



NASA Planetary Protection Program Overview and Update

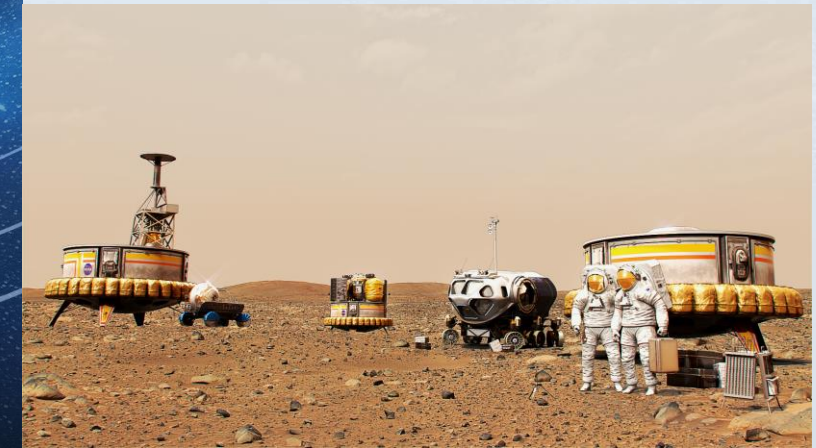
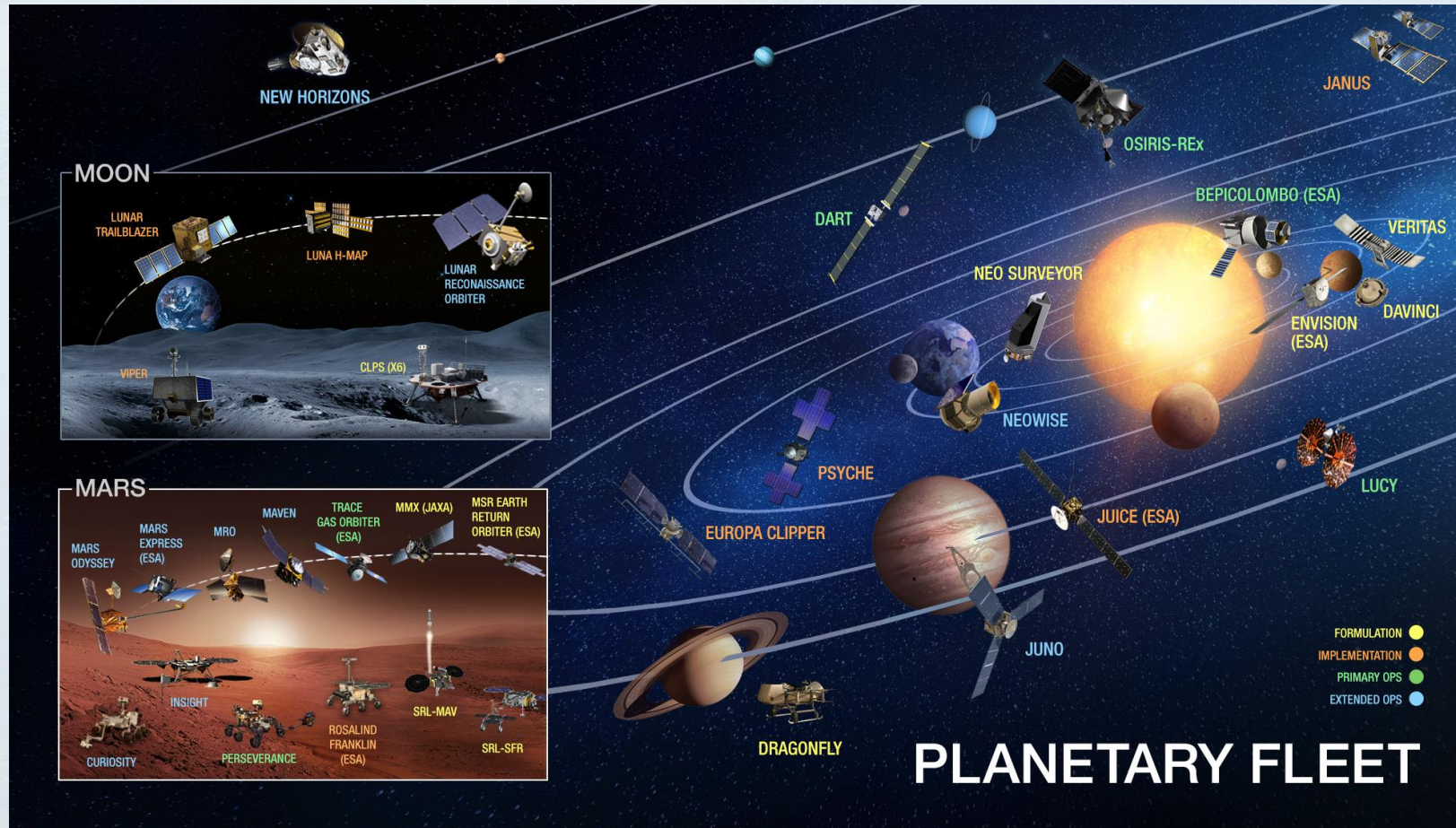
Dr. Frank Groen

NASA Office of Safety and Mission Assurance

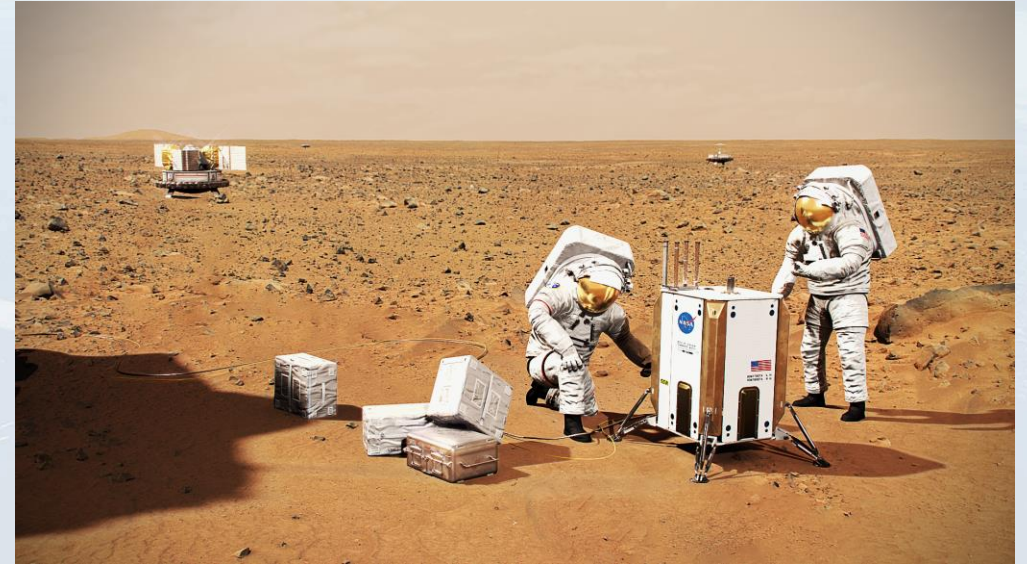
Presentation to the 44th COSPAR Scientific Assembly

July 20, 2022

Planetary Protection Across NASA's Missions



NASA's Continued Focus on Mars and Responsible Exploration



- ▶ The Perseverance Rover has collected 9 samples as of June 2022 (8 cores and 1 additional tube as an atmospheric sample).
- ▶ Mars Sample Return Campaign is continuing design of the Sample Return Lander (2028 launch), coordination with ESA for the Earth Return Orbiter (2026 launch) and conducting an industry study for the Sample Containment Facility.
- ▶ NASA invests in resolution of knowledge gaps to enable crewed PP policy through limiting the risk of both forward and backward contamination to acceptable levels (e.g., co-sponsorship of Human to Mars PP Workshops).

Upcoming, Relevant COSPAR Presentations and Posters

- ▶ COSPAR workshop series on refining planetary protection requirements for human missions to Mars, J Spry, July 21, 11:30-11:50, PPP1, Room MAICC-UL-3
- ▶ Development of a NASA Roadmap for Planetary Protection to prepare for the first Human Missions to Mars, J. Robinson, July 21 11:50-12:10, PPP1, Room MAICC-UL-3
- ▶ NASA's Revised Planetary Protection Policy and Implementation, E. Seasly, July 21, 12:10-12:30, PPP1, Room MAICC-UL-3.
- ▶ Planetary Protection Compliance of NASA Missions Past, Present and Future, J. Benardini, July 22, 10-10:15, PPP2, Room MAICC-UL-3
- ▶ Ensuring Containment: System-Level Backward Planetary Protection Requirements for Mars Sample Return, B. Clement, July 22, 10:45-11:00, PPP2 Room MAICC-UL-3.
- ▶ Poster - Historical and Modern Assessment of Contamination Risk Postures Informing Planetary Protection Cleanliness Standards, M. Cooper, TF-269

NASA's Internal Planetary Protection Roles



NASA's Planetary Protection Directives

Robotic Missions

NPR 8715.24

Replaced NPR 8020.12D/NID 8020.109A
*Planetary Protection Provisions for
Robotic Extraterrestrial Missions*

Defines NASA roles and responsibilities and the procedural requirements, not technical requirements

“Guided by the COSPAR policy and guidelines as an accepted approach for demonstrating compliance with the Outer Space Treaty”

Human Missions

NID 8715.129 (“Mars NID”)

*Biological Planetary Protection for
Human Missions to Mars*

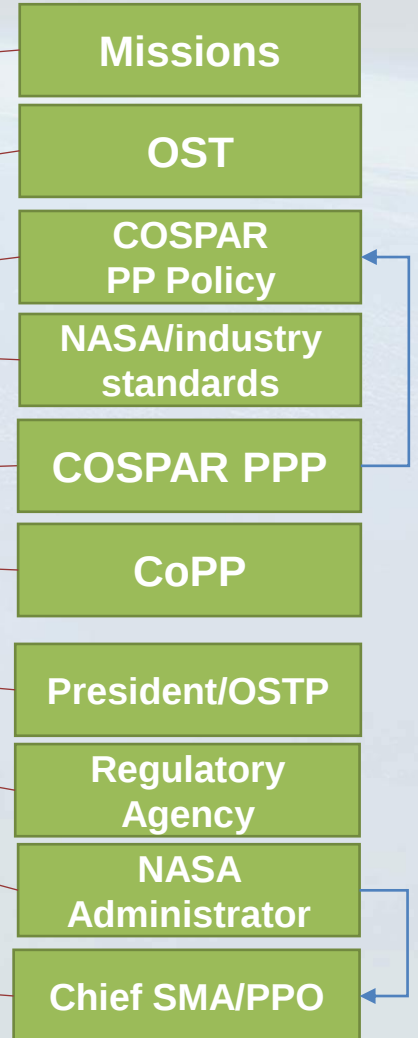
Accepts principles for human missions to Mars in the COSPAR policy

“NASA will develop risk-informed decision-making implementation strategies for human missions to Mars, which account for and balance the needs of human space exploration, science, commercial activities, and safety. Specifically, NASA will develop guidelines and utilize data and experience gained via ground-based tests, the International Space Station (ISS), Artemis, and other missions.”

Lunar missions (“Artemis”) will implement reporting requirements in accordance with COSPAR Policy on Planetary Protection dated 3 June 2021.

Safety Management Perspective of NASA's Planetary Protection

- ▶ Managing safety as an integral aspect and objective of **Program, Project, Facility, and Center** operations and activities
- ▶ Complying with statutes, regulations and directives and meeting **external obligations**
- ▶ Adopting effective and responsible **safety standards and guidelines** to manage hazards requiring control, while prioritizing performance-based approaches
- ▶ When there is no accepted standard to manage novel or unique hazards, consulting with **subject matter experts** on strategies to ensure an acceptable level of safety
- ▶ Obtaining the consent of an **authorized official** representing entities exposed to potential harm unless consent is established by adherence to standards or policy
- ▶ Sharing NASA safety standards, guidelines, and best practices with international, interagency, and commercial partners operating in a shared space environment to manage hazards and mitigate risk to NASA missions, operations and the public.
- ▶ Systematically **measuring and assessing** the effectiveness of safety practices and overall safety posture and managing related risks at all levels of the Agency.

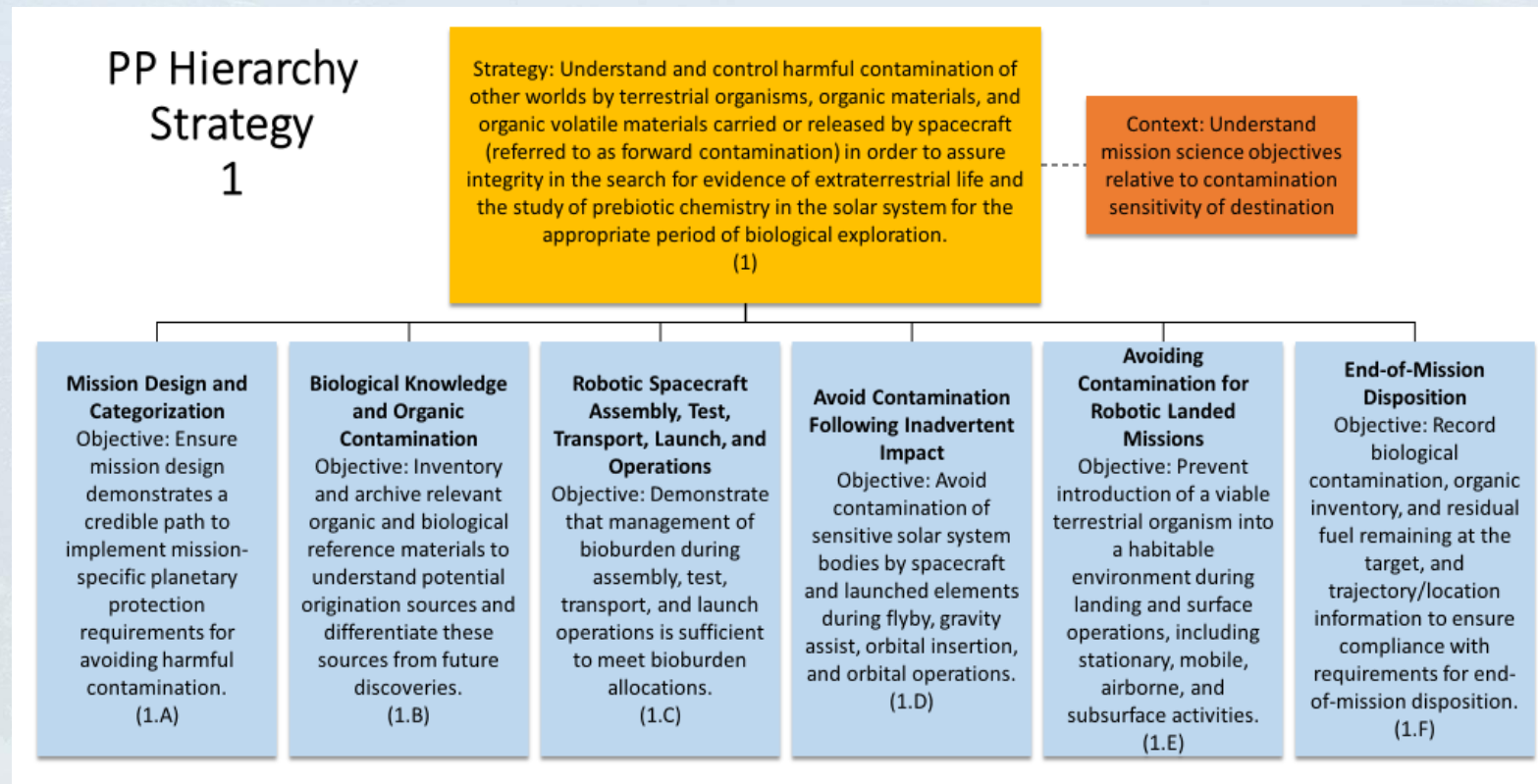


NASA's Planetary Protection Strategy

- ▶ **NASA relies upon the COSPAR PP policy as an accepted approach for the avoidance of harmful contamination of outer space and adverse changes in the Earth's environment**
 - ▷ NASA's planetary protection approaches are informed by the COSPAR policy and associated guidelines
 - ▷ NASA expects partner organizations to implement measures consistent with the policy and guidelines
- ▶ **NASA is increasingly moving towards a performance-based planetary protection policy**
 - ▷ Adopting risk-informed and case-based approaches to allow flexibility
 - ▷ Leveraging the intent of the informed prescriptive requirement and central objective of planetary protection
 - ▷ Identify and actively pursue resolution of knowledge gaps to manage risks and advance technical guidelines

NASA Planetary Protection Standard - Preview

- ▶ Will be used as reference standard for **ALL** NASA missions (e.g., robotic, crewed, partnered missions)
- ▶ Informed by COSPAR such as PP Categorization and numerical prescriptive requirements for forward contamination (e.g., inadvertent contamination, spore requirements).
- ▶ Organizes and defines PP (forward and backward) objectives to be addressed and related technical requirements
- ▶ Limits prescription to enable novel approaches



Towards A More Agile Planetary Protection Policy

- ▶ Maintenance of planetary protection requirements is becoming increasingly challenging
 - ▷ *Reactive policy updates in response to an increasing number and diversity of missions and advances in scientific knowledge are likely to suffer from delay and cause a proliferation of categories*
 - ▷ *Similar to experience in other domains, e.g., human rating*
- ▶ NASA will increasingly rely on assurance cases to plan and assure planetary protection measures
 - ▷ *Enable flexible and novel implementation of planetary protection measures*
 - ▷ *Based on performance-based objectives and associated risk postures*
 - ▷ *Missions have responsibility to develop, communicate and gain acceptance of arguments, evidence, and assumptions to substantiate adequacy*