Abstract #1640

English

Lunar regolith sampling using PACKMOON device and its potential application for Moon exploration and utilization

Surface sampling and excavation processes on planetary bodies significantly differ from their Earth equivalents due to spacecraft constraints and nontrivial influence of lower gravity. In some cases, new devices or their subsystems need to be invented to get feasible operations. In this paper the prototype of a new type of sampling device, called PACKMOON, dedicated for low gravity bodies space environment, is presented. The principle of operation of the PACKMOON device is based on two key elements: insertion of the spherical jaws into regolith by rotary hammering actions and minimization of interaction with the lander by taking advantage of doubling mechanical subsystems, which operate in the same angular direction but in opposite sense. Results of the tests that were conducted with highly compacted lunar regolith (Chenobi and AGK2010) have shown its reliable operation. The tests conducted on harder materials have shown its proper operation if the regolith bearing capacity do not exceed 5-7 MPa. The tests on air bearing table with lander mock-up shown its negligible influence on lander stability. In addition, the analysis of PACKMOON re-scaling was done to estimate its potential usage for more industry oriented excavation processes needed for both the early phase of Lunar base development as well as its further nominal operation.

French

No abstract title in French

No French resume

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Karol Seweryn is an assistant professor at the Space Research Centre of the Polish Academy of Sciences in Warsaw, Poland. He obtained his Ph.D. from Warsaw University of Technology in the field of Control System and Robotics. His principal research interests lie in the field of dynamics of elastic and rigid multibody systems working in space environments, and planetary surface/subsurface exploration in low gravity environments. He is involved in future ESA robotic and exploratory missions such as Phootprint or eDeorbit.

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