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SAMOSA - A SAMPLE RETURN MISSION TO A MAIN BELT COMET

Abstract

SAMOSA (Study of Active Main belt Object through Sample Acquisition) is a proposed 10 year L-class mission to return a sample of approximately 50g from a Main Belt Comet (MBC). MBCs are objects in the Main Belt which have been shown to consist partially of volatiles. Until recently, it was supposed that only non-volatile material persists in the Main Belt. The discovery of icy objects in this region raises questions about our understanding of the Solar System, including the formation of planets, and the delivery of water and organic material to the early Earth; a key to the origins of life. The study of the volatile and non-volatile material from MBCs would help answer these questions, but many of the required analyses can only be carried out adequately using modern techniques in ground-based laboratories. SAMOSA would launch in March 2020, arriving at Main Belt Comet Elst-Pizarro in October 2025. During a 6 month stay at the body, SAMOSA would use its remote sensing instruments to map the surface, measure the gravitational field and conduct spectroscopic investigations using Mid-IR and Vis-Near-IR spectrometers. This data would be used by mission scientists to determine an appropriate sampling site. A lander would then be deployed to the surface, to acquire a core sample of up to 12cm depth, and carry out an in-situ investigation using a microscopic imager and APXS. The sample canister would be ejected from the lander and captured by the orbiter. The orbiter would depart Elst-Pizarro in April 2026, arriving at Earth in June 2030. SAMOSA represents a challenging, but feasible mission, with a large potential scientific return.