RESETTABLE LANDING GEAR FOR MARS HOPPER. W. S. Gullotta[1], C. G. Kirchner[2], and A.P. Yuengert[3], [1]Boston University, College of Engineering, Boston, MA, USA (Email: wgullott@bu.edu), [2]Boston University, College of Engineering, Boston, MA, United States (Email: ckirch@bu.edu), [3]Boston University, College of Engineering, Boston, MA, United States (Email: yuengert@bu.edu).

The University of Leicester Space Research Center has proposed a new Mars lander to carry more scientific equipment, traverse more difficult terrain, and cover a larger range than the NASA rovers previously used. The proposed lander uses a radioisotope-powered rocket to perform ballistic hops of up to 1 km at a time. This “hopper” faces one fundamental problem: there is no viable design for reusable legs for interplanetary landers in existence. Until now, all legged landers have been designed to facilitate a single touchdown, utilizing a non-reusable crushable honeycomb material to attenuate the impact. In this research, a passive electromagnetic shock absorption solution was developed by taking into account the rigid requirements for operation on Mars and the dynamic landing forces upon the hopper. Mathematical models were derived for the landing dynamics and the electromagnetic damper, computer simulations and analysis on the landing gear were performed, and a physical prototype to test the damper was constructed. It was found that the electromagnetic damper landing gear is a predictable, reliable, and extremely effectual solution for resettable landing gear for the Mars hopper or any future interplanetary repeated landing vehicles. The steps required to implement the landing gear include the development of the mathematical models, refined design of the components to withstand operation on Mars, and the creation and testing of a scale physical model of the entire hopper.