persons outside the space community. It should be always remembered that Japan shall take the initiative in establishing a borderless platform through the cooperation with not only other players in Japan but also with Asian countries which own and will own satellites.

Reference: precedents and cases conceivable for the future use the platform beneficial to the wide range of users are enumerated below:

(a) to combat disasters and piracy as well as advance and enhance profits agriculture, forestry, fisheries, and other primary sector of industry

(i) fact-finding and monitoring natural disasters such as earthquakes, volcanic activity, wind and flood disasters, and other natural disasters;

(ii) monitoring the acreage of planting in agriculture and harvest prediction based on the components, etc. (some cases are already in operation in foreign countries);

(iii) monitoring the illicit forest cutting and the precision information on forest acreage;

(iv) exploring mineral resources (in cooperation with the field of the marine resources development).

(b) new services enabled by the collaboration of the platform with global positioning satellites (GPS) information

(i) creating more precise car-navigation and man-navigation;

(ii) automated farming on large-sized farms and fields;

(iii) custom-made information provision to satisfy the users' demands making the most of the communications networks (satellites-based and Earth-based). (That will also create various new businesses based on the information acquired by such communications networks.).

(c) new services making the most of the information (such as the meteorological satellite information) through the platform

(i) meteorological data made use of by the insurance companies and retailers, which use such data for the development and purchase of new insurance products and merchandize;

(ii) detecting a school of fish by observing the surface temperature;

(iii) monitoring the emissions and absorption of greenhouse gases based on the information on the concentration of greenhouse gases.

(2) Establish the Appropriate Environment for Space Utilization including the Development of a National Legal System

1) Develop a National Legislation for the Reduction of the Risks of Private Space Activities

Up to now, Japan's space activities have been mainly conducted by the government and quasi-governmental organizations. However, new stakeholders are expected to enter into

space activities as the space industry matures. Under such circumstances, legislating national laws on space activities will be carried on for the following purposes: (i) to ensure the implementation of the national obligations provided for in the UN space treaties on outer space vis-à-vis private space activities; (ii) to reduce the risks of new players in a space industry and to contribute to the healthy development of the space industry by establishing a mechanism in which safe private-sector space activities will be conducted and an appropriate third party liability scheme on space damage will be established.

2) Make the Most of Measures to Expand the Circle of the Stakeholders

It is necessary to minimize the risks of entering into the space activities as much as possible to increase the number of new stakeholders. Already, such conditions are being established as witnessed by the increasing participation of SMEs and universities. To accelerate such trend, the measures below should be taken: (i) the inclusion of a satellite for the subject of the Act on Promotion of Private Finance Initiative (PFI Act); thus utilizing PPP in a satellite manufacturing will be possible; (ii) making the most of the industries investment and low-interest loan; (iii) introduction of appropriate regulations (such as the Space Activities Act; see, subsection 1) of this chapter); and (iv) the possible introduction of new policies and ideas such as "anchor tenancy" and "dual-use."

3) Establish the Facilities and Equipment to Promote Data Use Aiming at the World Leading-Edge Results

A utilization promotion and analysis centers for satellite data, launching sites, communication facilities, and other facilities and equipment shall be constructed and refurbished in order to promote measures enumerated in the present document so as to achieve the world leading-edge results.

2. Expand Cooperative Countries through Space Diplomacy and Promote Japan's Overseas Space Utilization: Promote Space Utilization with Space-Emerging Countries in Asia and Other Regions

(1) Promote Space Diplomacy

Space assets can contribute to the global agenda such as natural disasters and global environmental problems, beneficial not only to one country, but to the global society as a whole. In addition, as proved in some countries, where Earth-based infrastructures are underdeveloped, space-based systems play a vital role in providing, effectively and efficiently, communications and other information to their nationals. Since Japan's technology, experience, and human resources in space development can assist such countries in establishing space assets, Japan should promote such international cooperation as a diplomatic resource, or a source of "soft power" of Japan, through which Japan can occupy an honored place in the international society.

The extension of the operational period of the *International Space Station* (*ISS*), originally planned until 2015, is now being considered. At present, Japan has been intensively utilizing its module *Kibo* for the experiments of, e.g., new materials and medicines irrespective of the future of the *ISS*. *Kibo* should also be used as a diplomatic resource that can provide a precious opportunity to conduct scientific tests to non-members of the *ISS*, considering that Japan is the only Asian nation which has been participating in the *ISS* program and has a module of its own.

In addition, as referred to in 1 (1) 3) & 4), it is important to cooperate with emerging space countries in Asia and other regions in the construction of the Earth observation satellites network and in the utilization of its data and information in a mutually beneficial manner. One candidate for the cooperative program would be the setting up of an East Asia disaster monitoring satellite network through which the image of the same spot is frequently collected.

(2) Promote the Overseas Development Using Inclusive Space Systems

At present, space emerging countries tend to purchase and operate launching services, satellites, and ground facilities without developing national rockets and satellites. This implies that there is a promising international market for Japan's space business, especially in Asia where the rapid economic developments are found. Advanced spacefaring nations are energetically marketing to sell inclusively their own space asset sys-

tems, from launching services to ground stations, especially countries which have just decided to own a satellite, because the types of satellites and ground stations introduced for the first time tend to be a standard type in the recipient country for a long time to come.

Thus, to develop a space industry, it is essential not only exploiting internal demands but also to obtain a foreign contract by meeting foreign demands. That could be only realized by accumulating good records on the use of Japanese spacecraft and data and information from Japanese satellites in a domestic market in the first place. However, it will not be so easy as far as the present situation is assessed. It is true that the latest meteorological satellite *Himawari* is made by a national company as a fruit of the long-time R & D efforts, but the result is not so promising in the overseas market. While procuring and operating satellites are progressing in Asian countries, it is only one communications satellite for a Taiwan/Singapore corporation that a Japanese company got a contract to develop and manufacture; likewise, a Japanese company got only one launching service contract using the H-II A rocket from the South Korean government to launch its satellite. To create a robust industry, the precise demands of the users have to be found and to be reflected in future R & D in the promising fields of information and communications as well as Earth observation. Economies of scale of the industry shall also be pursued for the cost reduction. The consistent "Three Step Approach" mentioned below has to be flexibly taken to satisfy the true needs of a recipient country by the government and the private sector based on the social conditions in the developing countries:

(i) public relations and dissemination activities concerning space utilization to the developing countries;

(ii) technical cooperation for the necessary capacity-building required for promoting a specific space application program;

(iii) support in the provision and operation of space equipment and services to developing countries. In one word, making efforts to meet the true needs of a recipient country is important. To recognize the true demands, the following measures shall be comprehensively conducted as a package of the space business toward the possible recipient countries as already have

been taken in the other industry when entering the foreign markets was pursued:

(i) Prime Ministerial level and Ministerial level "top sales" initiatives as well as the close cooperation with the local embassies and similar authorities of Japan;

(ii) utilization of the long-term system of money supply risk by Japan Bank for International Cooperation (JBIC) and the use of the insurance program of Nippon Export and Investment Insurance (NEXI) (For instance, policy finance, trade insurance, and industry investment can be made use of);

(iii) appropriate use of Official Development Assistance (ODA) based on the request from developing countries. It has to be noted that it is essential that Japan be involved with the development of the infrastructures of a recipient country from the very first stage. In this respect, priority of the efforts should be given to the countries with which the cooperative basis has already been established through joint research programs and the agency-to-agency cooperation. Examples of such countries are Vietnam, Thailand, and Indonesia. In approaching those countries, it is necessary to strategically develop the consistent "Three Step Approach" mentioned above. For that purpose, close cooperation has to be established with not only space-related agencies, but also with the government-related agencies, both in Japan and in a potential partner country, as well as international organizations that are to engage in a specific project for international cooperation. Examples of such agencies and organizations would be the local embassies concerned, Japan International Cooperation Agency (JICA), Japan External Trade Organization (JETRO), and JBIC.

3. Strengthen State-of-the-Art Science and Technology as an Innovation Engine

(1) Obtain and/or Ensure the Fundamental Technology (including Transportation and Satellites Systems) Needed for Japan to Ensure the Autonomous Space Capability

It is indispensable to retain the autonomous capability concerning space activities, considering the current and future importance of space. More specifically, transportation systems (in-

cluding H-IIA Rocket and small-sized solid rockets) which enable access to outer space, buses as a common part of satellites, sensor technologies for the various kinds of observations shall be maintained. In order to advance such technologies to retain the autonomous capability, it is of essential importance to continuously develop and enhance the comprehensive S & T capability through the continuous development of cutting-edge technologies from the long-term standpoint, nurturing human resources and accumulating the experience and knowledge.

It should also be remembered that it is necessary to develop and maintain the ability to manufacture the strategic parts and components of satellites and rockets which can support those technologies. Because some of the parts traditionally imported from overseas are likely to be unavailable in the near future, that problems should be addressed as a priority agenda. Another urgent matter to address is to secure a second source material if only the single source material has been utilized for making space equipment. It is also important to expand the application of civil parts including the excellent technologies owned by SMEs and universities.

(2) Contribute to Green Innovation (Satellite Utilization as the "Guardian of the Environment")

"The New Growth Strategy" declares that Japan become an environment and energy power through "green innovation," a developing field on which Japan has an advantage. Spreading renewable energy is stated as one of the "green innovation" measures, and to better contribute to the international society and to be a global leader in the field of the global warming countermeasures, Japan shall verify the effect of the renewable energy in combatting global warming on a global scale.

For that purpose, obtaining global observation data is essential, but currently there are only about 280 Earth-based observation spots. Space-based systems will be able to surmount that limitation. In addition to *Ibuki* and *Daichi*, now in operation, Japan plans to launch *Global Change Observation Mission-Water* (*GCOM-W*) and *Global Change Observation Mission-Climate* (*GCOM-C*) satellites, by which concentration distribution of greenhouse gases and situations of the world forests, an absorption source of carbon dioxide, can be monitored and as-

sessed. (At present, *Ibuki* has about 56,000 observing spots and doubling the number of the spots for observation is possible in the future.) To pursue a strategy to become an environment and energy power, Japan has to be equipped with a verification tool as an indispensable means. It leads Japan to have an initiative to build an environmental observation satellites network.

(3) Space Science and Technology (Moon and Planetary Exploration as well as Space Astronomy)

Space S & T such as Moon and planetary exploration as well as space astronomy will strengthen the foundation of state-of-the-art S & T as a new frontier field. It could be an investment for the future that gives a dream and an inspiration for the future to the children who will create the world of tomorrow, that helps to nurture human resources responsible for the future S & T, and that assists Japan to be more visible in the international society.

Japan so far has been accomplishing a world top level results concerning S & T of space and will continue to seek the top level accomplishments focusing on Japan's strong points in this field. Among various subjects in the space S & T, the goal and roadmap of the lunar exploration, with which China and India are most enthusiastically involved, is currently studied at the Lunar Exploration Council established at the Strategic Headquarters. Although the conclusion remains to be decided, the direction of the discussion, at present, is as follows: since mastering the exploration technology on the gravity astral body closest to the Earth will bring a key technology to venturing into the planetary exploration within the solar system, establishing such technology should be given a priority. The Council is also of the view that long-term lunar exploration by robots and sample return from the Moon by 2020 should be a goal in order to advance science concerning the Moon, because, at present, Japan takes advantage as a leading country of the Moon exploration based on the successful outcomes of *Kaguya*, and in order to play a leading role in the international rule-making on the peaceful use of the Moon.

It is important that Japan should engage in strategic R & D for future independent human space activities. Such R & D includes, for instance, the re-entry technology which is presently