22nd IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Spacecraft for Deep-Space Exploration (8)

Author: Dr. Yongjun Moon
Satrec Initiative, Korea, Republic of, yjmoon@satreci.com

Mr. Jae-Sung Jeon
Satrec Initiative, Korea, Republic of, jsjeon@satreci.com
Mr. Minwoo Lee
Satrec Initiative, Korea, Republic of, mwlee@satreci.com

CONCEPTUAL DESIGN OF A LOW COST LUNAR MISSION USING FLIGHT-PROVEN SMALL SATELLITE TECHNOLOGIES

Abstract

A low cost lunar mission using a flight-proven small satellite system and state-of-the-art technologies was conceptualized. Based on a scenario to send a flight-proven 300-kg-class Earth observation satellite into a low lunar orbit (LLO) with an altitude of 150 km, mission duration, propulsion system, maneuver plans, and mass budget were designed. The mission duration on the LLO was set to be more than six months considering reliability and allowable total ionizing dose of components currently used for small satellites in low earth orbits. To reduce launch costs, the lunar orbiter was assumed to use piggy-back launch to be inserted into a geosynchronous transfer orbit (GTO). A H2O2/high density polyethylene hybrid rocket system was selected for orbit transfer maneuvers from the GTO to the LLO. In order for a flexible mission design, the transfer orbits consisted of 2.5 phasing loops. The estimated total mass of the spacecraft was about 750 kg including the propulsion system. It has been found that, from this study, the total mission cost is expected to be less than $100 million USD including spacecraft development, launch service, and operations.