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Elective Sample Mass Measurement Technique

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About the Study

The Origins, Spectral Interpretation, Resource Identification, and Security-Regolith Explorer (OSIRIS-REx) shuttle is the third NASA New Frontiers Program mission and showed up at the close Earth asteroid (101955) Bennu in December 2018. Following the culmination of sample assortment in October 2020, also called Touch-And-Go (TAG), the OSIRIS-REx shuttle was set to verify its gathered sample mass necessity (>60g of material). The completely tested Sample Mass Measurement (SMM) technique was to be utilized for this verification. Imaging of the Touch-And-Go Sample Acquisition Mechanism (TAGSAM) was received shortly following the TAG event, expected to ensure mechanism health preceding pushing ahead with the SMM activity. Hazard of proceeded with sample loss and a desire to retain much material as could reasonably be expected lead the group to seek after a sped up sample stow planned SMM activity. When the sample was securely stowed in the return capsule an option SMM technique was proposed. The alternative SMM technique used reaction wheel momentum data from indistinguishable TAGSAM movement preceding and following the TAG event to gauge changes in space craft moment of inertia. Conservation of energy was utilized to disengage the sample mass from this dormancy change. Utilizing this new method, the space team was able to effectively appraise the collected sample mass to be 250.37 ± 101 g.

The Origins, Spectral Interpretations, Resource Identification, and Security-Regolith Explorer (OSIRIS-REx) mission launched from Cape Canaveral in September of 2016. With a mission prerequisite of collecting and returning a 60-gram regolith sample from asteroid Bennu to Earth. Bennu is both the most accessible carbonaceous asteroid and one of the most possibly Earth-dangerous asteroids currently known. As a B-type carbonaceous asteroid, Bennu might address a significant wellspring of volatiles and organic matter make a difference to early Earth just as being direct remnant of the original building blocks of the terrestrial planets. Information on the nature of near-Earth asteroids, for sample, Bennu is fundamental to understanding planet development and the beginning of life. The return to Earth of immaculate regolith samples with realized geologic context empowers exact investigations that can't be copied by space apparatus based instruments alone, consequently up context our comprehension of the early Solar System. The investigation of Bennu tends to numerous NASA objectives to comprehend the origin of the Solar System and the origin of life and will give a more noteworthy comprehension of both the perils and assets in near-Earth space, serving as a forerunner to future missions to asteroids.

Throughout the span of 2 years, the OSIRIS-REx spacecraft ventured from its Florida launch site to asteroid Bennu, a mission stage known as outbound voyage. It's arrival at Bennu in December 2018 denoted the beginning of another mission stage, proximity activities. OSIRIS-REx and the flight activities group spent the following 18 months imaging and studying on the outer layer of Bennu exhaustively, fully intent on deciding an appropriate site for sample assortment. The spacecraft was to drop to the asteroid surface, reaching the predetermined site to gather a sample (regolith). The interface between the asteroid surface and OSIRIS-REx is the Touch-and-Go Sample Acquisition Mechanism (TAGSAM), a gadget used to gather and catch regolith.

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