SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations (IP)

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EMIRATES MARS MISSION (EMM) SPACECRAFT DESIGN OVERVIEW

Abstract

Emirates Mars Mission program is responsible for the definition, design, development, integration, and test of the spacecraft that orbits Mars. The spacecraft provides the capabilities required to achieve and maintain the Mars orbit post-launch, supply the payloads, which are: • The Emirates eXploration Imager, an instrument that is dual-channel spectral imager capable of producing full-disk, 12.6 megapixel images of Mars in 6 spectral bands. • The Emirates Mars InfraRed Spectrometer, this instrument is a Fourier transform spectrometer based on a Michelson 2-port design. • The Emirates Mars Ultraviolet Spectrometer, an instrument that is an imaging spectrograph that measures emission from the Mars atmosphere and corona in the spectral range 100-170 nm. with needed structural support, power, thermal control, data handling, pointing, and fault management responses, send science, ancillary, and housekeeping data to the ground, and receive command data from mission operations centers. The spacecraft system includes the harnessing required to connect the payloads to the spacecraft for full space segment capability. The EMM spacecraft structure ensures all components, including instruments, have unobstructed fields of view, and ensures all components survive the launch environment. The structure design is heavily influenced by the launch vehicle interface and launch environment, thermal considerations, pointing and alignment requirements, and mass properties requirements. The spacecraft launch mass is 1500kg. The design also pays careful consideration to manufacturing and assembly operations, as well as facility and ground support equipment limitations. The structure is based on heritage spacecraft configurations utilizing qualified parts and manufacturing processes to successfully achieve program schedule milestones while still achieving a mass efficient design. EMM will operate using 2 solar arrays folded wings and batteries. To survive the harsh space environment, the EMM thermal design utilizes passive cooling and heater circuits to maintain component temperature limits throughout all mission environments. For trajectory maneuvers, EMM uses a propulsion system that is set for a pressure regulated monopropellant hydrazine system with six Delta-V thrusters and eight Reaction Control System thrusters. For communication with ground, EMM uses an APL Frontier Radio for command reception, telemetry transmission and ranging; a 1.85m diameter high gain antenna, coupled low gain antennas capable of providing spherical coverage, a single omnidirectional LGA for post-LEOPs operations.