

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Space Exploration Overview (1)

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## MISSION AND SYSTEM ARCHITECTURE DESIGN OF A DEIMOS SAMPLE-RETURN MISSION

**Abstract**

The subject of Mars has long drawn the attention of mankind. Dedicated space missions from NASA and SpaceX are aiming to land humans on Mars by 2030, which has accelerated the exploration of Mars. Despite humanity's desire to explore Mars, we don't know much about its moons. The moons of the red planet have received very little attention. Possible sources of in-situ resources on the moons could be used to support future human exploration in space or on Mars. We might be able to learn a lot more about the origin and composition of those moons if we get a sample back from them. This research paper presents a complete system design of a Deimos sample-return mission. The novelty in any sample-return mission lies in the mining architecture developed to extract an adequate amount of the required materials from another celestial body's surface and transport them back securely to Earth within the mission timeframe. Sample return missions by various space agencies around the world have tried to unravel some of the greatest mysteries surrounding our universe. The mission design is an overview of the sample return mission. To dive into the specifics of various segments and phases of the mission, subsystem detailing with a focus on outcome-based analysis has been performed. The paper details an innovative grappling mechanism to extract samples from Deimos as part of the novel mining architecture presented