SPACE EXPLORATION SYMPOSIUM (A3)
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# CRUISE STATUS OF HAYABUSA2 : ROUND TRIP MISSION TO ASTEROID 162173 RYUGU

**Abstract**

The Japan Aerospace Exploration Agency launched an asteroid sample return spacecraft "Hayabusa2" on December 3, 2014 by the Japanese H2A launch vehicle. Following the successful return back of Hayabusa from the asteroid 25143 Itokawa, Hayabusa2 aims at the round trip mission to the asteroid 162173 Ryugu. Ryugu is a near-Earth C-type asteroid, which is believed to contain organic and hydrated minerals. Thus it is expected that its successful sample return may provide fundamental information regarding the origin and evolution of terrestrial planets as well as the origin of water and organics delivered to the Earth.

The spacecraft is equipped with four 10mN-class ion engines that provide a total delta-V of approximately 2km/s, which enables to realize the round-trip journey between the asteroid and the Earth. Some enabling technologies include the sample collection mechanism, optical navigation cameras, reentry capsule, four asteroid surface rovers and the impactor. The impactor is a kinetic impact device to create a 2m-class crater on the surface of the asteroid, enabling us to observe/collect not only the surface but also the sub-surface of the asteroid. Hayabusa2 is heavier than former Hayabusa by 100kg and has increased reliability and drastically more science capability as a sample-return spacecraft.

Hayabusa2 will reach Ryugu in the middle of 2018 and perform an asteroid proximity operation for 1.5 years. Three touch downs for sample collection and one crater generation by a high-speed kinetic impact are planned during the asteroid proximity operation. The sample is to be brought back to the Earth by a re-entry capsule in December 2020.

Hayabusa2 successfully conducted the Earth gravity assist (EGA) operation on December 3, 2015, passing above Hawaii islands at the altitude of 3090km, and increasing the interplanetary flight velocity by 1.6km/s. After the EGA, the spacecraft is planned to actuate the ion engine in March 2016 for the powered-cruise operation toward Ryugu rendezvous in 2018. This paper shows a brief introduction to the mission objective and spacecraft design, and then describes the first two year operation including launch, Earth gravity assist and ion engine-powered cruise operation. Finally the paper also provides a future operation plan for the asteroid proximity operation.