Overview of the Mars Exploration Rover Mission

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The Mars Exploration Rover (MER) Project is an ambitious mission to land two highly capable rovers at different sites in the equatorial region of Mars. The two vehicles are launched separately in May through July of 2003. Mars surface operations begin on January 4, 2004 with the first landing, followed by the second landing three weeks later on January 25. The useful surface lifetime of each rover will be at least 90 sols. The science objectives of exploring multiple locations within each of two widely separated and scientifically distinct landing sites will be accomplished along with the demonstration of key surface exploration technologies for future missions.

The two MER spacecraft are planned to be identical. The rovers are landed using the Mars Pathfinder approach of a heatshield and parachute to slow the vehicle relative to the atmosphere, solid rockets to slow the lander near the surface, and airbags to cushion the surface impacts. During entry, descent, and landing, the vehicles will transmit coded tones directly to Earth, and in the terminal descent phase will also transmit telemetry to the MGS orbiter to indicate progress through the critical events.

Once the lander rolls to a stop, a tetrahedral structure opens to right the lander and to reveal the folded rover, which then deploys and later by command will roll off of the lander to begin its exploration. Each six-wheeled rover carries a suite of instruments to collect contextual information about the landing site using visible and thermal infrared remote sensing, and to collect in situ information on the composition, mineralogy, and texture of selected Martian soils and rocks using an arm-mounted microscopic imager, rock abrasion tool, and spectrometers.

During their surface missions, the rovers will communicate with Earth directly through the Deep Space Network as well as indirectly through the Odyssey and MGS orbiters. The solar-powered rovers will be commanded in the morning of each Sol, with the results returned in the afternoon of that Sol guiding the plans for the following Sol. Between the command sessions, the rover will autonomously execute the requested activities, including as an example traverses of tens of meters using autonomous navigation and hazard avoidance.