

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration including Ocean Worlds (5)

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DESIGN OF A LANDER MISSION ARCHITECTURE FOR THE SURFACE EXPLORATION OF
MERCURY**Abstract**

The research paper focuses on the design of a mission architecture to explore the planet Mercury in detail. Mercury being the innermost planet of our solar system and currently is one of the least explored as well. While the NASA Messenger Mission and upcoming ESA-JAXA BepiColombo Mission have provided valuable insight, there is a limitation to their scientific return as they are orbiter missions. Mercury's position as the innermost planet leads to long energy intensive transfer windows which discourages the use of large vehicles. The planet's environment is quite harsh due to its proximity to the sun and its spin on its axis. Surface temperatures vary from 703 Kelvin to 94 Kelvin on the day and night side respectively. The presence of a thin exosphere and a weak magnetosphere make the surface susceptible to high intensity solar wind and plasma particles as well as ionizing and non-ionizing radiation from the sun. The above factors influence the design of any spacecraft, and requires it to be robust enough to survive and collect valuable data. The following paper discuss the mission architecture of a lander mission to Mercury with an emphasis on the design of an orbital trajectory using GMAT and descent of the lander on the surface. The paper also discusses the potential landing sites, exploration objectives and a preliminary cost analysis for the same.