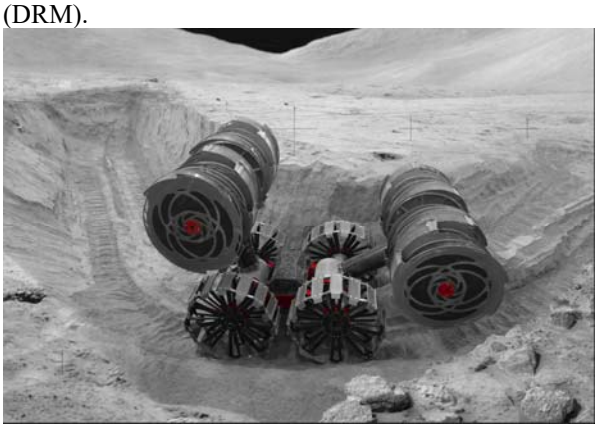
RASSOR EXCAVATOR FOR ISRU LUNAR MINING. J. D. Smith[1], J. M. Schuler[2], and R. P. Mueller[3], A. J. Nick[4], B. C. Buckley[5], [1,2,3] NASA Kennedy Space Center, UB-R1-A, Kennedy Space Center, FL 32899, jonathan.d.smith@nasa.gov, jason.m.schuler@nasa.gov, rob.mueller@nasa.gov, [4,5] The Bionetics Corporation, LASSO-6720, Kennedy Space Center, FL 32899, andrew.j.nick@nasa.gov and bradley.buckles@nasa.gov.

Introduction: Regolith is the primary resource available to enable a sustained presence on the lunar surface. We will need to mine thousands of metric tons of regolith for propellant production, water, construction material, and more. However, to date robotic vehicles have only collected small samples. To overcome this we will need to develop and test a new class of space robot that must perform a series of operations never attempted on another planetary body before.

The purpose of this paper is to discuss the validation testing of a prototype robotic lunar excavator. The Regolith Advanced Surface Systems Operations Robot (RASSOR) is a 67kg robot that is designed to mine regolith in reduced gravity. A notional in-situ resource utilization (ISRU) technology demonstration with a goal of producing 10mT of oxygen in 1 year was selected as the design reference mission (DRM).



The DRM was used to develop a concept of operations for RASSOR. Each operation was performed at the Kennedy Space Center in a lunar regolith testbed filled with 120mT of lunar simulant. Time, energy, and visual data were recorded for each operation. Some of the tested operations included: driving 100m with and without a regolith payload, excavating, delivering regolith into a hopper, building a ramp, building a berm, and contingency operations.

The testing demonstrated that RASSOR is capable of the completing necessary operations for the DRM. This paper will discuss the time and energy usage for the various operations and compare the results to model based predictions. Photographs of the operations and lessons learned will be presented. These results will be used to inform future mission planning and, if selected, a protoflight version of RASSOR will be developed and appropriate lifetime and flight qualification testing will be completed.