RETURN TO THE RED PLANET: AN OVERVIEW OF THE *MARS PATHFINDER* MISSION

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ABSTRACT

The *Mars Pathfinder* Project is being developed by the U. S. National Aeronautics and Space Administration (NASA) to demonstrate new technologies for use in future missions to Mars, and to conduct focused, but significant, scientific observations of the planet. The mission will be the first attempted in 20 years to land an automated spacecraft on Mars. The scientific objectives are to investigate the structure of the Martian atmosphere, the geology and morphology of the surface, and the elemental composition of Martian rocks and soil. In addition, a free-ranging surface rover will be deployed to conduct technology experiments, and to carry some of the science instrumentation. Scheduled for launch in December 1996 and arrival in July 1997, *Mars Pathfinder* is the second mission in NASA's Discovery Program, a new initiative to support small, relatively low-cost interplanetary missions with a maximum three year development period. Upon reaching Mars, the primary surface operations phase of the mission will begin, and is planned to continue for 30 Martian solar days (sols).

An overview of the *Mars Pathfinder* project is presented, covering the salient features of the spacecraft and its payload, and some of the more unusual engineering aspects of the mission. Perhaps the most significant feature of the mission is the use of an entry, descent, and landing system employing only passive elements: the spacecraft will enter the Martian atmosphere directly from its interplanetary transfer trajectory, decelerate with the aid of a parachute and rocket braking system, then reach the surface with a speed at impact of 10 to 20 m/s, using an airbag system to cushion the vehicle from the landing shock. After rolling to a halt, the spacecraft will autonomously deflate and retract its airbags, then upright itself with a system of three motor-driven petals to which the solar arrays for surface power generation are affixed, as well as the rover in its stowed configuration. The motor drive/petal system is capable of uprighting the spacecraft regardless of its orientation after landing. Both these and other unique aspects of the vehicle are discussed.