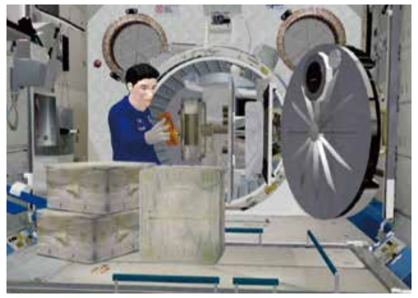
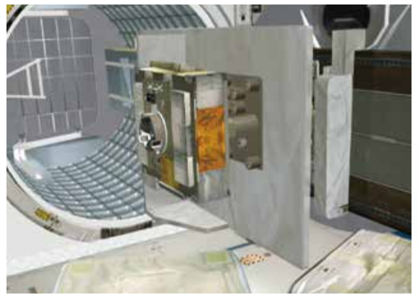
Sample retrieving scenario back to the ground

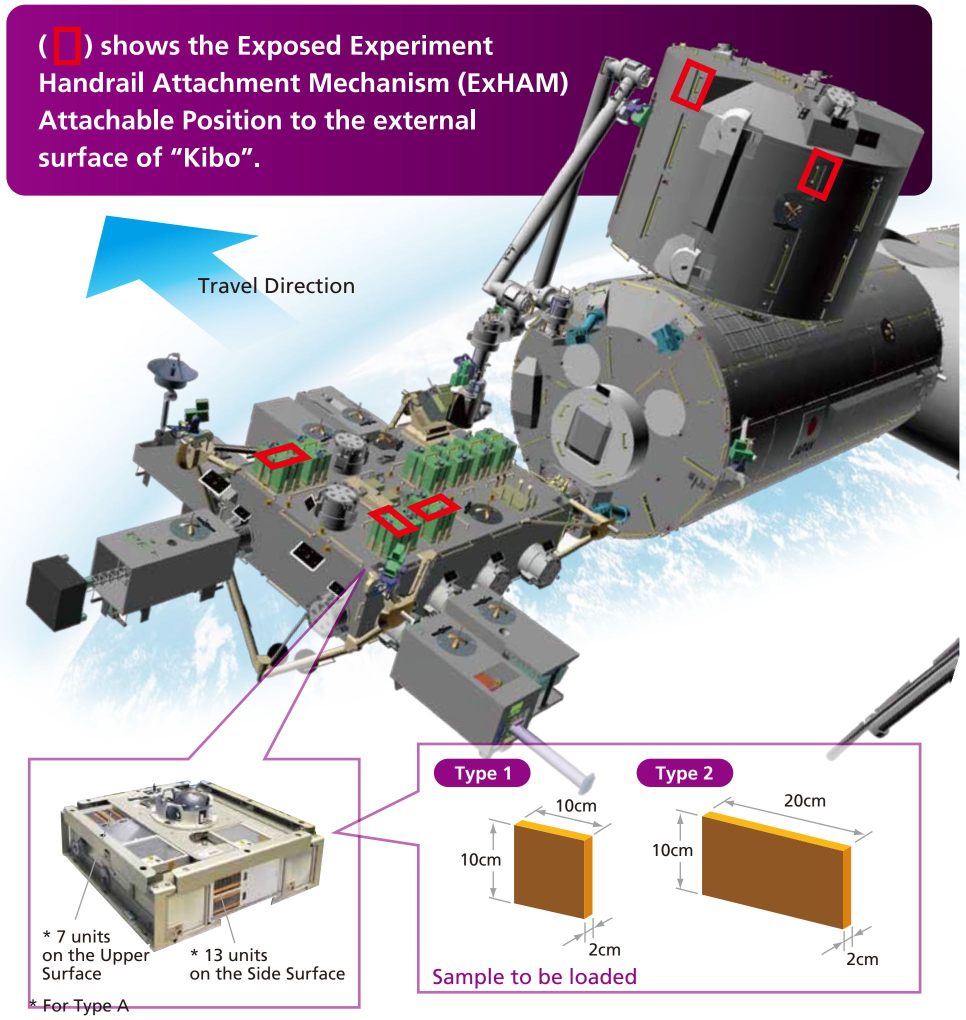


1 The sample is packaged in a Soft Bag and carried to "Kibo" using a transfer vehicle as cargo in a pressurized section.

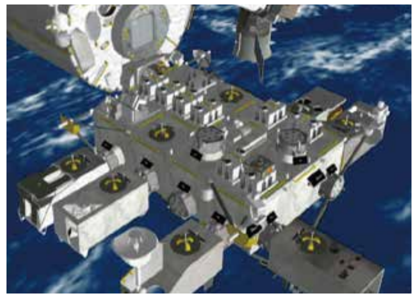


2 The sample is attached onto the Exposed Experiment Handrail Attachment Mechanism (ExHAM) and carried out of "Kibo" from the airlock door.

3 The robot arm of "Kibo" is operated on the ground and the sample is attached to the handrail outside section of "Kibo" .

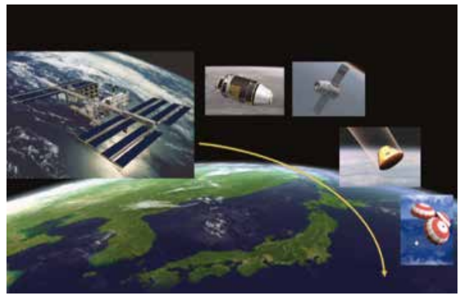


- The Exposed Experiment Handrail Attachment Mechanism can be attached onto the external area of "Kibo" .
- A sample with a size of 10cm x 10cm (Type 1) or 10cm x 20cm (Type 2) can be loaded.
- For Type 1, seven samples can be loaded to the upper surface and thirteen samples on the side surface of the Exposed Experiment Handrail Attachment Mechanism (ExHAM).



4 Experiment Commencement
The sample is exposed to the space environment for the period required by the user.

5 Experiment Complete
The robot arm of "Kibo" is operated on the ground and returns samples to the inside of "Kibo" experiment module from the airlock door.



6 The sample is returned to the ground with a transfer vehicle. The effects of the space environment are analyzed on the ground.

JAXA Japan Aerospace Exploration Agency

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Z-KIBO-PROMOTION@jaxa.jp
If you are interested in ExHAM, access the following address.

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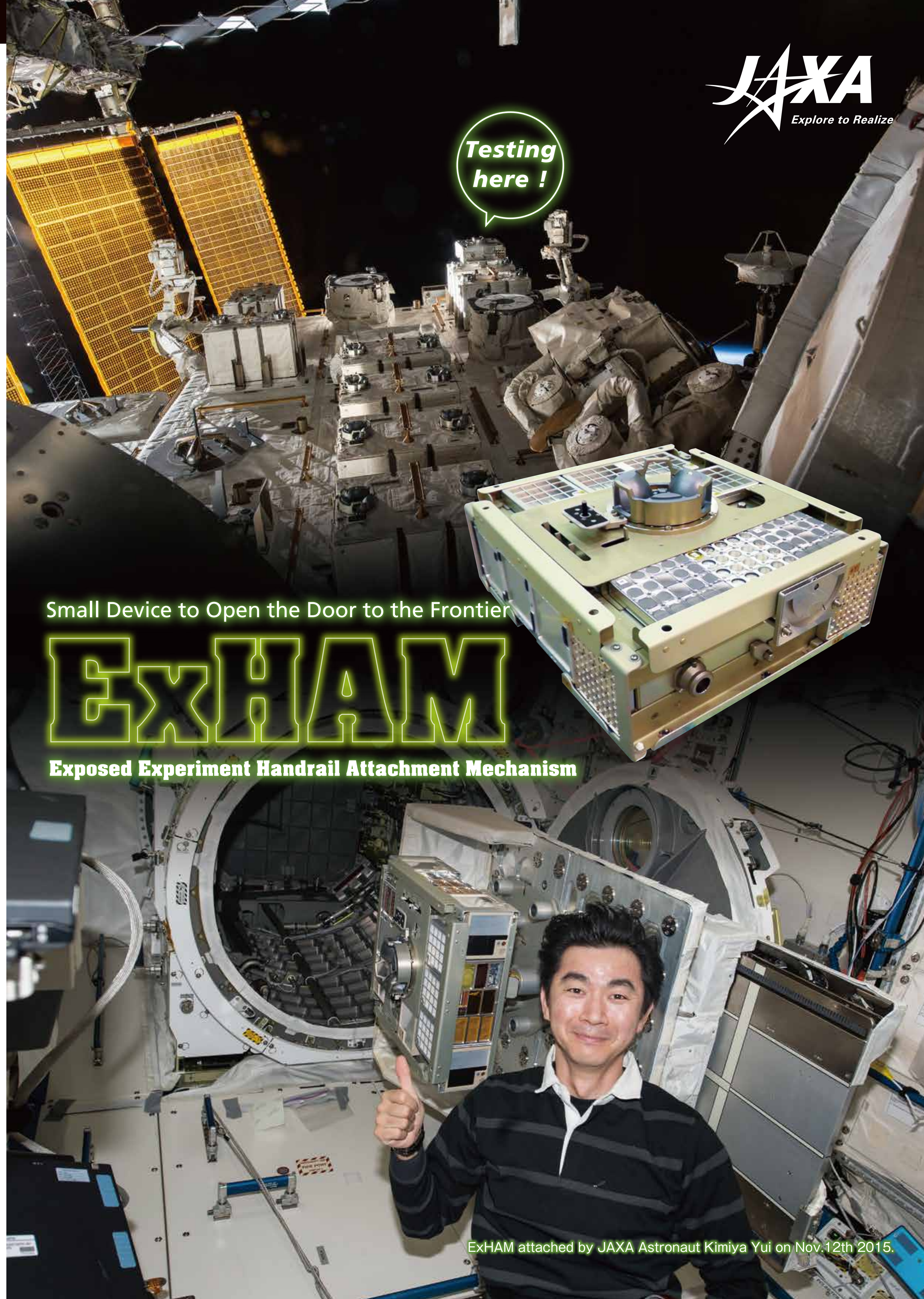
TEL : 050-3362-3202 FAX : 029-868-3950

Institute of Space and Astronautical Science
3-1-1, Yoshino-dai, Chuo-ku, Sagamihara-shi,
Kanagawa Pref. 252-5210
TEL : 042-751-3911 (Rep.)

ISS JEM Public Relation Information Center
http://iss.jaxa.jp/en/

Institute of Space and Astronautical Science (ISAS) Website
http://www.isas.jaxa.jp/e/

Exposed Experiment Handrail Attachment Mechanism (ExHAM) Website
http://iss.jaxa.jp/kiboexp/equipment/ef/exham/



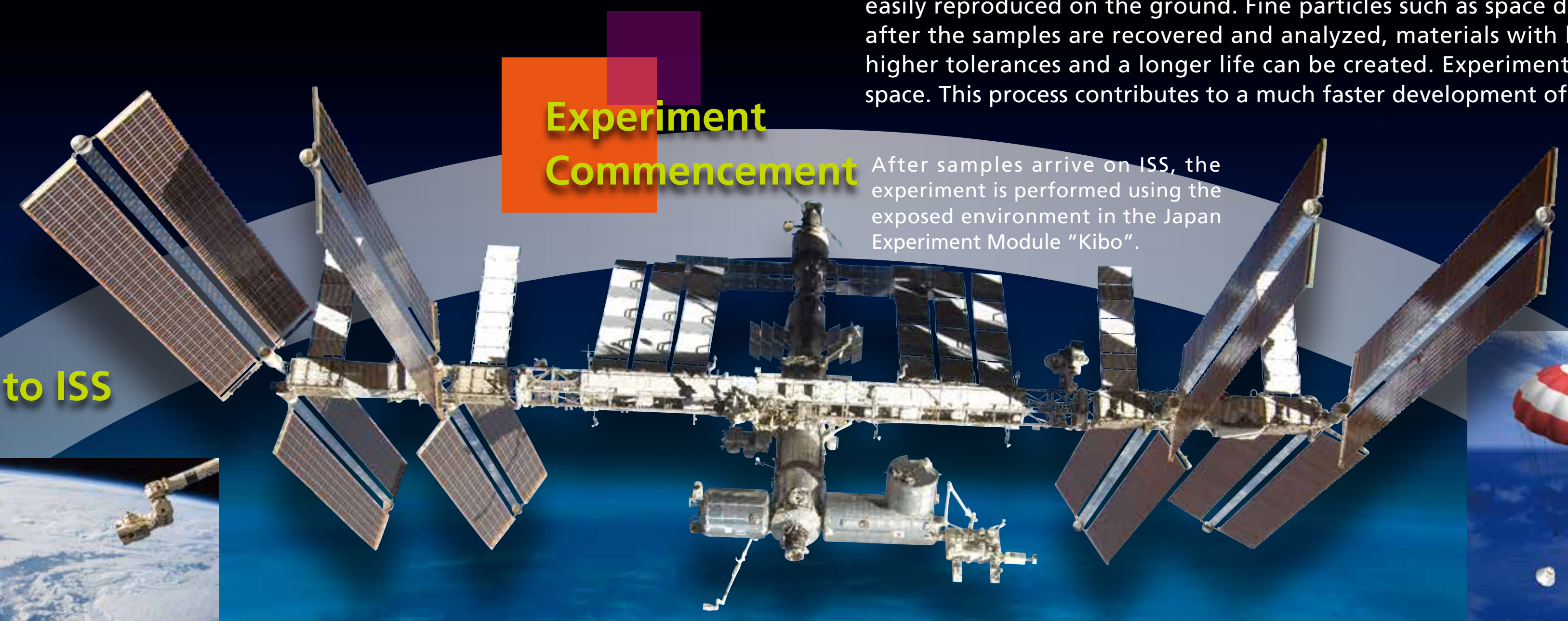
ExHAM attached by JAXA Astronaut Kimiya Yui on Nov.12th 2015.

A Small Sample Establishes a Foundation for the Future

Research & Development for

- Advanced Materials Durable in Harsh Space
- Discovery of Unknown Objects

In the Japanese Experiment Module "Kibo" on the International Space Station (ISS) revolving in an orbit 400km away from earth, experiments can be conducted in the environment of space. The Exposed Experiment Handrail Attachment Mechanism (ExHAM) effectively utilizes this opportunity: The influence of space on various materials, such as changes over the years due to material exposure over a long period can be investigated comprehensively in the severe space environment. This cannot be easily reproduced on the ground. Fine particles such as space debris or cosmic dust that collide with ISS can be captured. So, after the samples are recovered and analyzed, materials with higher reliability, better performance, higher stability levels, higher tolerances and a longer life can be created. Experiments that deliver the necessary data for this can only be done in space. This process contributes to a much faster development of advanced technology, the development of highly competitive space parts and materials, as well as a greater space activity domain. Also, the investigation of the environment around ISS and the collection of samples enable us to detect new clues concerning the mystery of the origin of the solar system and the origin of life, giving us greater understanding of our own evolution.



Sample Launch

H-IIB Rocket

Samples are launched using the H-IIB Rocket or a Rocket developed by another country.

Transport to ISS

Japanese H-II Transfer Vehicle "KOUNOTORI"

The sample is transported to ISS using the H-II transfer vehicle "KOUNOTORI" or another country's spacecraft.

Experiment Commencement

After samples arrive on ISS, the experiment is performed using the exposed environment in the Japan Experiment Module "Kibo".

Experiment Completion Sample Return

The sample is transported with spacecraft "Dragon", etc.

Analysis on the Ground

The returned sample can be analyzed on the ground.

Contributing to High Functioning and High Performance Material Development

Material Exposure Experiment

Micro-Particle Capture Experiment (MPAC) Device and Space Environment Exposure Device (SEED) attached to the Space Environment Data Acquisition Equipment-Attached Payload (SEDA-AP) of "Kibo"

Damage caused by Atomic Oxygen Erosion

Leads for creating new materials with higher tolerances and excellent features can be obtained by clarifying the influence of severe aspects of the space environment such as cosmic rays on each of the various materials.

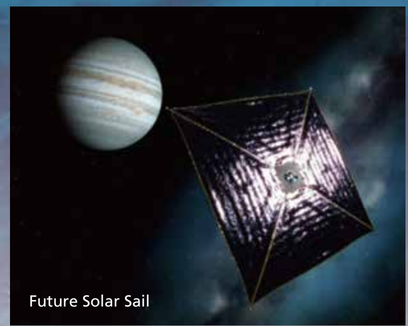
In a similar experiment in the past,

basic data was obtained to advance development of durable materials for the space environment.

In the "Space Environment Exposure Device (SEED) Experiment" , samples of parts and materials for space use were exposed directly to the harsh space environment. They were then returned to the ground in order to investigate the influence of the space environment on such parts and materials. This experiment, as performed in the past by Japan on ISS, obtained data analyzing the changes that occurred over the years including the degradation status of the space materials (thermal control materials and solid lubricant, etc.). The experiment was performed outside the Russian service module "Zvezda" located on the anterior of the forward-facing ISS. The sample was returned and analyzed at periods of 1 year, 2 years and 4 years later. Also, the "SEED" was attached to the Space Environment Data Acquisition Equipment-Attached Payload (SEDA-AP). This in turn was attached to the external payload platform located on the front side of the forward-facing ISS. One year later, the samples were returned and the accumulated data was analyzed. This data has been used for the development of new space materials and highly reliable material evaluation methods.

For Solar System Expedition

New Spacecraft Development

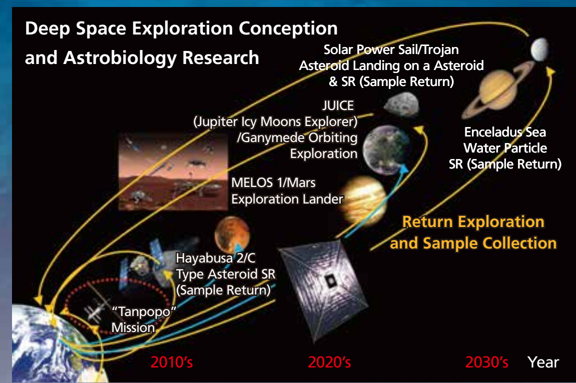


Future Solar Sail

Material samples for a solar sail are subjected to a lengthy exposure in the harsh space environment, and examined to discover the extent of degradation. The degradation mechanism is analyzed based on the samples returned on the ground, and the influence on the samples exposed is inspected. This will contribute to a better understanding of how to reduce costs, shorten development & manufacturing periods, as well as downsizing and lightening the space equipment.

Detecting a clue to the Original Material of Life

Capture of Cosmic Dust



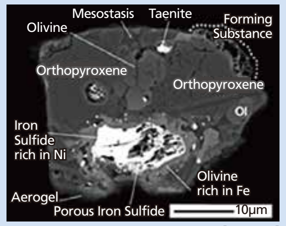
The material experiment on cosmic dust using the Exposed Experiment Handrail Attachment Mechanism (ExHAM) contributes to astrobiology.

The data about cosmic dust parent bodies such as comets or asteroids is detected by directly collecting the cosmic dust that continually impacts ISS, in an environment where there is no pollution from the earth. In addition, the original material of life brought from cosmic space to earth is detected by collecting and analyzing cosmic dust. This includes a diversity of life-related organic substances such as heat sensitive amino acids using the world minimum density dust collector called "Aerogel".

In a similar experiment in the past,

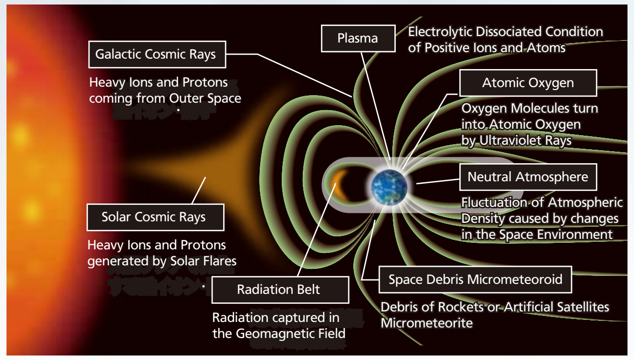
a new type of extraterrestrial substance was captured and collected successfully.

In the "Micro-Particles Capturer (MPAC) Experiment" performed by Japan on ISS in the past, a new type of extraterrestrial substance with mineralogical properties never before seen was captured for the first time in the world. When cosmic dust etc. reaches the earth, it heats up due to friction as it enters the atmosphere, and is then affected by decomposition, weathering, etc. on the ground. However, captured micro-particles in space are in the original condition as when the solar system was generated. The cosmic dust particle named "Hoshi" is being analyzed to provide clues to the conditions in the early stages of the solar system.



[Hoshi]

ISS operates in a high vacuum environment with extreme heat changes, and is continually showered with Cosmic Dust.



It takes about 90 minutes for ISS to make one revolution around the earth, along an orbit 400km from the ground, where a small amount of atmospheric gas is still detectable.

The environment around ISS is very severe, and great temperatures changes between -100 degrees C or lower and +100 degrees C or higher occur repeatedly. This is because day shifts to night and vice verse every 90 minutes in the microgravity and high vacuum environment. High-energy space radiation and ultraviolet rays pour over ISS, and the material strength changes due to the influence of solar flares. Space debris and cosmic dust are continually flying around, and atomic oxygen (generated by the decomposition of oxygen molecules by strong ultraviolet rays) is present, which erodes the materials of spacecraft.