JAXA TODAY

Japan Aerospace Exploration Agency

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JAXA Organization Aims to Lead the Way in Aerospace Technology

JAXA's enterprising spirit comes to the fore

- A new generation of leaders help to drive international organizations
- Astronaut Kimiya Yui prepares for his first ISS long-duration mission
- Hayabusa2 begins a new asteroid exploration adventure

JAXA

Explore to Realize

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Welcome to JAXA TODAY

The Japan Aerospace Exploration Agency (JAXA) works to realize its vision of contributing to a safe and prosperous society through the pursuit of research and development in the aerospace field to deepen humankind's understanding of the universe. JAXA's activities cover a broad spectrum of the space and aeronautical fields, including satellite development and operation, astronomical observation, planetary exploration, participation in the International Space Station (ISS) project and the development of new rockets and next-generation aeronautical technology.

With the aim of disseminating information about JAXA's activities and recent news relating to Japan's space development programs to as wide an audience as possible, we launched JAXA TODAY in January 2010.

To All Our Readers

Shigeki Kamigaichi
Director of the JAXA
Public Affairs Department

My name is Shigeki Kamigaichi, and I am the Director of the JAXA Public Affairs Department. From this issue of JAXA TODAY, I take over the reins as executive editor. Prior to my current role, I have been involved in such areas as the development of satellite and rocket engines, and for a long period I worked on the International Space Station (ISS) program. During such projects, I have been privileged to work alongside many researchers and engineers from overseas. Based on this experience, I am keenly aware of how indispensable international cooperation is in the aerospace field.

We at JAXA aim to deliver results through technology development that will contribute to the improved future well-being and lives of all people living on this planet. I believe that the people working at research institutions in other countries also share this hope.

Through JAXA TODAY, we hope that people outside Japan will gain greater knowledge about Japan's research and development activities in the aerospace field. We also wish to help increase understanding of the role that JAXA is playing internationally.

Implementation of Organizational Reforms by JAXA

On April 1, 2015, JAXA implemented an overhaul of its organization. This reform was carried out in line with the transition of JAXA's legal status to a National Research and Development Agency on the same date, and reflects the new Basic Plan on Space Policy announced by the Japanese government on January 9, 2015.

Looking ahead, JAXA will strive to strengthen its mission planning functions and bolster its research and development capabilities in preparation for future missions. These moves carry such aims as the strengthening of international competitiveness, the realization of project proposals that will contribute to solutions to societal challenges and the fostering of industries, and the fulfilment of its role as a driver of the utilization of space development underpinned by leading technologies. To realize these goals, JAXA will work to further integrate its organization to enable the maximization of interdisciplinary functions.

Cover Story

Artist's Rendition of Japan's Next Generation Launcher in Flight

In fiscal year 2014 (FY2014), JAXA began development of a new flagship launch vehicle as the successor to the H-IIA and H-IIB launch vehicles. By successfully combining very high reliability and reduced launch costs, the program aims to further bolster Japan's space transportation systems and strengthen the country's international competitiveness in the satellite launch market. The program is targeting a test launch in FY2020.
(© JAXA)

The Hayabusa2 mission logo features an illustration of the planned touchdown on asteroid 1999 JU3 (© JAXA)

The Hayabusa2 Challenge: Heralding a New Era of Epic Voyages into Deep Space

Asteroid explorer Hayabusa2 was successfully launched on December 3, 2014. It completed its initial operation phase in excellent shape and everything is proceeding smoothly. The spacecraft is due to soon enter cruising phase using ion engine thrust in preparation for an Earth swing-by in late 2015. JAXA TODAY asked Hayabusa2 Project Manager Professor Hitoshi Kuninaka to give his insights and opinions on a range of topics, including space exploration and asteroid probes.
(This interview was conducted on February 17, 2015.)

Hitoshi Kuninaka
Asteroid Explorer Hayabusa2 Project Manager
Professor of Space Flight Systems
Institute of Space and Astronautical Science, JAXA
Ph.D. (Engineering)

Dr. Kuninaka completed the Ph.D. program in aerodynamics at the School of Engineering, The University of Tokyo. He was in charge of ion engine development for asteroid explorer Hayabusa. In 2012, he was appointed Project Manager for Hayabusa2.

An artist's rendition of the planned touchdown by Hayabusa2 on an artificial crater (computer graphic image)
(© Akihiro Ikeshita)

Asteroid Explorer Hayabusa (MUSES-C)

Hayabusa returned to Earth from asteroid Itokawa in June 2010. This mission was the world's first-ever successful sample return of matter from the surface of an asteroid. The Hayabusa mission also accomplished many engineering and technology world-firsts, such as the practical application of microwave discharge ion engines. As the successor to Hayabusa, the Hayabusa2 project is currently in progress.

An artist's rendition of the original Hayabusa explorer heading for Asteroid Itokawa (computer graphic image)
(© Akihiro Ikeshita)

The Significance of Hayabusa2: A Multifaceted Pursuit of the Potential of Deep Space Exploration

Please summarize the objectives of Hayabusa2.

Kuninaka: The project has three objectives. The first is to expand scientific knowledge. The target for Hayabusa2—1999 JU3—is a carbonaceous C-type asteroid. We may discover organic matter or water, which are the primary building blocks of life. Many scientists worldwide hold significant expectations regarding the potentially high scientific value of a sample return to Earth from this asteroid. Such a sample may help to elucidate the origins and evolution of the Solar System, and clarify the mechanism for the emergence of life.

The second objective is to develop Japan's own technological capabilities for deep-space exploration. We are striving to cultivate spacecraft development and operational technologies to a very sophisticated level of performance.

The third objective is to take up the challenge of being at the frontier of exploration. This includes the ultimate goal of expanding the sphere of human activity into space. All of our project team—including me—have a very strong desire to contribute to the development of international manned space exploration, and this is what has brought us together to work for the success of Hayabusa2.

How has the success of Hayabusa enhanced the degree of confidence enjoyed internationally by your program?

Kuninaka: The fact that Hayabusa2 is carrying the Mobile Asteroid Surface Scout (MASCOT) from the German Aerospace Center (DLR) signifies just how high the expectations are for this project. MASCOT is a small landing package, which will detach from Hayabusa2 and land on the asteroid. It will then conduct observations through direct contact with the asteroid surface. MASCOT's payload includes a near-infrared imaging microscope developed by France's Centre National d'Etudes Spatiales (CNES; National Centre for Space Research), which is capable of analyzing asteroid surface materials down to particles as small as 1/40 of a millimeter.

Asteroid 1999 JU3

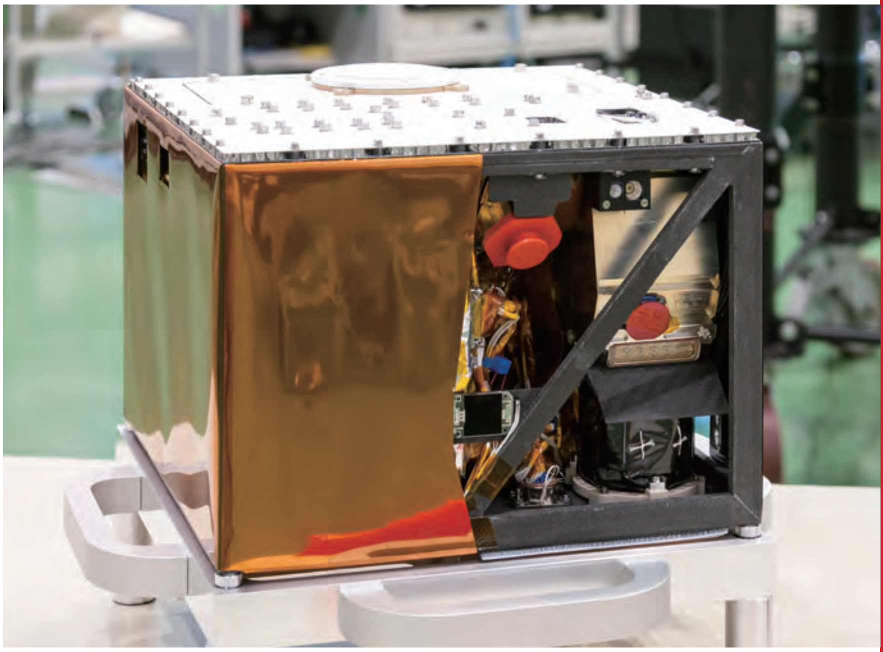
This is the asteroid targeted by Hayabusa2. "1999 JU3" is a provisional designation, and the asteroid does not yet have a formal name. It is one of the near-Earth asteroids (NEAs) whose orbit brings it relatively close to the Earth. Its size is estimated at roughly 900m in length, or about twice that of asteroid Itokawa. Its period of rotation is understood to be approximately 7.6 hours.

Itokawa is an S-type asteroid of rocky composition. In contrast, 1999 JU3 is a C-type asteroid—a type that contains large amounts of organic matter and water. It was for this reason that 1999 JU3 was chosen as the exploration target for Hayabusa2. Generally, C-type asteroids are found within the asteroid belt between Mars and Jupiter. However, 1999 JU3 is somewhat exceptional in that it is situated near the orbits of Earth and Mars.

An artist's rendition of Hayabusa2 and asteroid 1999 JU3 (computer graphic image)
(© Akihiro Ikeshita)

In the area of operations too, the project is being run within a framework of international cooperative relationships. For example, we are utilizing NASA's Deep Space Network (DSN) as part of a structure to ensure seamless tracking of Hayabusa2.

In addition to the partnerships built during the Hayabusa project with such countries as the United States and Australia, for Hayabusa2 we are also collaborating with a number of European countries. I believe that this reflects a rising level of international confidence in Japan.



The Mobile Asteroid Surface Scout (MASCOT) development test model. The German Aerospace Center (DLR) and the French National Centre for Space Research (CNES) cooperated on the development of this small lander. (© JAXA)

Frontier Spirit: Project Driven by an Enterprising Culture of Venturing into New Territory

While pursuing the project, what sort of things do you pay particular attention to?

Kuninaka: Hayabusa2 comprises a myriad of specialized subsystems. These include mechanics, thermal engineering, communications, ion engines and many others. During the space probe's development, on several occasions we encountered problems that seemed to fall into gaps between the various subsystems. As project manager, I had to spend a great amount of energy putting the spotlight on such problems and exercising the leadership required to find and implement solutions. However, I believe that the reason we were able to build this space probe to such a high degree of sophistication can be attributed to our ability to pursue development with all team members sharing a common "big picture" of Hayabusa2. As project manager, I endeavor to create an environment in which all members can share a common goal.

Ion Engines

This type of electrical propulsion engine was used in Hayabusa and is also being employed in Hayabusa2. One of the main features of this type of engine is the use of microwaves to generate plasma. The ionized propellant—xenon gas—is accelerated using a strong electrical field, and propulsion is achieved by thrusting this plasma at high speed. Compared with chemical propulsion engines, which combust fuel and an oxidizer, the propulsion power of ion engines is small. However, they are very fuel-efficient and are capable of continuous acceleration for long periods.

Hayabusa was the world's first successful practical application of microwave discharge ion engines. Leveraging the development experience gained through the first Hayabusa project, the ion engines used in Hayabusa2 boast a 25% propulsion power improvement.

Hayabusa2's ion engines have increased propulsion power compared with Hayabusa, and were designed to have an extended life. (© JAXA)


An artist's rendition of the impactor shot out by Hayabusa2 to make an artificial crater (computer graphic image)
(© Akihiro Ikeshita)

As project manager, are you likely to spend more time from here on coordinating operations with international partners?

Kuninaka: Since one of Hayabusa2's main objectives is scientific, the project can only be realized through cooperation with overseas partners. As the project progresses, I think we are very likely to see many instances where adjustments and coordination are necessary.

In relation to Hayabusa2's development, we received a large number of requests from planetary scientists worldwide urging us to build a space probe that would adequately fulfill many scientific objectives. When Hayabusa2 reaches its target asteroid and we are deciding on the location from which to take a sample, we may face a very tough decision—should we prioritize the scientific value or the safety of the explorer spacecraft? However, I believe that the difficulty inherent in such negotiations is really a reflection of the high level of international trust that we have gained.

Obviously you put a lot of hard work into this project. What are your feelings when approaching this role?

Kuninaka: When approaching this project, one of my primary thoughts and motivations is my strong will to keep on seeking new challenges. Whether I am focusing on the deep space voyage, the return journey back to Earth or the microwave discharge ion engines, what drives me is the desire to constantly venture into new territory.

This kind of enterprising spirit is also an ingrained part of the JAXA organizational culture, which we have continuously inherited. JAXA, as an organization, may be summed up in the following way. "Seek the challenges that no one else has tried. Prove that what you are doing is useful, and convert it into an operable system. Then give those results back to society." For me, that is the essence of a sample-return mission and deep space exploration.

Main Improvements over Hayabusa

1. Ion engine propulsion power is enhanced 25%, from 8mN* (millinewtons) to 10mN.
   *Newton is the SI-derived unit of force. One Newton (1N) is the force needed to accelerate one kilogram of mass at the rate of one meter per second squared.

2. For communication frequency band, in addition to X-band (8 GHz), Hayabusa2 is also able to communicate using the Ka-band (32 GHz). This means it is capable of transmitting high volumes of observation data back to Earth.


Two large discs that feature on the upper-exterior of Hayabusa2 are an X-band high-gain antenna (left) and a Ka-band high-gain antenna (right) (computer graphic image)
(© Akihiro Ikeshita)

The Future of Hayabusa2: Contributing to the World through International Space Exploration

Please outline the future schedule for Hayabusa2.

Kuninaka: Hayabusa2's space voyage has only just begun. After using its ion engine thrust, the spacecraft will continue in cruising phase for approximately nine months. Around December 2015, it will accelerate by performing an Earth-gravity-assisted swing-by. From there it will head on a trajectory toward asteroid 1999 JU3. Hayabusa2 is expected to rendezvous with the asteroid around September 2018. After conducting remote sensing analysis and carrying out sample collection of surface material, it is scheduled to return to Earth around November 2020.

We're on the cusp of a new era of deep space voyaging.

Kuninaka: Yes, I believe so. The first Hayabusa was a world pioneer in making a return voyage between Earth and an asteroid. At present, I think Japan is leading the charge in this era of deep space voyaging.

Meanwhile, stimulated by the success of Hayabusa, the United States and several European countries have greatly stepped up their efforts in asteroid exploration. So we are getting a taste of the pressure from having others close on our tail. However, when we view things from the broad perspective of international space exploration, I believe there is great significance in the fact that we have taken the lead and have been able to show other countries guideposts, so to speak.

In the international space exploration scene, what type of role are you looking to play from here on?

Kuninaka: Space exploration is an extremely large-scale undertaking, which cannot be achieved by any one country on its own. Notwithstanding, Japan is still the only country to have sent a mission to an asteroid and successfully returned a sample back to Earth. For this reason we have gained substantial knowledge that is not held by other countries. This is an important factor enabling us to drive this project forward while cooperating with many countries worldwide. And there are many scientists globally who wish to use as reference the observation and navigation data we have accumulated.

In pursuing the Hayabusa2 project, I hope that we can spread the asteroid exploration technology and knowledge we have, and maintain our strong, influential voice within an international framework. I want us to take the initiative in the activities we choose to undertake.

3. Hayabusa2 is equipped with an impactor, which will fire a projectile made of pure copper at the surface of the asteroid. The projectile, travelling at a velocity of 2km/s, will make an artificial crater. Rather than sampling surface material, which tends to become weathered from exposure to sunlight and solar wind, to achieve the mission's scientific objective, Hayabusa2 will take samples of fresh, subsurface material.

The impactor made of pure copper (photograph of a dummy model)
(© JAXA / Nippon Koki Co., Ltd.)

A New Generation of Leaders Emerging from JAXA are Helping to Drive International Organizations in the Aerospace Field

In the fields of manned spaceflight, aeronautical research and Earth-observation satellites—where multilateral cooperation is essential—international appraisal of JAXA's capabilities and expectations toward its future role are growing. Here, we present a discussion by three of JAXA's emerging new leaders, who are helping to drive international organizations in each of these fields, on the theme of "the role of international cooperation."

01

Soichi Noguchi

President, Association of Space Explorers (ASE)
JAXA Astronaut

Noguchi received a master's degree in Aeronautical Engineering from The University of Tokyo. In 2005, during STS-114 mission aboard Space Shuttle Discovery, Noguchi performed extra-vehicular activity (EVA; or space walks) on three occasions, and acted as leader. From December 2009 to June 2010, he was a member of the long-duration crew for ISS Expeditions 22/23. In August 2012, he was appointed Head of Astronaut Group. In September 2014, he was chosen as President of ASE.

02

Kazuhiro Nakahashi

Vice-Chair, International Forum for Aviation Research (IFAR)
Vice President

After obtaining his doctorate in engineering from The University of Tokyo, Nakahashi joined the National Aerospace Laboratory (NAL; a predecessor of JAXA). Other roles have included professor at Tohoku University. In April 2012, he was appointed a Vice President of JAXA. He has served as Vice-Chair of IFAR since 2013, and has been elected to assume the position of IFAR Chair in October 2015.

03

Shizuo Yamamoto

Chairman, Committee on Earth Observation Satellites (CEOS)
Vice President

Yamamoto graduated from the Department of Aeronautics Engineering, Faculty of Engineering, Nagoya University. After serving in such roles as Senior Chief Officer of Space Applications in the Space Applications Mission Directorate and Associate Director General, he was appointed a Vice President of JAXA in April 2013. For one year from November 2014, he holds the post of Chairman of CEOS.

04

Shigeki Kamigaichi

Director, JAXA Public Affairs Department

Kamigaichi serves as executive editor of JAXA TODAY. After holding the position of Director of the Space Environment Utilization Center he was appointed Director of the Public Affairs Department. For this discussion he takes on the role of moderator.

The Raison d'être of International Organizations: The Vital Role of Cooperation and Collaboration that Transcends National Borders

***Kamigaichi:* Could we begin with each of you providing a brief explanation of the international organization in which you serve?**

Noguchi: The Association of Space Explorers (ASE) is an international organization whose membership comprises astronauts and cosmonauts from countries worldwide. To qualify for membership a person needs to have completed at least one Earth orbit in space. ASE was founded in 1985 with the objective of promoting exchange among astronauts regardless of nationality. The organization's activities include technical information exchanges and forums related to manned space programs, and advocating widely on education-related matters. In recent years, ASE has strengthened its cooperation with such organizations as the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and the International Astronautical Federation (IAF), and is involved in a diverse array of activities.

Nakahashi: The International Forum for Aviation Research (IFAR) is the world's first aviation research network connecting the government-supported aviation research community worldwide. Taking into account the results of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)—released in 2007—IFAR participants agreed to found the organization in 2010. IFAR's objectives are to promote multilateral cooperation and collaboration in non-competitive spheres, including the environment and flight safety, and it pursues international cooperation through joint research and other means. IFAR comprises 26 public research organizations representing each participating country, with the combined number of researchers at these organizations totaling more than 34,000 people.

Yamamoto: The Committee on Earth Observation Satellites (CEOS) was established in 1984 in response to the recommendation of a Panel of Experts set up under the aegis of the Group of Seven (G7) summit. CEOS was set up to undertake international coordination of satellite-based Earth-observation activities. Today, CEOS has more than 50 participating organizations, including associate members, and the number of satellites operated by these organizations exceeds 100.

***Kamigaichi:* When did you—or when will you—assume office in your respective leadership roles?**

Noguchi: At the 27th ASE Planetary Congress—held in Beijing, China, in September 2014—I was appointed president for a term of two years. The previous president—former Chairman of COPUOS, Dr. Dumitru-Dorin Prunariu—completed his term of office at the Planetary Congress.

Nakahashi: At present, I am scheduled to take up the post of new Chair of IFAR in October 2015 following the conclusion of Dr. Jaiwon Shin's term as chair. Dr. Shin is the NASA Associate Administrator for the Aeronautics Research Mission Directorate. Since 2013 I have been serving as Vice-Chair of IFAR.

Yamamoto: I was appointed as chairman at the CEOS Plenary Meeting in October 2014, for a one-year term. I am the third Japanese chairman during the organization's 30-years history.

Focus Activities of Each Organization: Pursuing Projects Beneficial to the Entire Globe

Kamigaichi: ***What has each organization focused on in recent years?***

Noguchi: ASE has been particularly active in promoting educational programs. We hold a wide variety of lectures, including educational workshops called the "International Space Classroom." This program is held in countries worldwide, and aims to communicate to children the fascination of spaceflight.

With regard to advocacy in the international community from ASE's perspective, at the United Nations General Assembly session that commenced in September 2014, together with COPUOS we made a recommendation for the early establishment of an international network to monitor near-Earth objects (NEOs). We were also involved in producing a blueprint that includes a method for reciprocal use of future monitoring data.

Nakahashi: At IFAR we have embarked on cooperation programs involving a wide variety of agencies. Among these, in the research field focused on expanding the use of biofuels with the aim of reducing aircraft CO_2 emissions, NASA, the German Aerospace Center (DLR), the National Research Council of Canada (NRC), JAXA and other partners are collaborating to conduct flight tests and combustion testing. Significant progress is being made toward elucidating the impact of biofuels on the environment.

Fostering young researchers who will be at the forefront of future aviation technology development is one of the critical challenges faced by organizations worldwide. JAXA is taking a leadership role in the promotion of international networking among young researchers. This includes holding the IFAR Virtual Conference, in which people can take part from locations worldwide via the Internet, and promoting Internet-based exchanges that utilize the IFARlink platform.

Yamamoto: Let me explain some specific details about the activities that CEOS has undertaken to date. Space-based Earth observation is an ongoing response to such global issues as climate change, global warming and protection of the Earth's environment. It is an add-on solution to existing Earth-based observation methods that applies space technology to make global and frequent observation possible.

To contribute to effective, global data gathering, CEOS conducts discussions regarding the technical inter-operability of Earth observation satellite programs implemented by each country. Through such discussions, it is possible to maximize overall observation capabilities by collaborating and making the Earth observation satellite programs of each country complementary. For example, CEOS has taken on a coordinating role to ensure gaps or duplications among the satellite programs of each country are minimized when compared to the global observations needed. We have also coordinated the standardization of data formats and data quality to facilitate the reciprocal use of data collected by multiple space agencies.

JAXA's Position and Role: Raising Japan's Appraisal and Profile in the International Community

Kamigaichi: ***In each field, how do you see Japan and JAXA's international position and role?***

Noguchi: Over the past decade or so, the efforts of Asian countries in space development have been remarkable. Japan is the only International Space Station (ISS) partner from Asia, and in terms of such measures as the cumulative length of long-duration stays on the ISS and the number of times extra-vehicular activity (EVA) has been undertaken, Japanese astronauts rank third among all countries. This gives us a lot of recognition internationally. I believe that my selection as ASE President reflects the expectations toward Japan as a leader driving space development in the Asian region.

Nakahashi: The scale of the aviation industry in Japan is still small compared with the United States or Europe. However, one of our key strengths is JAXA's strong presence as a leading organization in Asia. In addition, over many years JAXA has maintained close working relationships with NASA, DLR, Office National d'Etudes et Recherches Aérospatiales (ONERA; also known in English as the French Aerospace Lab) and other partners in joint research programs. I believe

that the appraisal and trust we have gained through these relationships is substantial. I also think that JAXA's record of such accomplishments contributed to my being elected as Chair of IFAR, and I am greatly honored to serve as the third Chair in the footsteps of the organization's founders, DLR and NASA.

Yamamoto: I feel extremely honored to have been chosen as CEOS chairman for a term that coincides with the organization's 30th anniversary. In this particular period, as the chair organization of CEOS, JAXA has to contribute to expanding the value-added from CEOS. We can accomplish this by not only providing data and information, but also by creating solutions to societal challenges, and delivering these solutions to stakeholders and decision makers.

Through these activities, I believe that we can deepen Japan's contribution to CEOS, and maintain our position as one of the three pillars of the organization—together with the United States and Europe—since its foundation.

Looking to the Future: Seeking an International Cooperation Role that Leverages JAXA's Strengths

***Kamigaichi:* What are your key tasks as you perceive them at present?**

Noguchi: We have to offer recommendations about how future space exploration programs should be formalized over the next 10 to 20 years. In recent years, astronauts from a diverse array of countries have joined ASE. I see one of my main tasks as adeptly putting forward the Japanese perspective while listening carefully to the opinions of my colleagues from many countries.

Nakahashi: IFAR is still a very young organization, so we intend to steadily build results by further expanding multilateral cooperation. As an international organization that draws together many research institutions, I want IFAR to enhance its value by contributing to the development of the aviation sector. For example, at the IFAR summit held in November 2014, a proposal was made regarding activities that will contribute to the formulation of international standards relating to sonic booms. Such standards are necessary for the realization of supersonic passenger aircraft. This is one of the major issues that must be addressed in order to make supersonic airliners commercially feasible, and I have high hopes that JAXA will be able to contribute significantly in this technical field.

Yamamoto: The roles demanded of international institutions change over time. Hence, I sense that there is a need for CEOS to engage in self-reform, enabling it to adapt to those changing demands. To ensure CEOS' sustainable operation, I strongly believe that each participating country must assume common ownership of CEOS' role within a set of global values, and we must strive to develop an attractive organization and programs.

***Kamigaichi:* In closing, please offer a few words on your aspirations for the future.**

Nakahashi: I am set to take up the Chair of IFAR in October 2015. I want IFAR to exercise leadership and generate results that could only be achieved from its unique position as an international organization drawing together publicly backed aviation research institutions worldwide. In addition, I am particularly keen to further promote the development of young researchers—an area in which JAXA is taking the lead role at present.

Noguchi: I have no doubt that I would not have made it to where I am today if it were not for the efforts of our predecessors. The colleagues that came before us at JAXA built up an organizational legacy and contributed to the creation of a "personality" that permeates the organization. I want to aim for international exchange that combines these traits and gives JAXA a human face.

Yamamoto: I absolutely agree with regards to the efforts of our predecessors. It is only natural that we hold important the accomplishments built up over many years, but I also think it is essential for us to pursue ways to contribute to the international community that reflect a distinctly Japanese approach.

***Kamigaichi:* Thank you for your time today gentlemen, and I wish you all success in your endeavors.**

Research and Development of a New Water Recovery System in Preparation for Future Manned Space Exploration

—Highly Efficient Reclamation with No Consumables Required—

Water is essential to support life. However, water is not available in the space environment. On the International Space Station (ISS), water is obtained through two principal means. Water is transported from the ground via resupply spacecraft, while the other important method for procuring water is through the re-use of wastewater from astronauts staying on the ISS. Underpinned by the excellent water treatment technologies possessed by Japan, JAXA is researching a high-performance water recovery system in preparation for space development programs that follow on from the ISS, particularly with a view toward future manned space exploration programs.

Yusuke Matsumura

Manager
JEM Mission Operations and Integration Center
Human Spaceflight Technology Directorate

The Necessity for a New Water Recovery System

The ISS has long had a system for reclamation of condensate water. In May 2009, a system for reclamation of urine of crew was added. Why is a new water recovery system needed?

At present, there are water recovery systems on the ISS operated by the United States and Russia. The American system recovers urine and condensate water, while the Russian system recovers condensate water. However, these systems are not sufficient to meet all water needs on the ISS, so water is regularly transported from the ground. Hence, under current circumstances the use of water on the ISS is subject to significant constraints.

Your objective, then, is to improve the current situation?

Yes. The existing system operated by the United States uses distillation, whereby the water is heated into vapor, which is then condensed back into water. This method requires large, heavy equipment, and accounts for significant power consumption. The system is also vulnerable to malfunctions, meaning maintenance is a considerable burden. The water recovery system that we are developing addresses these problems through the application of new technologies.

Revitalization of the Ion-Exchange Resin Eliminates the Need for Consumables

What type of treatment methods will the new system use?

First of all, the wastewater will pass through an ion-exchange resin to remove calcium and magnesium present in urine. Next, organic constituents will be removed using electrolysis at high temperature and high pressure. Finally, ions will be removed using an electrodialysis unit.

What are the system's specific technical features?

One of the fundamental problems that must be addressed when designing a water recovery system is clogging caused by deposition—commonly known as scaling—of such compounds as calcium carbonate and magnesium carbonate in ducts. To prevent such occurrence, we employ an ion-exchange resin filter to remove these substances. Normally, a filter is a consumable item and requires regular replacement. However, under our new system, alkaline water and acidic water produced by the electrodialysis unit are used to revitalize the ion-exchange resin. This technology has the major advantage of enabling the system to operate without the use of any consumables.

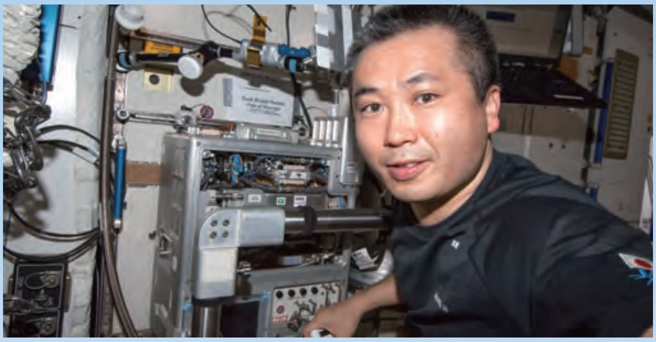
Please tell us more about how the electrolysis process works.

The electrolysis unit has several unique features. An electrical current is applied to the processed water using high-efficiency diamond electrodes. This acts to break down organic constituents in urine. This component of the system uses high temperature and pressure of 250oC and 7MPa—the latter being approximately 70 times the atmospheric pressure on the ground. These conditions not only help to effectively drive the chemical reaction but also inhibit the generation of bubbles. This technique also facilitates efficient conduction of the electrical current while keeping in check excessive electrolyzing of the water. The end result is an enhanced water-recovery rate.

Aiming to Develop a System that Will be Adopted for Lunar and Planetary Exploration

What are the new system's key advantages compared with conventional systems?

Compared with the system currently in use on the ISS, the size and weight of the new system is around one quarter, and the electrical power consumption is approximately half. At the same time, we are aiming to achieve a recovery rate of 90%, which would surpass the operating performance of the existing ISS system. A crew of six astronauts stays on the ISS, who produce around 18 liters of urine and condensate water per day. Hence, if this new system were introduced, it would be possible to reduce the amount of water transported from the ground by 650kg annually. Furthermore, there would be no need for consumables, and maintenance requirements would be minimal. Such characteristics are of course advantageous for the ISS program, but the merits would be magnified even further for lunar or planetary exploration programs, which would present greater challenges than the ISS in the transportation of supplies.



On February 25, 2014, Astronaut Koichi Wakata carries out work relating to the Total Organic Carbon Analyzer (TOCA II), which was installed in the ISS' Water Recovery System (WRS)
(© JAXA/NASA)

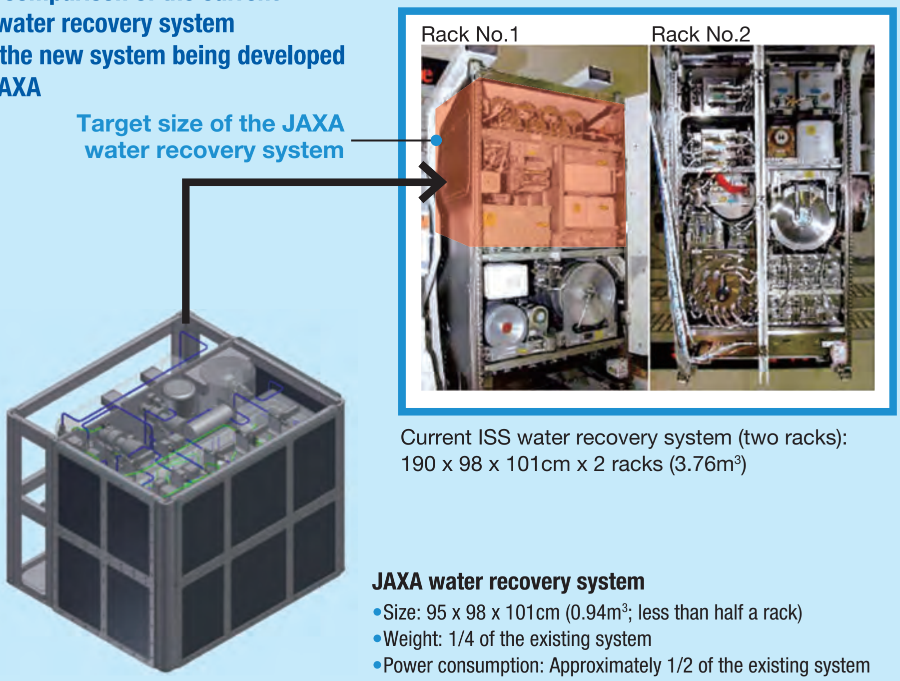
What is the potential for this kind of system to be applied on the ground?

We believe that the system would be useful in disaster-affected areas or regions suffering from severe drought. In addition, one of the system's key technologies—the highly efficient decomposition of persistent organic constituents—is likely to have a myriad of applications. These technologies are based on the results of collaborative research conducted by JAXA and Kurita Water Industries Ltd.—a manufacturer specializing in water treatment. These R&D activities not only provide a showcase to the rest of the world for Japan's excellent water recycling technology but also open up the potential for new scientific discoveries and the creation of novel environment-friendly technologies.

Please briefly describe the future prospects for the new system.

We plan to send a demonstration system to the ISS during FY2016 (ending March 2017) for testing. Development of the system is being conducted based on this initial target. Further in the future, our dream is to have Japanese technology adopted for water recovery systems used in joint international manned lunar and planetary exploration.

Size comparison of the current ISS water recovery system and the new system being developed by JAXA



Current ISS water recovery system (two racks): 190 x 98 x 101cm x 2 racks (3.76m^3)

Less than a quarter of the size of the current ISS system

JAXA water recovery system

- Size: 95 x 98 x 101cm (0.94m^3; less than half a rack)
- Weight: 1/4 of the existing system
- Power consumption: Approximately 1/2 of the existing system
- Recovery rate: Targeting 90% (surpassing the existing system)
- Reduction in water transported from the ground: 650kg annually

The mission logo design adopts a turtle as its overall motif. This was chosen since Astronaut Kimiya Yui's name includes the kanji for turtle (亀). The turtle shell is patterned to look like the seven windows of the ISS Cupola observatory module. The moon and Mars can be seen shining through two of the windows.

"I Want to Be at the Vanguard of Expanding Humanity's Potential in Space"

Astronaut Kimiya Yui Prepares for His First ISS Long-Duration Mission

In the immediate lead-up to his ISS Expedition 44/45 long-duration mission, which is due to begin in May 2015, Astronaut Kimiya Yui discusses such topics as the role of space development in expanding the potential of humanity and the significance of space exploration.

Kimiya Yui
JAXA Astronaut

Kimiya Yui was born in Nagano, Japan, in 1970. After serving as a test pilot in the Japan Air Self-Defense Force, he was certified as an ISS astronaut in July 2011. As a flight engineer on the ISS Expedition 44/45 long-duration mission crew, Astronaut Yui will handle such tasks as ISS operations, a variety of scientific experiments and communication events with people on the ground.

Inheriting the Fine Tradition Built by Japanese Astronauts

To date, many astronauts have contributed to Japan’s excellent record in long-duration missions. I will inherit that tradition, but for me this mission represents a new challenge. On the ISS I will work on a wide variety of scientific experiments and other activities. I believe that it is my duty—as the one who is travelling into space as a representative of Japan—to explain in my own words the results of those activities to the people of Japan. The ISS is set to continue operations until 2020. Hence, we may see new types of missions undertaken, which differ from those carried out until now. While looking ahead to such a future scenario, I want to anticipate what kind of experience I should be aiming to gain right now. I also want to take a very proactive approach to participating in experiments that will help me build the experience I require.

The Potential of Space and the Potential of Humanity

During my long-duration mission, English soprano singer Sarah Brightman is scheduled to visit the ISS in the northern-hemisphere autumn of 2015. I believe that the potential of space and the potential of humanity are both infinite. When humanity and space intersect, I am extremely interested to see what kinds of results are generated. In the near future, I very much look forward to seeing a diversity of people with abundant sensibilities and creative potential travel into space. Ms. Brightman’s visit is just the start, and I hope we see many others, such as authors, poets and painters. To make this a reality, I and my fellow astronauts need to be at the vanguard, clarifying and ironing out a myriad of problems so that we can create an environment in which ordinary people are able to aim for space travel that is safer and less costly.

Space Exploration for the Sake of Humankind’s Survival

If we think about the Earth’s future over a timespan of several hundred years, a time will surely come when humans and other life forms will no longer be able to live on this planet. To build bases on other terrestrial bodies—the moon or Mars, for example—in preparation for interplanetary migration as representatives of the Earth’s biota, we need to begin from now the consistent, step-by-step process of space and planetary exploration, underpinned by international cooperation. I have a habit of saying things like, “Let’s do it faster; aim higher; go farther.” This reflects human beings’ inbuilt instinct toward expanding their own range or habitat. With the development of the means of transportation having greatly expanded the reach of human activity on the Earth, I believe that it is only reasonable to expect human endeavor to extend into space as well.

Sharing Your Dreams

I think that many children—when they look out at the world—have dreams of being a part of space development or becoming an astronaut. I always tell people that to realize your dreams it is important to talk about and share your dreams with many different kinds of people. If you share your dreams, you also find out about other people’s dreams. This motivates you to try and help them realize their dreams. When you do this, the person you help feels appreciation for your kindness and they in turn will try to help you make your dream a reality. Talking to someone about your dreams and helping each other is probably one of the best shortcuts to fulfilling those dreams. During the communication events we are planning for my long-duration mission aboard the ISS, I want to talk with children from all over the world about ways that they can move toward achieving their dreams.

Liaison Diary:
United States

In preparation for his long-duration mission aboard the International Space Station—due to begin in May 2015—JAXA Astronaut Kimiya Yui underwent training at the Johnson Space Center (JSC) in Houston, Texas. For this edition of Liaison Diary, we interviewed Junichi Sakai, director of the JAXA Houston Office.

Please begin by briefly introducing yourself.

I joined the National Space Development Agency of Japan (NASDA)—one of the predecessors of JAXA—in 1990. After working at the Tanegashima Space Center (TNSC) for two years, in 1992 I was assigned to work in the Space Station Program (currently the ISS Program). I was mainly involved in the development of the control system for the Japanese Experiment Module (JEM) Kibo. Later on in my career, in 2006, I returned to the Kibo project to participate in preparations for the start of full JEM operations (on-orbit assembly and regular operations), working in the operations division. When Kibo was launched in 2008, I served as the flight director. Since the summer of 2012, I have worked at the JAXA Houston Office. As a way of repaying the kindness I have received in the past from many people in Houston, I am supporting from the frontline Japan's manned space development—which began with the JEM Kibo project—and actual operation.

Please provide an overview of the role of the JAXA Houston Office.

Our main tasks are, first of all, to follow up on various coordination meetings held at JSC relating to such matters as the operation of the ISS and experiments conducted therein, coordinate with JAXA divisions in Japan, advocate JAXA's position, and support program adjustments implemented in response to an array of issues that arise. Furthermore, we gather information on the development of manned systems and experiment payloads, and pass this on to JAXA divisions in Japan. We also act as a liaison for coordination with related divisions and provide support for Japanese astronaut training and other activities in this region.

Please tell us about how you have felt while carrying out your liaison role with NASA—a key international partner for JAXA—and any memories you have of difficulties you have needed to deal with.

When I look back on the period in which we were developing Kibo, I think there was a certain level of frustration on both sides as interface coordination and verification procedures were quite time consuming. Often this stemmed from the timing differences of on-orbit assembly and the many to-and-fro exchanges of opinion while acting as the intermediary for design requests.

Once the Kibo module was actually put into orbit and was successfully activated and began operations, the absence of any significant defects and the module's performance in line with specifications greatly reassured the NASA side regarding the high level of Japan's manned space technology. With regard, also, to operational systems and skills, I feel that we were successful in gaining the confidence of our colleagues at NASA by rapidly enhancing our proficiency as the Kibo launch drew closer, and by demonstrating that we are capable of reliably performing our tasks during the regular operation of JEM. I believe that confidence has been further bolstered by the ongoing success of JAXA's space station resupply spacecraft, the H-II Transfer Vehicle (HTV).

Please tell us about your lifestyle in the United States outside of your work. Has living in the United States affected your self-identity as a Japanese person?

We have very timely access to news from Japan through the Internet and Japanese-language TV channels. When I see news stories highlighting the diligence and courtesy of Japanese people, I think this gives me encouragement to hold my head up high.

The time difference between Texas and Japan means that when everyone is finishing up their regular office day in Houston, my colleagues in Japan are just starting their working day. So although that often means late workday finishes for me, when I have the opportunity, I enjoy playing sports and touring around the country's national parks. The United States is blessed with a great diversity of natural features, and there are so many wonderful sights that I could never grow bored of it. I think that being able to fully enjoy a rich variety of nature is one of the United States' particular characteristics.

The JAXA Houston Office staff, with director Junichi Sakai pictured in the center

Would you like to say anything in closing?

At present, preparations are in full swing for JAXA Astronaut Kimiya Yui's long-duration mission aboard the ISS. All of the staff at the JAXA Houston Office are unified in support of this mission so that we can leverage the raison d'être of Japan's manned space development program cultivated to date. We are hoping that it will not only enhance Japan's presence but also act as a stepping stone to the next phase of development.


View from the JAXA Houston Office window

View from the Editor's Window

Astronaut Chiaki Mukai Given the Ordre National de la Légion d'Honneur by France

Astronaut Chiaki Mukai shakes hands with Ambassador of France to Japan, Mr. Thierry Dana (right), at the award ceremony

On February 3, 2015, JAXA Astronaut Chiaki Mukai was given the Chevalier* de la Légion d'Honneur (Knight of the Legion of Honour) by France. The Ambassador of France to Japan, Mr. Thierry Dana, conferred the award.

The Légion d'Honneur is France's highest decoration, having been established by Napoleon Bonaparte in 1802. The purpose of the award is to honor "eminent merits" by military personnel and by civilians active in such fields as culture, science, industry, commerce and creative endeavors.

Astronaut Mukai's remarkable record of achievements was praised by Ambassador Dana. Those he cited included cooperation with France in the space medicine field—particularly on the International Microgravity Laboratory (IML-2) Mission—and her teaching activities at the International Space University (ISU) in Strasbourg, France.

On conferment of the Légion d'Honneur, Astronaut Mukai expressed her appreciation, "Thank you for giving me such a prestigious award. I am greatly honored and delighted to receive the historic decoration of Chevalier from the Government of France. Just being able to pursue the work that I truly wanted to do—in medicine, space and education—has made me very happy. Hence, I am profoundly grateful to receive this acknowledgement of my efforts. "

"For all people around the world, the Earth is the common birthplace and home of humankind. While coexisting with nature, I hope that we can utilize science and technology to expand the domain of human activity to the moon, Mars and other celestial bodies. Through academic and other exchanges between Japan and France, I wish to continue my work so that I may contribute to a bright future for humankind."

Astronaut Mukai also remarked, "If I were to go into space again, I would like to travel to the moon. When the era of space travel for all arrives, I hope I can accompany travelers as a tour guide." Her beaming smile as she spoke these words was particularly memorable.

*Chevalier means "knight" in French, and denotes one of the degrees of distinction of the Légion d'Honneur.

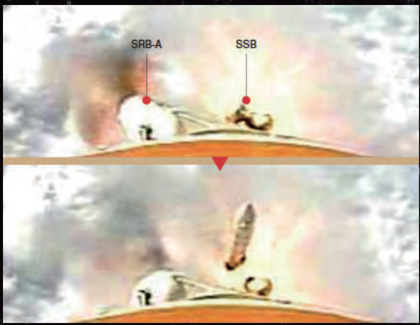
Chiaki Mukai

JAXA Astronaut

In 1994 and 1998, Chiaki Mukai flew missions aboard the Space Shuttle as a Payload Specialist (PS). During these missions, she carried out numerous experiments inside the Spacelab and Spacehab modules, which were carried in the Space Shuttle's cargo bay. Experiments were conducted in such research areas as life sciences and space medicine.

Moving beyond Its First Decade, JAXA Sets Course on a New Stage of Its Journey

Since its establishment in October 2003, JAXA has steadily built up a record of accomplishments in the aerospace field. In just over a decade, internationally JAXA has won a high level of trust as a space agency, reflected in such milestones as Astronaut Koichi Wakata's appointment as the first Japanese commander of the ISS in 2014. Let's recap some of the highlights of the first dozen years of JAXA's continuing journey.



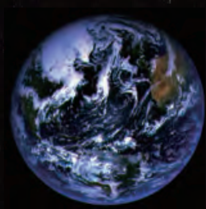
H-IIA F6 rocket immediately following launch. After separation of the solid strap-on booster (SSB; right), the vehicle failed to jettison one of its two solid rocket boosters (SRB-A; left). The launch vehicle was subsequently destroyed via a command from the ground, as it was unable to gain planned altitude owing to the jettison failure.

PLANET-B (NOZOMI) abandons attempt to go into orbit around Mars (computer graphic image) (© Akihiro Ikeshita)

2003

New Organization Suffers Three Early Failures

The newly inaugurated JAXA got off to a bumpy start with three setbacks in its first three months. H-IIA Launch Vehicle No. 6 (H-IIA F6) was destroyed after a launch failure, and two spacecraft—ADEOS-II (Midori II) and PLANET-B (NOZOMI)—ceased operation.



A photograph of the Earth taken from Hayabusa (© JAXA)

After its Earth swing-by, Hayabusa headed for Asteroid Itokawa (computer graphic image) (© Akihiro Ikeshita)

2004

Hayabusa Heads for Asteroid Itokawa

Asteroid explorer MUSES-C (later renamed Hayabusa) lifted off in May 2003, and in May 2004 successfully executed an Earth swing-by using Earth gravity assist to put it on course for a rendezvous with Asteroid Itokawa. Meanwhile, in the aftermath of the H-IIA F6 rocket failure in 2003, JAXA implemented a thorough review of all projects currently in progress.

Astronaut Soichi Noguchi carries out ISS assembly work during extra-vehicular activity (EVA) (© JAXA/NASA)

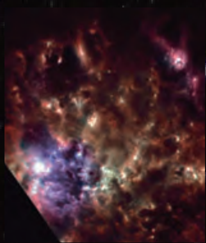
NEXST-1 is launched from the Woomera Test Range in Australia (© JAXA)

2005

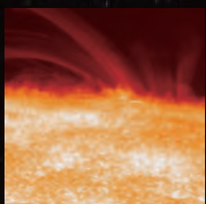
Flights Recommence

In 2005, several successful launches marked JAXA's recommencement of space flight. In February, there was the launch of H-IIA F7, and July saw the safe insertion into orbit of X-ray astronomy satellite Suzaku (ASTRO-EII). Suzaku's predecessor, ASTRO-E, had been lost shortly after launch in 2000, hence this new mission aimed to make up for the earlier setback. Also in July, the Space Shuttle Discovery—with JAXA Astronaut Soichi Noguchi aboard—was launched on the Return to Flight mission for the Space Shuttle program following the Space Shuttle Columbia disaster. In October, JAXA conducted a successful flight test for the National Experimental Supersonic Transport (NEXST-1) scaled aircraft, thus overcoming the first test failure in 2002.

The June 2, 2006, edition of *Science* contained the first feature articles on a Japanese interplanetary exploration mission



A far-infrared image of the Large Magellanic Cloud (LMC) observed by Akari



Eruptive phenomena in the vicinity of solar flares observed by Hinode

2006

Four Satellites Launched into Orbit

This was the year in which JAXA made a full-fledged return to its core role as a space agency with the launch into orbit of four satellites—Advanced Land Observing Satellite (ALOS; "DAICHI"), Engineering Test Satellite VIII (ETS-VIII; "KIKU-8"), Infrared Imaging Satellite (ASTRO-F; "Akari") and Solar Physics Satellite (SOLAR-B; "Hinode"). In June, observation results from Hayabusa of Asteroid Itokawa featured in a set of articles in the journal *Science*.

Images showing the "Earth-rise" taken by SELENE's HDTV cameras (© JAXA/NHK)

The two sub-satellites separate from SELENE (computer graphic image) (© JAXA)

2007

KAGUYA Heads for her Lunar Home

Japan's lunar explorer spacecraft, Selenological and Engineering Explorer (SELENE), was launched in September. SELENE comprised the main orbiter and two sub-satellites. The orbiter's Japanese nickname, KAGUYA, was selected by the general public, and comes from the name of a lunar princess in the ancient Japanese folktale, *The Tale of the Bamboo Cutter*. After their successful release, the sub-satellites Rstar and Vstar were renamed Okina and Ouna, respectively. These names are also derived from characters in the tale. SELENE carried a payload of 15 instruments used in its scientific mission, including high-definition television (HDTV) cameras. Detailed observations of the moon included magnetic fields, topography, the lunar elemental composition and plasma.

The ISS crew, including Astronaut Takao Doi (lower right) gather in Kibo's ELM-PS (© JAXA/NASA)

Astronaut Akihiko Hoshide installs experiment racks in Kibo's PM (© JAXA/NASA)

WINDS (computer graphic image) (© JAXA)

2008

Assembly of JEM Kibo Begins

The mission to assemble JEM Kibo got under way after the module was transported to the ISS aboard the Space Shuttle. In March, Astronaut Takao Doi installed the Experiment Logistics Module Pressurized Section (ELM-PS) onto the ISS, and in June Astronaut Akihiko Hoshide installed the Pressurized Module and the JEM Remote Manipulator System (JEMRMS), marking the start of operations for Kibo. Wideband Inter- Networking Engineering Test and Demonstration Satellite (WINDS; Japanese nickname: "KIZUNA") was launched as part of a mission to realize high-speed, wideband telecommunications.

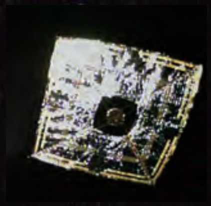
The completed JEM Kibo (© NASA)

HTV approaches the ISS (© NASA)

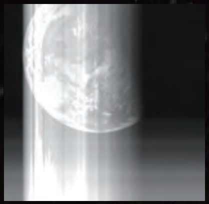
2009

JEM Kibo and HTV Extend Manned Space Activities

In July, Astronaut Koichi Wakata installed the Exposed Facility (EF) onto the JEM Kibo PM, thus completing the assembly of Kibo. In September, the HTV resupply spacecraft made a successful rendezvous and docking with the ISS. The original method used for rendezvous and docking was developed in Japan and was subsequently used as the model for a system employed by a U.S.-manufactured resupply spacecraft.



A photograph taken by miniature deployable camera DCAM2 shows IKAROS' fully unfurled solar sail
(© JAXA)



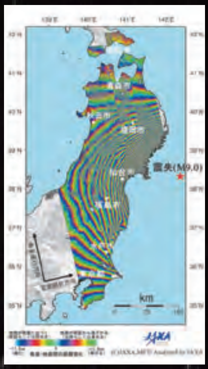
The final image of Earth taken by Hayabusa

The glowing trail made by Hayabusa and its sample-return capsule as they re-enter the atmosphere
(© JAXA)

2010

Hayabusa Returns to Earth

After successfully touching down on Asteroid Itokawa, Hayabusa overcame a myriad of difficulties to make a triumphant return to Earth after an epic seven-year journey through deep space. Long lines of people waited to see the sample-return capsule when it was put on public display. Other milestones, such as MICHIBIKI—the first satellite of the Quasi-Zenith Satellite System (QZSS)—and the Small Solar Power Sail Demonstrator IKAROS, also helped fuel an unprecedented level of interest in space among the general public.



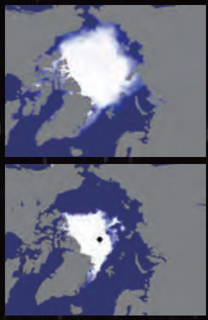
A map showing crustal movement caused by the Great East Japan Earthquake based on observation data provided by ALOS

Astronaut Satoshi Furukawa serves a long-duration mission aboard the ISS from June 2011
(© JAXA/NASA)

2011

Assisting Disaster-Affected Areas from Space

After the Great East Japan Earthquake struck on March 11, control of JEM Kibo was temporarily transferred from the Kibo Mission Control Room (MCR) at the Tsukuba Space Center (TKSC) to NASA. ALOS carried out emergency observations to ascertain the extent of damage from the earthquake and tsunami. Astronaut Satoshi Furukawa—serving a long-duration mission aboard the ISS—sent messages of support and encouragement to people in the disaster-affected areas.



The observation by SHIZUKU of Arctic sea ice cover on September 16, 2012, is shown on the bottom. The extent of sea ice cover is much smaller than that shown on the top, which is based on the average minimum Arctic sea ice cover in September during the 1980s.

Astronaut Akihiko Hoshide prepares an experiment in JEM Kibo
(© JAXA/NASA)

FTB "Hisho" prepares for takeoff
(© JAXA)

2012

SHIZUKU Observes the Earth's Water Cycle

JAXA launches a satellite called Global Change Observation Mission 1st–Water (GCOM-W1; Japanese nickname: "SHIZUKU"), which aims to enhance understanding of the global water cycle. SHIZUKU began observations using the giant revolving antenna of its main instrument, Advanced Microwave Scanning Radiometer 2 (AMSR2). Astronaut Akihiko Hoshide used the JEM Airlock and JEMRMS (robotic arm) to deploy "CubeSat" small satellites during his long-duration ISS mission. JAXA commenced operation of the Flying Test Bed (FTB) "Hisho," which is used for experiments and demonstration of cutting-edge aircraft technology and instruments.

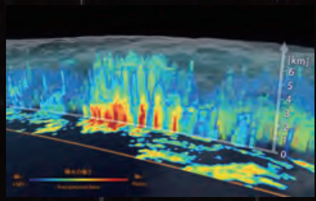
Epsilon Launch Vehicle lifts off from the Uchinoura Space Center in Kagoshima, Japan
(© JAXA)

Astronaut Koichi Wakata operates the Space Station Remote Manipulator System (SSRMS) to assist an EVA
(© JAXA/NASA)

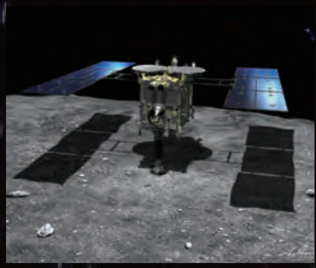
2013

Dawn of a New Era for Launch Vehicles

On September 14, JAXA successfully launched its new Epsilon rocket, which realizes lower operational costs and high performance. The launch vehicle carried into orbit SPRINT-A (Japanese nickname: "HISAKI"), an ultraviolet astronomy satellite tasked with observing Solar System bodies. The first Epsilon launch heralded the start of a new era in Japanese solid-fuel rocket development. In November, Astronaut Koichi Wakata began a long-duration mission aboard the ISS. He subsequently became Japan's first ISS Commander in March 2014.



Precipitation data captured by DPR from an extratropical cyclone. The data is shown as a three-dimensional (3D) distribution
(© JAXA/NASA)

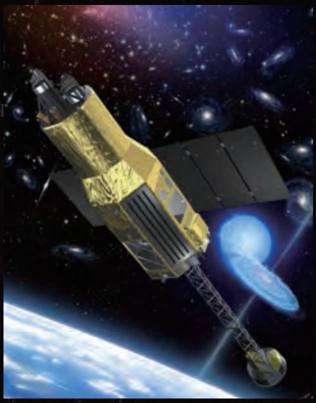


An artist's rendition of Hayabusa2 touching down on an asteroid (computer graphic image)
(© Akihiro Ikeshita)

2014

Continuation and Expansion of Planetary Exploration

Using the Dual-frequency Precipitation Radar (DPR) carried by the Core Observatory satellite of the Global Precipitation Measurement (GPM) mission, JAXA began providing precipitation data with even higher precision than was possible to date. In December, Hayabusa2 was launched on its journey to explore Asteroid 1999 JU3. The mission hopes to bolster understanding of the evolution of the Solar System and matter that led to the origins of life. JAXA commenced development in FY2014 of Japan's next flagship launch vehicle—expected to play a key role in Japan's future space development activities.



An artist's rendition of the orbiting ASTRO-H X-ray astronomy satellite (computer graphic image)
(© Akihiro Ikeshita)

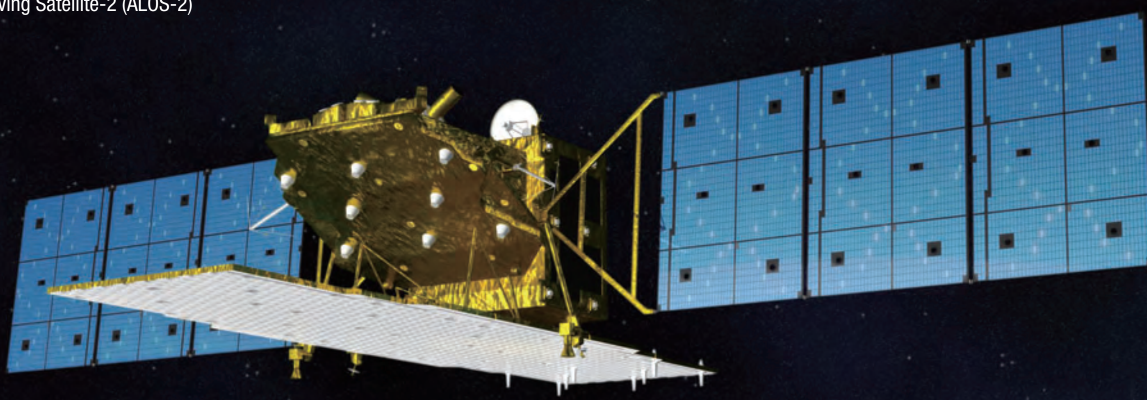
Astronaut Kimiya Yui
(© JAXA/NASA)

2015

New Organizational Form Aims for World-Leading Research and Development

In April, JAXA's organizational form was transitioned from its previous status as an Independent Administrative Agency, to become a National Research and Development Agency. This reform is aimed at maximizing the benefits generated by JAXA's research and development programs. JAXA newly developed the ASTRO-H X-ray astronomy satellite, which is expected to be launched during FY2015 (ending March 2016). ASTRO-H will make possible high-sensitivity observations over a very broad wavelength range, from X-rays through gamma rays. JAXA is taking a lead role in this joint international mission. Astronaut Kimiya Yui becomes the next astronaut from Japan to serve aboard the ISS, following on from Astronaut Koichi Wakata. Astronaut Yui's tasks will include installation of the CALorimetric Electron Telescope (CALET) and observations using this instrument.

Advanced Land Observing Satellite-2 (ALOS-2)
(© JAXA)

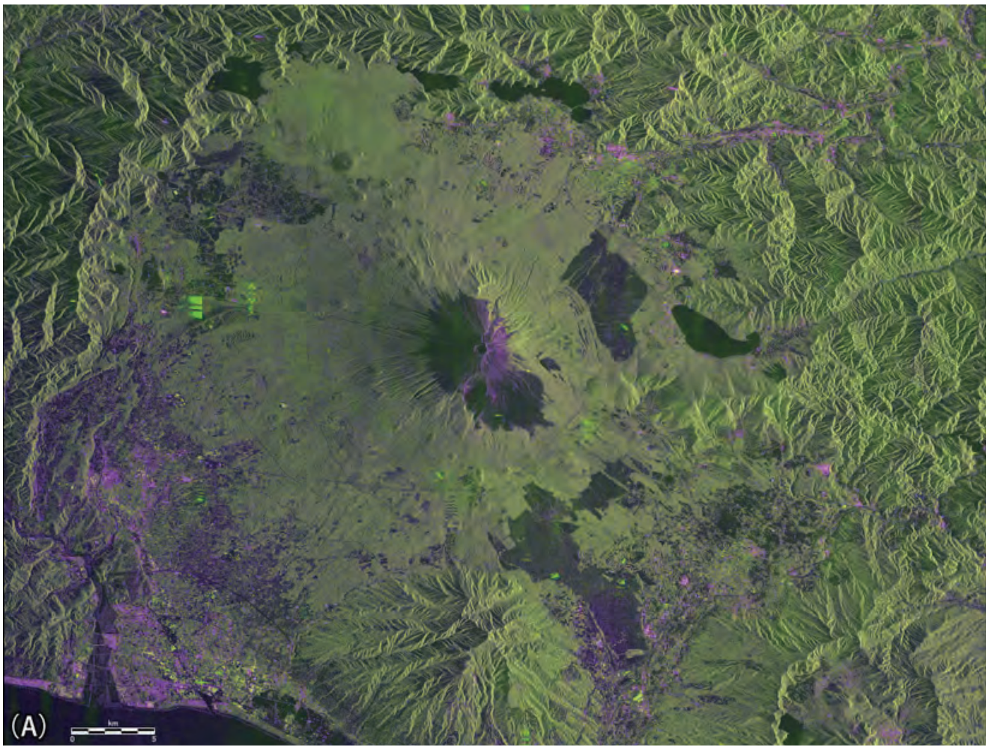


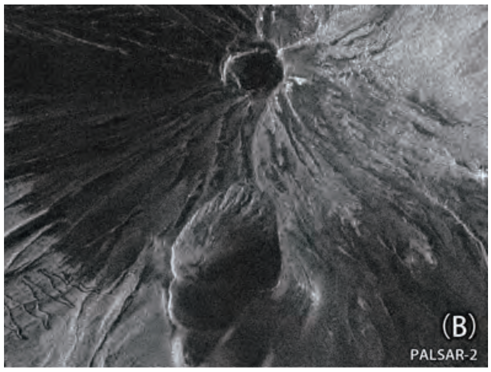
Advanced Land Observing Satellite-2 (ALOS-2) Carries Out Observations of Mount Fuji —A UNESCO World Heritage Site

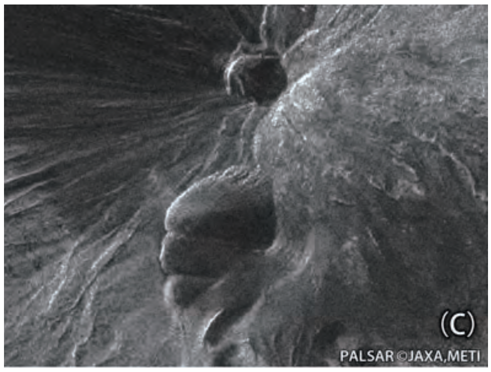
ALOS-2 mission logo
(© JAXA)

ALOS-2—launched in May 2014—is the successor to Advanced Land Observing Satellite (ALOS; in operation from 2006–2011). ALOS-2 carries the newly developed Phased Array-type L-band Synthetic Aperture Radar (PALSAR-2), which realizes an expansion of the observation area and enhanced image resolution performance.

These images of Mount Fuji were taken in June 2014. Image (A) has been artificially colored, with the green parts indicating forests, the bright-purple and yellow-green parts denoting built-up areas, and the dark-purple parts indicating bare land. Image (B) shows an enlargement of the Mount Fuji summit area. When this image is compared with image (C), taken previously by ALOS, the newer image provides greater detail of such features as craters and roads.







(© JAXA)

JAXA Explore to Realize

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