Geophysical Research Abstracts, Vol. 9, 08751, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08751
© European Geosciences Union 2007

Status of NASA Lunar Precursor Robotic Program

J. B. Plescia (1), A. Lavoie (2), P. Spudis (1), and B. Bussey (1)

(1) Applied Physics Laboratory, Johns Hopkins University, Laurel, MD, (2) NASA Marshall Space Flight Center, Huntsville, AL (jeffrey.plescia@jhuapl.edu / 240 228 1468)

NASA's Lunar Precursor Robotic Program (LPRP) has the mandate to provide the precursor data necessary to implement the Vision for Space. This will be accomplished by: defining a robust and sustainable architecture for robotic missions that accomplish defined objectives; identifying key assumptions and guidelines; identifying system interfaces; building constituencies in the exploration community; defining specific requirements for each mission; establishing and overseeing projects to execute mission design, development, integration, test and operation; and reducing risk for future human missions (Constellation program) through technology validation.

NASA's Lunar Architecture Team recently completed its study and recommended that the architecture focus on the establishment of an outpost at one of the lunar poles (rather than a series of sortie missions to various points on the Moon). The poles have thus become the focus of exploration activities with Hydrogen and Oxygen being the critical resources.

Specific areas of interest for the near-term robotic program include: global mapping of the lunar surface; identifying the optimal landing site for the outpost; finding and characterizing resources that make exploration affordable and sustainable; locating and characterizing lunar volatiles; characterize sunlight and surface environment of poles; field testing new equipment, technologies and approaches (e.g., dust and radiation mitigation); supporting demonstration, validation, and establishment of heritage of systems for use on human missions; determining how life will adapt to space environments; emplacing infrastructure to support human exploration; gaining operational experience in lunar environments and providing opportunities for industry, educational and international partners.

The first LPRP missions will be the Lunar Reconnaissance Orbiter (LRO) and the

Lunar Crater Observation and Sensing Satellite (LCROSS). LRO will be placed in a 100 km circular polar orbit and will acquire a variety of data to provide an integrated global map of the Moon. LCROSS, to be launched with LRO, uses an impactor and observation spacecraft to determine if volatiles exist in permanently shadowed regions of the lunar poles.

Subsequent to these missions, attention will turn to surface exploration of the polar regions. The first surface mission will be a lander to an area of permanent or near-permanent sunlight to evaluate the surface environment (e.g., lighting, temperature, radiation, geotechnical properties) as well as the hydrogen content and chemistry of the regolith. The next mission would entail the exploration of a permanently shadowed area to determine the form and distribution of the volatile H-bearing species. Even after LRO, the other international orbital missions, and a landed mission to an illuminated area, the form, concentration and distribution of the volatiles-bearing species in the shadowed areas will remain unknown. Thus, a rover with the ability to sample the subsurface and analyze the volatiles as well as map their distribution will be employed. This will provide sufficient data to allow a decision regarding which type of resource ore body will be exploited.

Once the site has been selected and the resource potential evaluated, the focus changes to one of demonstration of resource technology. Of interest here will be the technology necessary to excavate and process the regolith - an activity that could be complicated by the potential requirement of having to work in permanent shadow - and the technology to remove, process and store the resources.