

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
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DRILL AND DIVE EXPEDITION FOR ENCELADUS EXPLORATION

**Abstract**

Enceladus, as researched by Cassini's Mission, has the icy replica of volcanic activity particularly geyser-like plumes, the existence of the ocean world beneath its frozen surface along with the presence of biological minerals namely water, methane, and silica; questions the possibility of microbial life.

This project aims to create an exploratory vehicle mission named "Enceladus Divers" to study the Saturnian icy moon, positioned at the southernmost end of 'Baghdad sulcus', considered the most unsailable and adequate site for exploration, including a thermal drilling approach to spike the icy veneer of the moon and a maneuverable underwater diver, uncovering hydrothermal vents under Enceladus' thick ice crust.

The thermal driller, by melting and drilling the icy crust, would create a fluid space for the diver to descend into moon's surface that functions in analogizing the newly formed ice with that frozen over centuries, alongside detecting the organic elements, operated vertically by varying buoyancy and dragged horizontally by wings, optimized with minimal payload. The experiment will execute on the diver, sending data to the driller which will then be communicated back to the ground station on Earth for further examination. The underground ocean is the target in the pursuit of extraterrestrial life. Since, the divers will be steering in extreme areas, varying from cold ice to hot vents, material selection of all the subsystem components, and the outer body is done along these constraints. Multi Layer insulation is simulated on Ansys and the vehicle operational design is developed on Autodesk Fusion 360. The proposed Enceladus exploration idea is a phenomenal opportunity towards several unexplored findings and to encounter habitat for life in the outer solar system.