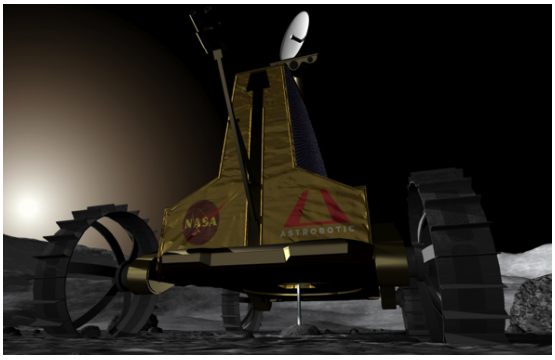
COMMERCIAL MODELS FOR LUNAR LANDING AND EXPLORATION. K. M. Peterson[1] and J. Thornton[1], [1]Astrobotic Technology, 4551 Forbes Avenue #300, Pittsburgh, PA 15213, kevin.peterson@astrobotictech.com, john.thornton@astrobotictech.com

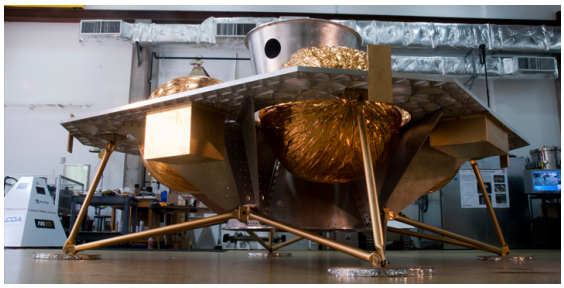
Introduction: Space agency costs for exploration and science missions can be reduced by combining fixed-price contracts with methods that enable commercial bidders to earn supplementary revenue. This non-agency revenue in many cases will feature novel methods of public involvement, transforming "public outreach and education" from a cost to the space agency into a revenue source for the commercial bidder. The space agency will get services at a fixed price that is lower than traditional cost-plus methods. Lower cost stems from several factors including commercial culture, where every dollar saved is profit so long as it doesn't materially impact mission success.

In the long term, select space endeavors will come to fruition solely with private funding. These endeavors will span prospecting, resource extraction, site preparation for human missions, and science goals from far-side radio astronomy to understanding the bombardment history of the early solar system. Many of these missions will be repetitive such as multiple prospectors to survey large areas, scrapers and dozers for resource extraction and site preparation and mobile rovers providing basic utilities like power, thermal control and communication for science payloads. Many of the same systems are common to each class of rover including power systems, drive-trains, communication systems, camera and antenna pointing mechanisms, navigation sensors and software. These factors argue for having the bulk of lunar robotic activity based in the cost effective private sector with governments as customers, rather than being carried out directly by government agencies.

However, further exploration is necessary to spur commercial activity on the moon. Financial models rely on presence of volatiles, precious metals, or sustained human activity. The uncertainty in these markets poses a significant barrier to investment. A public-private partnership to evaluate unknowns in these financial models is called for. The proposed partnership exploits commercial cost savings to advance lunar science and resolve financial uncertainty.

Astrobotic Technology, a spin-off from Carnegie Mellon University's Robotics Institute, has developed a lander and a prospecting rover for initial surface activities. A first expedition, Icebreaker, will launch from Florida in October 2015 to explore Polar regions in search of water. A SpaceX Falcon 9 will carry the lander and rover to trans-lunar injection. The lander will cruise for three days, capture into orbit, descend and precisely land near the pole.





The rover is a self-sustaining lunar exploration platform designed for long-distance traverse. Freeze tolerant design enables unprecedented non-isotope operation through multiple day-night cycles. It features a U-shaped composite chassis allowing for large payloads up to 100-kg. Its navigation system provides better than two-meter global registration to terrain.

Subsequent missions will scout skylights - holes providing access to volcanic caves - and routes that circumnavigate the poles to stay perpetually in sunlight. Reuse of the chassis and lander designs will provide significant reduction in mission development cost.