Mechanical Behavior of Simulated Lunar Soils
Under Varying Gravity Conditions

by

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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.