SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

Author: Mr. William Larson
National Aeronautics and Space Administration (NASA), Kennedy Space Center, United States

Mr. Gerald Sanders
National Aeronautics and Space Administration (NASA), Johnson Space Center, United States
Mr. Martin Picard
Canadian Space Agency, Canada
Dr. Jacqueline Quinn
NASA John F. Kennedy Space Center, United States
Dr. Anthony Colaprete
United States
Dr. Richard Elphic
NASA Ames Research Center, United States

NASA'S LUNAR POLAR ICE PROSPECTOR, RESOLVE: MISSION SIMULATION IN APOLLO VALLEY

Abstract

After the completion of the Apollo Program, space agencies didn't visit the moon for many years. But then in the 90's, the Clementine and Lunar Prospector missions returned and showed evidence of water ice at the poles. Then in 2009 the Lunar Crater Observation and Sensing Satellite indisputably showed that the Cabeus crater contained water ice and other useful volatiles. Furthermore, instruments aboard the Lunar Reconnaissance Orbiter (LRO) show evidence that the water ice may also be present in areas that receive several days of continuous sunlight each month. However, before we can factor this resource into our 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), has been developing a payload to answer these questions. The payload is named RESOLVE. RESOLVE is on a development path that will deliver a tested flight design by the end of 2014. The team has developed a Design Reference Mission using LRO data that has RESOLVE landing near Cabeus Crater in May of 2016. One of the toughest obstacles for RESOLVE's solar powered mission is its tight timeline. RESOLVE must be able to complete its objectives in the 5-7 days of available sunlight. The RESOLVE team must be able to work around obstacles to the mission timeline in real time. They can't afford to take a day off to replan as other planetary missions have done. To insure that this mission can be executed as planned, a prototype version of RESOLVE was developed this year and tested at a lunar analog site on Hawaii, known as Apollo Valley, which was once used to train the Apollo astronauts. The RESOLVE team planned the mission with the same type of orbital imagery that would be available from LRO. The simulation team prepositioned a Lander in Apollo Valley with RESOLVE on top mounted on its CSA rover. Then the mission simulation began as the operations team's consoles came alive with data and images. They executed the mission just like the real mission with lunar communications delays and limited bandwidth a realistic remote mission control room. This paper will describe the RESOVLE payload in detail and describe the results of the mission simulation in Hawaii.