

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

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TITAN EXPLORATION USING AUTONOMOUS DRONEBOAT WITH SAMPLE ANALYSIS &
VISUAL PERSPECTIVE

Abstract

After sending the First ever probe on Titan, 'Huygen Probe' during the Cassini mission, data received made us wonder if Titan has life on it and explore its methane lake to find the signature of life. This paper focuses on robotic boat-based exploration that will land in methane lakes of Titan and search for signs of life and sample collection and analysis using onboard instruments. The Robotic drone boat will consist of a robotic hovercraft, an amphibian Boat that can move over land too, enabling us to take samples of rock from surrounding land. The hovercraft placed inside the chief drone boat; the hovercraft has low weight, a low-power robotic arm with a variable toolset that will collect solid samples for analysis using various onboard instruments. Hovercraft will be powered up using solar panels and a nuclear core used in spectrometer, doubling up to keep internal circuits warmed up as the atmospheric temperature on Titan goes as low as -179 degrees Celsius. Hovercraft will receive commands from a chief drone boat that communicates with earth using an orbiter placed in Titan's orbit. This exploration will help us understand this celestial body's capability to sustain life, organic life that can live in different environmental conditions, and its geological aspect. The Drone boat has a low-speed, low-power motor and will carry an onboard 3D LIDAR for mapping that will help us to map and autonomously guide the Boat while avoiding obstacles. It has equipped with different sets of cameras for visual perspective and sonar to map the depth of the lake. The hovercraft allows flexibility to exploration by operating on the land as well as water. With the abundance of methane and nitrogen, Titan can be a possible human outpost as a refuelling station for deep space missions outside the solar system as methane is also rocket fuel.