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IMPLEMENTATION OF A PSEUDO SATELLITE ON TITAN

Abstract

Since the dawn of time, humans have harbored aspirations of visiting other celestial bodies, which has spurred the development of numerous spacecraft by the space industry. Titan, Saturn's largest moon, has the potential to support life due to its atmospheric density, gravity, presence of a methane lake, and a thick atmosphere that shields living beings from cosmic radiation, according to research on recent space developments. In 2004, NASA and ESA launched the Cassini Huygens probe, a mission whose goal was to explore Titan's atmosphere, learn more about the moon, and its lakes. In order to collect data about Titan's surface and atmosphere, NASA's Dragonfly mission will deliver a rotorcraft to Titan. The mission is scheduled to launch in 2027. The multi-rotor vehicle used for the Dragonfly mission has a 7-year transit time and a 2-year landing period. In order to explore and study Titan, it is suggested in this paper that a pseudo-satellite system be designed and put into operation. A pseudo satellite refers to an unmanned fixed-wing autonomous aircraft operating in higher altitude, that bridges the gap between satellites and UAVs. The system is intended to function as a high-altitude surveillance platform that can loiter over Titan's surface, especially above places of interest for long periods of time while providing a steady and ongoing observation for scientific study. This paper proposes to design a pseudo satellite system, which employs ASRG RTGs as its power source, enabling it to keep a stable position in Titan's atmosphere. According to NASA, the Dragonfly will be in operation for 2 hours out of every 196 hours in a Titan day for a total mission duration of 2 years, whereas the pseudo satellite implemented in this paper, can fly continuously for a period of 6 years. This paper also describes a variety of scientific tools used in the pseudo satellite for gathering information about Titan's atmosphere and surface. A unique opportunity for long-term observation and study of Titan is provided by the proposed pseudo-satellite system, allowing for a deeper comprehension of the complex environment of the moon and the potential for further exploration.