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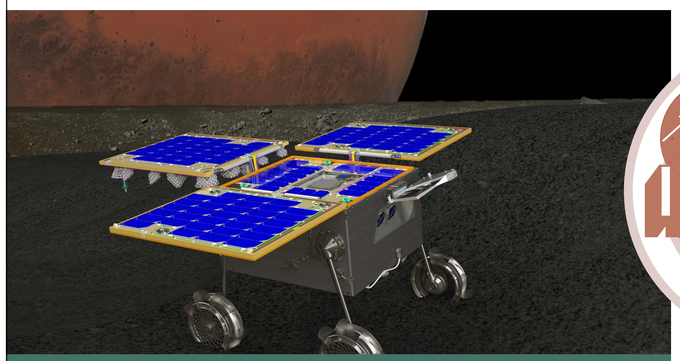
MECHANICAL, THERMAL ARCHITECTURE AND STRUCTURAL CONCEPT OF THE INTERNAL MODULE OF THE IDEFIX ROVER



ARTIST IMPRESSION OF **IDEFIX** ON PHOBOS (@ CNES, 2023)

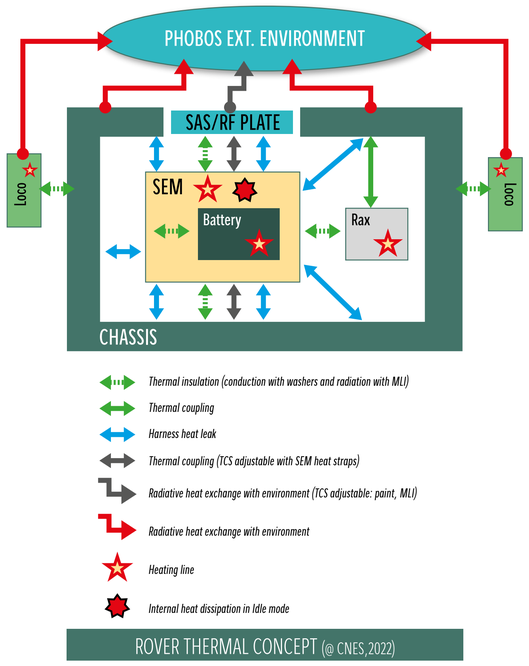
The Martian Moons eXploration (MMX) mission, led by the **Japan Aerospace Exploration Agency, JAXA,** aims at studying **the Martian Moons Phobos and Deimos**.

It will return samples from **Phobos** back to **Earth** and deliver a small (about 25 kg) Rover named **IDEFIX®** to the **Phobos** surface.

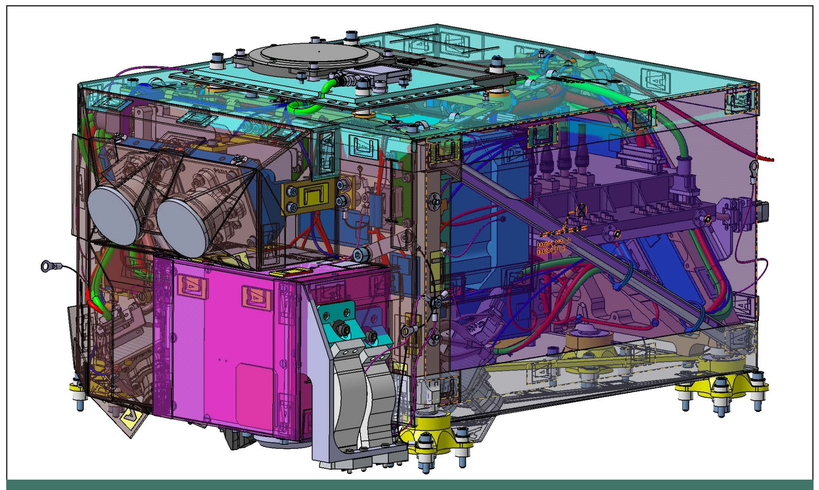
The rover will be deployed onto the surface of the **Martian moon.** It aims to demonstrate locomotion in a milli-gravity environment, to provide valuable insights of what **Phobos** is like to the **MMX spacecraft** before its own landing and to perform science in situ with its 4 different instruments.

A technical challenge for the structural and thermal architecture

- A tight 4-year schedule with several thermal models for thermal characterization.
- Various Phobos landing sites with a wide variation of surface temperatures (-130 °C / +50 °C) and dust.
- Energy conservation (<1W heating power).
- 9 thermal zones in a small volume.
- High stiffness structure, late interface changes compatibility and significant launch environment.



ROVER THERMAL CONCEPT (@ CNES,2022)



THE MAIN ROVER INTERNAL MODULE HOUSING MOST EQUIPMENT AND SCIENTIFIC INSTRUMENTS. THE THERMAL ARCHITECTURE DEFINITION OF THE ROVER, TOGETHER WITH THE MECHANICAL ARCHITECTURE AND THE STRUCTURE CONCEPT DEVELOPMENT OF THE ROVER'S INTERNAL MODULE WERE CONDUCTED BY THE CNES. (@ CNES,2022)

IDEFIX® was assembled on MMX in Japan at the beginning of 2024, with a launch planned for 2026.

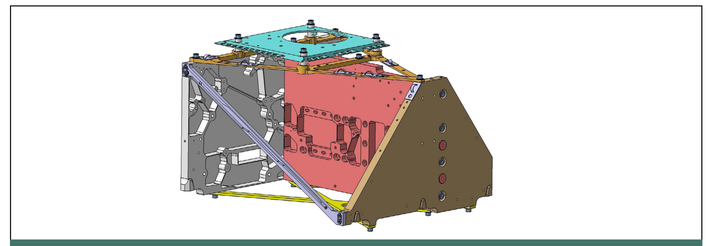
IDEFIX® is a joint contribution by the Centre National d'Etudes Spatiales (CNES) and the German Aerospace Center (DLR).

IDEFIX IN JAPAN (@JAXA, 2024)

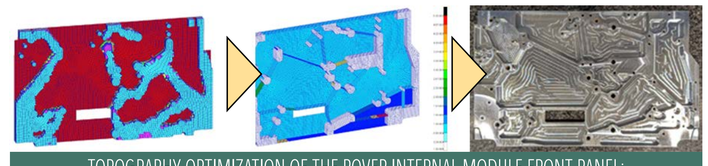
Internal module built of 3 milled aluminium grid-stiffened main panels, whose stiffness to mass ratio enhanced thanks to topography optimization.

Payload brackets produced through additive manufacturing and designed using topology optimization.

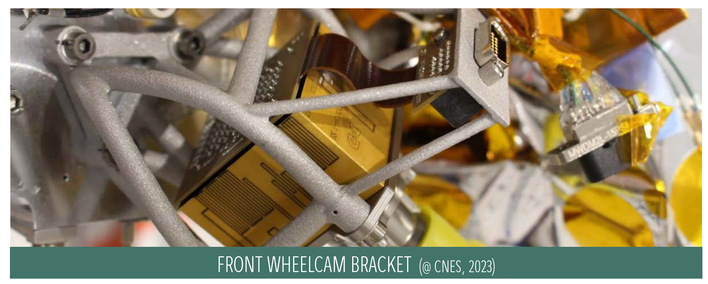
Early strategic decision of a compact damping solution to ensure the successful development and mechanical qualification of the Rover's units.



ROVER INTERNAL MODULE STRUCTURE (@ CNES, 2022)



TOPOGRAPHY OPTIMIZATION OF THE ROVER INTERNAL MODULE FRONT PANEL: FROM ANALYSIS TO MANUFACTURING (@ CNES, 2022)



FRONT WHEELCAM BRACKET (@ CNES, 2023)

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