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Hayabusa-2: Its Mission Design and Scientific and Engineering Objectives

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The engineering verification spacecraft Hayabusa is now on its return cruising operation back to the Earth this summer of 2010, from the sub-km, S-type Near Earth Object (NEO) Itokawa, after seven years from its initial launch in 2003. By taking advantages of its technical heritage, lessons learned and invaluable operational experiences, the second generation sample return mission tentatively called Hayabusa-2 has been rigorously studied its mission requirements and both engineering and scientific objectives up to now.

This mission aims to complete establishing all necessary technologies for deep space round trips and to scientifically investigate materials and structure of C-type asteroids, which are more primitive than S-types in order to better understand links among origins of the Earth, its ocean and its life. This talk explains these characteristics of the mission, by taking into accounts of the following aspects.

The current baseline assumes 1999 JU3, a 1-km sized C-type NEO, as its sample return mission target whose launch window is the best in 2014 for the Hayabusa-class spacecraft with ion propulsion system. The spacecraft design is based upon the original Hayabusa system, together with some improvements and redundancies for what did not go right in the original one as well as replacements of old components that are no longer available and new additions to adapt for the C-type asteroid and new science measurements.

During its presumed stay period of about 1.5 years, it also aims to gain new insights on the carbonaceous asteroid by possibly performing surface science measurements and hypervelocity impact experiments to form an artificial crater, in addition to global observations, touch & go sampling and micro-rover deployment like the original Hayabusa. The earth return with collected samples is expected to be in 2020. It is also noted that potential international collaborations are investigated from multi-lateral perspectives, by acknowledging the most recent policy shift of U.S. space exploration as well as space science road maps for both U.S. and European communities.

Keywords: Small Solar System Bodies, Deep Space Exploration, Asteroids, Sample Return, 1999 JU3, Near Earth Objects