




Japan Aerospace Exploration Agency

JAXA SPACE EDUCATION CENTER

Report on Its Activities in 2016 — 2017




REPORT OF JAXA SPACE EDUCATION CENTER ON ITS ACTIVITIES IN 2016 AND 2017

(Information as of March 2017)

TABLE OF CONTENTS

FROM THE DIRECTOR

"Ten" is a milestone. The Space Education Center marked a decade of existence in 2014, and the following year, Kimiya Yui became the 10th Japanese astronaut in space. But most achievements in life do not fall on milestones. Achievement is a process of learning, and learning is a continuous multifaceted process. Learning is what happens between milestones. Learning to know. Learning to do. And eventually, learning to simply be, and to live together as neighbors, as a species.[1]

For JAXA, 2016 was less about celebrating milestones and more about learning. We continued building on what came before, sometimes with encouraging results, other times less so. The ISS Expedition 48–49 was certainly one of the former. As one of two flight engineers on the 4-month mission, astronaut Takuya Onishi worked with a colleague from NASA to capture the Cygnus cargo vessel. He also conducted experiments inside the "Kibo" module, among them experiments submitted from Indonesia, Japan, Malaysia, New Zealand, Singapore, Thailand, Vietnam, and more.

We also built towards what is to come. JAXA's second Epsilon rocket was launched in December 2016. The payload was the satellite "Arase," and its mission is to study the enormous rings of energetic particles that surround our planet, known as Van Allen belts. The level of charged particles fluctuates dramatically according to solar activity, and this "weather" poses a challenge to space flight. By working to unlock the many mysteries of the Van Allen belts, "Arase" is helping shape the future of space travel.

The Space Education Center turned 12 in 2016. In human years, this is a milestone indeed—childhood's end. For a dozen years, the Center has worked in schools and homes, in community and international settings. We have learned a great deal, and are taking a fresh look at our activities. Like the unseen particles in the Van Allen belts, space education should be energetic. As JAXA Space Education Center continues to form new partnerships both at home and abroad, we remind ourselves anew that understanding is not a static process.

NOZOMU SAKURABA, Ph.D.
Director, Space Education Center

[1] I refer here, of course, to the Four Pillars of Education famously laid out in the Delors Report of 1996. You can find the original remarkable document in its entirety here: http://unesdoc.unesco.org/images/0010/001095/109590eo.pdf

Staff of JAXA Space Education Center

CLASSROOM PARTNERSHIP AT SHIMOSUWA YASHIRO MIDDLE SCHOOL

A public school known for its progressive approach rooted in the community, Yashiro worked with the Space Education Center to study cutting-edge subjects across grade levels. Through the science of energy efficiency, space elevators, and ecologically-responsible cars, the students were challenged to think about what it takes to have, pursue, and operationalize good ideas.

THE YEAR IN REVIEW

VIDEO REPORT OF THE SEC'S ACTIVITIES

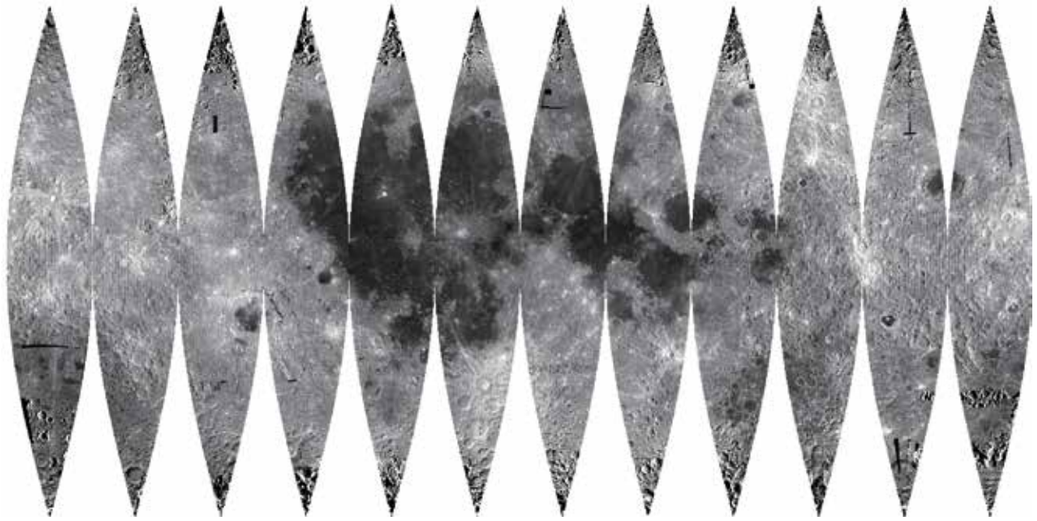
Can we really sum up 365 days in **6 minutes 27 seconds**?
Watch the intrepid staff of the Space Education Center give it their best shot!
(https://youtu.be/OrwHhaOPeEE)
[Japanese Only]

APRSAF INTERNATIONAL SPACE CAMP

Fifty-five adventurous young souls from Bangladesh, Cambodia, China, South Korea, Thailand, Vietnam, and Japan descended on Daejeon, South Korea for 5 days. Organized by the Korea Aerospace Research Institute (KARI) and backed by both the Ministries of Education and Science, the 2016 space Camp was also a wonderful opportunity for the Space Education Center to learn from our neighbor and colleague.

SELENE LEARNING MATERIALS RELEASED

Developed from data collected by the lunar orbiter SELENE (Kaguya), these classroom aids such as 3D printing data, video, and papercraft kits are freely available online.
(http://edu.jaxa.jp/kaguya/) [Japanese only]



AUGUST

YOUR OWN SPACE MISSION (aka KIMISSION)

Your mission, should you choose to accept is, is...? 24 high school students descended on JAXA's Sagamihara Campus for 5 days of mission planning under the tutelage of 45 Institute of Space and Astronautical Science (ISAS) graduate students.

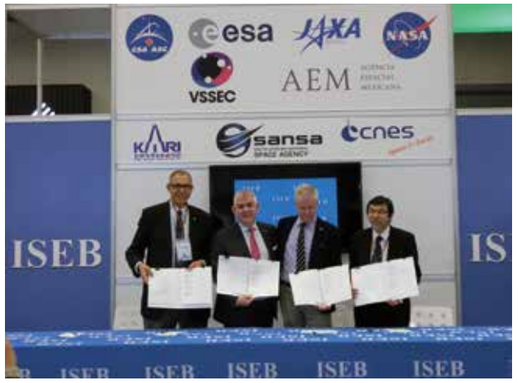
APRSAF SPACE EDUCATION SEMINAR FOR EDUCATORS

The Malaysian National Space Agency (ANGKASA) and the Ministry of Science, Technology and Innovation (MOSTI), in partnership with JAXA Space Education Center, held a three-day seminar in Sarawak. A total of sixty primary and secondary school science teachers took part in hands-on activities and learned from talks given by JAXA and ANGKASA representatives.

AEROSPACE SCHOOLS

Taiki Aerospace Research Field, Kakuda Space Center, Tsukuba Space Center, and Chofu Aerospace Center host 78 high school students for multi-day summer learning experience. The focus? "The Front Lines of Space Science Mission" (Taiki), "Rocket Engine 101" (Kakuda), "Earth Observation for Social Betterment" (Tsukuba), and "Technology for Next-Gen Aircrafts" (Chofu).

SEPTEMBER



ISEB @ IAC2016

Sponsored students from 7 member agencies gathered in Guadalajara, Mexico to present, connect, and help mentor a new generation of space scholars. After a week full of conference sessions, presentations, and activities, JAXA formally took over as the Chair of ISEB 2017, to be hosted by Adelaide, Australia.

OCTOBER

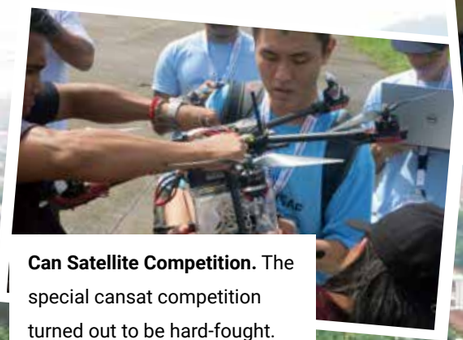
SCIENCE EXPERIMENTS IN SPACE

The Center partnered with JAXA astronaut Takuya Onishi during his stay on the International Space Station. The video footage of Onishi's experiments into the effects of microgravity is slated to be released as learning material for high school students.

PARTNERSHIPS IN KAKAMIGAHARA CITY AND KOMAKI CITY

As a major aerospace industrial hub, respectively, people in the cities of Kakamigahara and Komaki are both historically familiar with aviation and space. Considering the cities' high-flying heritage and civic spirit, both community revitalization and investment in the next generation should be well within reach of these partnerships.

Water Rocket Event. Despite worries about the weather, it was a perfect day at the University of the Philippines, Los Baños.



Can Satellite Competition. The special cansat competition turned out to be hard-fought.

Teacher Program. The teacher program provided the opportunity to share the efforts towards space education with the colleagues from across the Asia Pacific Region.

Poster Contest. Ultimately, 34 interpretations of “My Dream Planet” by children from 12 countries were selected for the 2017 APRSAF calendar. The following young artists were chosen for additional honors.

SEWG Annual Meeting. During the SEWG annual meeting, 25 presentations were given, including nine country updates and 10 topics regarding space education.

APRSAF-23

DECEMBER-JANUARY 2017

"SPACE SCIENCE REPORTER FOR A DAY" PROGRAM

Three high school students went where few students have gone before—to Tanegashima, an island with a storied past and home to largest of JAXA's launch facilities. The culmination of their 3-day trip was the blast-off of a H-IIA rocket, which they covered live for their schools in Kamimizo-Minami, Unomori, and Hokuso, via video linkup.

"POSTER CONTEST CALENDAR FOR 2017" ISSUE

The drawings and paintings presented in this calendar were selected from entries from children ages 8 to 11 for the APRSAF-23 Poster Contest, held under the theme, "My Dream Planet".

<URL to download>
http://www.aprsaf.org/interviews_features/features_2016/feature_127.php

"SORA NO TOBIRA," WINTER 2016/2017 ISSUE

The 38th issue introduces children to two engines designed and developed in Japan: the LE-7A used in H-IIA and IIB, and the LE-9, the engine that powers the new H-III rocket.

LOCALIZATION OF LEARNING MATERIAL

Communication is critical to astronauts at work, so we launched a new learning material around this idea. Users loved its flexibility around participant number and venue, and the ease of incorporating instructors' ideas into the activity. As a result, an English prototype was created-and wowed middle schoolers, who suddenly saw the point in studying for their English class!

FEBURARY-MARCH 2017

24TH ANNUAL SPACE EXPLORATION EDUCATORS CONFERENCE (SEEC)

The selected two Japanese teachers spend 3 days at Space Center Houston, USA, learning and teaching alongside educators from around the world.

SPACE EDUCATION SYMPOSIUM

What has space education given us? What is it doing for us right now? And what benefits will it bring in the future? Those were the big questions addressed at a two-day seminar held by the Space Education Center over a weekend. Comprising groupwork, lectures, and on-the-ground reports from people active in space education, the program brought together education professionals, stakeholders, and members of the public, turning interest into opportunity.

WHO WE ARE

Space is a unique source of interest and inspiration, and gives flight to the imagination. The Space Education Center of Japan Aerospace Exploration Agency (JAXA) works with children and young people to nurture their inherent curiosity about the natural world, the universe, and all living things. Over the last 12 years, we have increased and expanded our program, bringing space-related topics and materials into schools and homes across the nation and around the Asia-Pacific region, and connecting Japanese STEM students to future collaborators and colleagues in Asia-Pacific, Europe, the Americas, and Africa. Our mission is to stimulate interest in not only science and technology, but in human behavior.

THE HISTORY OF THE SPACE EDUCATION CENTER

Space education has long been a part of the Japanese space program's mission. The early years were marked by the Public Affairs Department's efforts to increase general awareness of space and gain the public's understanding of how society could benefit from space-related activities.

One team involved in this outreach specialized in working with children and young people, using compelling, space-related educational materials to connect science to everyday life; the hope was that a greater interest in science would positively influence their intellectual growth. With the creation of JAXA in October 2003, it was increasingly recognized that education is fundamentally distinct from public relations. Combined with the foundation already laid by the student outreach team, this led to the establishment of the Space Education Center on May 1, 2005, by executive order of the then-President of JAXA. Since then, the Center has been a vibrant presence on JAXA's Sagamihara Campus.

OUR GOALS & PRINCIPLES

Children love the natural world, and look at life with wonder. In particular, the mysteries of space tug on their curiosity, fire the imagination. Space exploration calls to their spirit of adventure. But alongside the spirit of the seeker and the adventurer is another spirit, just as important. Without hands-on perseverance to match the adventurousness, there can be no reaching what you seek. This is the spirit of the builder—the maker.

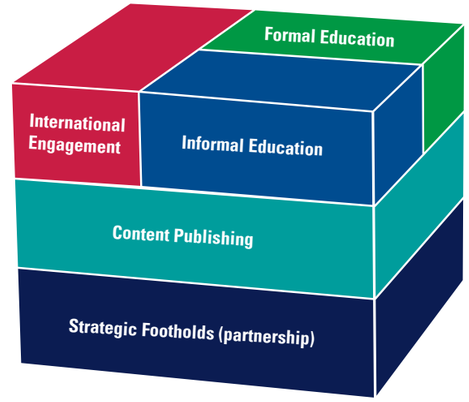
If only children can encounter all three of these inner selves, they will grow their own knowledge and experience, driven by the joy of learning.

This is where JAXA's Space Education Center comes in. With space as our playing field and the wonders of life as our guide, we aim to use the wealth of knowledge and technology gained from space development to nurture young minds.

The seeker, the adventurer, the maker. By learning "in space" rather than learning "about space," children develop the capacity to learn continuously. That, we believe, is the key to raising people capable of creating knowledge and techniques on their own, and all their lives.

WHAT WE DO

The Space Education Center consists of teams that support educators, serve community learners, structure international actions, and share information with the public in a meaningful way.



FORMAL EDUCATION: PROFESSIONAL DEVELOPMENT & CLASSROOM PARTNERSHIP

Space is a great fit for classrooms, and not just in STEM courses. The possibilities for application are many: social studies, language learning, art, ethics, even life skills. From lesson plans to learning materials, the Space Education Center is there to support teachers.

Teaching is a demanding profession, and flexibility is the cornerstone of our **educator professional development programs**. We work with education boards and other groups to organize lectures and workshops targeting educators for all age levels throughout their career: preschool and kindergarten, primary, middle, and high schools, education majors and seasoned teachers. We also work with individual educators on an advisory basis.

<Number of teacher training sessions and participants>

	FY2005		FY2013		FY2014		FY2015		FY2016	
	Sessions	Students/ Teachers	Sessions	Students/ Teachers	Sessions	Students/ Teachers	Sessions	Students/ Teachers	Sessions	Students/ Teachers
For candidates for teachers	Nil	3	3	239	1	200	4	350	2	265
For teachers	1	39	29	1,897	28	1,200	35	1,929	34	1,550
TOTAL	1	42	32	2,136	29	1,200	39	2,279	36	1,815

NOTE: Japanese Fiscal year starts from April 1 to the following March 31.

By bringing space into the classroom, we change perspectives and encourage observation. The **classroom partnership** program consists of thematic lesson activity, information about and rental of space-related learning materials, and lesson planning advice. In one example, students in a life skills class conducted a taste test of two instant curries, one for astronauts and one from the supermarket, discussing the noticed differences in ingredients and properties to build their analytical thinking skills.

<Numbers of schools supported by the Center and the students who have benefited from the program >

	FY2005		FY2013		FY2014		FY2015		FY2016	
	Schools	Students	Schools	Students	Schools	Students	Schools	Students	Schools	Students
Kindergarten	0	2	3	146	5	264	3	207	4	284
Elementary Schools	1	14	95	12,947	69	7,180	74	6,669	69	5,400
Junior High Schools	5	14	36	6,287	25	4,663	24	5,714	31	6,549
High Schools	14	20	28	3,185	18	1,273	17	1,450	13	1,084
TOTAL	20	50	162	22,565	117	13,380	118	14,040	117	13,317

INFORMAL EDUCATION: EXTRACURRICULAR AND HOME ACTIVITIES

Weekends and holidays offer a wonderful opportunity for an informal space education. The Space Education Center has a raft of cohort-specific programs that children of all ages, their parents and even grandparents can participate in.

For the youngest learners, **"Space School for Families"** represents an opportunity to not only gain early exposure to science but a stronger family unit and more close-knit local community. Co-organized with the NPO Kodomo Uchu Mirai Association (KU-MA), the program consists of hands-on group sessions with "homework" in between and a final presentation by each family; to date, the Center has developed 104 homework texts in 12 subject areas.

<Number of Courses and Participants of Space Schools for Families>

	FY2012	FY2013	FY2014	FY2015	FY2016
Courses	42	49	51	53	54
Participants	4438	4768	4987	4799	4701

The **"Cosmic College"** is an experiential learning program for primary and middle schoolers, designed to be facilitated by leaders in the community. Lasting just half a day, these workshops use engaging hands-on activity to encourage young learners to think about familiar phenomena through the lens of science. One popular "Cosmic College" course guides children through the basics of aerodynamics, then has them construct, test, and make adjustments to paper hovercrafts. The Space Education Center also holds seminars to train community leaders to facilitate "Cosmic College" courses.

As children grow, they need more--more independence, more interaction, and more immersion. In JAXA's **"Aerospace School"** program, high schoolers live and work as a team for several days, in space center facilities across Japan. The program brings students into direct contact with working members of the Japanese space program, state-of-the-art research facilities and spacecrafts, and authentic experiences that emerge from working with other teens that share their passion.

<Number of events and participants of Cosmic Colleges and Aerospace Schools>

	FY2012		FY2013		FY2014		FY2015		FY2016	
	Events	Participants	Events	Participants	Events	Participants	Events	Participants	Events	Participants
Cosmic College	246	18,550	260	19,163	280	18,598	328	18,184	405	26,948
Aerospace School	7	203	8	144	7	104	12	222	17	103
TOTAL	253	18,635	268	19,307	287	18,702	340	18,406	412	26,051

The **"Space Education Leaders (SEL) Seminar"** is for any individual interested in carrying out space education activities with or without experience in informal education activities. The program aims to transfer to the participants basic information and the principles of Space Education.

<Number of Courses and Participants of Space Schools for Families>

FY2012	FY2013	FY2014	FY2015	FY2016
1005	972	645	583	636

"Your Own Space Mission" (aka "Kimission") goes further with the idea of youth autonomy. Adults take the backseat in while high school students team up and plan a space mission from the ground up under the tutelage of graduate students from the Institute of Space and Astronautical Science. For 5 days, the young mission planners live in visitors' accommodations on JAXA's Sagamihara campus, exploring their own independence along with space. The mission is presented to an audience of astronautical scientists on the last day, and teams have the option of further developing their mission for a poster presentation at the annual meeting of the Astronomical Society of Japan.

INTERNATIONAL ENGAGEMENT: INVESTMENT IN A SHARED FUTURE

The dream of space is a dream of the world united. The Space Education Center supports and creates opportunities for students and educators to expand their horizon through intellectual and social interaction that cross borders. JAXA is a founding member of the International Space Education Board and co-organizer of the Asia-Pacific Regional Space Agency Forum.

The **International Space Education Board (ISEB)** brings together 8 space agencies (AEM, CSA, CNES, ESA, JAXA, KARI, NASA and SANSA) and 1 space education entity (VSSEC). Every year, one of the 4 founding members of ISEB organizes the "International Student Zone" at the International Astronautical Congress, the world's largest gathering of space professionals. The ISZ serves as a vital hub for university and graduate school students sponsored by each of the member agencies, who attend IAC sessions, present their research, network with space professionals and fellow students, and conduct outreach for local students.

Now the largest space conference in the Asia-Pacific, **the Asia-Pacific Regional Space Agency Forum (APRSAF)** draws attendees from public, private, academic, and non-governmental sectors from over 40 countries and regions. It has also become a magnet for aspiring space engineers and artists, and the educators that inspire and support them. The Space Education Center assists in organizing the water rocket event and the themed poster contest. The annual pair of events gives primary, middle, and high schooler students a rare opportunity to shine on the international stage.

CONTENT PUBLISHING:
INFORMATION AND LEARNING MATERIALS IN PRINT AND ONLINE

Curating information about space, science, and our own activities is also a major part of the Space Education Center's mission. We use a variety of media to deliver knowledge and learning to people of all ages.

A quarterly print magazine geared to children, ***Sora no Tobira (Portal to Space)*** is also available in PDF format. Young readers can find news about space development, interviews with astronauts and technologists, and information about space education activity they can participate in, across Japan. Copies are available in school libraries, science museums, and online. (http://edu.jaxa.jp/soratobi)

Space is only a click away with **Space Education TV**, our online video channel packed with original content for young people, space education professionals, and the general public. Our programming requirements are simple: the content should be interesting, and it should be useful. Check out the eclectic collection, from satellite launch and expert speaker sessions to space-related experiments and coverage of educational events like the "Space Science Reporter for a Day" program. (http://fanfun.jaxa.jp/jaxatv/yac)

The Space Education Center shares information about its events on **Twitter**. It's also a great way to stay in touch after one of our many international outreach. Heart us, retweet us, and share your own pictures of events! (@spaceedu_info)

Developing learning materials is an essential support for space education. Utilizing images and video linked to JAXA's R&D achievements, we develop material and tools that work with a variety of space education programs, in collaboration with outside experts. The results are released online for anyone engaged in space education to use in their own learning activity.

The Center's series of **learning materials designed for the classroom** are linked to subjects mandated by the official curriculum, for easy implementation in classes such as social studies, science, even ethics.

The **workbooks for "Space School for Families"** are designed to be provided in sets (of 30 over one year) for home learning. Some 104 workbooks have been created to date, and we have been seeing expanding use of individual workbooks, and beyond the setting of family homes at that. Of these workbooks, we have localized 40 of them into English to date.

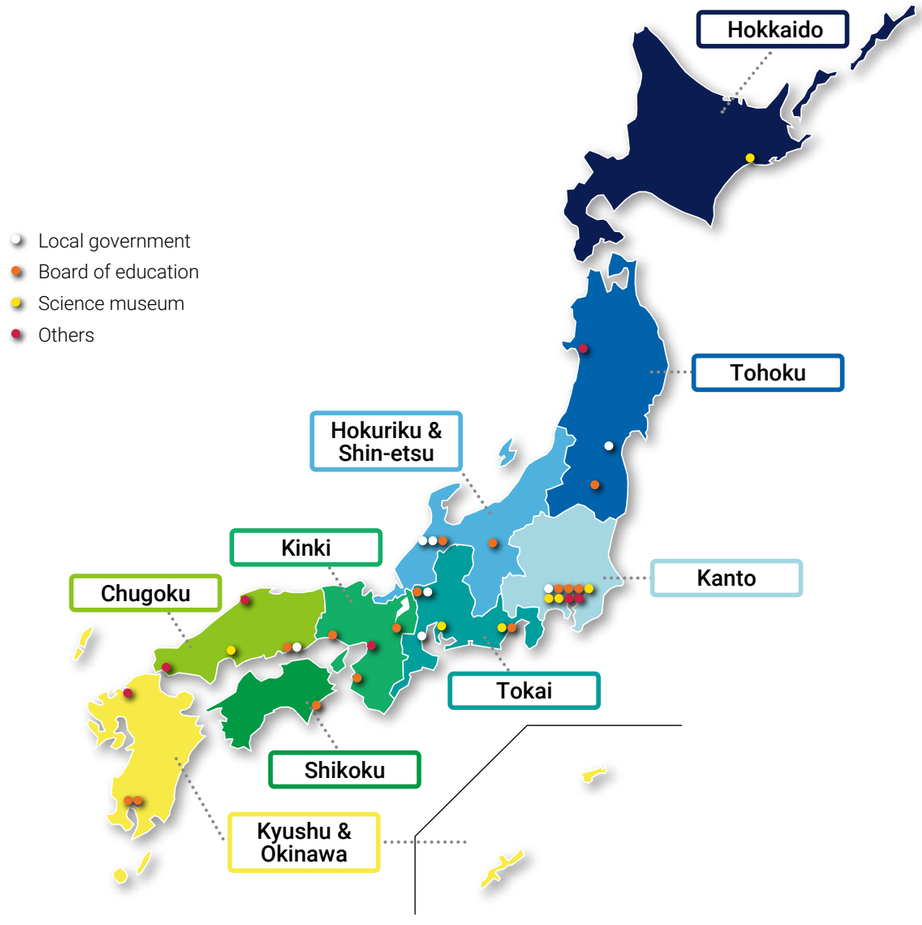
On a related note, our learning materials extend to recordings of simple **experiments conducted in the Kibo module** by JAXA astronauts during their multi-month stay on the International Space Station. The contrast with earthbound iterations of the same experiment brings home the mystery and allure of space.

ESTABLISHING STRATEGIC FOOTHOLDS

As part of the executive directions set by the management of JAXA, the Space Education Center has been tasked since the fiscal year 2008 to establish strategic footholds in all nine regional blocs of Japan, i.e. Hokkaido, Tohoku, Kanto, Hokuriku and Shinetsu, Tokai, Kinki, Chugoku, Shikoku, Kyushu and Okinawa, by March 2012. This is to ensure that the kind of classroom support provided by the Center continues to be expanded and further enhanced in an effective manner to benefit each of the primary and secondary schools without requiring direct and intense support by the Center itself. While it does not need to be a school, and it could well be a science museum or a board of education in the local community, a strategic foothold should endorse the goals and principles of the Center and should actively pursue the development of space education materials and teaching methods to be introduced to schools within the block under its responsibility. The Center was also tasked to ensure the steady increase in the number of schools that newly introduce aerospace subjects into their classroom teaching by using the materials or teaching methods developed by the strategic foothold in their bloc.

As of March 2017, the Center has concluded agreements with 36 entities to serve as its strategic footholds in all nine blocs.

<Strategic Footholds (Partnership) of the Space Education Center>



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On Its Activities in 2016 – 2017

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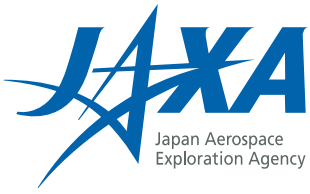
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