Japan’s Contributions to the International Space Station (ISS)

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Congratulations on 50th Anniversary

1963.6.16

2008.3.11 The first part of Japanese Experiment Module was launched
1984: US President Ronald Reagan proposed developing a permanently-occupied space station

1988: Governments of Canada, ESA member countries, US and Japan signed the Intergovernmental Agreement on a cooperative framework for the space station

1993: Russia joined the program

1998: Beginning of on-orbit station assembly

2000: Beginning of continuous stay of the astronauts

2008: Beginning of assembly of Japanese Experiment Module

2011: Completion of station assembly

Present: In the utilization phase
International Partners

ISS is truly an International space collaboration effort, with the participation of many countries.
The First Piece of ISS

ISS assembly sequence started in 1998 with the Russian module, Zarya (sunrise), launched by a Russian Proton rocket vehicle.

Nov. 20, 1998

Zarya provides battery power, fuel storage and rendezvous and docking capability for Soyuz and Progress space vehicles.
ISS Under Construction... (1998-2011)
July 2011, Space shuttle Atlantis, on its final spaceflight of the Space Shuttle Program, carried the Raffaello multipurpose logistics module.
- The largest pressurized module on ISS
- 10 payload racks can be installed
- Various resources provided
  (power, communication, thermal control, gas supply and exhaust)

**Experiment Logistic Module - Pressurized Section (2008. Mar)**
- 8 racks can be installed
- Cargo storage area

- Length: 10 m
- Relocate payloads on the exposed facility without space walk (EVA)

- Only full-scale external experiment area on ISS
- 10 attachment ports for experiment payloads
- Various resources provided
  (Power, Communication and Thermal control)
Inside of Kibo
Astronaut Furukawa playing yo-yo in zero gravity
Japanese Style...

- Compact, efficient, clean
- Built-in storage
- Windows with healing views
- Beautiful balcony
The great music studio in space
Example 1
Contribution to New Medicine Development

- A high-quality protein crystal was generated in space, and then minute three-dimensional structure data was acquired on the ground.
- Discovery of unknown protein structure which causes illness helps effective selection of appropriate medicine candidate.

Example 2
24-Hour Monitoring of Space and the Earth

- MAXI (Monitor of All-sky X-ray Image)
  In cooperation with the U.S. satellite (Swift), new discoveries regarding a black hole have been observed. The related thesis was published in “Nature” magazine.

- SMILES (Superconducting Submillimeter-Wave Limb-Emission Sounder)
  Simultaneous high accuracy observation on atmospheric trace components (nearly 10 kinds including ozone (O3))

  - Ozone: Stratospheric ozone decreased above Europe and Russia.
  - ClO: Plenty of chlorine compounds generated in the process of ozone destruction are observed.
  - HCl: The decrease of hydrogen chloride indirectly suggests an increase of ClO.
Another outcome...

JAXA has a certification system for space food and provides Japanese food to crew members onboard. They are appreciated not only by Japanese astronauts but also crew members from other countries.
The first Japanese ISS Commander

Under training aiming at future ISS mission

Yui
Exp. 44,45

Onishi

Kanai
H-II Transfer Vehicle (HTV) - Kounotori

- Delivered by H-IIB from Tanegashima S.C.

- EP with unpressurized cargo transferred by SSRMS

- PLC internal view (Cargo and Rack)

- Delivered a total of 6 tons of pressurized and unpressurized cargo to ISS

- Provide unique cargo transfer capability essential for ISS operations after the shuttle retirement.
  - Large unpressurized cargo
  - Pressurized cargo, including the experiment payload racks
Roles of Kounotori

- 18th century adventurers set the stage for modern alpinism
- Famous adventurers were supported by many porters
- Thanks to their tireless efforts, mountain huts were built, and...
Roles of Kounotori

200 years later, access to the top of the mountains is a lot easier
Kounotori is the Japanese word for stork.
It brings tons of cargo, including experiment equipment, spares, crew’s clothes, foods, anything the astronauts might need for their space life in...like a porter.
Eventually, anyone will be able to go up there...like a mountain huts in the future...perhaps?
There are 2 Mission Control Rooms in TKSC, one is for Kibo and the other is for Kounotori.

- Kibo Control is 24x7 basis.
- 9 console positions and approximately 80 flight controllers monitor and control the Kibo system and support crew activities on a shift basis.

- Kounotori Control is only on line during the mission period.
- 15 console positions and about 80 flight controllers navigate and control Kounotori to the ISS and ensure it re-enters the earth’s atmosphere safely at the end of the mission.

- One of our most important achievement is....
1998, the moment when Kibo was just installed in the ISS
Team Work!

2013, 5th anniversary ceremony of Kibo
Team Work!

2012, right after HTV3 mission complete
And Team Work

- In March 2011, there was a huge earthquake in Japan.
- Fortunately there were no injuries to staff in TKSC, however several buildings, including the one where the Mission Control Rooms are located, incurred severe damage.
- As a result, we were unable to continue operations there.
- NASA volunteered to monitor Kibo and Kounotori for us and provided us with facilities in Houston to continue our operations.
- Thanks to their support, we were able to continue our operations and our control room capability was back in 2 weeks or so.
- Sometime later, to cheer up flight controllers as well as all the people in Japan, NASA and other international partners gave us a great present....
Priceless Partnership

- The ISS crew members as well as flight controllers around the world folded paper cranes (orizuru) wishing for the recuperation of all those affected by the huge earthquake in Japan.
- In Japan, the paper crane is a symbol of hope and peace.
ISS and Kounotori flying over the area devastated by the huge earthquake
My Friends – Female Flight Directors

NASA(Houston) Flight Directors, ESA (Columbus/ATV) Flight Directors, Russian Flight Director, JAXA (JEM/HTV) Flight Directors
THANK YOU