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The 25th Session of the Asia-Pacific Regional Space Agency Forum
Singapore, 6-9th November 2018
APRSAF-25 is also supported by the following organizations

Singapore:
- Singapore Tourism Board
- National Youth Council

Japan:
- National Space Policy Secretariat, Cabinet Office, Government of Japan
- Ministry of Foreign Affairs of Japan (MOFA)
- Ministry of Internal Affairs and Communications (MIC)
- Ministry of Agriculture, Forestry and Fisheries (MAFF)
- Ministry of Economy, Trade and Industry (METI)
- Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
- Ministry of the Environment (MOE)
- Japan Meteorological Agency (JMA)
- Japan International Cooperation Agency (JICA)
- Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

For further information including APRSAF-25 joint statement, detailed program, presentation materials and photos, please visit the APRSAF website: http://www.aprsaf.org/annual_meetings/aprsaf25/meeting_details.php
The 25th Asia-Pacific Regional Space Agency Forum (APRSAF-25) co-organized by the Singapore Space and Technology Association (SSTA), the Ministry of Education, Culture, Sports, Science and Technology - Japan (MEXT), and the Japan Aerospace Exploration Agency (JAXA) was held from November 6-9, 2018 in Singapore under the theme “Innovative Space Technology for Evolving Needs.”

The forum was attended by 384 participants from 29 countries and regions and nine international organizations, including four heads and five deputy heads of space agencies from Asia-Pacific countries as well as high-level officials from governmental institutions in charge of space policy.

Discussions covered a wide range of topics from technology to policy issues, including enhancement of partnerships with regional and international organizations by the establishment of a new SAFE initiative framework, finalization of a mission concept for co-development of an innovative small satellite, and promotion of the establishment of a policy-level community. Through the forum, participants were able to recognize the importance of further deepening cooperative relationships in the Asia-Pacific region in terms of space.

On Day 1 & 2 of the forum, all four working groups (Space Applications, Space Technology, Space Environment Utilization, Space Education) held discussions with a focus on the following important points:

1. Space Applications Working Group: Enhancement of partnerships with user organizations for sustainable initiatives
2. Space Technology Working Group: Discussions on cooperative activities to improve space technology capability in the Asia-Pacific region
3. Space Environment Utilization Working Group: Progress of space development and applications in the Asia-Pacific region through the utilization of ISS/Kibo
4. Space Education Working Group: Human resource development for the next generation

The first day of the plenary session began with a welcome address by Mr. Jonathan Hung, SSTA President, opening remarks by Ms. Naoko Okamura, APRSAF-25 General Co-chair and Deputy Director General of Research and Development Bureau, MEXT.

The keynote speech was given by the co-organizer JAXA President, Dr. Hiroshi Yamakawa.

In the first session, reports were given on APRSAF-24, APRSAF Executive Committee activities and participating countries and international organizations provided information on their recent activities and policies to promote the space industry. The sharing of issues by each country was a chance to recognize the importance of international cooperation.

Two panel discussions were held in the afternoon.

In the Heads of Space Agencies Session, the nine agency heads and deputy heads took the stage to introduce satellite development and satellite data utilization etc. to solve societal issues such as disasters and climate change under the theme "Innovative Space Technology for Solving Societal Issues". In the session, the importance of cooperation with the private sector in promoting the utilization of space technology was pointed out. Furthermore, a proposal was submitted for the creation of a platform in which satellite data, knowledge, and experiences etc. could be shared to achieve the common theme of SDGs.

In the session organized by SSTA, organizations which include government agencies, private companies and academia in Singapore participated and introduced Singapore's latest space technology research and development and its application in fields such as satellite development, communication, and positioning. Singapore shows excellence in terms of acceptability and diversity of innovation. However, the securement of a manufacturing supply chain was raised as an issue.

On the second day of the plenary session, two panel discussions were organized.

In the Space Policy Session, representatives in charge of space policy in Australia, India, Indonesia, Japan, Korea, and Vietnam introduced each country's policies and initiatives toward creating new players in space and exchanged their views on the challenges, key success factors and possibilities of international cooperation. Participants raised important points regarding space industry promotion such as proper laws and regulations, awareness of business opportunities in space, prospects for program continuity, and innovative technology acquisition.

In the Space Exploration Session, Japan (MEXT, JAXA), space agencies from India, Indonesia, and the US, an Australian private company, and Japanese academia participated in discussing opportunities for Asia-Pacific countries to be involved in space exploration and the introduction of potential collaborations between space agencies and industries/academia. MEXT presented the results of the 2nd International Space Exploration Forum (ISEF2), while JAXA outlined partnership cases with Japanese companies as efforts by the JAXA Space Exploration Innovation Hub Center.

During the session, the importance of continuing discussion regarding space exploration in the Asia-Pacific region was recognized, and participants confirmed that APRSAF will continue to highlight the importance of international space exploration.

Following the APRSAF-25 discussions, exchange of views were held on the future direction of space activities and expectations of APRSAF at a round table session by leaders in the area of space. Some opinions were expressed that it is important to establish a forum for dialogue with industries including start-ups and human resources for the next generation, and the linking of regional efforts with global ones. The results of APRSAF-25 were summarized in a Joint Statement and confirmed by the participants.

In addition to the 4-day forum, a water rocket and poster contests were held for children and students by the Space Education Working Group in a workshop organized by the WG Initiative. There were also booth exhibitions by corporations and universities making it a place where a wide range of people could participate.

The next APRSAF-26 will be held in Japan from November 26 to 29, 2019, co-organized by MEXT and JAXA.
The Space Applications Working Group (SAWG) held a successful meeting on November 6 and 7 attended by 212 participants. During the meeting, the evolution of the SAFE (Space Applications For Environment) initiative, the Sentinel Asia initiative and the progress of many other activities under SAWG such as the sustainable development goals (SDGs) & international cooperation, agriculture applications, water resource management and advanced IT technologies & partnership with commercial sectors were discussed, and progresses were confirmed.

Discussions were also held on the evolution of the SAFE framework to share common interests, knowledge, methods and technologies of space observation applications in the Asia Pacific region. In order to execute these new approaches, a SAFE Executive Board co-chaired by ISRO and JAXA with the participation of APRSAF agencies was established. The first activity of the Executive Board will be to discuss and devise a new SAFE Terms of Reference (TOR) addressing the SAFE evolution. Furthermore, during the SAFE evolution discussions, two SAFE projects “APRSAF SAFE Rice Crop Monitoring Project” and “APRSAF SAFE Agromet Project” were proposed. These projects will target the promotion of space technology use for crop area estimation, mapping, forecasting, outlook of crop growth and harvest estimation. In addition, these projects are expected to conduct cross validation and comparison of satellite based agriculture related indices and products; for example, drought indices and precipitation that are provided by participating APRSAF agencies. These projects will be used to experiment and incorporate some of the new technologies such as big data analysis and AI technology in the integration of multiple satellite data with ground observation data.

The SAWG participants were highly commended for the continuous support that was provided through Sentinel Asia to mitigate disaster impact in Asia. The participants acknowledged the latest updates of the Sentinel Asia evolution’s concept which is targeted to realize Sentinel Asia Step-3 through a “Joint Drive” contributed by member organizations of Sentinel Asia, particularly GISTDA’s mission operation tool “OPTEMIS” and NARLabs/NSPO’s support for cloud resources through the Academia Sinica Grid Computing Centre (ASGC).

The endorsement of Sentinel Asia Step-3 as well as the SAFE Evolution demonstrates the contribution of SAWG to the advancement and practical use of space-based technologies for sustainable development and climate change adaptation in the region by the coordination and collaboration of participating APRSAF agencies. Commendable progress and tangible benefits for participating agencies would further strengthen the working group and APRSAF itself in promoting space technology. Moving ahead with the SAFE Evolution, the SAFE Executive Board will soon finalize a new SAFE TOR to implement SAFE evolution with an initial focus on the Mekong region while contributing to the Sendai frame work, SDGs and Paris agreements. We look forward for your continuous support for SAWG to realize many activities we discussed during APRSAF-25, particularly SAFE Evolution and Sentinel Asia Step-3, and we would also like to welcome new space applications with advanced IT to the SAWG of APRSAF-26 in Japan.
REPORTS BY CO-CHAIRS

Space Environment Utilization Working Group (SEUWG)

CO-CHAIRS OF SEUWG
MR. CHENG HAI TAN
PROFESSIONAL MEMBER, SINGAPORE SPACE AND TECHNOLOGY ASSOCIATION (SSTA)

MR. FUMIAKI TANIGAKI
ASSOCIATE SENIOR ENGINEER,
JAPANESE EXPERIMENT MODULE UTILIZATION CENTER, JAXA

At the Space Environment Utilization Working Group (SEUWG), 75 participants from 20 countries shared and discussed their activities on November 6 and 7, 2018 in order to encourage countries in the Asia-Pacific region to utilize the space environment. Many activities regarding space environment utilization, space policies, and future plans were reported by delegates from attending countries (Indonesia, Japan, Malaysia, New Zealand, Philippines, Singapore, Thailand, Turkey and Vietnam), international organizations, and private companies. During a special session, various speakers discussed commercialization of the International Space Station (ISS) utilization services.

The Japanese Experiment Module of ISS, also known as “Kibo” is a manned space facility that provides unique research capabilities. One key capability of Kibo is small-satellite deployment that employs the JEM Small Satellite Orbital Deployer (J-SSOD). UBASYSAT from Turkey and 3 satellites (Bhutan/Malaysia/Philippines) under the BIRD-S2 project were deployed in 2018. SpooQy-1 which is being developed by the Centre for Quantum Technology of the National University of Singapore will be deployed through J-SSOD in 2019. SuryaSat from Indonesia has been selected for the third round of KiboCUBE by UNOOSA and JAXA.

Experiments by Turkey using Kibo’s Exposed Experiment Handrail Attachment Mechanism (ExHAM) are ongoing. Universiti Putra Malaysia with ANGKASA/JAXA has started a new dosimetry experiment project to be conducted on Kibo in 2019. Furthermore, Indonesia and Thailand are conducting feasibility studies of their microgravity experiments.

A SEUWG initiative, the Kibo-ABC Workshop, held on November 5, 2018, was attended by 35 participants from 14 countries. One highlight activity of the Kibo-ABC was “Asian Try Zero-G (ATZ-G) 2018” which was performed on Kibo by astronaut Norishige Kanai in February 2018. The achieved improvements were reviewed and discussed. Accomplishments of “ATZ-G 2018” are the following:

• The number of applicants were tripled from the previous ATZ-G program and international exchange on capacity building was promoted.
• The first experiment result meeting using a web conference system was held.
• Member agencies learned the process of space experiment through the preparation of launch items and procedures.
• Awards ceremonies were given by ministers and VIPs from many countries.

JAXA introduced a new Kibo-ABC program for member countries “Kibo Robot Programming Challenge” with small robots (JAXA’s Int-Ball and NASA’s Astrobot) to be performed under the Japan US Open Platform Partnership Program from 2020. Details of the competition will be discussed at Kibo-ABC meetings. JAXA has re-introduced the parabolic flight program which remains popular for project proposers to carry out individual experiments. Sponsorship has been allowed to help participating teams fund the fee-based parabolic flights.

After various fruitful discussions, the following recommendation was adopted: “We highly value human resource development in Asian countries through the Kibo-ABC programs and the start of space application research using micro satellites, and expect further progress of space development and applications in each country of our region through the utilization of ISS/Kibo.”

Space Education Working Group (SEWG)

CO-CHAIRS OF SEWG
DR. ROGEL MARI SESE,
PROGRAM LEADER, NATIONAL SPACE DEVELOPMENT PROGRAM

DR. NOZOMU SAKURABA,
DIRECTOR, SPACE EDUCATION OFFICE (SPACE EDUCATION CENTER), JAXA

The Space Education Working Group met in Singapore on November 6-7 with attendance by 62 experts from 13 countries/regions and three international organizations.

At the session on general exchange of views on space education, delegates from 7 countries made presentations on the highlights of their activities in the past year and gave a briefing on future plans. One of the main topics of this year’s meeting was Innovative Space Education Programs. Four presenters introduced their respective programs that utilize innovative techniques and materials for space education, including programming, CanSat and robotics. Seven other presentations were made on the sharing of teaching and educational materials and other Space Education Activities.

The 14th APRSAF Water Rocket Event was held in Singapore on November 3-4. The event was attended by 58 students, 22 educators and 19 observers from 12 countries. A student from Sri Lanka won first place. An educator workshop was held during the event and 12 presentations were made to share each countries’ continued efforts to promote STEM education and human resource development. This was the first time that the event was supported by industry sponsors, namely Yakult Honsha Co., Ltd., Yakult (Singapore) Pte. Ltd., Young Astronauts Club – Japan (YAC), and Northrop Grumman.

The 13th APRSAF Poster Contest was held under the theme “My Home in Space”. There were 34 selected artworks submitted from 12 countries. All posters were displayed during APRSAF-25 at the same venue. The Best Poster selected by vote was awarded to a student from China. The Working Group discussed and agreed that “See you in Space!” will be the theme for next year’s poster contest.

The SEWG adopted the following recommendations:
1. To further promote educational activities, using space as a method that will be beneficial for the human resource development of the next generation. In order to do so, to continuously provide opportunities, tools and information through seminars, hands-on events, websites, joint space education programs, and sharing best practices and methods throughout the region;

2. To continue to conduct the Water Rocket Event, Poster Contest and other self-initiated educational programs in the Asia-Pacific countries, as means of generating young people’s interests in space and nurturing their creativity and innovative thoughts, and to encourage strategic partnerships with private industries and other organizations.

3. To strengthen, enhance and promote space education activities across all educational levels using conventional and innovative programs, and to ensure continuous engagement of students in preparation for their space-related careers.
JOINT STATEMENT OF THE 25TH SESSION OF THE ASIA-PACIFIC REGIONAL SPACE AGENCY FORUM

NOVEMBER 6-9, 2018, SINGAPORE

The 25th annual session of the Asia-Pacific Regional Space Agency Forum (APRSAF-25) was successfully held in Singapore from November 6 to 9, 2018, with the theme “Innovative Space Technology for Evolving Needs.”

Since its establishment in 1993, APRSAF has been serving as an open forum for those interested in cooperation in the field of space activities in the Asia-Pacific region. The forum has become the platform for space cooperation in the Asia-Pacific region with participation not only of space agencies but also governmental bodies, international organizations, development aid agencies, research institutes, and universities. APRSAF celebrates its 25th anniversary this year and the activities of the various Working Groups (WGs) and initiatives throughout the years have resulted in notable regional cooperation, and have made APRSAF into a sustainable forum.

The participants recognized and shared the following key points during APRSAF-25:

1. Innovative Space Technology for Evolving Needs
   - Due to advancements in economic and societal system, our needs for seeking a peaceful, secure, and affluent society are also evolving. As a consequence, outer space is also becoming congested through the increase in space activities, resulting to space debris. In order to respond to these new needs and emerging issues, it is important for space agencies to continue to face the challenge of developing innovative future space technology and to make efforts for advancing space technology.
   - To effectively utilize innovative space technologies for solving societal issues in the Asia-Pacific region, social implementation of high level solutions using big data analytics using earth observation data, while AI and IoT will be the key areas for solutions.

2. Improvement of space technology capability in the Asia-Pacific region
   - We welcome the progress of the space agencies who have interest in the mission concept of joint development of innovative small and cube satellites, which was recommended in APRSAF-24, for providing new solutions to social issues. We expect the participating agencies to promote and deepen the discussions on the establishment of the necessary framework to realize this joint development of satellites by accumulating high-level technology among space agencies.
   - We have been sharing the various opportunities of space education programs and capacity building conducted in the countries of Asia-Pacific region. We highly recognize the new efforts to organize the space science and technology workshops which provide advanced and technical lectures for higher education with the aim of improving the space capability of our countries. We acknowledge the importance of regional cooperation for the continuation and enhancement of such activities to meet the demands of our region.
   - We highly value human resource development in the Asia-Pacific region through the Kibo-ABC Program and the start of space application research using small satellites, and expect further progress of space development and applications in each country of our region through the utilization of ISS/Kibo.

3. Cooperation with user organizations toward social implementation
   - We recognize the importance to further enhance APRSAF initiatives such as Sentinel Asia and SAFE and to further strengthen the cooperation with user organizations, development aid agencies, and international organizations for solving societal issues such as natural disaster, climate change, food security, water resource management and urban issues, which are listed in the Sendai Framework, Paris Agreement as well as SDGs of the United Nations.
   - We welcome the advancement of SAFE activities into a new framework based on the cooperative relationships between and among participating space agencies, as well as, regional and international organizations such as the ASEAN. We expect to promote the new SAFE projects such as crop forecast and harvest by using space technology.
   - We acknowledge that Sentinel Asia has established a long-term strategic plan and is being jointly implemented by participating members. This will effectively support the disaster management activities of the participating members and lead to making Sentinel Asia a societal infrastructure.
   - We welcome the newly arriving satellite positioning system, Michibiki, which covers the Asia-Pacific region. We acknowledge the contribution of satellite positioning systems such as Michibiki, for applications in the fields of land development, agriculture and transportation management, and expect further promotion to other applications.

4. Creation of space policy community in the Asia-Pacific region.
   - We acknowledge that each country is promoting its own space policies for industrial development at different stages and with diverse approaches. We expect to promote the participation of the new players into the space industry through development of space policies for promoting the launch of enterprise and programs such as space business idea contest, including “S-Booster in Asia”, and strengthening partnership with the organizations which support launching enterprises.
   - We welcome the progress in organizing periodic gatherings among officials in charge of space policy of the countries in Asia-Pacific region, by taking opportunities such as space policy side event during UN/COPUOS or discussions during ASEAN-SCOSA. We believe that the exchange of views on space policy during such opportunities will not only deepen the mutual understanding of policy issues in each country, but also lead to create cooperative opportunities for solving the common societal issues together.

5. Promotion of participation in future space exploration activities
   - As described in the Tokyo Principles adopted at the second International Space Exploration Forum (ISEF2), space exploration brings benefits to humanity on Earth through the development and application of advanced technologies, creation of global partnerships, stimulation of economic expansion and promotion of new business opportunities.
   - We acknowledge that there are various opportunities of participation in space exploration, including emerging countries and non-space sectors in the Asia-Pacific region. We also recognize that the evolving role of space agencies and the new cooperation arising among existing and emerging players in space exploration. For the expansion of space exploration, we recognize the importance of continuing utilization of the SS, while satellite development to demonstrate technologies in LEO are to be pursued for lunar exploration and beyond, applying ground technology to space exploration and contribution of space exploration technologies back to terrestrial applications, promoting cooperation between space agencies and new players, and inspiring young generations.

   Based on the increasing momentum brought by the ISEF2, we expect to continue our discussion regarding space exploration among various players in the Asia-Pacific region. APRSAF will continue to highlight the importance of international space exploration.

6. Expectation for future APRSAF discussion
   - The participants welcomed following suggestions:
     - To have dialogue among industries including start-ups and discuss on the role of space agencies for tackling common issues
     - To have a dialogue with young generations and new incubations with innovative ideas
     - To provide more linkage between regional and global efforts including agendas discussed at UN/COPUOS
     - To discuss how satellite data could be shared to achieve regional goal
     - To have a focused discussion on disaster risk reduction (disaster forecast models), climate studies and, space science

APRSAF-26 is scheduled to be held in Japan in 2019.
APRSAF-25 RELATED EVENTS

Water Rocket Events
APRSAF-25 Water Rocket Event was held from 2nd to 4th November 2018 in Singapore. 58 Students at age of 12 to 16 from 12 countries in Asia-Pacific region participated in the event, enjoying international communication as well as the water rocket competition.

The 5th Asia-Pacific Space Generation Workshop (APSGW 2018)
The 5th Asia-Pacific Space Generation Workshop (AP-SGW 2018) was held in a two and a half-day workshop from November 3rd to 5th at Boeing Flight Services, Changi – Singapore. Students and young professionals (aged 18-35 years) discussed pertinent issues in the Asia-Pacific region. The Working Group topics focused on the rise of small satellites, how internet of things will shape the Asia-Pacific space industry, what UNISPACE+50 means to the region, as well as cover gender diversity in Asia-Pacific space.

The 4th meeting on joint development of innovative small & cube satellites
The 4th meeting on joint development of innovative small and cube satellites organized by the APRSAF Secretariat was successfully held on November 6, 2018 during the APRSAF-25. Balanced discussion hearing a broad range of views was held during the meeting in order to prepare the mission concept. 35 participants from 22 organizations including space agencies and universities attended the meeting.

Poster Contest
The thirteenth APRSAF Poster Contest was held in conjunction with APRSAF-25. Schoolchildren aged between 8 and 11 years old prepared their poster under the theme “My Home in Space”. Among 34 posters from 12 countries, a total of four posters were awarded prizes, including one Best APRSAF Poster Award. For details and a Poster Contest Calendar showing all 34 posters, please visit the link below: http://www.aprsaf.org/working_groups/se/

APRSAF Exhibition
16 exhibition booths in total were displayed during APRSAF-25 period:
Greetings from Japan! APRSAF-26 will be held in Nagoya, Japan from November 26 to 29, 2019. Nagoya is the prefectural capital city of Aichi prefecture which is one of the aerospace industrial hubs in Japan where there are many space development related companies.

I am pleased to welcome you to Japan and to confirm our great cooperative relationships in the field of space with a central focus on the Asia-Pacific region.

APRSAF has developed into the biggest space forum in the Asia-Pacific region. Looking back upon the history of APRSAF, the first forum was held in Tokyo in 1993 and was continually hosted by different countries with the number of participants and participating countries increasing with each round. While APRSAF is an open and flexible platform, it is my belief that the active discussions by the participants led to the formation of a common understanding. Initiatives such as Sentinel Asia and Kibo-ABC, and concrete projects such as joint development of innovative small and Cube satellites have been fostered since the conception stage because of the independent and active actions contributed by participating countries.

The development of space technology has been remarkable and it has become an existence that closely contributes and improves our daily lives. It is expected that a wide range of players will participate in the field of space more than ever. In the beginning, participants were mainly space agencies but has now grown to also include governmental bodies, academia, industries and participation from various backgrounds. Accordingly to these changes, new points of view have been added such as the establishment of a policy session and exploration session. Regarding international space exploration in particular, the ISEF2 joint statement refers that “future space exploration will consist of numerous activities that, large or small, and regardless of destinations, can be strengthened through international collaboration and can be synergized based on shared visions and goals to enhance effective and efficient space exploration activities”. The way we are involved in future space exploration will be more diverse than ever. As the host country of both ISEF2 and APRSAF-26, Japan welcomes the participation of various players in the space field, and hopes that APRSAF can be a place to connect players and to cause a synergetic and far-reaching effect for the future.

Though space technology development expands possibilities, the number of issues has also increased such as space debris. Thus, we must face both the possibilities and challenges in the new environment. Let us continue to deepen understanding through the exchange of opinions.

It is valuable that we have relationships in which we can actively discuss regional topics and issues that this time and era present us. At the next APRSAF, let us continue to strengthen the foundation for these discussions based on past achievements, welcome new participants and ideas, and make efforts for further development of space activities in the Asia-Pacific region. I look forward to seeing all of you in Nagoya!