Stanford Lunar-X is a cross-disciplinary group with members from the Departments of Aeronautics & Astronautics, Electrical Engineering, and Mechanical Engineering. Under the supervision of Dr. James Cutler, the Space & Systems Development Laboratory applies its wealth of experience in rover and satellite design to the challenge of landing a rover on the moon.

The lab has trained students through hands-on experience with space systems. The first SSDL satellite flown was OPAL, launched in 2000.

The team is currently working on an agreement to partner with Space Systems/Loral. This partnership would complement the dynamic and innovative academic environment of Stanford with the practical experience of a well-established satellite manufacturer.

Teams competing for the Google Lunar X PRIZE must send a robot to the Moon, travel 500 meters, and transmit video and data back to the Earth.

To win the $20 million grand prize, a team must:
• soft land a craft on the Moon
• roam five hundred meters
• broadcast high-definition video back to the Earth

Bonus prizes worth up to $5 million are offered for:
• traveling five kilometers
• visiting man-made artifacts
• discovering water ice
• surviving the lunar night

Voyage to the moon

Mission concept

Launch
The craft will be launched on a commercial rocket flight into a low earth orbit or geostationary transfer orbit.

Descent and landing
A lander guides the craft to a designated point on the lunar surface and protects the rover from the shock of impact. A camera will capture video during landing.

Lunar transfer
Once the craft separates from the rocket, a kick motor injects it into a lunar transfer orbit. A three to four day voyage brings the craft to the moon.

Project timeline

An ambitious schedule leverages existing off-the-shelf technologies to minimize the required development time. A sequence of technology demonstrations including terrestrial tests, high-altitude balloon flights, and orbital launches will prove our system in harsh environments similar to what it will experience on the Moon.

Data from the Ranger, Surveyor, and Apollo missions is used to generate simulated lunar terrain. This is critical for determining the required mobility characteristics of a rover.

The rover will be tested in a high-altitude balloon drop in the Black Rock desert this summer. This will be the first operational component of the overall Lunar-X design.

Why return to the Moon?

Robotic capability on the Moon offers a safe, efficient approach to performing menial or dangerous tasks required to support a lunar human presence. Robotic systems launched ahead of manned missions can assemble a habitat and assure working on-site systems prior to crew arrival. Regolith collected by a robotic harvester can provide oxygen for life support and propulsion, and protect crews from radiation.

The Moon is an "eighth continent" of Earth, with unique resources that can be integrated into the global economy. Offsetting power generation to the Moon can reduce our environmental impact on Earth -- the Moon has relatively large quantities of Helium-3, which could enable clean power technologies to replace today's fossil fuel or nuclear fission plants. Low-gravity manufacturing processes will enable new products that are currently too expensive or difficult to create.

Voyage to the moon

Rover development

The AA236 year-long course sequence starts with rover development in the Fall quarter. Students integrate hardware and develop software to enable a fleet of rovers to perform a coordinated mission.

A prototype rover is drawn in SolidWorks to facilitate part design and manufacture. Different configurations are explored to compare performance and manufacturability.

Acknowledgements

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Join our voyage or help us along the way!