Non-intrusive Approaches to Full-domain, Scaling-law Based Experimental Investigation of Crater Formation and Plume-surface Interaction (PSI) Dynamics

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Research Objectives

- Mature and apply time-resolved, non-intrusive, 2D/3D diagnostic techniques for use in sub-scale and full-scale studies and obtain data suitable for validating current computational models under development
- Develop scaling laws to permit correlating experimental data to flight conditions for proposed landing sites
- Quantify the effects of descent rate on PSI processes

Approach

- Plenoptic/Tomographic 3D and FLIR and LiDAR imaging to measure crater and particle-plume formation and evolution
- Intermediate scale experimental facility for the study of PSI processes
- Hot and cold flow, sub-atmospheric, full-domain experiments including the effects of nozzle descent
- Develop and apply scaling laws for data correlation and planetary landing PSI prediction

Potential impact

- Provide new non-intrusive measurement technologies for studying PSI process in both sub-scale and full-scale experiments
- Develop new data analysis methods that permit correlation of experimental data from different experiments and predict PSI effects for proposed planetary landing sites
- Provide new quantitative data on the effects on nozzle descent on PSI processes