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Mars Exploration – missions current and future (3A)

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THE MARS RECONNAISSANCE ORBITER MISSION: CONTINUING A RECORD OF EXPLORATION FROM MARS ORBIT

Abstract

The Mars Reconnaissance Orbiter (MRO) has been on station in its low altitude, sun-synchronous, primary science orbit since September 2006 performing both scientific and Mars programmatic support functions. The spacecraft is a very capable remote sensing science platform carrying six science payloads and a UHF telecommunications radio (Electra) for surface relay. Developed to support targeted, high-resolution surface observations, the spacecraft's powerful telecommunications and command data handling (CDH) subsystems communicate an average of 16 hours a day with the Deep Space Network (DSN). To date, nearly 300 TB of scientific data has been returned to Earth. All of the original science payloads are active science investigations with their team members contributing to the advancement of Mars science through peer-reviewed paper publications and the timely dissemination of their data to the science community as a whole. Results from the teams have revealed an amazing diversity of ancient aqueous environments and ongoing surface change is evident through gully formation, avalanches, and cratering. Extending the MRO climate record is contributing to a better understanding of current atmospheric and polar processes. In addition to its fundamental scientific objectives, MRO is a critical element of NASA's Mars Exploration Program (MEP) providing needed infrastructure support for landed and future missions. Using its Electra telecommunications payload, MRO provides landers and rovers critical event coverage for their EDL (Entry, Descent, and Landing) phases and UHF relay support once they are on the Martian surface. MRO's high-resolution imagers are used to scout potential landing sites and certify safe zones for landing. As MRO begins its Fourth Extended Mission, the spacecraft remains fully capable of carrying out an ambitious science observing plan and the programmatic tasks assigned to it. In addition to highlighting recent discoveries of the mission, this paper describes recent challenges the spacecraft engineers have faced in flight and the plans for extending spacecraft life well into the 2020's.