Landing Capsule and Rover Designs for the Sooner Lunar Schooner Mission

D. P. Miller, M. Alfaro, A. Balasubramanyam, Z. Butler, J. Calero, B. DeKock, M. Dirckx, A. Huizenga, T. Hunt, M. Moffitt, M. Roman, A. Shah, J. Stephens, E. Tirado, M. Welker, L. Wilmes, A. Winterholler & J. Yoon

School of Aerospace & Mechanical Engineering
University of Oklahoma
Norman, OK 73072
dpmiller@ou.edu; V: 405-325-1094; F: 405-325-1088

The Sooner Lunar Schooner mission is a robotic mission to the Moon that will hopefully launch in the latter half of this decade. The Basic mission scenario is as follows: The spacecraft will be launched and inserted into a Lunar transfer orbit; A few minutes before impact on the Moon, a braking rocket (e.g., Star 27) will be fired killing off virtually all of the relative motion between the spacecraft and the Lunar Surface; the spacecraft will come to a stop approximately 50 meters above the Lunar surface; it will then freefall to the surface; the landing ellipse will be centered around the Apollo 17 landing site; after landing, the landing capsule will split apart releasing the two rovers; one rover, capable of doing materials studies will head for the Apollo 17 LEM. The other, a high speed rover, will start on a traverse to Lunakhod 2's last known position, approximately 140km distant.

The mission described above has been developed and is being used as a focus for a number of multi-disciplinary engineering and science projects at the University of Oklahoma. During the courses, critical systems for the SLS missions are designed or built. The SLS project is designed to be more than a paper study. In a few years, when the design is finished, and much of the hardware has been completed, an alumni campaign will take place to raise completion and launch costs.

During the 2002-2003 AY, two SLS classes of note took place. The first course was a graduate robotics course which explored rover architectures for a Lunar mission. The results from this class were the rover mission scenario described above and a detailed preliminary design, including mechanical form and fit models, of each rover. The full paper will describe these rovers, and their mission on the surface, in detail.

The Spring class was a ME senior capstone class where the students designed and built a crash landing capsule to deliver the rovers through the last 50-100m of free fall to the Lunar surface. A full size mockup was built and dropped from a crane onto a concrete surface from 18m in height (yielding an impact speed similar to a 100m drop on the Moon). The full paper will present the design of the capsule and the results from the drop tests.