

China's Mars Sample Return Mission (TW-3)

Lunar Exploration and Space Engineering Center

Mission Name

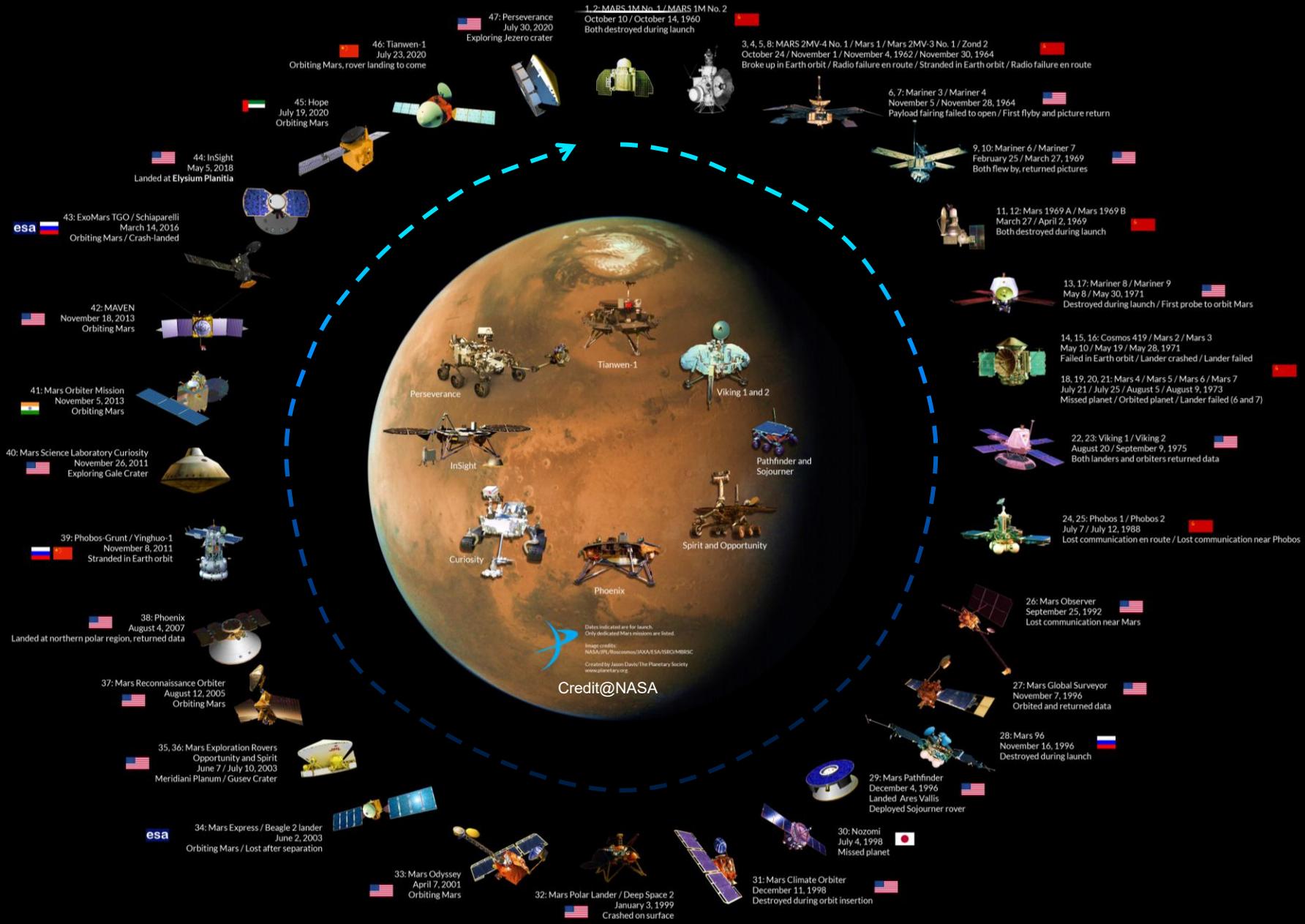
Planetary Exploration
of China

China's Mars Sample Return
Mission

Tianwen

TW-3

Current Status of Mars Exploration

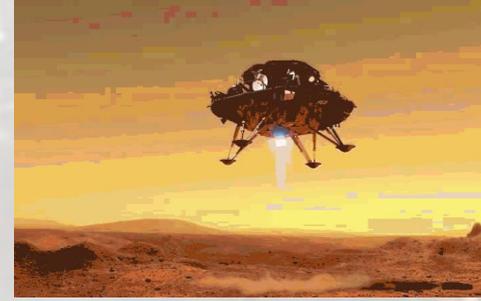


Tianwen-1 Mission

Launch 2020.7.23
Wenchang, Hainan



Land 2021.5.15
Landing of the lander-rover
integrated assembly



Rove 2021.5.22
Martian surface roving



Initiate a new journey of China's planetary exploration



Orbiting, landing and roving at one time
Distance 1921m

Scientific Objectives of TW-3

Primary Objective: Traces of life on Mars

① Potential biosignatures

Martian habitability

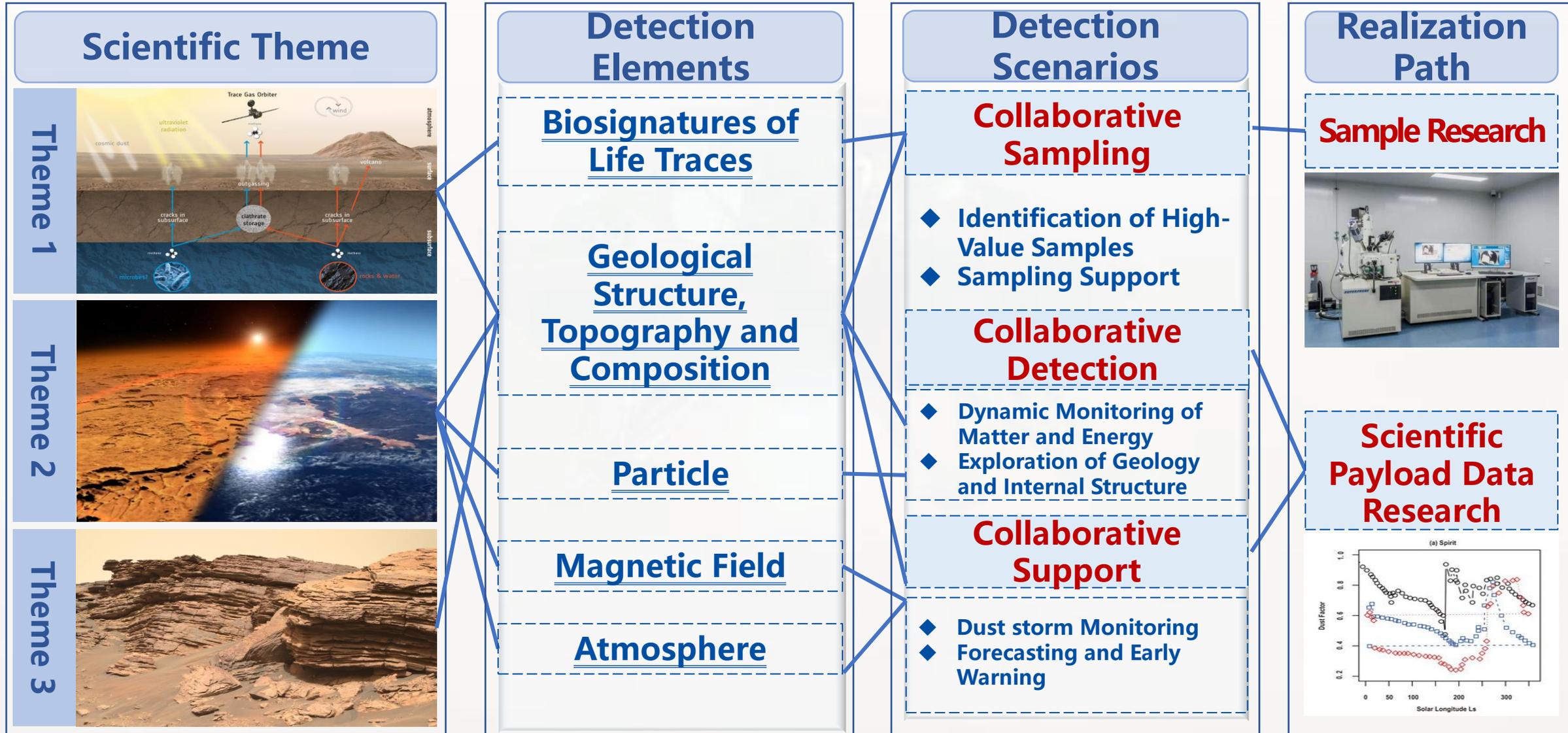
Evolution of climate and habitable environments

- ① Evolution of the surface water environment on Mars
- ② Atmosphere, dust and water activities
- ③ Solar wind and atmospheric escape
- ④ Water and volatile spatiotemporal evolution

Geological structures and internal processes

- ① Material composition of Martian crust
- ② Material composition and evolution of Martian mantle
- ③ Impact flux and temporal distribution of geological tectonic activity
- ④ Core, mantle and crust genesis and early evolution

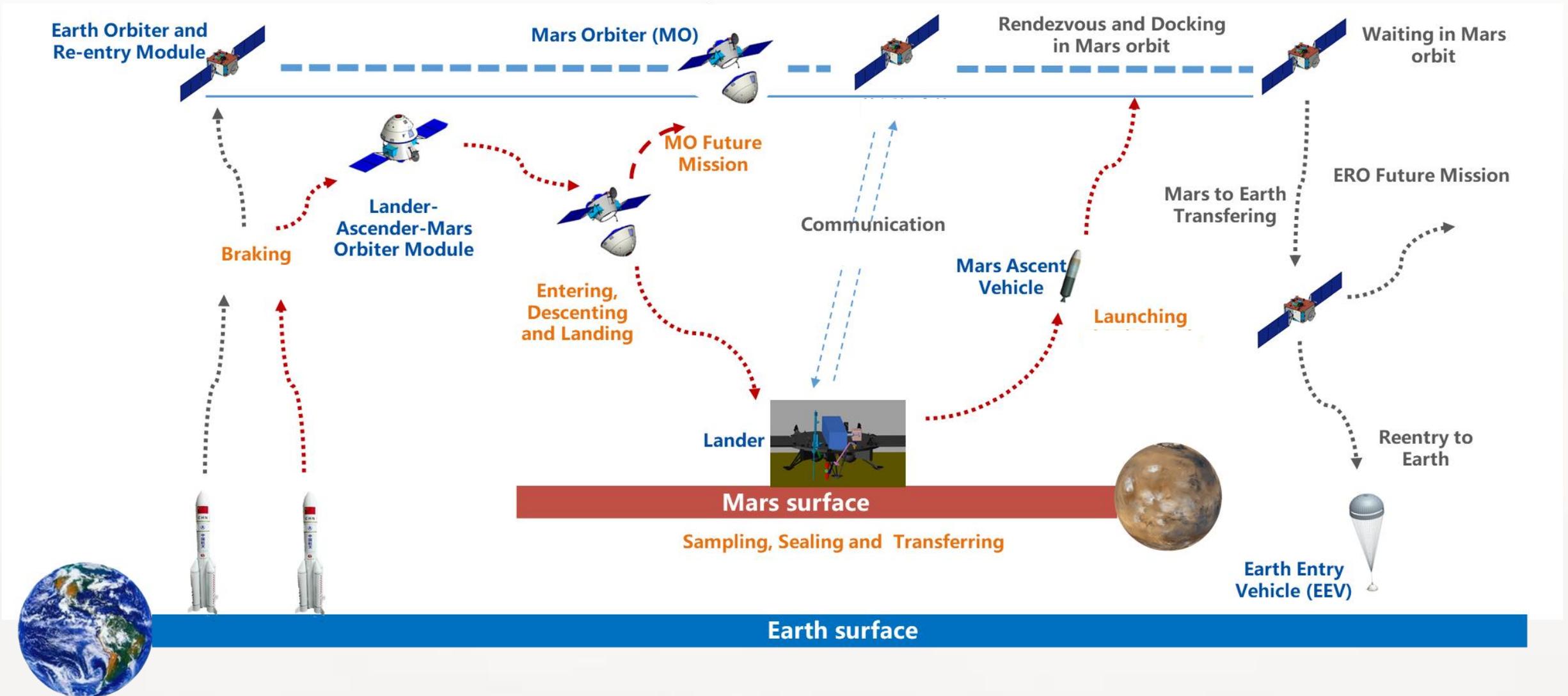
Feasibility of Scientific Objectives



Main Scheme



Main Scheme



China's Planetary Protection Standards

COSPAR Planetary Protection Policy

China's Planetary Protection Standard

COSPAR BUSINESS

Editorial to the New Restructured and Edited COSPAR Policy on Planetary Protection

The COSPAR Panel on Planetary Protection established a subcommittee in 2023 to propose a new version of the COSPAR Policy on Planetary Protection. Upon endorsement of the new version of the Panel members on 1 March 2024, the text was submitted to the COSPAR Bureau for validation, approved by the Bureau on 20 March 2024. Below follows a brief explanation to the new version Policy, which is published hereafter in the Space Research Today journal.

Chapters 1 and 2 – Preamble and Policy Statement

The previous 2021 version of the COSPAR Policy represented a Policy document which had its occasional modifications after gradual evolution without always safeguarding the coherence and readability of the text. This new version builds on the 2021 text and reflects editorial and structural adjustments to ensure active consistency and better understanding of the Policy and all its components. The content and respective substantive guidelines in this document has not been altered beyond what has been approved by the Panel and validated by the Bureau previously.

Compared to the 2021 version, the Preamble and Policy chapters [1 and 2] of the new document have been changed to not just improve consistency and clarity of the language, but also to introduce a more driven and case-adapted (vs. prescriptive) approach to the formulation and implementation of planetary protection controls. The new restructured version explicitly calls these two chapters out to delineate the policy statement and the technical guidelines.

The preamble references the relevant articles of the Outer Space Treaty of 1967. The previous 2021 version only referenced Article IX which require State Parties to avoid harmful contamination during planetary missions (forward contamination) and avoiding adverse changes to Earth's environment during return (backward contamination). The new version adds Article VI to address the roles and responsibilities for all national activities to include both governmental agencies and non-governmental entities.

Space Research Today 19-220 July 2024

COSPAR BUSINESS

COSPAR Policy on Planetary Protection

Table of Contents

1. Preamble	15
2. Policy Statement	16
3. Role of the COSPAR Panel on Planetary Protection	16
4. Key Assumptions	17
4.1 Exploration Assumptions	17
4.2 Environmental Conditions for Replication	17
4.3 Bioburden Constraints	18
4.4 Biological Exploration Period	18
4.5 Life Detection and Sample Return "False Positives"	18
4.6 Crewed Missions to Mars	18
5. Categorization	19
6. Guidelines	23
6.1 Biological Control	23
6.1.1 Numerical Implementation for Forward Contamination Calculations	23
6.1.2 Category III and IV Missions	24
6.1.2.1 Missions to Icy Worlds	24
6.1.2.2 Missions to Mars	24
6.1.2.2.1 Category III for Mars	24
6.1.2.2.2 Category IVa for Mars	25
6.1.2.2.3 Category IVb Life Detection and Sample Return Missions for Mars	25
6.1.2.2.4 Category IVc Special Region Access for Mars	26
6.2 Organics Inventory	26
6.2.1 Category II, IIa and IIb Missions to the Moon	27
6.2.2 Category III and IV Missions	27
6.3 Cleanroom	27
6.4 Trajectory Biasing	27
6.5 Category V: Restricted Earth Return	27
6.5.1 Sample Return Missions	27
6.5.2 Sample Return from Small Solar System Bodies	28
6.6 Crewed Mars Missions	29
7. Reporting on Mission Activities	30

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深空探测器行星保护要求

Planetary protection requirements for deep space probe

2024-07-24 发布 2025-02-01 实施

国家市场监督管理总局 发布
国家标准化管理委员会

Planetary Protection Categories

Table 1. Planetary Protection Categories in relation to target bodies

Category	Mission Type	Target Body
I	Flyby, Orbiter, Lander	Undifferentiated, metamorphosed asteroids; Io; others to-be-defined (TBD)
II	Flyby, Orbiter, Lander	Venus; Moon (Cat. II, IIa & IIb); Comets; Carbonaceous Chondrite Asteroids; Jupiter; Saturn; Uranus; Neptune; Ganymede*; Callisto; Titan*; Triton*; Pluto/Charon*; Ceres; Kuiper-belt objects > ½ the size of Pluto*; Kuiper-belt objects < ½ the size of Pluto; others TBD
III	Flyby, Orbiters	Mars; Europa; Enceladus; others TBD
IV	Landers	Mars (Cat. IVa, IVb, & IVc); Europa; Enceladus; others TBD
V "Restricted Earth return"	-	Mars; Europa; Enceladus; others TBD
V "Unrestricted Earth return"	-	Venus, Moon; others TBD

Table 2. An example of the guidelines that may be considered based on planetary protection categories

Category	Guidelines					
	Mission Documentation	Cleanroom	Trajectory Biasing	Inadvertent Impact	Organic Inventory	Biological Control
I	Yes	-	Yes	-	-	-
II (II,IIa, & IIb)	Yes	Only outer planets and their satellites; refer to Section 6.3	Yes	-	IIb only	-
III	Yes	Yes	Yes	Yes	Yes	Yes
IV (IV,IVa, IVb, IVc)	Yes	Yes	Yes	Yes	Yes	Yes
V "Restricted Earth return"	Yes	Yes	Yes	-	Yes	Yes
V "Unrestricted Earth return"	Yes	-	Yes	-	-	-

Planetary Protection Categories for Tianwen-3 Mission

Tianwen-3 is classified as a **Category V restricted Earth return mission**

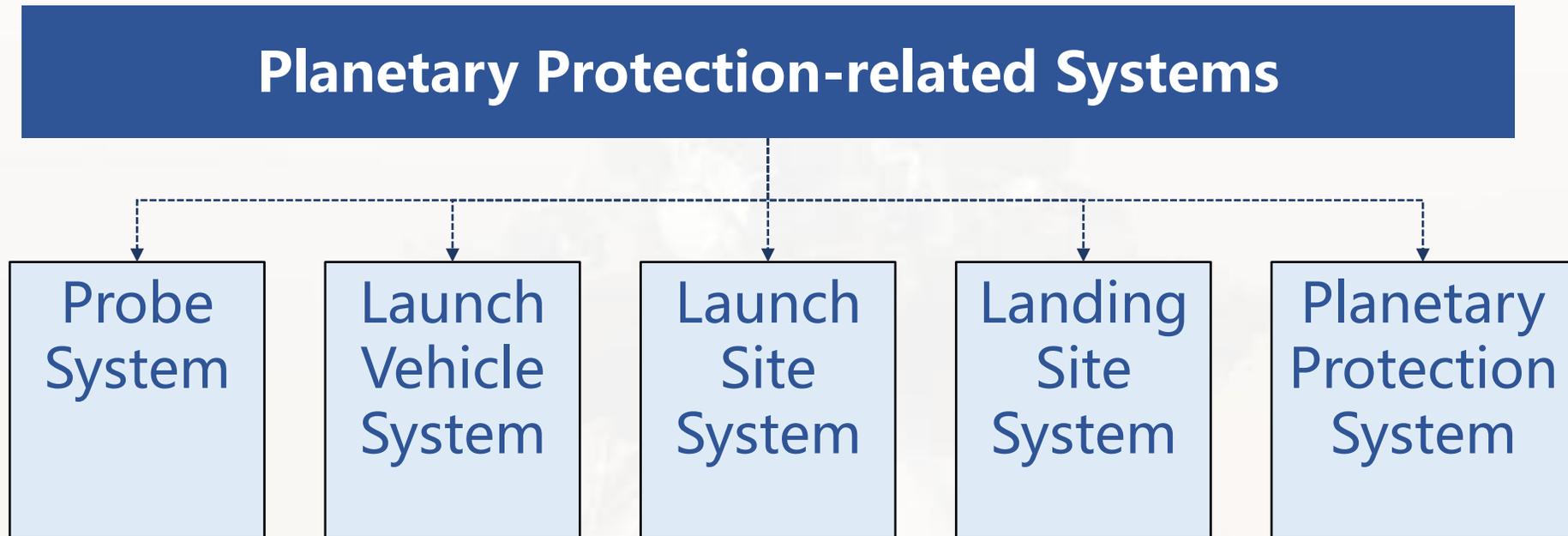


**Planetary Protection Design Specification
for Tianwen-3 Mission (V1.0)**

**Forward planetary
protection**

**Backward planetary
protection**

Planetary Protection Requirements



The planetary protection-related systems are being developed in accordance with the requirements of national standards and planetary protection design specifications.

Summary

According to the Planetary Protection Policy of COSPAR, Mars sample-return missions fall under the category of Class V restricted return missions, measures must be taken to avoid bidirectional cross-contamination between Earth and Mars.

For the Tianwen-3 mission, we attach great importance to planetary protection work. We have established a dedicated Planetary Protection System, formulated relevant technical standards and specifications, and carried out comprehensive forward and backward planetary protection efforts. These initiatives aim to faithfully fulfill international conventions, effectively support mission objectives, and demonstrate the responsibilities of a major responsible country