

NASA's newest Mars lander to study quakes on Red Planet

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NASA's InSight lander aims to be the first to reach Mars since the Curiosity rover, pictured here on Mars' Vera Rubin Ridge, which landed in 2012 and remains on the planet

NASA is poised to launch its first lander to Mars since 2012, an unmanned spacecraft called InSight that aims to listen for quakes and unravel the mystery of how rocky planets like Earth form.

It is scheduled to launch on Saturday at 7:05 am Eastern time (1105 GMT) from Vandenberg Air Force Base in California, and if all goes as planned, it should land on the Red Planet November 26.

Since the Earth and Mars likely formed by similar processes 4.5 billion years ago, the US space agency hopes the lander—officially known as Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight)—will shed light on what made them so different.

"How we get from a ball of featureless rock into a planet that may or may not support life is a key question in planetary science," said Bruce Banerdt, InSight principal investigator at NASA's Jet

Propulsion Laboratory in Pasadena, California.

"We'd like to be able to understand what happened."

On Earth, these processes have been obscured over billions of years by earthquakes and the movement of molten rock in the mantle, he said.

But Mars, the fourth planet from the Sun and Earth's smaller and less geologically active neighbor, may yield more clues.

Quake sensor

InSight aims to rest in an isolated spot and detect "marsquakes," which NASA described as "like a flashbulb that illuminates the structure of the planet's interior."

The lander will gather information using three instruments, including a seismometer, called the Seismic Experiment for Interior Structure, made by the French Space Agency.

Banerdt called the seismometer "the heart of the mission."

After landing, the spacecraft's robotic arm will gently pull it out and set it on the ground, according to video images released by NASA.

Scientists expect to pick up as many as 100 quakes during the mission, which should last at least 26 Earth months, or one Martian year.

Most of the quakes are expected to be less than 6.0 on the Richter scale.

Studying how seismic waves pass through the crust, mantle and core of Mars can help scientists learn more about what the layers are made of and how deep they are.

The second key instrument is a first-of-its-kind on Mars self-hammering probe that will monitor the flow of heat in the planet's subsurface.

Called the Heat Flow and Physical Properties Package, it was made by the German Space Agency with the participation of the Polish Space Agency.

The probe should go 15 times deeper than any previous Mars mission, to a depth of 10 to 16 feet (three to five meters), said NASA.

A third instrument will help scientists on Earth keep precise track of the lander's location as Mars rotates. © 2018 AFP

The US spent \$813.8 million on the spacecraft and rocket launch, while investments on the instruments from France and Germany amount to \$180 million, according to NASA.

A pair of mini-spacecraft that are also launching on the rocket cost NASA \$18.5 million.

Known as Mars Cube One, or MarCO, the briefcase-sized satellites "will fly on their own path to Mars behind InSight," and test tiny new deep space communications equipment, NASA said.

Delay due to glitch

InSight was initially supposed to launch in 2016 but a problem with the seismometer was discovered in late 2015. One component cracked slightly during tests to replicate the large temperature extremes on Mars, which dipped to -120 Celsius (-194 Fahrenheit.)

Engineers decided it could not be patched, and NASA granted more time for them to properly fix the problem by shifting the launch window to 2018.

Launch weather officer Kristina Williams told reporters the weather forecast for Saturday morning is expected to be foggy, but that there were no other constraints to liftoff.

If Saturday's launch is delayed for any reason, another opportunity opens Sunday.

NASA's pair of Viking landers in the late 1970s had seismometers but only one of them worked. It was much less sensitive because it was bolted on top of the spacecraft.

In contrast, InSight's seismometer will be picked up with a robotic arm and placed directly on the ground.

InSight aims to be the first NASA instrument to land on Mars since the Curiosity rover which arrived in 2012 and is still working.

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