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COMMUNICATION RELAY SMALL SATELLITE FOR LUNAR FARSIDE LANDING EXPLORATION MISSION

Abstract

Recently, a Chinese lunar farside landing exploration mission has been proposed and will be implemented in the near future. The spacecraft for this exploration mission is composed of a lander, a rover and a communication relay satellite. As an important and innovative part of this lunar farside mission, the communication relay satellite will be developed to provide communication relay support for the lander and the rover to maintain contact with the Earth during their landing and surface operation. Compared to lunar polar orbit, the Earth-Moon L2 liberation point Halo orbit will be used to for relay satellite to provide the communication relay to the lander and the rover on the lunar farside while simultaneously performing the meteoroid impact flashes monitoring and low frequency radio astronomy measurements. According to design goals of providing continuous, reliable communication relay service, maximizing science data transferred from the land, the rover and relay satellite itself back to Earth, Minimizing the propellant requirements for orbit transfer and maintenance, and minimizing the flight time to the mission orbit, based on mature CAST100 small satellite platform developed by DFH Satellite Co.Ltd, a preliminary system design of the lunar communication relay satellite is proposed in this paper, including the orbit transfer and mission orbit selection, overall flight profile, satellite configuration and layout, the communication link budgets and communication system design tradeoff, GNC and propulsion system solution, etc. In order to support explorer's landing on the unexplored lunar farside, the communication relay satellite will be launched before the launching of the lander and the rover. The design life of the communication relay satellite is more than 5 years. Apart from providing communication support for this mission, it is possible to provide communication relay service for other lunar farside exploration mission in the future.