

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

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STATUS OF NASA'S REQUIREMENTS-DRIVEN, LOW-COST ROBOTIC LUNAR LANDER

Abstract

NASA's Resource Prospector Mission (RPM) will be the first In-Situ Resource Utilization (ISRU) demonstration to the lunar surface and first landing near a lunar pole. The RPM consists of a reference pallet lander (to inform partnering decisions), a medium-sized rover, and a science instrumentation package containing a miniature drilling and chemistry plant to collect and analyse soil for volatile components such as water or hydrogen that could be used in human exploration efforts. Over the last seven years, NASA has invested in development and risk-reduction for a new generation of small-medium planetary landers capable of carrying payloads to the lunar surface. NASA Marshall Space Flight Center (MSFC) and the Johns Hopkins University Applied Physics Laboratory (APL) have jointly implemented a robotic lander development known as the Mighty Eagle. Many lander technologies and algorithms have been tested and demonstrated in an integrated systems environment using the Mighty Eagle free-flying test article. Since 2010, the NASA Johnson Space Center (JSC) has been developing a vertical test bed, known as Morpheus, to demonstrate new green propellant propulsion systems, autonomous landing, and hazard detection technology. These investments, in concert with successful technology risk reduction efforts in focused subsystems, have significantly reduced development risk for landers, thereby reducing overall risk and associated costs for future missions. The RPM brings together the lander development efforts of the Science Mission Directorate and Human Exploration and Operations Mission Directorates. To support NASA's pursuit of a lander partner for RPM, a NASA led, requirements-driven, low-cost lander concept has been developed to help mature the mission architecture until a lander partner is identified. This paper presents NASA's current reference lander configuration for the Resource Prospector Mission, which has been jointly designed and implemented by an integrated team that merges expertise from the Mighty Eagle and Morpheus teams located at JSC, MSFC, APL, and Jet Propulsion Laboratory (JPL). The pallet configuration is unique and reduces complexity by having no legs or deployable ramps. The RPM, led by Ames Research Center, held a Successful Mission Concept review in September 2013 and plans to launch in 2018.