Mechanical Behavior of Simulated Lunar Soils Under Varying Gravity Conditions

by

N. C. Costes, G. T. Cohron, and D. C. Moss
Space Sciences Laboratory, George C. Marshall Space Flight Center
Huntsville, Alabama

Experimental studies on simulated lunar soils have assisted in gaining a better understanding of the mechanical behavior of lunar surface soils observed during the extravehicular activities of the Apollo 11 and 12 missions. These studies have included strength, confined-compression and penetration resistance tests on fine-grained, granular lunar soil simulants of varying grain-size distribution and consistency, and under varying gravity conditions, the latter including penetration resistance tests on air-dry simulants performed on board the NASA KC-135 aircraft during zero-, one-sixth-, one- and two-g parabolic flight trajectories.

The results of these tests have shown that the compressibility and penetration resistance of simulated lunar soils exhibiting the same strength depend on their grain-size distribution and mode of deposition. They have also shown that the penetration resistance of the same simulants decreases monotonically and nonlinearly with decreasing g-level, and in a manner confirming conclusions drawn from first-order analyses based on bearing capacity theory.

© Lunar and Planetary Institute • Provided by the NASA Astrophysics Data System