



By: TA | AP Insight

Japan sets the world's first mission to get samples from a Martian moon



Japan is set to launch a spacecraft on the world's first mission to bring back samples from Phobos, one of the two small, potato-shaped moons orbiting **Mars**.

Scientists hope the mission, which is expected to take five years, will provide clues to how Phobos and its smaller sibling Deimos formed, and hopefully even shed light on the origins of life in the solar system.

The Japan Aerospace Exploration Agency's launch of the spacecraft Tuesday on a new Japanese mainstay **H-3 rocket** comes as the United States, China and others consider sending astronauts to Mars.

Samples from Phobos will provide useful data for scientists to consider using a Martian moon as a base for a future manned mission to the planet, said MMX project manager Yasuhiro Kawakatsu.

"Despite their potential importance, Martian moons have never been fully investigated," Kawakatsu said. "They are known as the most important unclimbed mountains in the solar system."

Japan leads the international mission that includes equipment and communications support from NASA and other national space agencies.

JAXA aims to study how Mars' moons formed

Since the 1960s, dozens of missions have been sent to Mars, but its moons largely remain a mystery.

Phobos and Deimos take their names from the Greek mythological personifications of fear and terror, sons of the war god Ares, whose Roman counterpart is Mars.

Multiple Russian attempts to land on Phobos, including one in 2011, have failed.

A key question will be how they formed and

what they are made of. Some scientists think the two irregular crater-pocked bodies could be remnants of debris formed after a large celestial object crashed into Mars.

Others say the moons could be asteroids that have come from elsewhere.

JAXA officials think samples from Phobos will provide answers.

Phobos, about 20 to 30 kilometers in diameter, orbits Mars at a distance of about 6,000 kilometers three times a day

"We can almost certainly come to a conclusion by analyzing (Phobos) soil samples," MMX principal investigator Kiyoshi Kuramoto said.

Scientists chose to collect samples from Phobos mainly because the moon is closer to Mars than Deimos and therefore may have more information about the planet.

Material from Mars is expected to make up about 0.1% of the material collected from Phobos, JAXA officials say.

Phobos, about 20 to 30 kilometers (10 to 20 miles) in diameter, orbits Mars at a distance of about 6,000 kilometers (3,700 miles) three times a day.

Samples from Phobos could also shed light on the origin of Deimos as the two moons are believed to have similar roots, Kuramoto said. The mission also includes plans to fly by Deimos and collect observations.

MMX will spend 3 years studying Phobos

It will be a long journey to reach the red planet, 55 million kilometers (34 million miles) away from Earth at their closest point.

The actual flight distance will be 500-600 million kilometers, Kawakatsu said.

After launching on the H3 rocket, the spacecraft will arrive at the Mars region in around August, 2027.

The spacecraft will carry 13 instruments, including a rover jointly developed by France and Germany that will land on the moon

Then it will fly near and around Phobos for three years to collect data and gather samples from the moon before returning home in 2031.

MMX is made up of three modules — for propulsion, exploration and return — and weighs about 5 tons. Only the third module will return home, with the samples stored in a capsule.

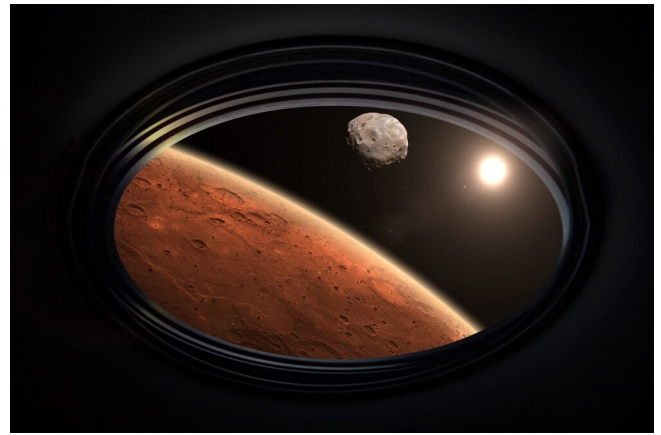
The spacecraft will carry 13 instruments, including a rover jointly developed by France and Germany that will land on the moon, as well as a NASA sampling device and instrument to measure gamma rays, and the European Space Agency's deep space communication device.

A Japanese radiation monitor will collect data that can help a future manned Mars exploration.

The mission will collect moon samples from Phobos

The French-German rover Idefix lands on Phobos first. During a 100-day mission in around 2029, it will explore the surface of the moon to help the subsequent Japanese soil-sampling.

Once the MMX lands some time later, JAXA scientists aim to collect at least 10 grams (0.35 ounces) of soil from the moon from two sampling attempts using U.S. and Japanese methods.



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NASA's sampling device uses pressurized gas to lift surface dust into a container, and JAXA's coring method will collect samples from a depth of about 2 centimeters (less than 1 inch).

In the first attempt, the MMX will collect surface and underground samples using both devices, and take additional underground samples in the second landing.

Scientists say collecting samples from multiple locations increases the chances of obtaining any potential traces of past microbial life from Mars.

The samples will be stored in a heat-protected capsule designed to survive reentry into Earth's atmosphere. It's expected to land in Australia before being sent back to Japan.

Japan's two **Hayabusa** missions returned asteroid samples, the first in 2010 and again in 2020.

The moon's extremely low gravity is a challenge

The spacecraft has to choose a relatively smooth and level site for its landing based on topographical data provided by the rover, and then collect samples within two hours.

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To minimize bouncing at touchdown, the MMX's exploration module is equipped with four-legged landing gear with shock absorption features.

The rover has wheels that can get traction in low gravity, right itself if it tips over, and move "at a snail's pace," JAXA said.