

Curiosity Rover Lands Safely on Mars

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PASADENA, Calif. — In a flawless, triumphant technological tour de force, a plutonium-powered rover the size of a small car was lowered at the end of 25-foot-long cables from a hovering rocket stage onto Mars early on Monday morning.

The rover, called Curiosity, ushers in a new era of exploration that could turn up evidence that the Red Planet once had the necessary ingredients for life — or might even still harbor life today. NASA and administration officials were also quick to point to the success to counter criticism that the space agency had turned into a creaky bureaucracy incapable of matching its past glory.

“If anybody has been harboring doubts about the status of U.S. leadership in space,” John P. Holdren, the president’s science adviser, said at a news conference following the landing, “well, there’s a one-ton, automobile-size piece of American ingenuity, and it’s sitting on the surface of Mars right now.”

Only one other country, the Soviet Union, has successfully landed anything on Mars, and that spacecraft, Mars 3 in 1971, fell silent shortly after landing.

Curiosity is far larger than earlier rovers and is packed with the most sophisticated movable laboratory that has ever been sent to another planet. It is to spend at least two years examining rocks within the 96-mile crater it landed in, looking for carbon-based molecules and other evidence that early Mars had conditions friendly for life.

As the spacecraft carrying the Curiosity sped toward its destination on Sunday, the pull of Mars’s gravity accelerating it to more than 13,000 miles per hour, NASA officials tried to tamp down concerns that a crash would entirely derail future plans.

“A failure is a setback,” said Doug McCuiston, the Mars exploration program director. “It’s not a disaster.”

Meanwhile, mission managers warned that glitches with interplanetary communications could leave them not knowing Curiosity’s fate for hours or days. They emphasized that, while the planning, testing and design had been careful and methodical, any attempt to land on Mars carried the risk of failure.

“These things are really hard to do,” Mr. McCuiston said.

The Curiosity landing seemed particularly risky. Engineers chose not to use the tried-and-true landing systems, neither the landing legs of the Viking missions in 1976 nor the cocoons of air bags that cushioned the two rovers that NASA placed on Mars in 2004. Those approaches, they said, would not work for a one-ton vehicle.

Instead, for the final landing step, they came up with something novel that they called the sky crane maneuver. The rover would be gently winched to the surface from a hovering rocket stage.

As the drama of the landing unfolded, each step proceeded without flaw. The capsule entered the atmosphere at the appointed time, with thrusters guiding it toward the crater. The parachute deployed. Then the rover and rocket stage dropped away from the parachute and began a powered descent toward the surface, and the sky crane maneuver worked as designed.

“Touchdown confirmed,” Allen Chen, an engineer in the control room, said at 1:32 a.m. Eastern time, followed by cheers, hugs and high-fives.

Two minutes later, the first image popped onto video screens — a grainy, 64-pixel-by-64-pixel black-and-white image that showed one of the rover’s wheels and the Martian horizon. A few minutes later, a clearer version appeared, and then came another image from the other side of the rover.

“That’s the shadow of the Curiosity rover on the surface of Mars,” Robert Manning, the chief engineer for the project, gushed in awe.

Even more photos were beamed back a couple of hours later.

“Curiosity’s landing site is beginning to come into focus,” said John P. Grotzinger, the project scientist, in a NASA news release. In one photograph, the rim of the crater is seen in the distance. “In the foreground, you can see a gravel field,” Dr. Grotzinger said. “The question is, where does this gravel come from? It is the first of what will be many scientific questions to come from our new home on Mars.”

Over the first week, Curiosity is to deploy its main antenna, raise a mast containing cameras, a rock-vaporizing laser and other instruments, and take its first panoramic shot of its surroundings.

NASA will spend the first weeks checking out Curiosity before embarking on the first drive. The rover will not scoop its first sample of Martian soil until mid-September at the earliest, and the first drilling into rock is not expected until October or November.

The successful landing helps wash away the mission's troubled beginnings. Originally it was to cost \$1.6 billion and was scheduled to launch in fall 2009, but it encountered a cascade of technical hurdles and cost overruns.

NASA officials faced a difficult choice: to rush to meet the launch date or miss it, waiting 26 months until the next time that Mars and Earth lined up in the proper positions.

They chose to wait, even though that added hundreds of millions of dollars to the price tag, bringing it to \$2.5 billion.

Charles Elachi, director of the NASA Jet Propulsion Laboratory, which operates Curiosity and many of the other planetary missions, said it was well worth the money and compared the night's exhilaration to an adventure movie.

"This movie cost you less than seven bucks per American citizen, and look at the excitement we got," Dr. Elachi said.

Even at the late hour, NASA's Web sites collapsed under the throngs of people across the Internet attempting to look at the new Mars photos.

"Tomorrow we're going to start exploring Mars," Dr. Elachi said. "And next week and next month and next year, we'll be bringing new discoveries every day, every week, to all of you."

Because Curiosity is powered by electricity generated from the heat of a chunk of plutonium, it could continue operating for years, perhaps decades, until it finally wears out.

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