

SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

Author: Dr. Gwanghyeok Ju
Korea Aerospace Research Institute (KARI), Korea, Republic of, ghju@kari.re.kr

Dr. Donghun Lee
Korea Aerospace Research Institute (KARI), Korea, Republic of, dhlee@ascl.kaist.ac.kr

DESIGN STUDY OF KOREAN LUNAR ORBITER PATHFINDER

Abstract

Motivated by the Korean president's key vision goal in 2013, a new Korean Lunar Exploration Program (KLEP) associated with the second generation Korean space launch vehicle program was initiated as a part of national policy agenda to open an era of with space exploration and to provide new paradigm and motivation in space science technology. The key focus of the KLEP is to make a lunar lander landed on the moon surface by 2020. A lunar orbiter pathfinder will be launched to the moon in 2017 as a stepping stone to the moon to verify a "proof-of-concept" for various technologies including IT-based payload platform and cubesat-based impactor. In this paper, the status of the Korean lunar orbiter pathfinder in early design phase is summarized. A set of scientific requirements are identified, categorized and prioritized to achieve goals for Korean lunar mission. They are originated from the science definition study performed by Korean science community, which included the background and information for all kinds of scientific payloads and missions which were carried out by prior lunar missions of foreign countries. The additional selection criteria are added to the conventional scientific criteria suggested in 'the Scientific Context for Exploration of the Moon' in order to select valuable and meaningful science missions; national consensus including public outreach and education, socio-Economic impact, and international collaborations for the lunar science mission. A set of engineering mission requirements and mission operational schematic for the orbiter pathfinder are described to achieve the scientific goal. A series of analytical results are presented including mission scenario analysis, feasible configuration design compatible with KSLV-II, mission implementation analysis by assessment of appropriate platform combination, risk analysis, and schedule analysis to compromise with the 2nd generation of Korean space launch vehicle program. The system design strategy for the orbiter pathfinder is suggested to find current technological and scientific capabilities by sharing the bus subsystem heritage with the Korean Next Generation Middle Class Satellite program and other previous space programs. In addition, the scientific and engineering definition study based on collaborative study with NASA are summarized to identify the feasibility and adaptability of the Korean lunar orbiter pathfinder for cubesat-based lunar impact mission, communication relay backup for Resource Prospector Mission, space communication with DSN, etc. In conclusion, the outcome of early-phase design study for the Korean lunar orbiter pathfinder could be definitely the concrete cornerstone to initiate the new ambitious Korean lunar mission and to open up the 'new era of Korean space pioneering and international collaboration before 2020.