Mars tugging on approaching Curiosity rover

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This artist's scoreboard displays a fictional game between Mars and Earth, with Mars in the lead. It refers to the success rate of sending missions to Mars, both as orbiters and landers. Of the previous 39 missions targeted for Mars from around the world, 15 have been successes and 24 failures. For baseball fans, that's a batting average of .385 . The United States has had 13 successes out of 18 attempts, or a "batting average" of .722. NASA's Curiosity rover, set to land on the Red Planet the evening of Aug. 5, 2012 PDT (morning of Aug. 6 EDT), will mark the United States' 19th attempt to tackle the challenge of Mars, and the world's 40th attempt. Image credit: NASA/JPL-Caltech
(Phys.org) -- The gravitational tug of Mars is now pulling NASA's carsize geochemistry laboratory, Curiosity, in for a suspenseful landing in less than 40 hours.
"After flying more than eight months and 350 million miles since launch, the Mars Science Laboratory spacecraft is now right on target to fly through the eye of the needle that is our target at the top of the Mars atmosphere," said Mission Manager Arthur Amador of NASA's Jet Propulsion Laboratory, Pasadena, Calif.

The spacecraft is healthy and on course for delivering the mission's Curiosity rover close to a Martian mountain at 10:31 p.m. Sunday, Aug. 5 PDT (1:31 a.m. Monday, Aug. 6 EDT). That's the time a signal confirming safe landing could reach Earth, give or take about a minute for the spacecraft's adjustments to sense changeable atmospheric conditions.

The only way a safe-landing confirmation can arrive during that first opportunity is via a relay by NASA's Mars Odyssey orbiter. Curiosity will not be communicating directly with Earth as it lands, because Earth will set beneath the Martian horizon from Curiosity's perspective about two minutes before the landing.


This global map of Mars was acquired on Aug. 2, 2012, by the Mars Color Imager instrument on NASA's Mars Reconnaissance Orbiter. One global map is generated each day to forecast weather conditions for the entry, descent and landing of NASA's Curiosity rover. The active dust storm observed south of Curiosity's landing site on July 31 has dissipated, leaving behind a dust cloud that will not pose a threat to the landing. The map is a rectangular projection of Mars (from 90 degrees latitude to minus 90 degrees latitude, and minus 180 degrees longitude to 180 degrees east longitude). The landing site is located on the right side of the map, near 137 degrees east longitude and 4.5 degrees south latitude. The map shows water ice clouds at equatorial latitudes that are typical for late southern winter, when Mars is farther from the sun. Along the southern (bottom) part of the map there are patches of orange clouds, indicating dust lofted into the atmosphere. Small, short-lived dust storms are common at this time of year on Mars and were taken into account when Curiosity's landing system was designed and tested. Larger and more long-lived dust storms are very rare at this time of year. Image credit: NASA/JPL-Caltech/MSSS


#### Abstract

"We are expecting Odyssey to relay good news," said Steve Sell of the JPL engineering team that developed and tested the mission's complicated "sky crane" landing system. "That moment has been more than eight years in the making."


A dust storm in southern Mars being monitored by NASA's Mars Reconnaissance Orbiter appears to be dissipating. "Mars is cooperating by providing good weather for landing," said JPL's Ashwin Vasavada, deputy project scientist for Curiosity.

Curiosity was approaching Mars at about 8,000 mph (about 3,600 meters per second) Saturday morning. By the time the spacecraft hits the top of Mars' atmosphere, about seven minutes before touchdown, gravity will accelerate it to about $13,200 \mathrm{mph}(5,900$ meters per second).

NASA plans to use Curiosity to investigate whether the study area has ever offered environmental conditions favorable for microbial life, including chemical ingredients for life.
"In the first few weeks after landing, we will be ramping up science activities gradually as we complete a series of checkouts and we gain practice at operating this complex robot in Martian conditions," said JPL's Richard Cook, deputy project manager for Curiosity.

The first Mars pictures expected from Curiosity are reduced-resolution fisheye black-and-white images received either in the first few minutes after touchdown or more than two hours later. Higher resolution and color images from other cameras could come later in the first week. Plans call for Curiosity to deploy a directional antenna on the first day after landing and raise the camera mast on the second day.

The big hurdle is landing. Under some possible scenarios, Curiosity could land safely, but temporary communication difficulties could delay
for hours or even days any confirmation that the rover has survived landing.

The prime mission lasts a full Martian year, which is nearly two Earth years. During that period, researchers plan to drive Curiosity partway up a mountain informally called Mount Sharp. Observations from orbit have identified exposures there of clay and sulfate minerals that formed in wet environments.

## Provided by JPL/NASA

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