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Introduction: 2001 Mars Odyssey Mission

WE are very pleased to present a selection of technical papers on the 2001 Mars Odyssey mission in this special edition of the *Journal of Spacecraft and Rockets*. The Odyssey project has delivered an orbiter to Mars to map the planet and search for water. The success of this mission has reestablished confidence in Mars exploration that has already paved the way for the Mars Exploration Rovers and the coming Mars Reconnaissance Orbiter, as well as other future orbiters, landers, and rovers. The Odyssey spacecraft has completed the primary science mission that began in February 2002, and the mission has been extended until September 2006.

Odyssey was designed and built to travel to Mars in the 2001 opportunity and carry a thermal and visible imager (THEMIS), a radiation monitor (MARIE), and the last of the lost Mars Observer instruments, the Gamma Ray Spectrometer (GRS). The GRS suite also includes a High Energy Neutron Detector (HEND) and a Neutron Spectrometer (NS). The goals of the payload suite are to globally image the planet, determine surface mineralogy and morphology, determine the elemental composition of the surface and shallow subsurface, and study the Mars radiation environment from orbit. The results of the science campaign have exceeded all expectations, and perhaps the most significant discovery so far has been the abundance of water-ice distributed primarily at the poles of the planet.

Before the science campaign could begin, the flight team had the challenging task of delivering the spacecraft to Mars and inserting it into the desired low-altitude, polar orbit, from which the entire planet could be mapped. Odyssey launched from Cape Canaveral in April 2001. The 200-day journey to Mars concluded with a perfect orbit insertion burn, which captured the spacecraft into orbit around Mars in October 2001. The next three months were spent aerobraking to reduce the large capture orbit into the desired 2-h, near-circular science mapping orbit. The aerobraking phase of the mission was the most operationally intense as it required round-the-clock operations to ensure the health and safety of the spacecraft. The vehicle endured a harsh dynamic and thermal environment as it dipped into the atmosphere on every orbit around the planet. The variability and uncertainty of the thin Martian atmosphere was large enough to make every drag pass potentially mission ending.

The papers presented here describe the engineering aspects of delivering the spacecraft to its planned orbit around Mars and preparing it for its scientific endeavor. The first two papers describe the task of delivering the spacecraft from the Earth to Mars, and the remaining papers describe the technical challenges associated with the design and operations of the aerobraking phase. The flight team consists primarily of personnel from the Jet Propulsion Laboratory in Pasadena, California, and Lockheed Martin Space Systems in Denver, Colorado. For the aerobraking phase, the project enlisted help from NASA's Langley Research Center in Hampton, Virginia, as well as various academic institutions around the country. The authors of these papers are associated with these institutions and have a first-hand experience with the Odyssey mission and flight operations.

The Mars Odyssey project is managed at JPL under the auspices of the Mars Exploration Directorate. The spacecraft flight elements were built and are managed by Lockheed Martin Space Systems in Denver, Colorado. The science instruments were built and are managed by their respective institutions.

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