

NASA SBIR/STTR Technologies

T7.01-9961 - Algorithms and Regolith Erosion Models for the Alert Code

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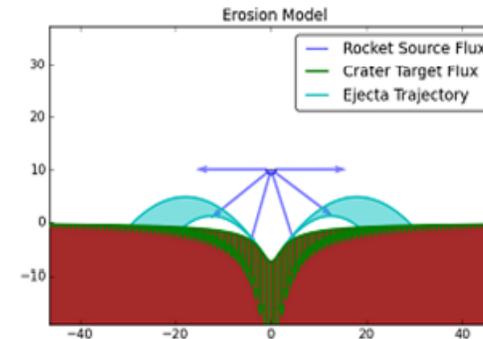
Identification and Significance of Innovation

ORBITEC and Duke University teamed on this STTR effort to develop the ALERT (Advanced Lunar Exhaust Regolith Transport) Code which includes powerful, experimentally validated, models for plume-regolith interactions. Experiments were done with JSC-1 Lunar and Mars regolith simulant. A minimum-drag variational approach yields accurate crater profiles, and ejecta sheet launch angle while conservation laws yield ejecta sheet velocity. Results: Lunar ejecta velocities may exceed 1.5km/sec for RL-10 descent engine and Mars landing site erosion may be severe.

Expected TRL Range at end of contract (1-9): 4

Technical Objectives and Work Plan

- Task 1. Define requirements for the ALERT code, with NASA input
- Task 2. Prepare design of ALERT code: momentum-mass conserved
- Task 3. Design a simulated plume-regolith impingement experiment
- Task 4. Momentum and mass conservation tests with the ALERT
- Task 5. Analyze the data from the plume-regolith experiment
- Task 6. Perform numerical modeling of plume-regolith experiment
- Task 7. Implement models derived from experiment for ALERT code
- Task 8. Preliminary design of a Lunar-Mars ALERT tool for Phase II



ALERT Uses Dust-plume Momentum Conservation to Accurately Model Landings on the Moon or Mars

NASA Applications

ALERT is a user-friendly plume-regolith interaction code which includes powerful, experimentally validated, models for plume-regolith interactions. The technology would be used in NASA space applications including: Lunar and Mars manned and unmanned surface operations, logistics Moon and Mars base planning and design.

Non-NASA Applications

This technology could be applied for other ORBITEC customers such as the Bigelow Aerospace's Space Hotel on the Moon, support for the Jamestown Group that may have many commercial Lunar missions. Plume entrainment of Lunar or Martian dust is a major hazard and planning consideration in the design of any commercial Moon base will benefit from the ALERT code as a planning tool.

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NON-PROPRIETARY DATA