

Martian Moons eXploration (MMX) Mission

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Why in news?

Recently, Japan's ambitious mission to unlock the mysteries of Mars' moons began its journey from the Tanegashima Space Centre aboard the H3 rocket and is set to reach the Red Planet in August 2027.

- **Martian Moons eXploration (MMX)** - It is a pioneering mission to explore Mars' moon Phobos, collect samples, return them to Earth and conduct observations of Deimos, Mars' smaller outer moon.
- It will carry out a five-year mission to the Martian moons and back to Earth.
- **Led by** - Japan Aerospace Exploration Agency (JAXA).
- It is the world's first planned sample-return mission from the Martian system.
- **Objectives**
 - To understand the history of the Martian system and the early evolution of the solar system.
 - To bring back material from Phobos - collect at least 10 grams of surface material from Phobos and return it to Earth in 2031.
 - To study Phobos' surface composition, internal structure, gravity, and geology.
- **Importance of Phobos** - Phobos and Deimos are among the least understood natural satellites in the solar system.
- Scientists are divided over whether the moons are asteroids captured by Mars' gravity or debris produced by a massive impact between Mars and another celestial body.
- **Working** - The spacecraft will enter a quasi-satellite orbit around Phobos, allowing it to observe the moon closely and identify suitable locations for sample collection.
- **3 modules of the mission**
 - The propulsion module,
 - The exploration module, and
 - The return module.
- The design leverages its versatility to support landing operations on the Martian moon, long-distance round-trip travel between Earth and the Mars sphere, and sample collection.
- The spacecraft is expected to undertake two landing operations as part of its exploration and sample-collection activities.



Other international partners & Payloads

- **Idefix** - A small French-German rover developed jointly by France's space agency CNES and the German Aerospace Centre (DLR) to investigate the moon's surface.
- **NASA** - MEGANE gamma-ray and neutron spectrometer to analyse surface elemental composition.
- **European Space Agency (ESA)** - Provided deep-space communication transponders, power amplifiers, and ground station support via the ESA Estrack network.

References

1. [India Today| Japan's MMX mission begins 10-month-long journey](#)
2. [JAXA | MMX Mission](#)