Lander Payloads

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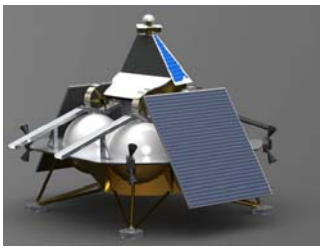
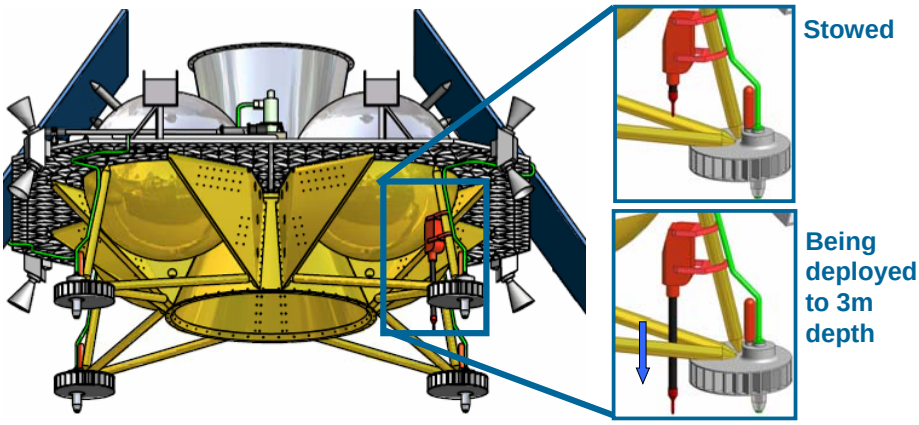
ASTROBOTIC TECHNOLOGY, INC.



Heat Flow Probe



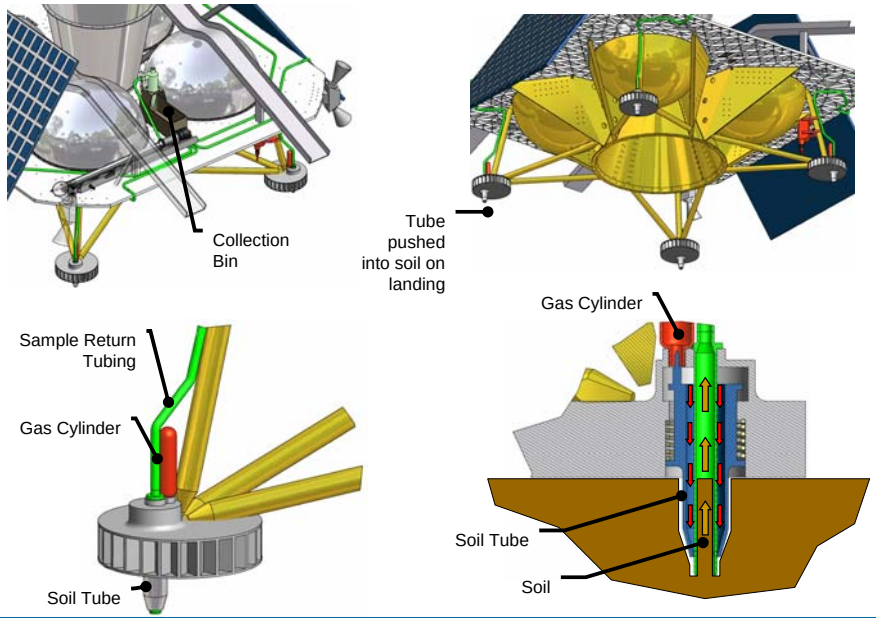
Heat Flow Probe [HFP] will measure the geothermal gradient (temperature versus depth) and the thermal conductivity of lunar regolith. Knowledge of the lunar thermal structure is fundamental to understanding the origin of the Moon, Earth and the Solar System.

HFP will use compressed gas to excavate a slim hole and deploy initially coiled up lenticular thermal stem. The probe will measure thermal conductivity of the regolith and record the temperature gradient along to 3m length.

References:

E. Mumm, K. Zacny, N. Kumar, M. Hedlund, S. Smrekar, P. Morgan, S. Nagihara, J. Shasho, A. Pierides, Heat Flow Probes for Lunar Landers, LPSC 2010, Houston, TX.

Soil Samplers



Sampling tubes will be deployed below each footpad of the lander to a depth of ~10-20cm, and capture several hundred grams of regolith. Compressed gas will loft the acquired regolith through a flexible hose into a science instrument on the lander deck.

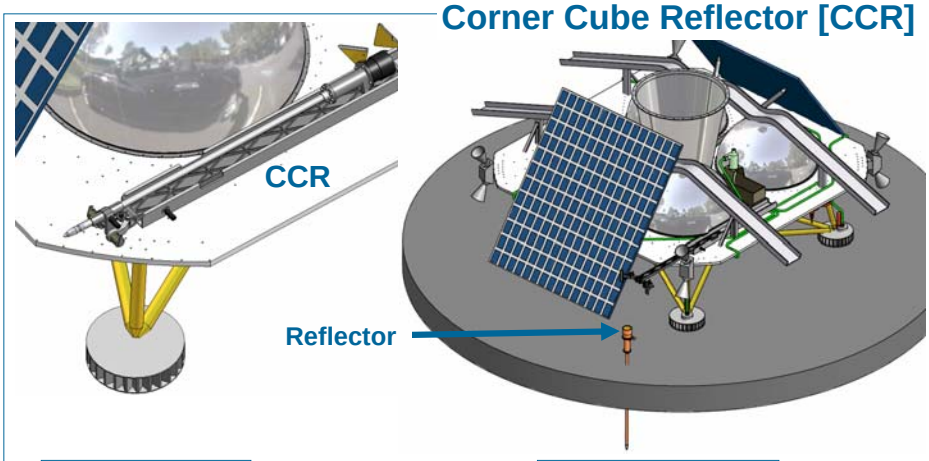
The pneumatic system has been tested in vacuum and 1/6th g (Lunar gravity). It was found that 1 gram of gas at 6psia is sufficient to loft ~6000 grams of JSC-1a lunar soil simulant at high velocity.

References:

K. Zacny; J. Craft; M. Hedlund; P. Chu; G. Galloway; R. Mueller, Investigating the Efficiency of Pneumatic Transfer of JSC-1a Lunar Regolith Simulant in Vacuum and Lunar Gravity During Parabolic Flights. AIAA Space 2010, Aug 31-Sep 2, 2010, Anaheim, CA

K. Zacny, D. McKay, L. Beegle, T. Onstott, R. Mueller, G. Mungas, P. Chu, and J. Craft, Novel Method of Regolith Sample Return from Extraterrestrial Body Using a Puff of Gas, IEEE Aerospace conf, 7-12 March 2010, Big Sky, MT.

Corner Cube Reflector [CCR]



The Corner Cube Reflector [CCR] allows measurement of the distance between Earth and the Moon to within 100 micron accuracy. Knowing the accurate distance helps to understand the structure of the Moon and test General Theory of Relativity.

The CCR will be anchored ~1 meter below the surface, i.e. below the reach of the diurnal and annual thermal wave propagation. Compressed gas will be used to excavate a slim hole and drive the anchor with a CCR mounted on top, into the subsurface.

Reference:

Zacny, K., and D. Currie, Regolith Drilling for the Lunar Laser Ranging Retroreflector Array for the 21st Century, NLSI Forum, NASA ARC, 20-22 July 2010.