NASA rover Curiosity makes historic Mars landing, beams back photos

Steve Gorman and Irene Klotz, Reuters

(Reuters) - NASA's Mars science rover Curiosity performed a daredevil descent through pink Martian skies late on Sunday to clinch an historic landing inside an ancient crater, ready to search for signs the Red Planet may once have harbored key ingredients for life.

Mission controllers burst into applause and cheers as they received signals confirming that the car-sized rover had survived a perilous seven-minute descent NASA called the most elaborate and difficult feat in the annals of robotic spaceflight.

Engineers said the tricky landing sequence, combining a giant parachute with a rocket-pack that lowered the rover to the Martian surface on a tether, allowed for zero margin for error.

"I can't believe this. This is unbelievable," enthused Allen Chen, the deputy head of the rover's descent and landing team at the Jet Propulsion Laboratory near Los Angeles.

Moments later, Curiosity beamed back its first three images from the Martian surface, one of them showing a wheel of the vehicle and the rover's shadow cast on the rocky terrain.

NASA put the official landing time of Curiosity, touted as the first full-fledged mobile science laboratory sent to a distant world, at 10:32 p.m. Pacific time (1:32 a.m. EDT/0532 GMT).

The landing marked a much-welcome success and a major milestone for a U.S. space agency beset by budget cuts and the recent cancellation of its space shuttle program, NASA's centerpiece for 30 years.

The $2.5 billion Curiosity project, formally called the Mars Science Laboratory, is NASA's first astrobiology mission since the 1970s-era Viking probes.

"It's an enormous step forward in planetary exploration. Nobody has ever done anything like this," said John Holdren, the top science advisor to President Barack Obama, who was visiting JPL for the event. "It was an incredible performance."

Obama himself issued a statement hailing the Curiosity landing as "an unprecedented feat of technology that will stand as a point of national pride far into the future."

"It proves that even the longest of odds are no match for our unique blend of

ingenuity and determination," he said.

CHECKUP FOR CURIOSITY BEFORE IT ROVES

While Curiosity rover appears to have landed intact, its exact condition was still to be ascertained.

NASA plans to put the one-ton, six-wheeled, nuclear-powered rover and its sophisticated instruments through several weeks of engineering checks before starting its two-year surface mission in earnest.

"We're going to make sure that we're firing on all cylinders before we blaze out across the plains," lead scientist John Grotzinger said.

The rover's precise location had yet to be determined, but NASA said it came to rest in its planned landing zone near the foot of a tall mountain rising from the floor of a vast impact basin called Gale Crater, in Mars' southern hemisphere.

Launched on November 26 from Cape Canaveral, Florida, the robotic lab sailed through space for more than eight months, covering 352 million miles (566 million km), before piercing Mars' thin atmosphere at 13,000 miles per hour -- 17 times the speed of sound -- and starting its descent.

Encased in a protective capsule-like shell, the craft utilized a first-of-its kind automated flight-entry system to sharply reduce its speed.

Then the probe rode a huge, supersonic parachute into the lower atmosphere before a jet-powered backpack NASA called a "sky crane" carried Curiosity most of the rest of the way to its destination, lowering it to the ground by nylon tethers.

'SEVEN MINUTES OF TERROR'

When the rover's wheels were planted firmly on the ground, the cords were cut and the sky crane flew a safe distance away and crashed.

The sequence also involved 79 pyrotechnic detonations to release exterior ballast weights, open the parachute, separate the heat shield, detach the craft's back shell, jettison the parachute and other functions. The failure of any one of those would have doomed the landing, JPL engineers said.

NASA sardonically referred the unorthodox seven-minute descent and landing sequence as "seven minutes of terror."

With a 14-minute delay in the time it takes for radio waves from Earth to reach Mars 154 million miles (248 million km) away, NASA engineers had little to do during Curiosity's descent but anxiously track its progress.

By the time they received radio confirmation of Curiosity's safe landing, relayed to Earth by a NASA satellite orbiting Mars, the craft already had been on the ground

for seven minutes.

NASA engineers said the intricate and elaborate landing system used by Curiosity was necessary because of its size and weight.

Over twice as large and five times heavier than either of the twin rovers Spirit and Opportunity that landed on Mars in 2004, Curiosity weighed too much to be bounced to the surface in airbags or fly itself all the way down with rocket thrusters -- systems successfully used by six previous NASA landers, engineers said.

Curiosity is designed to spend the next two years exploring Gale Crater and an unusual 3-mile- (5 km-) high mountain consisting of what appears to be sediments rising from the crater's floor.

Its primary mission is to look for evidence that Mars - the planet most similar to Earth - may have once hosted the basic building blocks necessary for microbial life to evolve.

The rover comes equipped with an array of sophisticated instruments capable of analyzing samples of soil, rocks and atmosphere on the spot and beaming results back to Earth.

One is a laser gun that can zap a rock from 23 feet away to create a spark whose spectral image is analyzed by a special telescope to discern the mineral's chemical composition.

Mission controllers were joined by 1,400 scientists, engineers and dignitaries who tensely waited at JPL to learn Curiosity's fate, among them film star Morgan Freeman, television's "Jeopardy!" host Alex Trebek, comic actor Seth Green and actress June Lockhart of "Lost in Space" fame. Another 5,000 people watched from the nearby California Institute of Technology, the academic home of JPL.

"There are many out in the community who say that NASA has lost its way, that we don't know how to explore, that we've lost our moxie. I think it's fair to say that NASA knows how to explore, we've been exploring and we're on Mars," former astronaut and NASA's associate administrator for science, John Grunsfeld, told reporters shortly after the touchdown.

(Editing by W Simon)

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