

Executive Summary

Date Prepared: August 17, 2007

Presenter's Name: Dr Pete Worden
Presenter's Title: Director
Presenter's Organization/Company: NASA Ames Research Center

Presentation Title

Small Spacecraft in support of the Lunar Exploration Program

Key Ideas

This paper analyses the ability of small, low cost spacecraft to deliver scientifically and technically useful payloads to lunar orbit and the lunar surface, in particular precursor mapping, infrastructure and in-situ resource utilization functions, that are necessary prior to human return as part of the Vision for Space Exploration

Supporting Information

This paper is based upon a technical study of the NASA-Ames Research Center's Small Spacecraft. Following an overview of the generalized capabilities of small spacecraft in comparison to the objectives of the robotic lunar exploration program, the paper documents the mission planning and overall spacecraft design for lunar missions. The study shows that spacecraft subject to the constraints laid out, within a budget of < \$100 Million and which can be launched on one of the next generation affordable launch vehicles such as Falcon-1 or Minotaur-V, can deliver payloads of 5-50 kg to the lunar surface or 10-200 kg payload to lunar orbit. The payloads carried would be capable of covering most of the functions of lunar missions that are needed prior to human arrival, as identified in NASA's Lunar Robotic Architecture Study, with the exception of the bulk ISRU tasks of the 'Lander Rover' (In-situ Resource Utilization (ISRU)) mission. The key advantages of smaller spacecraft are reduced cost and schedule. These missions include Laser Communications demonstration, validation of frozen orbits, high altitude dust measurements, high resolution neutron spectrometer measurements, precision landing, dust characterization, lighting and thermal ground truth at different locations, regolith composition and thickness and radiation shielding characteristics, small ISRU demonstrators, effects of lunar environment on life and mechanical structures, lunar astronomy, micro rover demonstrations