Racing the Midnight Sun

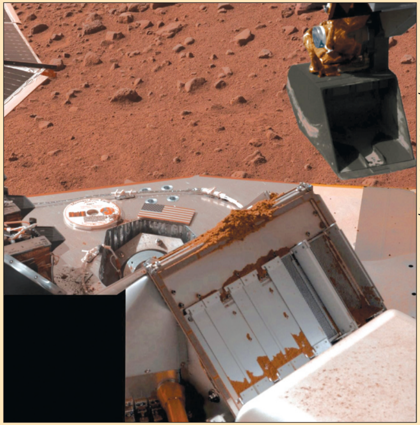
CRAIG COVAULT/CAPE CANAVERAL

The NASA Phoenix lander is in a race with approaching winter to complete its soil-sample operations before the Sun drops completely below the horizon at its arctic landing site, starving the platform of solar array power. Electricity levels have already begun to drop from 3,500 watt-hours generated daily to 2,500 watt-hr..

Mission operations are commanded from the Science Operations Control Center at the University of Arizona at Tucson. The team is likely to request funding to extend the flight an additional month through October.

To make maximum use of the power that will begin to dwindle dramatically in October, the science team decided to fill the remaining four cells of the Thermal and Evolved Gas Analyzer (TEGA) with soil collected relatively quickly from the trenches already dug in front of the lander. It takes less electricity to process samples in the TEGA cells than it does to operate the robotic arm.

But TEGA also has an engineering problem. A valve that controls the flow of a carrier gas for transporting sample vapors to the mass spectrometer is no longer reliable, reducing or cutting off the amount of carrier gas moving the sample to the spectrometer. Researchers anticipate, however, that the remaining samples will yield enough vaporized water and carbon dioxide to carry any vapors from the baking oven to the spectrometer. Mission engineers are also examining workarounds to the problem.



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Scoop on robotic arm hangs above TEGA after dropping another load of soil into the instrument. Red soil covers door area.

The lander's robotic arm is also ready to deliver the fourth and final sample to the Microscopy, Electrochemistry and Conductivity Analyzer (MECA) suite. The wet chemistry part of the instrument that mixes water from Earth with the Martian soil earlier found Earth-like minerals and pH levels in the soil. It also discovered perchlorate—a mineral that, depending upon the specific type, could be used as a food and energy source by extreme life forms, if any exist.

An earlier attempt to dump soil into MECA acquired from about 7 in. deep was unsuccessful when that material proved so clumpy that it would not fall through the MECA outer door.

Another instrument that's part of the MECA electro-conductivity probe is returning puzzling data. It obtains its findings by measuring the conductivity of the soil and air. When inserted in the water-ice soil, the device registers extremely dry conditions. But when it measures the air at different levels above the ground, it registers humidity levels consistent with an exchange of water vapor between the soil and the air.