Mars Polar Pathfinder and Mars Polar Lander

David Paige - UCLA

Lightning Talk – Caltech KISS Workshop on Unlocking the Climate Record Stored
Within Mars' Layered Deposits

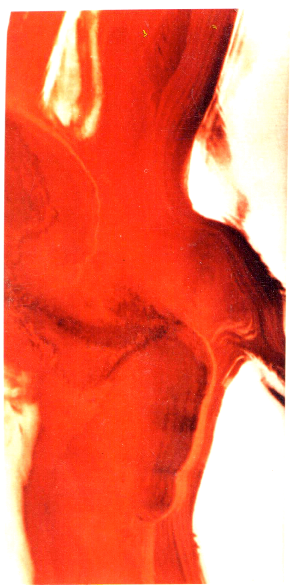
CONCEPT #83
Discovery Program Workshop
September, 1992

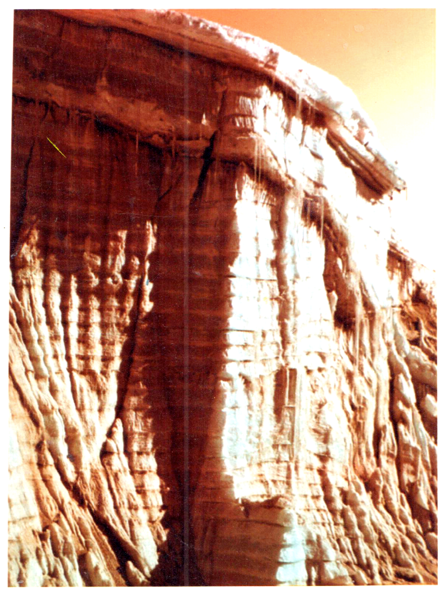
The Mars Polar Pathfinder

Principal Investigator

David A. Paige

University of California, Los Angeles

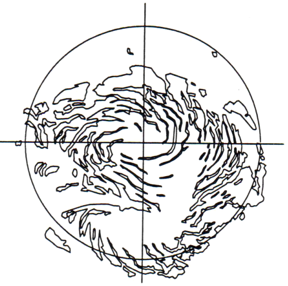




UCLA

JPL
Jet Propulsion Laboratory
California Institute of Technology

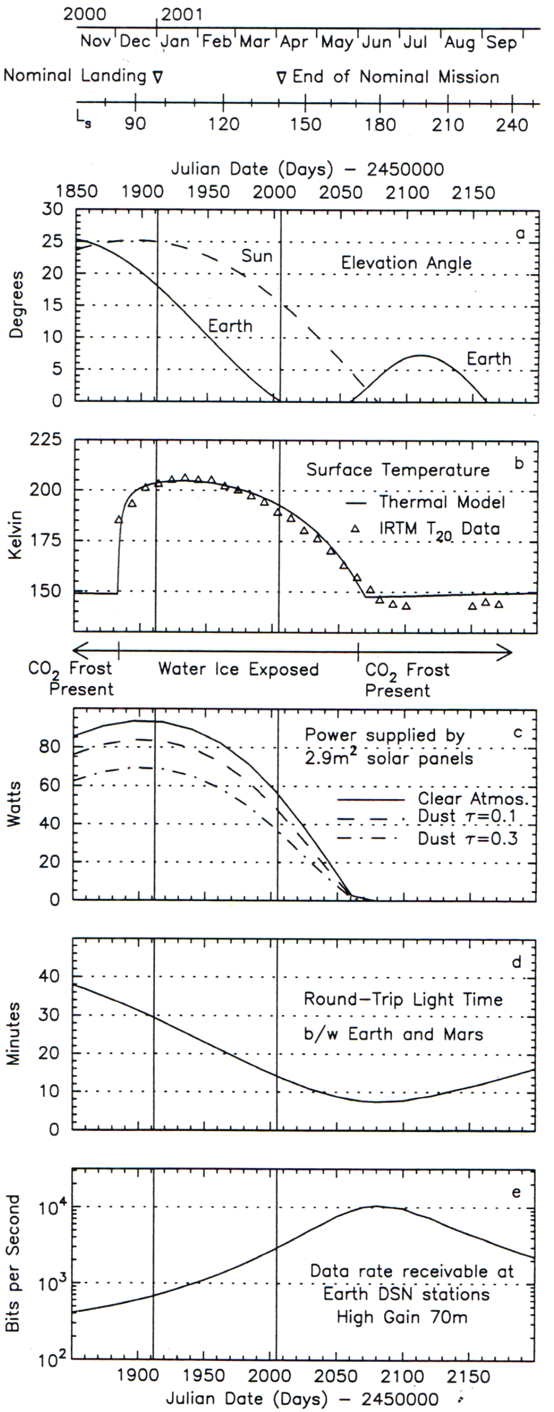
Mars Polar Pathfinder



INFORMATION PACKAGE

For the Definition and Development of the Scientific Payload

December 10, 1993



San Juan Version of the MPP Payload:

- Camera System
    - Mast Camera
    - Borehole Camera
- Dual-Frequency Radar
    - 400 MHz
    - 6 GHz
- Thermal Probe
    - Temperature
    - Pressure
    - Spectral Reflectance (0.4 to 1 micron)
    - Electrical Conductivity
    - Ion Abundances

Key Science Goals

- Layer Structure (near-surface and deep)
- Layer Composition (dust, salts)
- Thermal Structure (heat flow)

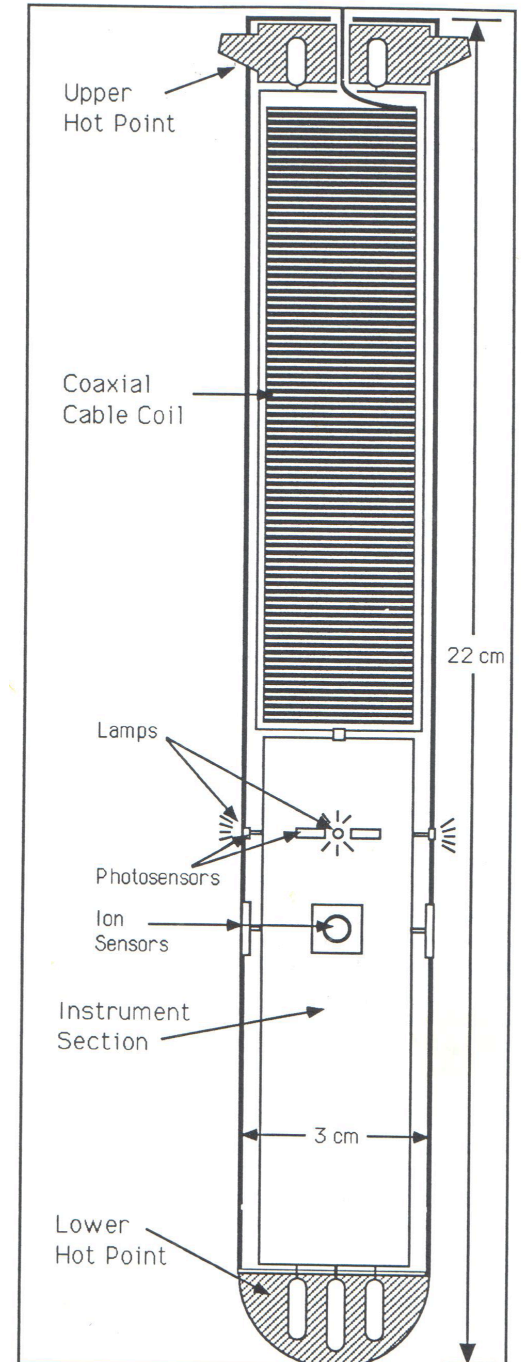


Figure 5-2. Mars Polar Pathfinder Thermal probe (actual size)

NASA AO No. 94-OSS-03
Submitted to NASA's Discovery Program

Volume I, II+
Copy # 37

Mars Polar Pathfinder

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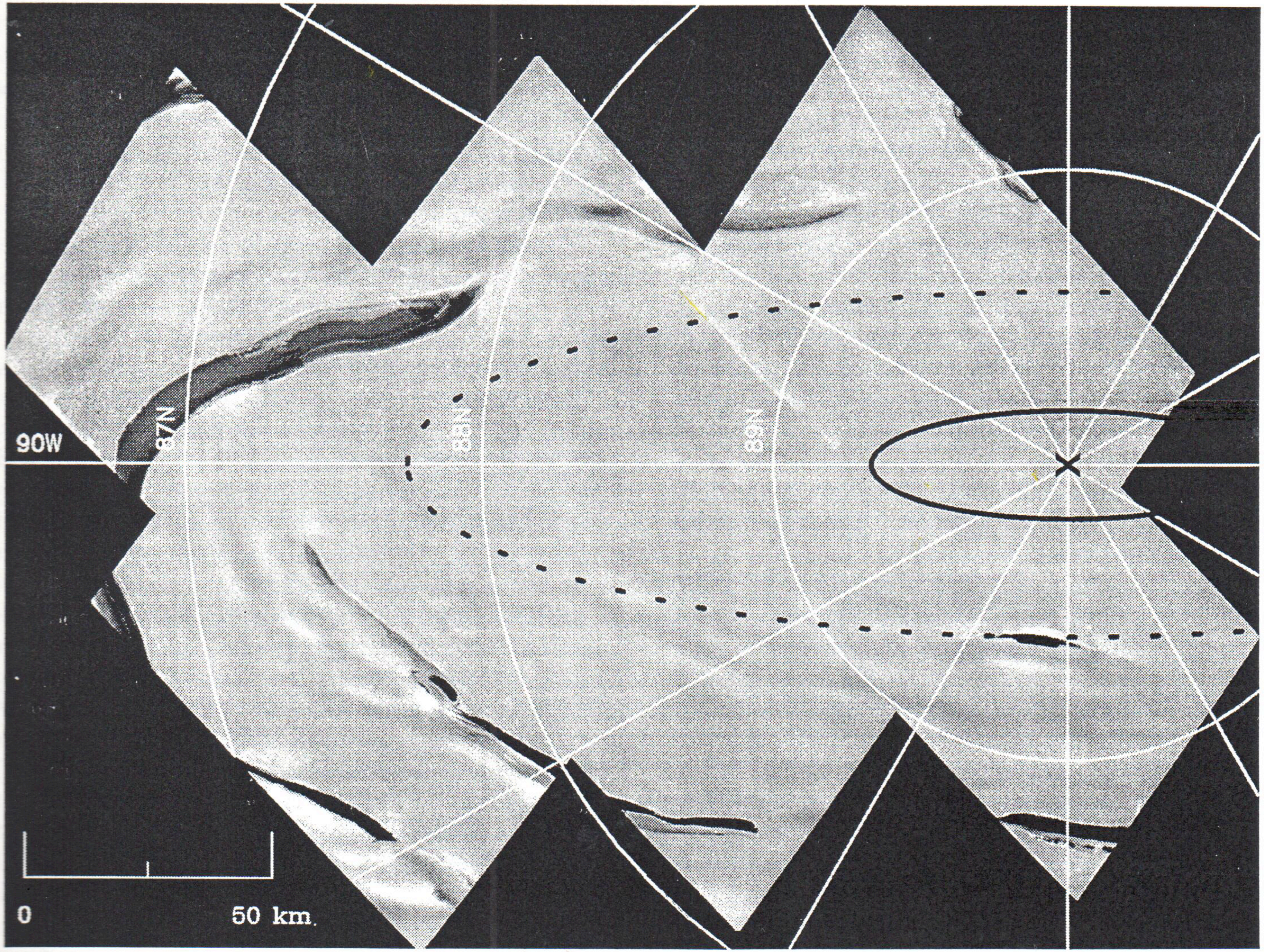
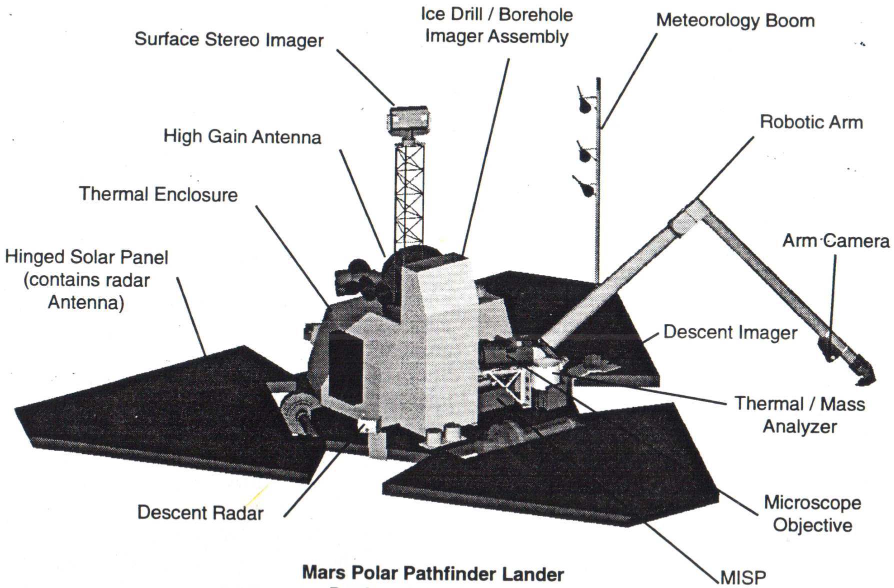


Figure IIB-1. Mars Polar Pathfinder Landing Site.
The best-available Viking Orbiter mosaic of the MPP landing site. Solid and dashed lines show the 1-sigma and 3-sigma landing ellipses respectively.



Mars Polar Pathfinder Lander Deployed Configuration

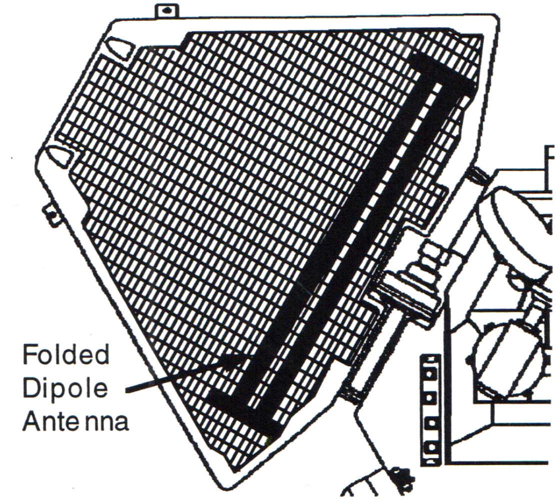


Figure IID6-2. Lander Petal with Antenna
The radar antenna is a complementary dielectric-filled void in the aluminum honeycomb petal.

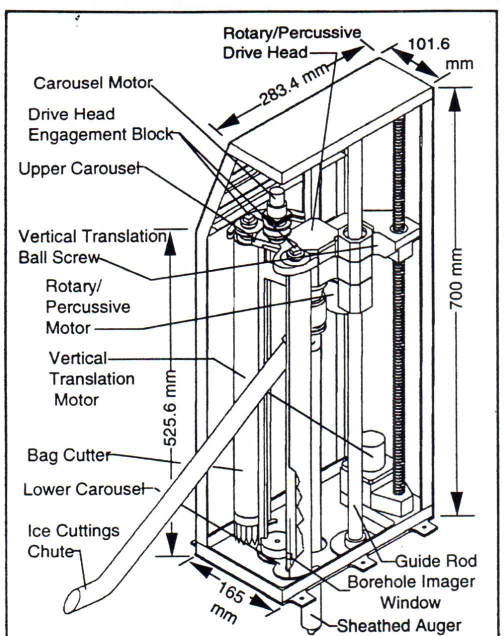


Figure IID4-4. Ice Drill Assembly
The auger is shown partially deployed while the bag cutter and Borehole Imager are stowed in the carousel.

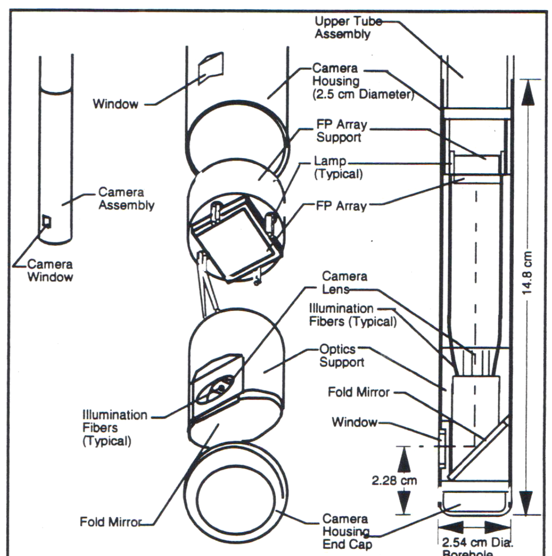


Figure IID3-4. Borehole Imager (BI)
Exploded and cutaway views of BI optics show accommodation of CCD, lens, fold mirror, LEDs and their fiber light guides in a tube for insertion in the drilled hole.

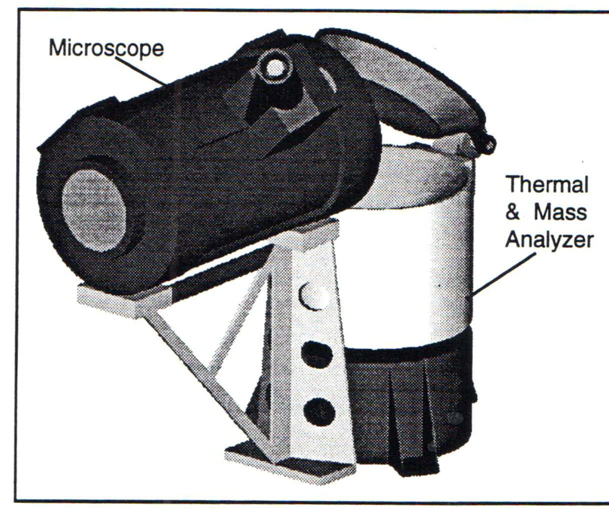


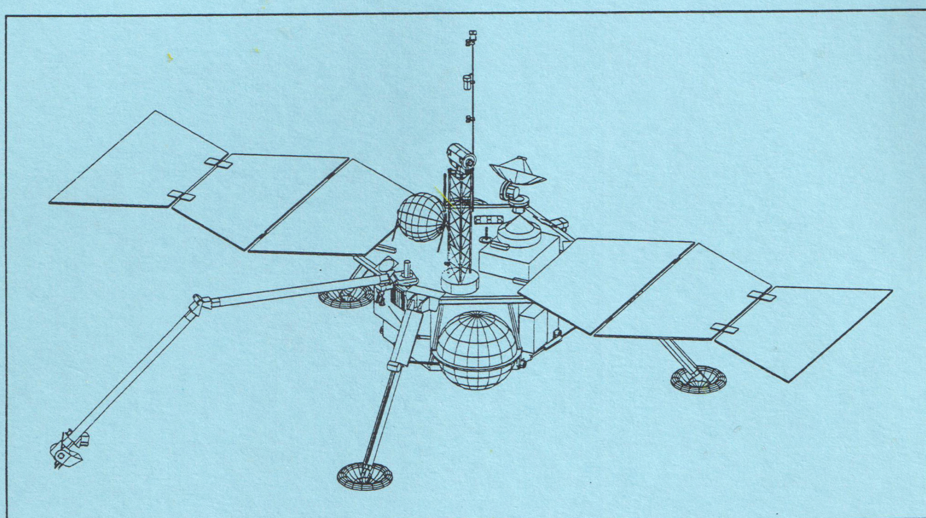
Figure IID5-1. TMA Assembly
IDEAS model of the TMA with reflecting microscope optic shown. The mirrored lid in position to allow viewing of dust residue after complete sublimation of a sample.

NASA AO No. 95-OSS-3

Mars Volatiles and Climate Surveyor (MVACS)

Integrated Payload Proposal for the Mars Surveyor Program '98 Lander

Volume 1
Investigation and Technical Plan



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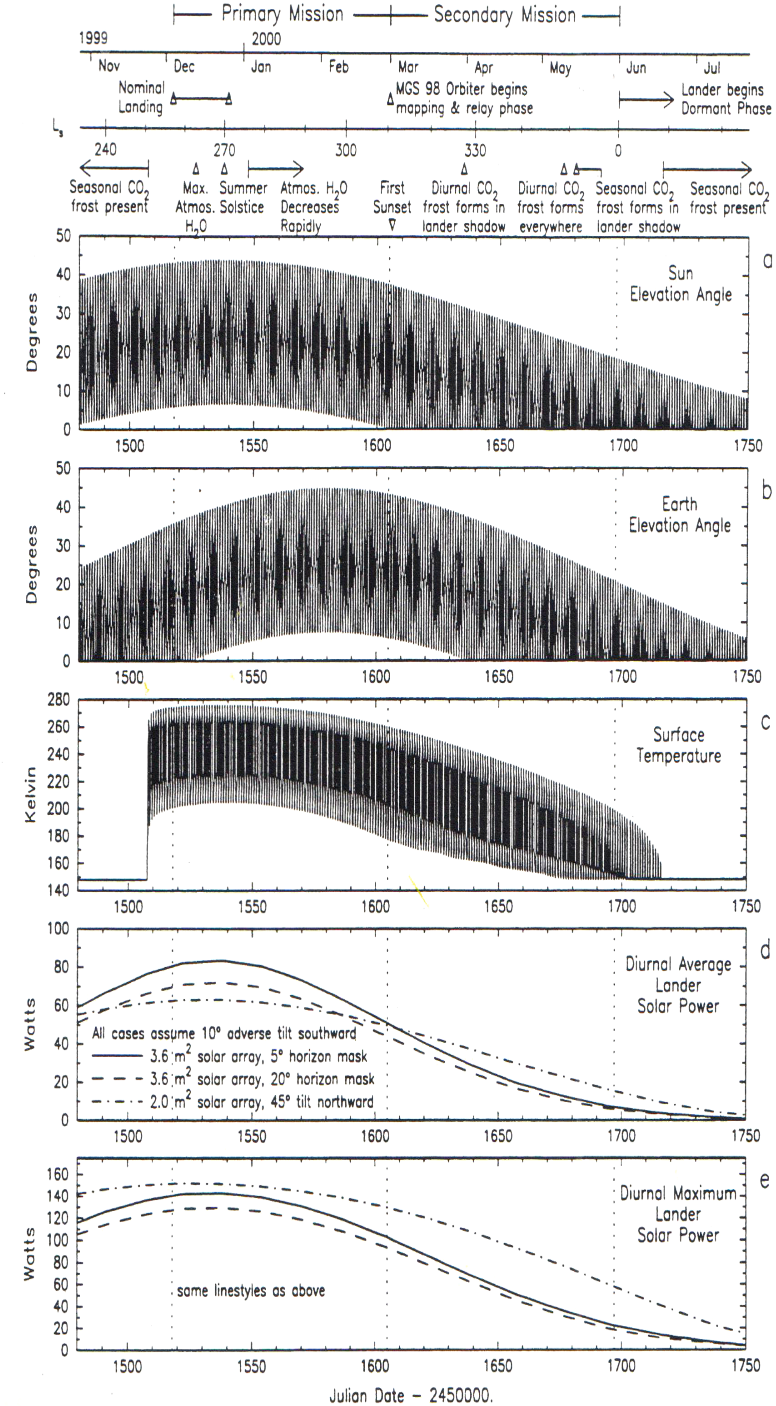


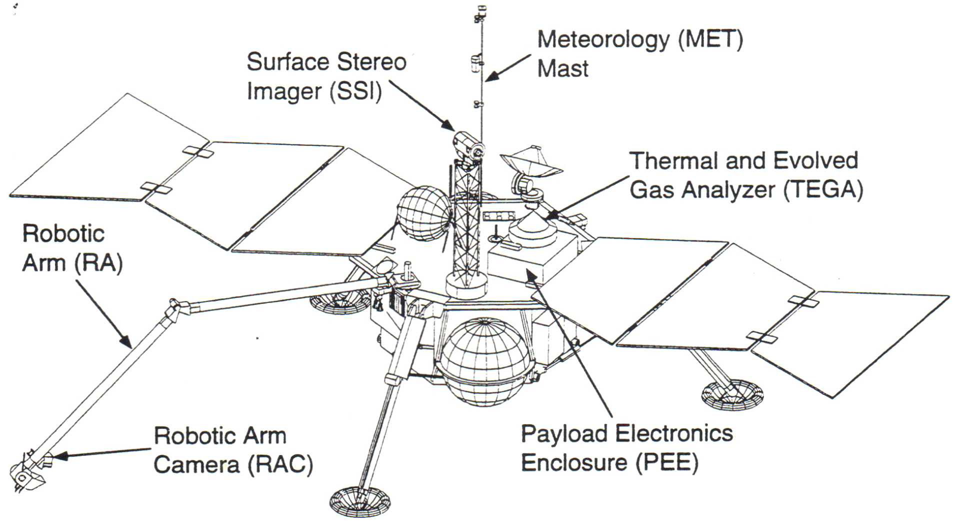


Fig. 1-1. The MSP '98 lander with the MVACS Payload in deployed configuration.

Payload Element	Measurements	Supplier(s)	Mass (kg)	Heritage	Phase C/D Cost ($M)
Surface Stereo Imager (SSI)	Multispectral stereo images; Atmospheric column aerosol and H_2O vapor abundances	P. Smith, Univ. of Arizona / H. Keller, MPAe (Germany)	6.53	Pathfinder IMP	2.18
Robotic Arm (RA) / Robotic Arm Camera (RAC)	Surface and subsurface sample acquisition; MET wind/temperature sensor profiling; close-up surface and subsurface images	JPL / P. Smith, Univ. of Arizona / H. Keller, MPAe (Germany)	4.29	Code X Development, Pathfinder Rover / Pathfinder IMP	5.28
Meteorology Package (MET)	Atmospheric surface pressure, wind, temperature, and H_2O vapor concentration	D. Crisp, JPL / R. May, JPL	1.52	Pathfinder MET, Stratospheric Aircraft, New Millenium	1.16
Thermal and Evolved Gas Analyzer (TEGA)	Abundances of water ice, adsorbed CO_2 and H_2O, and volatile-bearing minerals in surface and subsurface samples	W. Boynton, Univ. of Arizona / Lockheed Martin Astronautics	2.89	PIDDP, Lockheed Martin IR&D	4.41
Project Engineering / Payload Electronics Enclosure		JPL	1.85		2.22
Project Management		Y. Park, JPL			1.5
PI Science / Education / Management		D. Paige, UCLA			1.39
Reserves		JPL			1.82
Total			**17.08**		**19.98**

MVACS Tunable Diode Laser (TDL) Spectrometers

- Mast-Mounted TDL
- TEGA Evolved Gas Analyzer

Measured Species:

- H2O (1.37 microns)
- CO2 [626, 636 and 628 Isotopes] (2.05 microns)

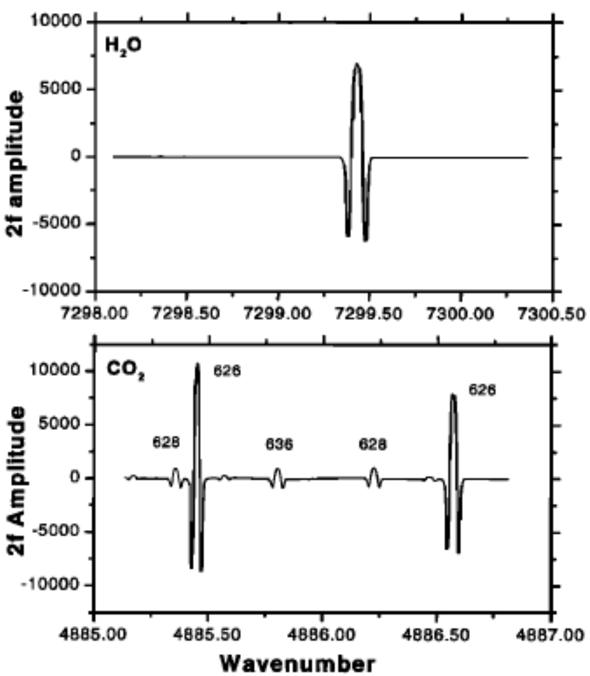


Figure 5. Spectral regions chosen for monitoring (top) H_2O and (bottom) CO_2 for the MET TDL spectrometer. The numeric labels in the CO_2 spectrum identify the isotopomers ($626 = {}^{12}C^{16}O^{16}O$, $636 = {}^{13}C^{16}O^{16}O$, $628 = {}^{12}C^{16}O^{18}O$). Signal amplitudes are in counts from the A/D converter.

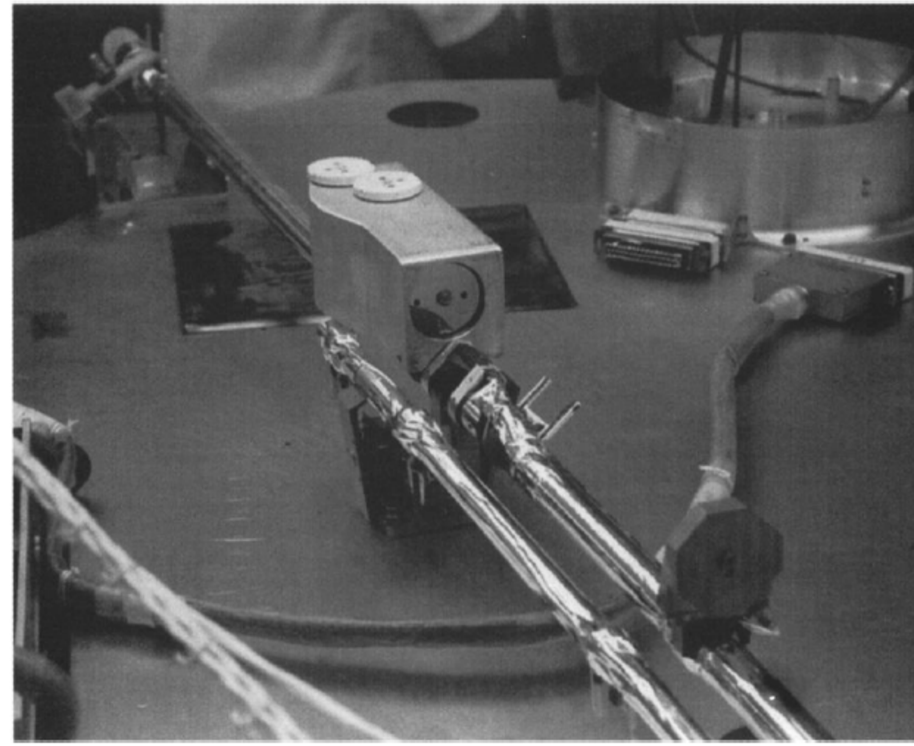


Figure 4. Photograph of the meteorological (MET) TDL spectrometer as mounted on the MET mast. The optical heads are contained in an Al enclosure shown toward the rear of the photograph with the two radiator disks on top. The face of the Herriott cell coupling mirror can be seen here, with the opposing Herriott cell mirror mounted in an Al mount located ~28 cm away (Table 1).

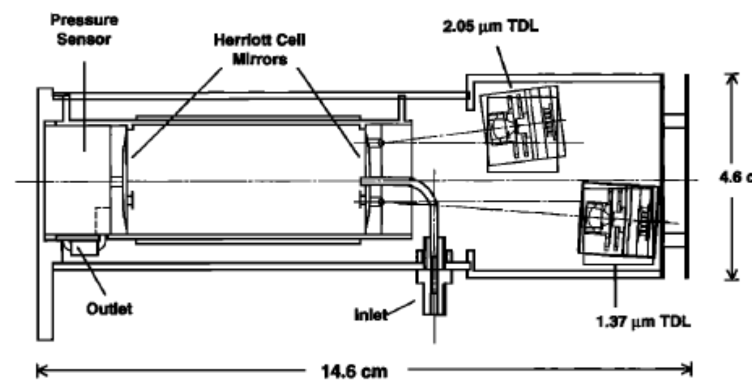
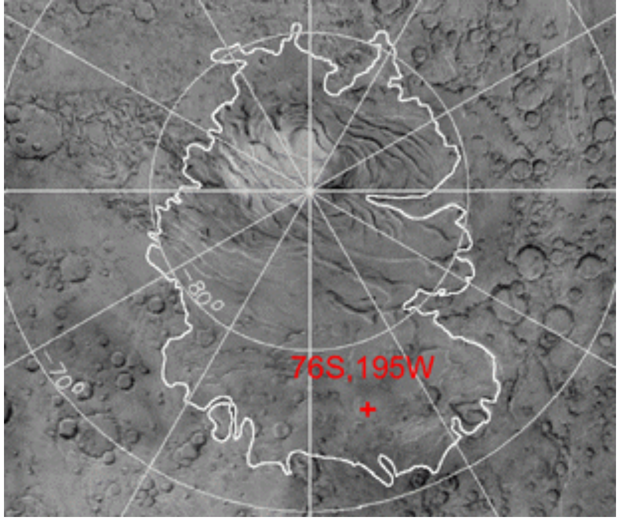
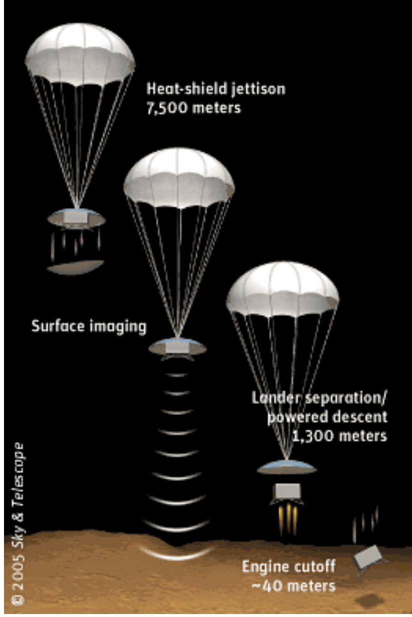


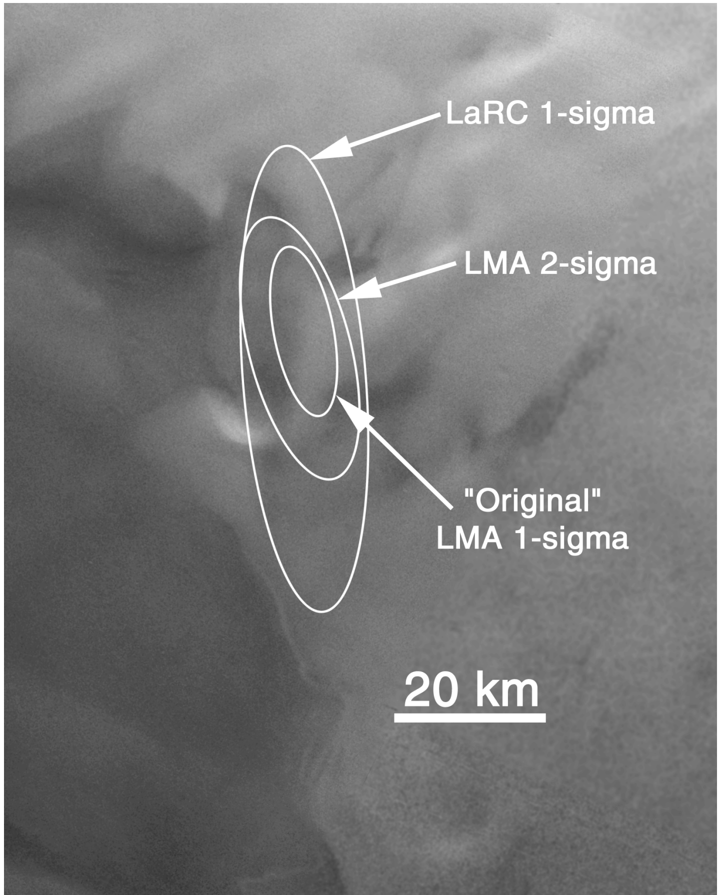
Figure 7. Plan view layout of the TEGA TDLs and Herriott cell. The laser/detector assemblies are located in a chamber that is connected to the insulated (aerogel) Herriott cell but thermally isolated from the Herriott cell itself via a G-10 insulating washer. Gas enters the Herriott cell through a 1/16" OD stainless steel tube and exits at the opposite end of the cell, where a pressure sensor is located. The Herriott cell temperature is stabilized at 308 K to avoid condensation of H_2O.

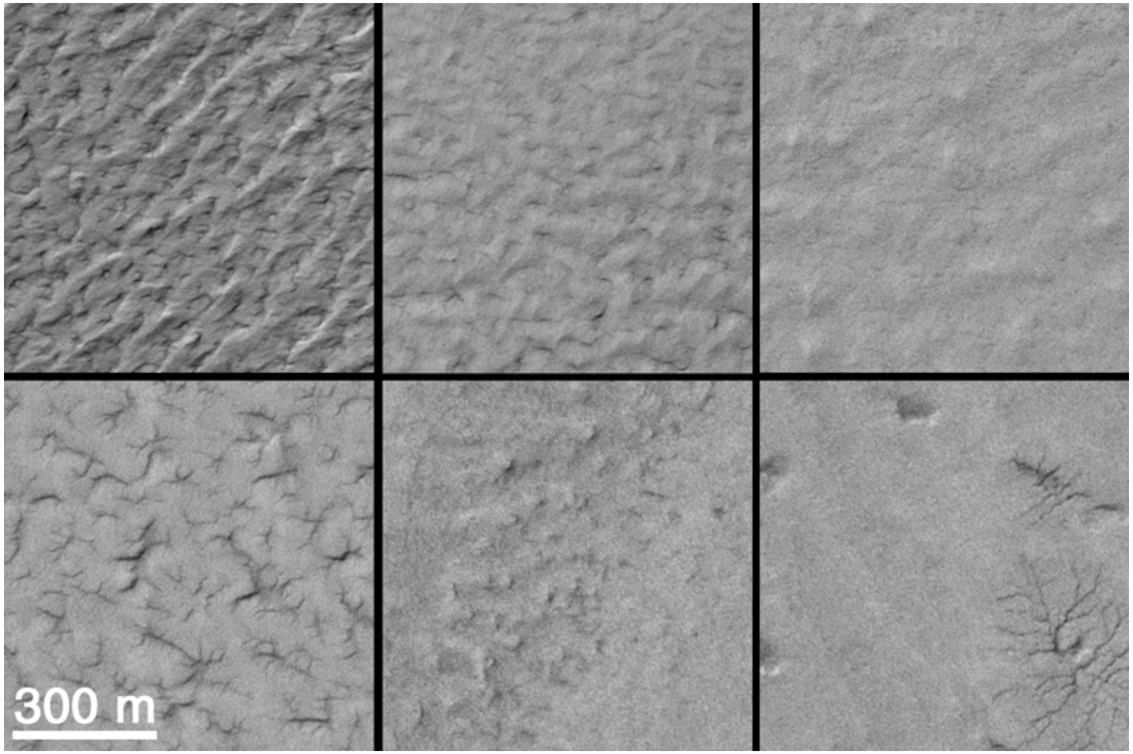


MPL Landing:

- December 3, 1999
- 76.3°S, 195.0°W







Representative MOC images of the MPL Landing Ellipse