

## FY2011 Phase 2 Project Summary

**Firm:** Orbital Technologies Corporation

**Contract Number:** NNX09CB40C

**Project Title:** High-Fidelity Lunar Dust Simulant

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**Purpose of the Research:** The primary objective of the Phase 2 project was to develop a complete manufacturing process to create high-fidelity lunar dust simulants. The results of the Phase 1 project were used to guide improvements in the manufacturing process. High-fidelity lunar dust simulants are required to evaluate the effects of lunar dust and verify the effectiveness of dust mitigation strategies and technologies for all Exploration Surface Systems, including: extravehicular mobility suit material composition and cleaning operations, lunar habitat construction design, mechanical performance (radiators, seals, valves), electrical performance (tools and equipment), landing operations (vision systems), and all manners of surface operations. Since there is strong evidence that the prototype lunar dust simulants contain the critical metallic iron component (including nanophase Fe<sup>0</sup>) along with the morphologies of lunar dust particles, it will also be applicable to human health and toxicity studies.

**Description of the Research Performed in FY2011:** The work on the Phase 2 project focused on implementing improvements in the manufacturing process to create and deliver high-fidelity lunar dust simulants to NASA. After these improvements were made in the manufacturing process, an improved lunar dust simulant was produced and delivered to NASA. In addition, three other lunar regolith simulants with varying compositions were processed and delivered to NASA.

**Phase 2 Results in FY2011:** During FY2011, ORBITEC completed significant upgrades to the Agglutinate Processing System. The upgraded Agglutinate Processing System was used to process JSC-1A lunar regolith simulant into a highly glassy feedstock material containing very fine metallic iron globules. This glassy feedstock material was jet milled to create an improved lunar dust simulant that was delivered to NASA. The improved lunar dust simulant has a maximum measured particle size of 6.16 µm. ORBITEC then processed JSC-1A lunar regolith simulant, CHENOBI lunar highland regolith simulant, and NU-LHT-2M lunar highland regolith simulant in the Agglutinate Processing System to create glass spherules and simulated agglutinates containing metallic iron globules. The processed simulants were all delivered to NASA near the end of the Phase 2 project for further analyses and distribution to the research community. ORBITEC also processed small reference samples of each type of simulant so that it contained similar glass spherules and simulated agglutinates, but did not contain any metallic iron globules.