SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 1 (2A)

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RESOLVE: AN INTERNATIONAL LUNAR POLAR ICE PROSPECTOR MISSION MOVES TOWARDS FLIGHT

Abstract

Numerous studies have shown that the use of space resources to manufacture propellant and consumables can enable new space exploration architectures that will pave the way for the human exploration of Mars. While the moon's regolith is a significant source of oxygen, it is poor in hydrogen and carbon so fuel production is not viable. A series of lunar missions over the last 20 years has shown that water ice and other volatiles useful for the production of propellant are located at the lunar poles, though most of it is located within permanently shadowed craters where accessing these resources is challenging. However, instruments aboard the Lunar Reconnaissance Orbiter (LRO) also show evidence that the water ice may be present in areas that receive several days of continuous sunlight each month. Before we can factor these resources into future mission designs, we must understand the distribution and quantity of ice or other volatiles at the poles and whether it can be reasonably harvested for use as propellant or mission consumables.

NASA, in partnership with the Canadian Space Agency (CSA), is developing a Class D mission, named RESOLVE, to answer these questions. RESOLVE will deliver a rover-mounted instrument platform to a partially sunlit region of the poles. As the rover moves along the surface, RESOLVE will measure surface-bound hydroxyls, generate subsurface maps of hydrogen concentrations, as well as collect and analyze one-meter regolith core samples. The RESOLVE payload has been through several design iterations to date, and in 2012 completed a full mission simulation at a lunar analog test site. After the success of these tests, the design team is now turning their focus towards the flight mission, which is tentatively targeting an April 2017 launch. This paper will cover the payload risk reduction testing and flight planning work performed in Fiscal Year 2013, as well as highlight mission formulation efforts. During this year, all of the major payload subsystems are undergoing a design and test cycle targeted at reducing technical risk. NASA has also formed a flight planning office to study the available lander options, conduct critical

mission trade studies, develop a list of potential landing sites and develop the mission operations plan. The products generated in FY 2013 will feed forward into the Mission Concept Review scheduled for September of this year, which is the final step in the process leading to RESOLVE's authorization for flight.