Title: Developments in The Mars Reconnaissance Orbiter Mission
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In August 2005, NASA will launch the Mars Reconnaissance Orbiter (MRO) aboard an Atlas V-401 launch vehicle from Cape Canaveral Air Force Station in Florida. This mission has the primary objective of delivering into a low altitude orbit at Mars a spacecraft capable of performing remote sensing science investigations. A major mission of the Mars Exploration Program (MEP), MRO will pursue the Program's "Follow-the-Water" theme by conducting science observations that will return sets of globally distributed data that will be used to: 1) advance our understanding of the current Mars climate, the processes that have formed and modified the surface of the planet, and the extent to which water has played a role in surface processes; 2) identify sites of possible aqueous activity indicating environments that may have been or are conducive to biological activity; and 3) identify and characterize sites for future landed missions.

In addition to its scientific objectives, MRO will provide telecommunications relay capability for follow-on missions and will conduct, telecom and navigation demonstrations in support of future MEP activities. Specifically, the MRO mission will: 1) provide navigation and data relay support services to future MEP missions, 2) demonstrate Optical Navigation techniques for high precision delivery of future landed missions, and 3) perform an operational demonstration of high data rate Ka-band telecommunications and navigation services

The MRO spacecraft is being designed to last until the year 2011. The orbiter payload will consist of six science instruments and three engineering payload elements listed as follows:

Science Instruments
- -HiRISE, High Resolution Imaging Science Experiment
- -CRISM, Compact Reconnaissance Imaging Spectrometer for Mars
- -MCS, Mars Climate Sounder
- -MARCI, Mars Color Imager
- -CTX, Context Imager
- -SHARAD, Shallow (Subsurface) Radar

Engineering Payloads
- -Electra UHF communications and navigation package
- -Optical Navigation (Camera) Experiment
- -Ka Band Telecommunication Experiment

The total spacecraft injected mass on the Atlas V-401 is 2180 kg. Of this 2180 kg, the allowable dry mass is 1031 kg; the rest of the injected mass is for needed fuel. Of the dry mass, a total payload capability of 139 kg has been established. The propulsion system

can deliver a total DV capability of at least 1545 m/s. The majority of that DV capability (1000 m/s) is for use to capture at Mars. To accomplish the needed targeted observations, the spacecraft is 3-axis stabilized with large momentum wheels providing stability and control. Additionally, the spacecraft has an impressive telecommunications and command and data handling architecture enabling large volumes of scientific data to be returned to Earth. The total estimated data return for the mission is near 34 Tb.

After launch, MRO will be guided to Mars on an interplanetary trajectory that will take approximately seven months. After capture into a highly elliptical orbit, MRO will use aerobraking techniques to establish its primary science orbit (PSO). The PSO will have a periapsis altitude of 255 km and an apoapsis altitude of 320 km. The orbit orientation will be near-polar with an ascending node designed for a mid-afternoon equatorial crossing time that will be maintained in a sun-synchronous condition. The repeating groundtrack of the PSO has been designed based on the need for targeted, regional survey, and mapping observations.

The primary science phase of the mission is scheduled to begin in November 2006 and will extend for one Mars year following turn-on of the science instruments in the PSO. After the completion of the primary science phase, MRO will conduct relay operations until its nominal end of mission.

This paper will discuss the status of the MRO Mission following its successful Project/System Critical Design Review (CDR). This discussion will include an overview of the mission/science objectives and current descriptions of the mission design and the spacecraft and its payload suite. The mission description will include a discussion on operational planning activities with a particular focus on target planning and orbit maintenance/control.