

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Small Bodies Missions and Technologies (Part 1) (4A)

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## HAYABUSA2 EARTH RETURN AND SAMPLE RETURN CAPSULE REENTRY

**Abstract**

Hayabusa2 is a Japanese asteroid sample return mission. The spacecraft was launched on December 3, 2014, and arrived at Ryugu, a C-type asteroid, on June 27, 2018. During its 1.5-years asteroid proximity phase, we succeeded in two rovers and one lander landing, two sample collections, one artificial crater generation, and three small objects orbiting around the asteroid. After completing the asteroid proximity operation, Hayabusa2 left Ryugu on November 13, 2019. The propulsive return cruise with the ion thrusters began on December 3, 2019. After the cruising with the ion thrusters, the spacecraft moved to the precise guidance phase, in which the trajectory corrections with the chemical thrusters were conducted. The spacecraft was guided to Earth precisely and entered the reentry corridor by the trajectory correction maneuver 3 (TCM-3) conducted on November 26, 2020. The TCM-4 executed on December 1 precisely guided the spacecraft to Woomera Prohibited Area (WPA) in Australia, the landing point of the sample return capsule. The reentry capsule was separated 12 hours before the reentry, and

the spacecraft performed an orbital maneuver (TCM-5) to divert from the reentry trajectory one hour after the capsule separation. The reentry capsule entered Earth's atmosphere and successfully landed on the WPA on December 5, 2020. The capsule recovery team deployed in the WPA immediately found and retrieved the capsule. On the other hand, the spacecraft performed a swing-by and began its extended mission. Its new target is a 30m-diameter fast rotator asteroid 1998 KY26. This paper describes the results of Hayabusa2 Earth return and sample return capsule reentry, including the cruising and precise guidance phase and capsule release operation.