Summary and Recommendations of 23rd Session of Asia-Pacific Regional Space Agency Forum

November 15-18, 2016
Manila, the Philippines

The 23rd session of the Asia-Pacific Regional Space Agency Forum (APRSAF-23) was successfully held in Manila, the Philippines, from November 15 to 18, 2016, with the aim of enhancing regional cooperation to promote space utilization, advance space technology development and solve common agendas in the Asia-Pacific region, under the overall theme of “Building a Future through Space Science, Technology, and Innovation.” The session was attended by 576 participants from 33 countries/regions, as well as 10 international organizations.

The participants of APRSAF-23,

1. Welcoming the effective implementation of existing initiatives that address issues in the Asia-Pacific region, in response to the recommendations adopted in APRSAF-22;

2. Recognizing that information from Earth observation satellites contributes to decision-making in areas such as natural disaster mitigation, water management, and climate change measures due to the remarkable advancements in space technology;

3. Recognizing the need to further strengthen collaborative relationships with entities that use space technology, such as development aid agencies and private firms, to encourage space technology applications on the ground;

4. Welcoming engagement of an increased number of countries in R&D of space technologies, and the establishment of national space agencies, and increased opportunities for cooperation in various fields;

5. Noting with satisfaction the continuous study on solutions to address common issues in the Asia-Pacific region through the accumulation of expertise at the local, national, and regional levels, and the expansion of collaborative efforts under the APRSAF framework;

6. Supporting the series of successful acts of international cooperation among the entities participating in the APRSAF, from the development, launching, and applications of satellites, as well as the education of the youth through the process, as represented by the Philippines’ first microsatellite, DIWATA-1, developed by the Philippines, the APRSAF 23 host;

7. Recognizing the importance of space exploration activities that are currently under international consideration, and welcoming the acceleration of active discussion in the Asia-Pacific region regarding the acquisition of new knowledge from outer space and the acceleration of R&D;

8. Welcoming the summary reports from the four working groups that were
restructured in 2014 in Tokyo as: the Space Applications Working Group, the Space Technology Working Group, the Space Environment Utilization Working Group, and the Space Education Working Group; and from the three ongoing APRSAF Initiatives: Sentinel Asia, Space Applications For Environment (SAFE), and Kibo-ABC;

9. **Welcoming** the enhanced interaction among participants in the four working groups, seeking further synergy in delivering the benefit of space to the region;

10. **Recognizing** the importance of promoting existing initiatives, as well as the ongoing endeavor to and aspiration of small satellites, ISS/Kibo utilization, and space exploration;

11. **Confirmed the summary and agreed the recommendations for our future activities as follows:**

**[Space Applications Working Group (SAWG)]**

12. **Discussed** the effective applications of various space technologies to tackle natural disasters resulting from climate change as one of the highly prioritized areas in the region in the Host Country Session;

13. **Discussed** the integrated usage of Geostationary Orbit (GEO) and Low Earth Orbit (LEO) satellites, along with the Global Navigation Satellite Systems (GNSS) with the combination of ICT for the well-being of people in the Asia-Pacific region;

14. **Discussed,** in close cooperation with the Space Technology Working Group, as well as the Multi-GNSS Asia (MGA), integrated usage of Earth observing satellites, including small satellite constellations such as the Philippines’ first Earth observation microsatellite DIWATA-1, UNIFORM, Hodoyoshi, RISING-2, Axelspace satellites, and GEO satellites, as well as positioning information and ICT, and **confirmed** the progress of a study that could be utilized for ongoing APRSAF initiatives and projects, Sentinel Asia, and SAFE, in agriculture and water resource management, as well as for the GEO-LEO demonstration projects focusing on forest/peat fires, smoke and haze monitoring, and ocean environmental monitoring to support governments in the Asia-Pacific region making decisions;

15. **Noting with satisfaction** developments in the following areas:

A) **Agriculture:** the activities of the Asia-RiCE team in the Group on Earth Observations Global Agricultural Monitoring Initiative (GEOGLAM) that monitors rice crops and provides rice crop outlook information to the Food and Agriculture Organization (FAO) of the United Nations in cooperation with AFSIS (ASEAN) and encourages the technical projects of Asia-RiCE for the Asian Development Bank (ADB) in areas of agriculture such as typhoon damage assessment studies of rice production with the Philippine Statistics Authority (PSA) and integrated water resource management that makes use of the results of the SAFE prototyping project;
B) **Disaster monitoring:** the progress of space-based rainfall data called GSMaP, which provides early flood alerts and a warning system in cooperation with UNESCO, the International Flood Initiative (IFI), and the ADB;

C) **GEO-LEO integrated utilization:** the establishment of demonstration projects under consideration for forest/peat fires, smoke and haze monitoring, and ocean environmental monitoring by the integrated usage of satellite data including Himawari, MODIS, GOSAT, and GCOM-W/C with the ICT platform, by reviewing the results of the workshop organized by Japan and Australia in Tokyo in September 2016;

16. **Confirmed** the implementation of these demonstration projects as SAWG projects of the APRSAF, and **requested** increased participation by other entities in the Asia-Pacific region;

17. **Recognizing** the progress of ongoing regional programs under frameworks including ASEAN, GEOGLAM, the Economic Research Institute for ASEAN and East Asia (ERIA), and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) in order to maximize their best practices for space-based applications in the region, as well as to explore other application fields such as public health;

<**Recommendations**>

**The participants of the Space Applications Working Group:**

18. **Encourage** joint activities with development aid agencies such as the ADB and the Japan International Cooperation Agency (JICA), further cooperation with the Group on Earth Observations (GEO), such as mutual technical assistance, and further partnerships with international organizations and initiatives including UNESCAP, SERVIR-Mekong of NASA/US-AID, Mekong River Commission (MRC), ASEAN, and ERIA to promote the effective applications of space technologies, information and knowledge sharing, as well as capacity building, to solve issues in the Asia-Pacific region in a sustainable manner;

19. **Support** newly established demonstration projects for forest/peat fires, smoke and haze monitoring, and ocean environment monitoring, by the synergetic use of data from both geostationary, such as Himawari, and low Earth orbit, such as GCOM-C, satellites in combination with the Multi-GNSS and ICT platform in close coordination with regional frameworks such as ASEAN and UNESCAP;

[Sentinel Asia]

20. **Celebrated** the 10-year anniversary of Sentinel Asia initiative since its adoption in APRSAF-12 at Kitakyushu, Japan, in 2005, and confirmed 221 activations of emergency Earth observation satellite operations in the Asia-Pacific region with 102 organizations, which consisted of 87 space and disaster management agencies in 26 countries and 15 international organizations, to mitigate disasters in the Asia-Pacific region;
21. **Confirmed** the progress of ongoing successful projects called the “Success Story Projects” to apply satellite-based rainfall data known as “GSMaP” for a landslide warning system, and to validate the utility for local governments of the Philippines in practical operation – jointly developed by the Philippine Institute of Volcanology and Seismology (PHIVOLCS) and other agencies in the Philippines working with JAXA;

22. **Recognized** the progress made regarding the Steering Committee of Sentinel Asia, which aims to establish Sentinel Asia as a sustainable and autonomous framework underpinned by enhanced cooperation among space agencies, disaster management organizations, and local governments, and confirmed the review of the working group on the attempt to improve Sentinel Asia, which aims to provide Earth observation data and analyzes results to allow easy and rapid access by end users;

**<Recommendations regarding Sentinel Asia>**

**The participants of the Space Applications Working Group:**

23. **Further encourage** discussion of the Sentinel Asia Steering Committee toward sustainable and autonomous operation of Sentinel Asia;

24. **Encourage** the establishment of a system for rapid observation and dissemination of analyzed information to promote further utilization of space technology in the future;

25. **Call for** the reinforcement of disaster management by using accessible space technology and by the maximized use of Sentinel Asia by end users, including organizations responsible for disaster management;

26. **Emphasize** the importance of communicating knowledge in the Philippines regarding practical operations to mitigate and prevent natural disasters by using space technology in the Asia-Pacific region, as demonstrated in Success Story Projects;

**[SAFE (Space Applications for Environment)]**

27. **Welcome** new prototypes in relation to forest/peat fires and smoke and haze monitoring and confirmed the steady progress of the eight current prototypes;

28. **Recognized** the good progress of two follow-up activities: rice crop monitoring by the Indonesian Center for Agricultural Land Resources Research and Development (ICALRD) and Indonesia’s Ministry of Agriculture (MOA); and rice crop monitoring by the Vietnam National Satellite Center (VNSC) and the Vietnam Academy of Science and Technology (VAST), as well as subsequent efforts to realize the sustainable and practical use of their outcomes in their countries;

29. **Approved** the revised Terms of Reference for the SAFE Secretariat, which define SAFE follow-up activity mechanisms to promote practical use of SAFE results;

30. **Considered** the practical applications of SAFE results in cooperation with international organizations and development aid organizations, such as, but not
limited to, ADB and JICA;

31. Took note of best practices and solutions for social issues in SAFE stakeholder meetings and international conferences, such as the Asian Conference on Remote Sensing (ACRS), to enhance linkage between users and providers of space technology;

<Recommendations regarding SAFE>

The participants of the SAFE workshop:

32. Encourage users and providers of space technology to pursue the best practices demonstrated in SAFE accomplishments to solve social issues efficiently and effectively in the Asia-Pacific region to meet user demands;

33. Recommend the implementation of SAFE prototyping through dialogue and by communicating SAFE accomplishments in the region;

34. Invite further cooperation with development aid agencies to promote successful practical applications of space technology in the Asia-Pacific region;

[Space Technology Working Group (STWG)]

35. Noted with satisfaction that the following activities were discussed with an emphasis on small satellites, international collaborations, end-to-end space technologies, and joint efforts with other working groups:

   A) Progress and achievements of various small satellite missions that provided platforms for cost-effective scientific missions and capacity building, jointly with the Space Application Working Group, for enhanced synergy in developing space technology and its applications;

   B) Efforts and accomplishments in building test facilities and considerations in performing testing for small satellites;

   C) Low-cost and frequent launch/experiment opportunities for small satellites and examples exploiting such opportunities, jointly with the Space Environment Utilization Working Group;

   D) Various technologies and endeavors in mission instruments, space debris mitigation, and space exploration, as well as modular spacecraft;

   E) Ground station networks for small satellites and their constellations

   F) Engineering management, including quality management, project management, and system engineering for full-scale satellites and for small satellites;

   G) Current initiatives and proposed opportunities for capacity building and experiences in capacity-building efforts;
36. *Recognized* strong interest among participants in satellite development, test facilities, capacity building/training, and launch opportunities for small satellites and vigorous discussions took place in the sessions on these topics;

37. *Observed* increasing collaborations in satellite development, testing, launch, capacity building and training among various countries and universities, while pioneering efforts under international frameworks were undertaken by the private sector to meet new and unprecedented challenges;

<Recommendations>

The participants of the Space Technology Working Group:

38. *Encourage* information exchange on activities and experience of end-to-end space technologies, which include satellite and mission instrument technologies, ground systems and operations, launch and experiment opportunities, testing, engineering management, and data utilization of each country in the Asia-Pacific region, aiming to enable and sustain space activities, particularly in the development and utilization of small satellites, and to strengthen relationships that will bring more opportunities for participation and cooperation;

39. *Further encourage* information exchange on capacity building programs and training opportunities in the region;

40. *Call for* discussion and information exchange on international rules for addressing space debris toward further space development;

41. *Encourage* cooperation among space agencies, universities, research institutes, and the private sector for enhanced synergy and interaction;

42. *Affirms* the continuation of this working group in order to create an environment for new cooperation activities and promote innovation in space technology that contributes to the space industry in the region, and to continue the cooperation among working groups for topics of common interest;

[Space Environment Utilization Working Group (SEUWG)]

43. *Recognized* the usefulness of the International Space Station (ISS) Japanese Experiment Module “Kibo” Exposed Facility (EF) for space technology advancement;

44. *Welcomed* a joint session with the Space Technology Working Group on launch and experiment opportunities onboard Kibo;

45. *Noted with satisfaction* that the DIWATA-1 microsatellite, from the Philippines, was introduced as a successful case of utilizing the capacity of Kibo;

46. *Noted* an outline of CubeSat deployment and material exposure experiments using the Exposed Experiment Handrail Attachment Mechanism (ExHAM), as well as information on future missions;
47. Recognized the increasing international needs for Kibo utilization, as exemplified by the UN-JAXA collaborative mission for CubeSat deployment, named KiboCUBE;

48. Received reports from Indonesia, Malaysia, and Singapore promoting opportunities for CubeSat deployment and material exposure experiments;

49. Noted with appreciation that the 2nd Space Environment and Kibo Utilization Workshop (SEKUW), in cooperation with ANGKASA of Malaysia, was successfully held in April 2016 in Kuala Lumpur, where Malaysia proposed new themes for experiments onboard the Kibo Pressurized Module (PM) and EF;

50. Welcomed the 3rd SEKUW to be held in Thailand in 2017, as workshops in the past were effective in considering new themes for utilization and process for mutual coordination;

<Recommendations>

The participants of the Space Environment Utilization Working Group:

51. Further encourage Kibo utilization and to maximize the benefit of extended Japanese participation in the ISS operations until 2024;

52. Call for accelerated preparation for Kibo EF utilization, given the social values and positive influences created by CubeSat deployment missions, and the benefit of material exposure experiments for satellite design;

[Kibo-ABC] (Asian Beneficial Collaboration through “Kibo” Utilization)

53. Received information on an activity and outcome related to the Asian Try Zero-G 2016, which was held in September 2016, with participants from six Asian countries, namely, Indonesia, Malaysia, New Zealand, Singapore, Thailand, and Vietnam, and which was provided as a successful case and which had a positive influence on society in countries in the Asia-Pacific region;

54. Recognized that member entities in the Asia-Pacific region initiated their own missions while expanding cooperation with JAXA, based on experience in Kibo-ABC missions;

55. Considered a draft action plan for Kibo-ABC missions, which use the opportunities provided by long-duration stays of Japanese astronauts onboard the ISS, in order to make the missions effective cases of collaboration among governmental organizations, taking into account the success of the Asian Try Zero-G 2016;

<Recommendation regarding Kibo-ABC>

The participants of the Space Environment Utilization Working Group:

56. Recommend improving Kibo-ABC mission as a regional cooperation program at the governmental and national institution levels, aiming to maximize the outcome through active participation of more people, given its influence on promoting Kibo utilization, and the significance of such missions in particular for the youth in the
Asia-Pacific region;

[Space Education Working Group (SEWG)]

57. Recognized the importance of the role of space education for the development of the next generation, and applauded the success of a special session that introduced educational materials and tools for three consecutive years in order to further promote these activities at the national and the regional levels and noted two agencies introduced and demonstrated their educational materials and tools for hands-on activities using easily available and affordable items;

58. Confirmed a space education seminar for teachers and educators to be held in the Asia-Pacific region in the coming fiscal year to promote space education;

(Water Rocket Event)

59. Welcomed that the working group organized the 12th APRSAF Water Rocket Event successfully as an introductory program to raise students’ interest in space science and technology, along with global awareness, and held the event in the University of the Philippines, Los Baños, Laguna, on November 12-13, 2016;

60. Affirmed that the Water Rocket Event received a total of 54 qualified students aged 12 to 16 from 13 countries in the Asia-Pacific region, who actively interacted with each other and communicated their water rocket skills and their cultures, and applauding that first place was awarded to a student from Malaysia, second place and third place were awarded to students from Indonesia, and a special award to a student from Vietnam;

61. Noted with appreciation that teachers and educators communicated how to improve the quality of teaching and global awareness, while giving presentations and communicating their activities and efforts for space education and the methods;

(Poster Contest)

62. Affirmed that the 11th poster contest with the theme “My Dream Planet,” aimed at nurturing children’s curiosity in and creativity with respect to science by expressing their dreams about space with unlimited imagination, received submissions from 34 qualified students aged 8 to 11 from 12 countries and applauding that the Best Poster Award went to a student from Malaysia, and Special Poster Awards to students from Malaysia and Vietnam, the JAXA Award to a student from Vietnam, and the DOST Award to a student from Indonesia;

63. Noted with satisfaction that these events successfully promoted youth education in the region and would be continued next year;

(CanSat Competition)

64. Applauded the success of the CanSat Competition, which provided an opportunity for students to experience building a Can Satellite, a simulation of a real satellite integrated in the volume and shape of a standard soda can to perform imaging, telemetry, and navigation on a small scale, and which was initiated by the
Philippines, in the University of the Philippines, Los Baños, Laguna, on November 12-13, 2016;

65. Affirmed a total of 24 students aged 14 to 18 from five countries attended the competition and congratulated the winner of the 1st Can Satellite Competition, which was awarded to students from the Philippines;

66. Recognized that the CanSat Competition is effective as a new educational method for students to acquire expertise at the age at which they decide upon a career path that best suited students’ individual capabilities;

<Recommendations>

The participants of the Space Education Working Group:

67. Recommend further promoting educational activities using space as an inspiring subject to nurture children’s curiosity and creativity in science, for the human resource development of the next generation;

68. Support further providing opportunities, educational tools, and useful information to teachers and educators through seminars, events, and websites;

69. Recommend continuing to conduct the Water Rocket Event and Poster Contest as means of generating youths’ interests in space and nurturing their creativity and innovative thoughts;

70. Call for continuing to collaborate in self-initiated educational programs in Asia-Pacific countries, particularly motivating initiatives in host countries of APRSAF;

71. Request contributing to the advancement of space education at various levels by emphasizing the value of education, fostering open participation, given the growing demand on education;

[Joint Sessions of Working Groups]

72. Noted with satisfaction the three joint sessions of working groups in order to explore the potential innovation through the collaboration of professionals in different fields;

73. Recognized the following joint sessions were organized:

A) Space Applications Working Group and Space Technology Working Group;

B) Space Technology Working Group and Space Environment Utilization Working Group;

C) Space Applications Working Group and Multi-GNSS Asia;

<Recommendation>

The participants of the Joint Session of the Working Groups:

74. Encourage communication among participants in different working groups to
further stimulate innovation;

[Multi-GNSS Asia]

75. Acknowledged the latest activity report on Multi-GNSS Asia (MGA) and welcomed the active discussion on cooperation to solve the social problems using GNSS in the Asia-Pacific region;

76. Affirmed the importance of promoting regional cooperation toward establishing a user-friendly system to acquire high-accuracy positioning information in the Asia-Pacific region;

77. Recognized that the 8th MGA Conference was held in the Philippines from November 14 to 16, 2016, where active discussion was engaged in by participants and young professionals from industry and academia during the forum;

[New Cooperation Session]

78. Recalled that the New Cooperation Session was established in APRSAF-20 to identify new technologies and their applications that had not been covered by the existing working groups, and recognized a total of 11 proposals were presented by participants from governments, space agencies, academia, the private sector, and NPOs, for topics including the promotion of participation in APRSAF activities from industry; workshops for the next generation; and the Asian Asteroid Observation Network (APAON), small satellites, and ground network;

[Exhibition]

79. Welcomed the active networking and communication at the exhibitions of space agencies, private firms, and the other entities;

[Industry and Young Professional Side Event]

80. Applauded the successful new side event titled “The Innovative Space Enterprise Panel and Space Generation Leadership Mentoring” that was co-organized by JAXA, DOST-PCIEERD of the Philippines, and the Department of State of the United States, and supported by the Space Foundation and the Space Generation Advisory Council;

81. Noted the 3rd Asia-Pacific Space Generation Workshop (AP-SGW2016) was organized by the Space Generation Advisory Council (SGAC), in which students and young professionals from the Asia-Pacific region discussed approaches to promoting Asia-Pacific regional collaboration in the space sector;

82. Noted the International Workshop on Building Regional Space Policy Cooperation in Asia was co-organized by the University of Tokyo Policy Alternatives Research Institute (PARI) and the National Institute of Advanced Studies (NIAS) of India to address space policy in the Asia-Pacific region.

[Executive Committee (ExCom) Activity Report]
83. *Expressed appreciation* for the efforts by the Executive Committee (ExCom) in 2016 for making the APRSAF activities more sustainable and effective and for strengthening cooperation with various actors in a synergetic way;

84. *Welcomed* the report from ExCom that APRSAF was granted observer status and the APRSAF Secretariat participated in the 13th GEO Plenary held from November 9 to 10, 2016;

**[Country Reports]**

85. *Welcomed* reports by representatives from Australia, India, Indonesia, Japan, Malaysia, the Republic of Korea, the Russian Federation, Thailand, Singapore, Turkey, the United Arab Emirates, and Vietnam on the updates of their space activities and future prospects.

**[Special Sessions]**

(Special Session 1: “Space for Society: Technology Mitigates Natural Disasters”)

86. *Noted with appreciation* the presentations from the Department of Social Welfare and Development (DSWD) of the Philippines, the Philippine Geoscience and Remote Sensing Society (PHILGRSS), the Sentinel Asia Secretariat, the Philippine Institute of Volcanology and Seismology (PHIVOLCS), the Commonwealth Scientific and Industrial Research Organization (CSIRO) of Australia, and the Committee on Earth Observation Satellites (CEOS), and *welcomed* the vigorous discussion following the introduction of the projects using satellite images for disaster mitigation;

87. *Recognized* various applications of space technology to mitigate disasters such as typhoons, floods, tsunamis, landslides, volcano eruptions, drought, and wildfires, which are useful for local governments and disaster management authorities;

88. *Celebrated* the 10th year anniversary of Sentinel Asia and encouraged its continuous effort to further enhance the efforts of participating entities for disaster mitigation;

(Special Session 2: “Small Satellites for Innovation”)

89. *Applauded* the success of the Philippines’ DIWATA-1, which was enabled by effective cooperation in the development of a microsatellite among an administrative organ, a space agency, and universities, was effective in training talents, and underpinned space activities remarkably, and drew attention to the significance of efforts to address national and regional issues;

90. *Acknowledged* the advantage of a microsatellite, which could be developed at moderate expense yet which could be applied to bringing a variety of socioeconomic benefits;

91. *Confirmed* that the ISS was also effective in the education of youth by raising their interest in science, technology, engineering, and mathematics (STEM), as evident in the Asian-Try Zero G;
Acknowledged the introduction of the idea to deepen cooperation of the satellite constellation/standardized sensors enabled by collections of microsatellites and larger satellites, as one future possible collaboration;

[Reports on Space Cooperation in the Asia-Pacific Region]

93. Welcomed activity reports by representatives of international organizations, including the Group on Earth Observation (GEO), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), the Asian Development Bank (ADB), and the Asia-Pacific Space Cooperation Organization (APSCO);

94. Welcomed the presentations of active space cooperation in the Asia-Pacific region made by representatives from Japan, the United Kingdom, and the United States of America;

95. Welcomed the information provided by the 68th International Astronautical Congress (IAC) in Adelaide, Australia, and the Global Space Exploration Conference (GLEX) in Beijing, China, and welcomed the presentation by Japan on the 2nd International Space Exploration Forum (ISEF2) to be held in Tokyo in the period November 2017 to January 2018;

[Suggestions made in Wrap-up Session for the APRSAF Activities]

Space Leaders in Wrap-up Session:

96. Recommend arranging an opportunity to discuss space policy in the Asia-Pacific region, including space debris issues;

97. Encourage promoting new initiatives that could be organized multilaterally through the APRSAF framework following successful projects such as Sentinel Asia;

98. Suggest more involvement from the private sector regarding the future direction of GEO/LEO activities and enhanced cooperation in the field of space exploration by governments;

99. Further promote cooperation to transfer technologies to support emerging countries;

100. Invite more participants from the Pacific Islands and South American countries, as well as from industry;

101. Further promote space education initiatives to inspire the younger generation by providing opportunities to develop an interest in STEM using the unique experiments conducted onboard the ISS/Kibo;

102. Emphasize their notes of appreciation toward the contributions of the APRSAF in promoting space activities in the region,

103. Agree to continually support the expanding of networking not only among space agencies but also among all stakeholders to further enhance solutions for socioeconomic benefits in the spirit of the APRSAF as an open forum;

[APRSAF-24]
The participants of the APRSAF-23:

104. *Welcome* the proposal by the Indian Space Research Organization (ISRO) that the next session of APRSAF-24 will be held in Bangalore, India, from November 14 to 17 in 2017.

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*The participants of APRSAF-23 are satisfied with the discussions on the various topics, and reaffirmed the continuous efforts to build a future through space science, technology, and innovation.*