

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

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TITAN MISSION DESIGN OF A MULTI-USE SATELLITE STRUCTURE AND LANDER PLUS
DRONE SYSTEM**Abstract**

Titan is Saturn's largest moon and the Solar System's second-largest natural satellite. It is the only known moon with a dense atmosphere and an object in space other than Earth with clear evidence of stable bodies having liquid surfaces. Data collected from the Cassini mission sheds some light on the composition of Titan. However, there still exist a large number of unsolved questions about its atmospheric composition, terrain, the reason of methane deficiency near the surface, and more. To answer these mysteries, this paper presents a multi-faceted mission to Titan comprising a satellite and lander rover system with a band of drones attached for comprehensive testing and analysis of Titan's surface. The primary objective of the orbital satellite will be conducting preliminary analysis of the moon through observations in multi-band spectrum with improved resolution, terrain mapping, studying the atmospheric composition and more in preparation for the lander release. The satellite will also include a gradiometer through which subsurface analysis will be conducted. The lander rover will be a compact laboratory aiding in conducting analytical testing of the soil on the surface, examining the characteristics of the soil, and low-level atmospheric analysis— all of which help study and understand the methane problem including information on the structure of methane lakes on Titan. The drones will conduct small surveys over various distances of the surface of Titan, enabling mapping of the layout with great detail, providing key sites for future settlement missions, and analyzing terraforming possibilities on Titan. The mission will help scientists gather comprehensive data on the moon, laying the basis for the possibility of

future habitat missions. This paper, written by a team next generation in our ambitions for the space industry hope that this paper is also used for educational purposes for others to gain experience in the form of a comprehensive mission design considering the latest technologies and goals for exploring Titan. This paper is submitted as part of the Space Exploration Project Group at the Space Generation Advisory Council.