

THE MARS EXPRESS/NASA PROJECT AT JPL

T. W. Thompson¹, R. L. Horttor², C. H. Acton, Jr.³, B. Arroyo⁴, S. Butman⁵, P. L. Jepsen⁶,
W. T. K. Johnson⁷, J. J. Plaut⁸, D.P. Holmes⁹ and A. Vaisnys¹⁰

¹⁻¹⁰Jet Propulsion Laboratory, California Institute of Technology,
4800 Oak Grove Drive, Pasadena, California, USA 91109-8099

¹M/S 300-227, Thomas.W.Thompson@jpl.nasa.gov, ²M/S 238-540, Richard.L.Horttor@jpl.nasa.gov,

³M/S 301-125L, Charles.H.Acton-Jr@jpl.nasa.gov, ⁴M/S 264-235 Belinda.Arroyo@jpl.nasa.gov,

⁵M/S 161-260, Stanley.Butman@jpl.nasa.gov, ⁶M/S 168-514, Paul.L.Jepsen@jpl.nasa.gov,

⁷M/S 233-202, Williamt.K.Johnson@jpl.nasa.gov, ⁸M/S 183-501, Jeffrey.J.Plaut@jpl.nasa.gov,

⁹M/S 303-402, Dwight.P.Holmes@jpl.nasa.gov, ¹⁰M/S 161-260, Arvydas.Vaisnys@jpl.nasa.gov

Introduction: ESA's Mars Express Mission is an international collaboration between the European Space Agency (ESA) and the European space agencies with the National Aeronautics and Space Administration (NASA) as a junior partner. The primary objective of the mission is to conduct a search for potential hydrologic resources from orbit and on the surface of Mars. Launch will be from Baikonur, Kazakhstan in late May 2003; arrival at Mars will be in late December 2003.

Mars Express Experiments: ESA selected eight experiments for Mars Express. Eleven U.S. investigators were selected by ESA as instrument Co-Investigators. NASA and the Italian Space Agency (ASI - Agenzia Spaziale Italiana) are jointly sponsoring an advanced radar sounder (MARSIS). Also, NASA is funding hardware development, data reduction, and archiving tasks for the ASPERA instrument via NASA's Discovery Mission of Opportunity.

The Mars Express Mission experiments and sponsoring countries are:

- 1) ASPERA (Analyzer of Space Plasma and Energetic Atoms), Sweden
- 2) HRSC (High Resolution Stereo Camera), Germany
- 3) MARSIS (Mars Advanced Radar for Subsurface and Ionospheric Sounding), Italy/United States
- 4) OMEGA (Observatory of Mineralogy, Water, Ice, and Activity), France
- 5) PFS (Planetary Fourier Spectrometer), Italy
- 6) MaRS (Radio Science Experiment), Germany
- 7) SPICAM (Spectroscopic Investigation of the Characteristics of the Atmosphere of Mars), France
- 8) Beagle 2 Lander, United Kingdom

NASA/U.S. Participation in Mars Express: Most of the U.S. participation in ESA's Mars Express

Mission is supported by the Mars Express/NASA Project at the Jet Propulsion Laboratory (JPL) in Pasadena, California. ASPERA instrumentation is supported by the Discovery Program.

A key NASA objective is to archive Mars Express science investigation data in a format compatible with the Planetary Data System (PDS) via ESA's Mars Express Data Archive and NASA's Planetary Data System.

Mars Express/NASA Project Objectives:

- Provide the Radio Frequency (RF) subsystem (integrated transmitter, antenna, and receiver) for MARSIS. Alenia Spazio (ALS), Italy is responsible for the digital subsystem and instrument integration and test, under direction of the JPL Instrument Manager. A MARSIS Co-Principal Investigator from JPL serves as the lead scientist for the NASA side of the experiment.
- Assist in achieving Mars Express science objectives through U.S. Co-Investigator support
- Support the HRSC with image-processing software
- Deploy NASA's SPICE (Spacecraft, Planet, Instrument, C-matrix, Events) System to ESA and Instrument Teams
- Secure Deep Space Network (DSN) tracking
- Conduct joint navigation verification studies
- Plan relay communications to/from Beagle 2 and Mars Exploration Rover (MER) Landers using NASA and ESA orbital assets.

NASA Discovery Program: Two ASPERA sensors, the Electron Spectrometer and the Ion Mass Analyzer, are funded by NASA and being built by Southwest Research Institute. ASPERA will address the question of how strongly interplanetary plasma and electromagnetic fields affect the Martian atmosphere, which is directly related to the many questions about water on Mars.