Landing is key puzzle in Mars trip, experts say

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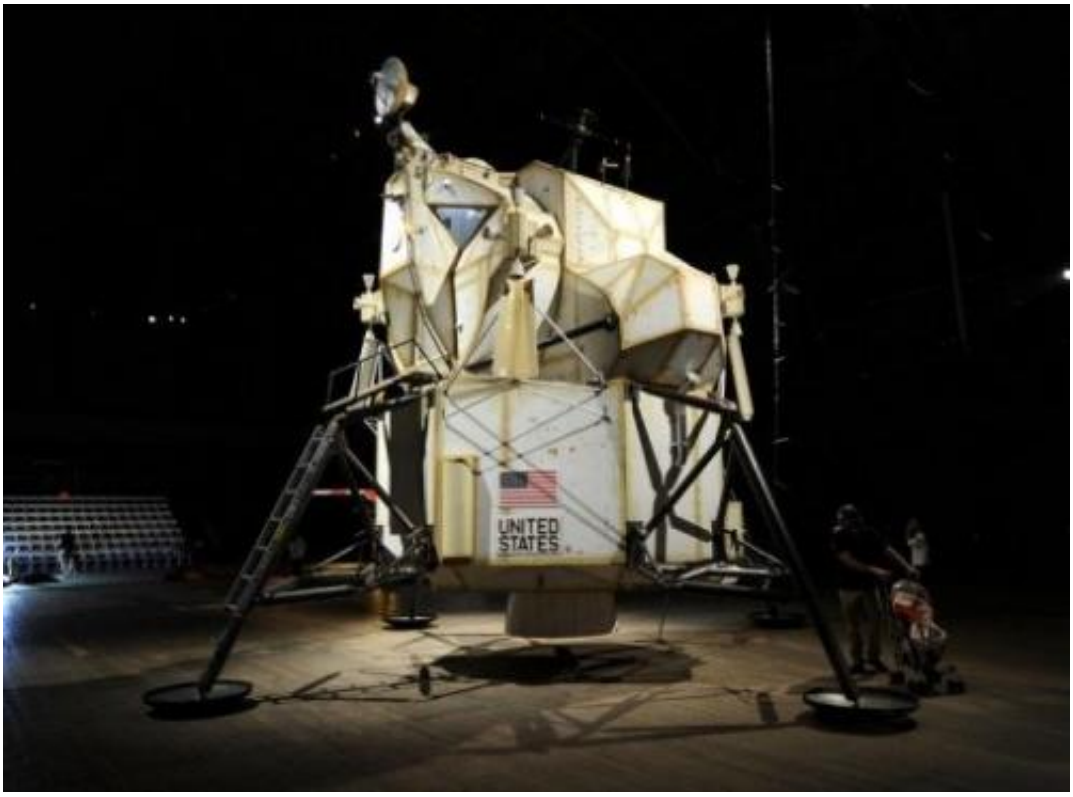

An art installation titled "Landing Excursion Module (LEM)," part of "SPACE PROGRAM: MARS" by artist Tom Sachs at the Park Avenue Armory May 16, 2012 in New York. Landing astronauts safely on Mars is one of the biggest technological hurdles for any future manned mission to the Red Planet, even more complicated than last year's daring rover touchdown.

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NASA dazzled observers by landing the one-ton Curiosity rover on Mars in August in a high-speed operation using a sky crane and supersonic parachute, but experts say the task would be even more challenging with humans onboard.

"The Curiosity landing was an amazing accomplishment," said Robert Braun, a former NASA engineer now at the Georgia Institute of Technology.

"But it's really a baby step that we needed to take, on the way of one day walking on the Mars surface," he said at a conference in Washington on Tuesday.

The three-day meeting, which started Monday, has brought together NASA experts, university researchers and members of the aerospace industry for talks focused on exploring the neighboring planet.

"Curiosity has been described as a small car," Braun said of the six-wheeled mobile lab that has been exploring Mars for the last nine months.

"What we are really talking about today is landing a two-storey house, and maybe landing that two-storey house next to another one that has been pre-positioned," he said.

Where Curiosity weighed one ton, engineers estimate a supply capsule to prepare for a manned landing would weigh somewhere around 40 tons.

Such a mission would require not only food, water and oxygen for the astronauts, but a vehicle powerful enough to get them back to their

spaceship, which would likely remain in orbit.

Artist concept painting shows NASA's Mars Science Laboratory Curiosity rover on the surface of the planet, July, 2011. Landing astronauts safely on Mars is one of the biggest technological hurdles for any future manned mission to the Red Planet, even more complicated than last year's daring rover touchdown.

"The technologies we will use to land our systems on Mars will probably have little semblance to the systems we have been using for the robot program because of their scale," Braun said.

The first six robots NASA sent to Mars starting in 1974 were light enough that their descent was slowed by parachutes and their landing aided by balloons.

Curiosity was heavier, so it required a complex landing apparatus that included a supersonic parachute and a rocket-powered crane.

But neither method is likely to work, without significant adjustments, for the much larger vehicles required for a manned landing, nor would the technology used to land spacecraft on Earth work on Mars.

Atmospheric pressure at 25 miles (40 kilometers) altitude on Earth is equivalent to just six miles up (10,000 meters) on Mars—which leaves little time to slow the faster-than-sound speed of a Mars lander, Braun said.

"It's a challenge we have not yet faced, and we don't have yet a specific answer to," he said.

A colour image released by NASA on August 28, 2012 and taken on Mars by the Curiosity rover on August 23 shows Mount Sharp in the background. Landing astronauts safely on Mars is one of the biggest technological hurdles for any future manned mission to the Red Planet, even more complicated than last year's daring rover touchdown.

Adam Stelzner, one of the inventors behind Curiosity's space crane, is more optimistic, saying that landing the rover did not require NASA to "invent some new device technology."

Instead, the project required "just thinking a little more creatively in using the materials, the technological materials, that were at hand," he said.

Stelzner, an engineer at NASA's Jet Propulsion Lab, believes similar creative thinking—such as scaling up the sky crane—could bring about a successful manned landing in the near future.

He points out that in the summer of 2003—just eight years before Curiosity's launch—NASA did not know how to land the robot.

But Charles Campbell, an aerodynamics expert at NASA, said the technological challenges should not be underestimated.

"We need a retropropulsion system at mach two or three at Mars," he said.

"We know how to design a hypersonic vehicle, but reconfiguring this vehicle to a retropropulsion vehicle is a transforming event."

Campbell added that the costs would be great and the effort would likely require international cooperation.

"A human mission to Mars is going to require a vehicle of the scale of a space shuttle," Campbell said, with the mission requiring a jump "in order of magnitude from what we are used to dealing with."