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A New Facility for Lander Touchdown and Rover Mobility Testing at DLR

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To support the development of future landing missions, the newly founded DLR Institute of Space Systems in Bremen, Germany, is currently procuring and installing a large scale test facility for lander touchdown testing and for rover testing. Both applications of the facility, named LAMA ('Lande- und Mobilitaets-TestAnlage'), call for the use of a realistic terrain in the form of a simulated lunar/planetary surface consisting of a 10 m x 3 m bin filled to 0.5 m depth with a physical regolith simulant and a configurable rock distribution. Moreover, both the intended lander touchdown and rover mobility tests demand an offloading device to adapt the weight of the test object to the lunar/planetary one under study. This is required to i) realistically simulate touchdown dynamics and tip-over stability of lander spacecraft in the presence of terrain slopes and a lateral velocity component (being of relevance in particular for landings in rough and poorly known terrains), and to ii) realistically study mobility of rovers at their operational weight while moving on soils. Therefore, LAMA features an industrial robot system moving alongside and above the soil bin to provide a real-time controlled offloading force to the test object to which it is attached. The advantage of the concept behind LAMA is that test objects need not be scaled but may (and should be) full mass and full size, to afford realistic simulations of dynamics. Allowable upper limit of test object mass is $\sim$500 kg, depending on the type of test to be conducted. Commissioning of the facility will start in March 2008. Results of analyses of the dynamical behaviour of LAMA and comparisons with initial landing impact test campaigns will be presented.