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

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MISSION EXTENSION OF HAYABUSA2 FOR PLANETARY DEFENSE, SMALL BODY FLYBY AND RENDEZVOUS SCIENCES

Abstract

Hayabusa2, the second Japanese asteroid sample return mission, successfully returned to Earth on December 6, 2020 with pristine samples of the carbonaceous asteroid Ryugu. After releasing the sample return capsule toward Earth, the Hayabusa2 spacecraft commenced the new mission to two new asteroids by taking advantage of the remaining space asset that was fully healthy state with approximately half of the fuel remaining. This mission extension aims at visiting two asteroids, 2001 CC21 to flyby in 2026, and 1998 KY26 to rendezvous in 2031, both of which provide us valuable opportunities to contribute to the planetary defense and small body science. The relative velocity at the 2001 CC21 flyby will be approximately 5km/s. To compensate for the optical navigation capability optimized for rendezvous missions that are not suitable for flyby operations, very close and accurate flyby is necessary. In the present mission plan, a closest approach distance is 5-20 km and the targeting accuracy is less than 1 km. To realize this, the on-board navigation and guidance software will be upgraded to enable the flyby auto-navigation. The final destination, 1998 KY26, is a unique near Earth asteroid, whose diameter is 30-40m and the rotation period is 10 minutes. Such fast-rotator asteroids are known to be one of the most abundant small bodies in the near Earth region. Hayabusa2 will be the first spacecraft in the world to explore a fast-rotator asteroid. Due to the very small size of this asteroid and the large centrifugal force that prevail over the gravity at around the equator, there are many technical challenges and scientific interests, that will be resolved during this mission. Through these engineering and scientific activities, very precise flyby (i.e. simulated impact) navigation and guidance technology, in-orbit flight software reconfiguration adaptability to variable target bodies, and proximity operation capabilities in extreme environments will be obtained, which should contribute to the planetary defense technology and the small body science. In this paper, the mission plan, technical challenges and ongoing development status of the Hayabusua2 extended mission, as well as its most recent flight status will be described.