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CHALLENGES OF THE MMX ROVER MISSION TO PHOBOS

Abstract

The Martian Moons eXploration (MMX) mission by the Japan Aerospace Exploration Agency, JAXA, aims at the Martian Moons Phobos and Deimos. It will return samples from Phobos back to Earth and deliver a small (about 25 kg) Rover to the surface. The Rover will be released from the mother spacecraft from below 100m high. After an uncontrolled descent and landing on Phobos, the Rover will uprighten itself. This is followed by the deployment and pointing of its Solar Array for the Rover to become independent from an energy point of view. This is all to happen autonomously, as the ground loop duration (Rover → MMX spacecraft → Earth → MMX spacecraft → Rover) is too long for the Rover to survive on battery power alone. Over its 100-day mission on Phobos, the Rover aims to demonstrate locomotion in a milli-g environment, to provide valuable insights of what Phobos is like and how its surface behaves to the MMX spacecraft before its own landing to perform the sampling and to experiment autonomous navigations algorithms. We will report on the particular challenges of designing, building and operating a rover on Phobos.

MMX will be launched in September 2024, with the Rover delivery to Phobos planned for 2026-2027. The Rover is a contribution by the Centre National d'Etudes Spatiales (CNES) and the German Aerospace Center (DLR).