The Phoenix Mission and its Current Landing Site Options

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1. Phoenix Goals

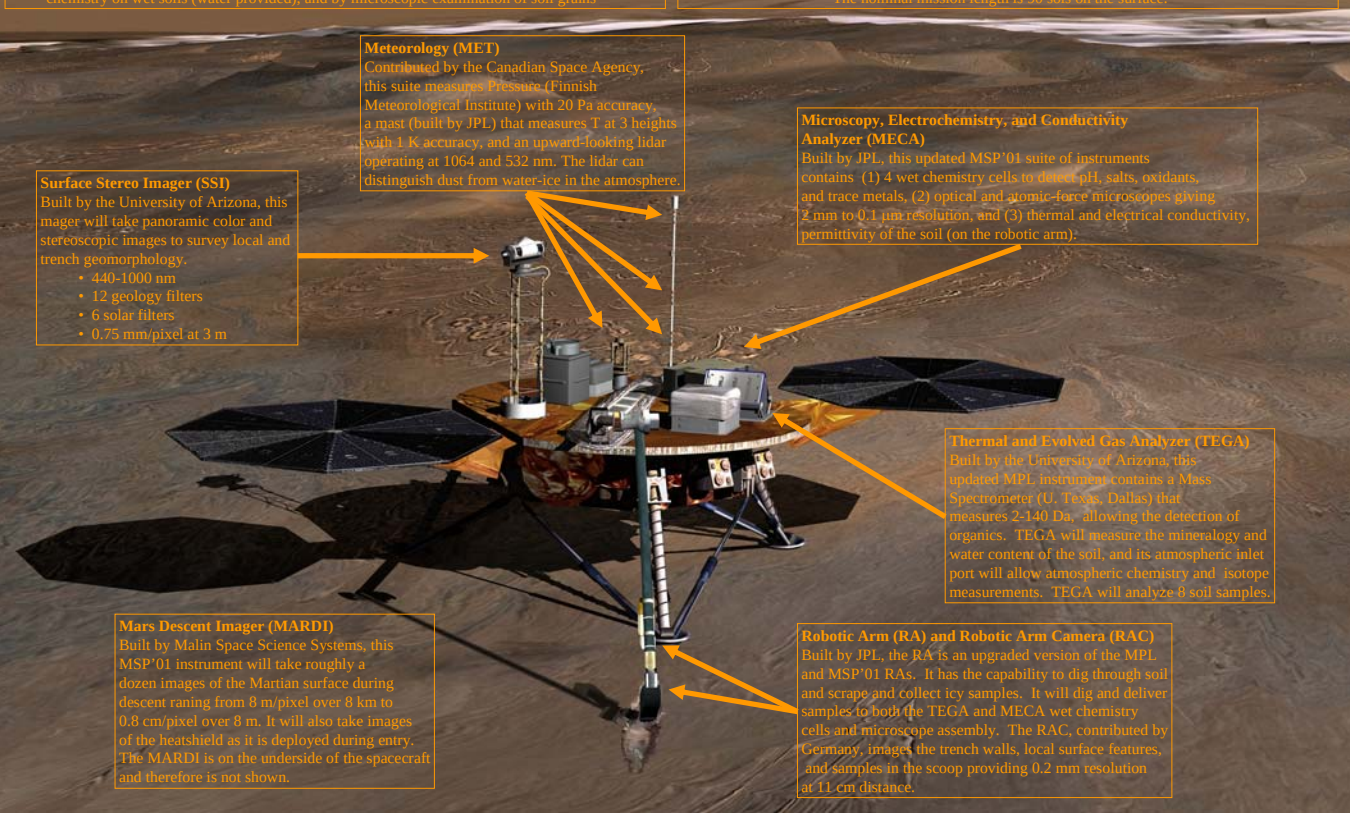
Phoenix, NASA's selected 2007 Mars Scout Program mission, will send a lander and suite of instruments to study the north polar region on Mars. The Phoenix central goals are:

1) To study water in all its phases to understand the paleo-hydrology, geology, chemistry, and meteorology of the region
2) To search for habitable zones by characterizing the subsurface environment in the permafrost region, by measuring the concentration of organic molecules, by performing water chemistry on wet soils (water provided), and by microscopic examination of soil grains

2. Highlights

May, 2005	Phoenix passes NASA's confirmation review
October, 2005	Critical Design Review
July, 2006	Select landing region (see below)
July, 2007	Select landing site (see below)
August, 2007	Launch from Kennedy Space Center, FL.
May-June, 2008	Land on Mars (corresponds to late spring in the northern hemisphere)

The nominal mission length is 90 sols on the surface.



Meteorology (MET)
Contributed by the Canadian Space Agency, this suite measures Pressure (Finnish Meteorological Institute) with 20 Pa accuracy, a mast (built by JPL) that measures T at 3 heights with 1 K accuracy, and an upward-looking lidar operating at 1064 and 532 nm. The lidar can distinguish dust from water-ice in the atmosphere.

Surface Stereo Imager (SSI)
Built by the University of Arizona, this mager will take panoramic color and stereoscopic images to survey local and trench geomorphology.

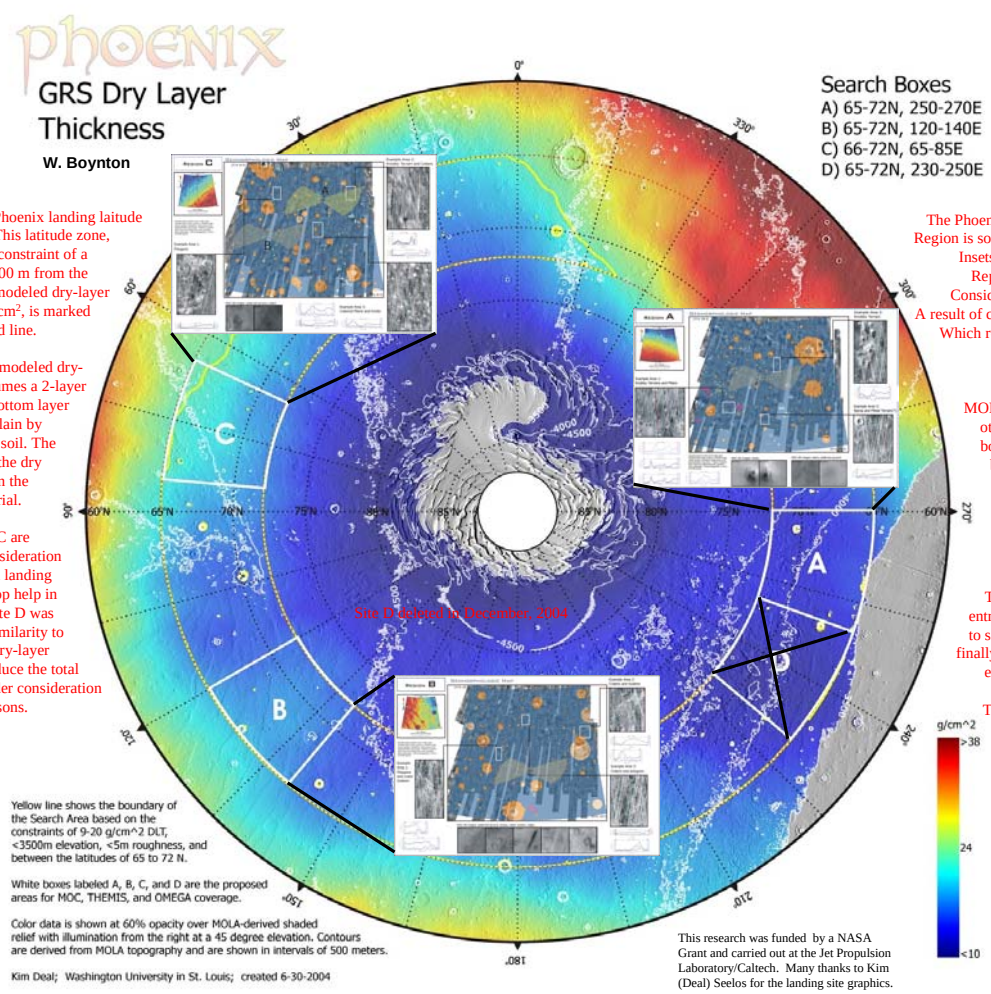
- 440-1000 nm
- 12 geology filters
- 6 solar filters
- 0.75 mm/pixel at 3 m

Microscopy, Electrochemistry, and Conductivity Analyzer (MECA)
Built by JPL, this updated MSP'01 suite of instruments contains (1) 4 wet chemistry cells to detect pH, salts, oxidants, and trace metals, (2) optical and atomic-force microscopes giving 2 mm to 0.1 µm resolution, and (3) thermal and electrical conductivity, permittivity of the soil (on the robotic arm).

Thermal and Evolved Gas Analyzer (TEGA)
Built by the University of Arizona, this updated MPL instrument contains a Mass Spectrometer (U. Texas, Dallas) that measures 2-140 Da, allowing the detection of organics. TEGA will measure the mineralogy and water content of the soil, and its atmospheric inlet port will allow atmospheric chemistry and isotope measurements. TEGA will analyze 8 soil samples.

Mars Descent Imager (MARDI)
Built by Malin Space Science Systems, this MSP'01 instrument will take roughly a dozen images of the Martian surface during descent raning from 8 m/pixel over 8 km to 0.8 cm/pixel over 8 m. It will also take images of the heatshield as it is deployed during entry. The MARDI is on the underside of the spacecraft and therefore is not shown.

Robotic Arm (RA) and Robotic Arm Camera (RAC)
Built by JPL, the RA is an upgraded version of the MPL and MSP'01 RAs. It has the capability to dig through soil and scrape and collect icy samples. It will dig and deliver samples to both the TEGA and MECA wet chemistry cells and microscope assembly. The RAC, contributed by Germany, images the trench walls, local surface features, and samples in the scoop providing 0.2 mm resolution at 11 cm distance.



Shown here is the Phoenix landing laitude zone of 65-72°N. This latitude zone, combined with the constraint of a landed altitude <3500 m from the Mars datum and a modeled dry-layer thickness of >38 g/cm^2, is marked by the yellow dotted line.

This version of the modeled dry-layer thickness assumes a 2-layer model in which a bottom layer of 100% ice is overlain by dry (3% hydration) soil. The actual thickness of the dry layer will depend on the density of the material.

Regions A, B, and C are currently under consideration as possible Phoenix landing sites. In a workshop help in December, 2004, site D was deleted due to its similarity to site A in modeled dry-layer thickness and to reduce the total number of sites under consideration for engineering reasons.

The Phoenix team has studied each landing Region is some detail, as shown in the region Insets. The shaded "bow-tie" features Represent the landing ellipses under Consideration. The "bow-tie" shape is A result of changes in the azimuth of landing Which result from different launch dates.

Geomophology maps have been produced, THEMIS, MOC and MOLA data ave been examined, and other work, not shown, on craters, boulders, and thermal inertia have been done by the Phoenix team. In addition, atmospheric characteristics have been examined and two mesoscale Models have been run for the Phoenix landing season and locations to better understand The atmospheric conditions upon entry. This information will be used to select the best landing region and finally site, based on both science and engineering safety considerations.

The landing site selection process is different from the MER process. Because Phoenix is a PI-led mission, the site will be selected by the PI. The Phoenix team plans to have a series of papers presented on our landing site selection activities at the March, 2006 Lunar and Planetary Science Conference. We hope to gather community feedback at that time.

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