Asteroid explorer, Hayabusa2, reporter briefing

September 2, 2020 JAXA Hayabusa2 Project







Regarding Hayabusa2,

- Permission to land re-entry capsule in Australia
- •Operation plan for re-entry terminal guidance



Contents



0. Hayabusa2 and mission flow outline

- 1. Current status and overall schedule of the project
- 2. Permission to land re-entry capsule in Australia
- 3. Operation plan for re-entry terminal guidance
- 4. Outreach

5. Future plans



Overview of Hayabusa2



Objective

We will explore and sample the C-type asteroid Ryugu, which is a more primitive type than the S-type asteroid Itokawa that Hayabusa explored, and elucidate interactions between minerals, water, and organic matter in the primitive solar system. By doing so, we will learn about the origin and evolution of Earth, the oceans, and life, and maintain and develop the technologies for deep-space return exploration (as demonstrated with Hayabusa), a field in which Japan leads the world.

Expected results and effects

- By exploring a C-type asteroid, which is rich in water and organic materials, we will clarify interactions between the building blocks of Earth and the evolution of its oceans and life, thereby developing solar system science.
- Japan will further its worldwide lead in this field by taking on the new challenge of obtaining samples from a crater produced by an impacting device.
- •We will establish stable technologies for return exploration of solar-system bodies.

Features:

- World's first sample return mission to a C-type asteroid.
- World's first attempt at a rendezvous with an asteroid and performance of observation before and after projectile impact from an impactor.
- Comparison with results from Hayabusa will allow deeper understanding of the distribution, origins, and evolution of materials in the solar system.

International positioning:

- Japan is a leader in the field of primitive body exploration, and visiting a type-C asteroid marks a new accomplishment.
- This mission builds on the originality and successes of the Hayabusa mission. In addition to developing planetary science and solar system exploration technologies in Japan, this mission develops new frontiers in exploration of primitive heavenly bodies.
- •NASA too is conducting an asteroid sample return mission, OSIRIS-REx (launch: 2016; asteroid arrival: 2018; Earth return: 2023). We will exchange samples and otherwise promote scientific exchange, and expect further scientific findings through comparison and investigation of the results from both missions.



(Illustration: Akihiro Ikeshita)

Hayabusa 2 primary specifications		
Mass	Approx. 609 kg	
Launch	3 Dec 2014	
Mission	Asteroid return	
Arrival	27 June 2018	
Earth return	2020	
Stay at asteroid	Approx. 18 months	
Target body	Near-Earth asteroid Ryugu	

Primary instruments

Sampling mechanism, re-entry capsule, optical cameras, laser range-finder, scientific observation equipment (near-infrared, thermal infrared), impactor, miniature rovers.



2020/9/2

Hayabusa2 reporter briefing



1. Current project status & schedule overview

Current – The 2nd ion engine operation was nearly complete on August 28 (99.9% of the operation was then completed for both forward and return trips). After precise orbit determination, the ion engine operation for the fine correction of the orbit will be performed in mid-September, and then the return ion engine operation will be complete.





2. Permission to land re-entry capsule in Australia 🤸



- On August 10, 2020, we received notification from Australian Space Agency (ASA) notified that landing permission for the Hayabusa2 re-entry capsule, the Authorisation of Return of Overseas-Launched Space Object (AROLSO), has been issued.
- Published : August 6, 2020
- Signatures : Karen Andrews, Minister of Industry, Science and Technology
- Original text:
 - ➤ (Section 1: Authorisation)
 - This Authorisation is granted to JAXA as the responsible party for the return of the space object described in section 4 of the Authorisation.
 - (Section 4: Space object)
 - The space object is the Sample Return Capsule.



2. Permission to land re-entry capsule in Australia

For the AROLSO application, the following contents were submitted in writing in August 2019:

- Management : capsule collection system etc.
- Safety: landing range and risks
- Emergency: Possible contingencies and response plan
- Environment: Environmental impacts during a normal and abnormal landing
- Recovery plan: Capsule search plan, recovery/transport sequence, schedule etc.

After submitting the plan, meetings in Australia and via video conference were held, providing supplementary explanations for the plan and adding and revising any missing information. After about a year of further examination, the landing clearance was granted.

2020/9/2





■ 2nd ion engine operation

- On August 28, the trajectory correction using the ion engines was almost complete, and the ion engines were stopped.
- After making a precise orbit determination, the ion engines will be restarted in mid-September to fine-tune the orbit (TCM-0).
- This completes the ion engine operation for the return trip, and the RCS (chemical thrusters) will be used for subsequent trajectory correction.

Re-entry terminal guidance

- Orbital corrections TCM-1~5 will be made via the RCS.
- Dates of the TCM (Trajectory Correction Maneuver) are shown on the following page.







2020/9/2

Hayabusa2 reporter briefing





Operation name	Date	Earth distance
TCM-0	around 9/15~21	about 36 million km
TCM-1	around 10/20~26	about 17 million km
TCM-2	around 11/2~19	about 12 million km
TCM-3	around 11/25~29	about 3.5 million km
TCM-4	around 12/1	about 1.8 million km
Capsule separation	12/5 14:00~15:00 JST	about 220,000 km
TCM-5	12/5 15:00~17:00 JST	about 200,000 km
Capsule landing	12/6 2:00~3:00 JST	0km

TCM: Trajectory Correction Maneuver

Note: Subject to change due to flight conditions.





XTCM: Trajectory Correction Maneuver







CG video explaining the Earth return.



2020/9/2



4. Outreach



The following outreach activates are planned for the Earth-return:

Call for messages of support

- Request support messages for re-entry to be posted on the Hayabsua2 website.
- Release of the spacecraft's return trajectory
 - We will publicly release information about the Earth return orbit of the spacecraft.
- ^{2nd} Ryugu observation campaign
 - Asteroid Ryugu will approach the Earth between October and December this year, providing an opportunity for observation. An observation campaign will be conducted during this time.
- Hayabusa2 welcome home observation campaign
 - Since there is a possibility that the spacecraft can be observed with a telescope just prior to re-entry, we will conduct a campaign similar to the observation campaign for the Earth swing-by.



5. Future plans



Operation schedule

2020/9 15~21Fine orbital correction by the ion engines (TCM-0)2020/10~Re-entry terminal guidance2020/12/6Re-entry

Press and media briefings2020/9(TBD) Press briefing @ online (TBD)





Reference



Return cruise operation plan

