NASA Planetary Protection Status and Updates

October 20, 2021

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NASA's Planetary Protection Policy Documents

NPD 8020.7G
Biological Contamination Control for Outbound and Inbound Planetary Spacecraft (Revalidated 05/17/13 w/change 1)
Expiration Date: June 19, 2022

NASA Policy Directives (NPDs)
- Documents Agency policy statements
- Describe what is required by NASA management to achieve NASA's vision, mission, and external mandates

NPR 8715.24
Replaced NPR 8020.12D/NID 8020.109A
Planetary Protection Provisions for Robotic Extraterrestrial Missions
Expiration Date: September 24, 2026
Effective Date September 24, 2021

NASA Procedural Requirements (NPRs)
- Provide detailed procedural requirements to implement policy
- Guide how policy directives are implemented in the context of specific missions

NID 8715.129 ("Mars NID")
Biological Planetary Protection for Human Missions to Mars
Expiration Date: July 9, 2022

NASA Interim Directives (NIDs)
- Documents an immediate, short-term statement of the Agency's policies, requirements, and identifies responsibilities for implementation
- Temporarily modify policy directives or implementation requirements

NASA Standards
- Provide technical requirements
- Each NASA Technical Standard is assigned to a Technical Discipline

NASA-STD-87XX.XX
Implementing Planetary Protection Requirements for Space Flight
Expiration Date: TBD
Status: Estimated Release ~3/22

NASA-HDBK-6022
Handbook for the Microbial Examination of Space Hardware
Expiration Date: N/A
Status: Revision planned. Last draft revision released Aug 17, 2010

NASA Handbooks
- Companion documents to NPRs and NASA Standards
- Provide supporting material such as guidelines, lessons learned, procedures, and recommendations

All published documents found in NODIS: https://nodis3.gsfc.nasa.gov/ or the OPP website: https://sma.nasa.gov/sma-disciplines/planetary-protection

= New Documents

Overview of NPR 8715.24 - Planetary Protection Provisions for Robotic Extraterrestrial Missions

Chapter 1. Introduction

1.1 Overview

1.2 Utilization of Current Scientific Consensus Throughout the Project

1.3 PP Considerations for Participation in Partnered Missions

1.4 Delegation of Responsibilities

1.5 Request for Relief

Chapter 2. Roles and Responsibilities

2.1 Mission Directorate Associate Administrator

2.2 NASA Project Manager

2.3 Chief, Safety and Mission Assurance

2.4 Planetary Protection Officer

2.5 Project-Level SMA Technical Authority

Chapter 3. Planetary Protection Procedural Requirements

3.1 Categorization and Planning

3.2 Verification, Assurance, and Pre-Launch Report Activities

3.3 Post-Launch/End of Mission

3.4 Restricted Sample Return and Containment

Chapter 1:

- Introduces risk-informed decision making
- Addresses how current scientific consensus is considered for missions
- Addresses missions with NASA partners / resources
- Baselines PP Relief using NASA General Safety Program Requirements

Chapter 2:

- Defines the key roles and responsibilities for executing PP
  - Previously, only the PPO role was defined
  - COSPAR Interfacing
- Merges PP into the regular mission and project management structure

Chapter 3:

- Provides the process for obtaining mission PP categorization
- Addresses PP documentation, review, and concurrence throughout the project lifecycle
- Defines independent verification/assurance activities as well as anomaly investigations
- Addresses sample return break-the-chain BTC, containment and process.

Planetary Protection in the Commercial Payload Review Process

- NASA supports FAA in the commercial payload review process to ensure planetary protection is appropriately addressed for each mission prior to launch.
- FAA has regulatory authority in the commercial payload review process.
- Updated PP Information to Expedite Review in July 2021.
- https://www.nasa.gov/recommendations-commercial-space-operators/
  1. Description of the energetic potential of the primary launch vehicle, second stage, cruise stage, and additional independent propulsion systems on primary and secondary payloads.
  2. Description of trajectory including flybys or gravity assists of celestial objects and orbital insertion or landing at the destination.
  3. Assessment of biological contamination risk and associated mitigation strategy for celestial objects along the trajectory and at the orbiting or landed destination.
  4. For missions to the surface of the Moon, an inventory of propulsion products released into the lunar environment. Additionally, for missions to permanently shadowed regions (PSRs) or the lunar poles, an inventory of organics.

NASA PP Policy for the Moon

- NASA has adopted the COSPAR Policy on Planetary Protection prepared by the COSPAR PPP and approved by the COSPAR Bureau on 3 June 2021.
  - Incorporated II, IIa, and IIb PP requirements into NPR 8715.24
  - Updated commercial payload voluntary information
  - Organic inventory reporting requirements will be captured in the NASA Standard Implementing Requirements PP for Space Flight
- Communicating and engaging applicable missions (e.g., Artemis, Gateway, HLS) to adopt new requirements.
  - Given new policy updates are not completed we are working this on mission-by-mission basis until detailed reporting requirements are captured in the published standard.
- Organic inventory reporting has been streamlined to a template

NASEM – Evaluation of Bioburden Requirements for Mars Missions

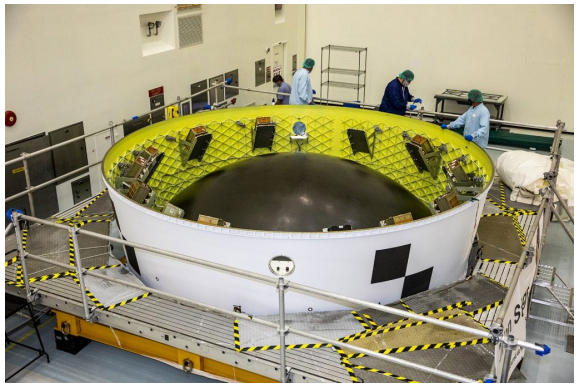
- Report Series on the Committee of Planetary Protection released 7 October 2021.
- NASA is still synthesizing this report.
- Initial impressions
  - Detailed report on the current understanding of environmental conditions on Mars relevant to terrestrial organisms' survival, transport and proliferation.
    - These could be leveraged as key modeling parameters in the risk decision making process, as relevant, on a mission-by-mission basis.
  - NPR 8715.24 and Draft Standard captures risk-informed decision-making so there is alignment with leveraging a risk management-based approach for PP.

Technology and Research Highlights

- NASA Federated Board supporting the Office of Planetary Protection for Science Mission Directorate, Space Technology Mission Directorate and Human Exploration and Operations Mission Directorate coordination.
  - Concurred on integrated roadmaps and identified technology gaps for planetary protection.
  - Helped to balance and ensure funding responsibilities across the stakeholders.
  - Monitor PP technology progress and serve as a forum to resolve issues.
- Continued support for PP ROSES Program – FY22 Selection
- Increased support for SBIR Phase I and Phase II PP focused awards.

Mission Highlights (1 of 4)

- Artemis
  - Issued Artemis-1 clarification letter to Mission Directorate Associate Administrator to provide an update on NASA PP Lunar Policy
  - Concurred on Artemis-1 PP Plan revisions
  - Started to receive organic reporting forms for a TBA November 2021 launch
  - Artemis-II starting to engage team for PP Categorization / requirements
- Gateway
  - Issued clarification letter to Program Safety and Mission Assurance Manager to provide update and guidance on NASA PP Lunar Policy
  - Power and Propulsion Element (PPE) and Habitation and Logistics Outpost (HALO) launch no earlier than May 2024 on a Falcon Heavy.
- HLS
  - Adopted updated requirements
  - Continuing to work technology gaps and incorporation of PP requirements into ground rules and assumptions for hardware design



All 10 secondary payloads have been installed in the Space Launch System (SLS) rocket's Orion stage adapter.

Mission Highlights (2 of 4)

- Mars Sample Return Campaign – Category III, IVa, and V(r)
  - Continued engagement with ESA for Planetary Protection for the Flight Elements of the MSR Campaign as per the NASA/ESA MOU
  - MSR Campaign PP Categorization Proposal currently being drafted
  - Sample Retrieval Lander (SRL) Mission System Requirement Review / Mission Design Review – Dec 2021
  - MSR Campaign System Requirements Review Feb 2022 (PP Splinter Jan 2022)
  - Mars 2020 / Helicopter
    - Nominal Operations

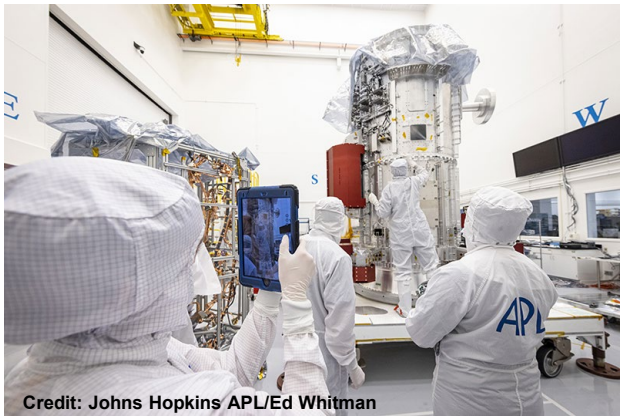
Image: NASA's Perseverance rover on Sept. 7, 2021, PDT (Sept. 8, EDT), shows two holes where the rover's drill obtained chalk-size samples from rock nicknamed "Rochette."
Credit: NASA/JPL-Caltech

Mission Highlights (3 of 4)

- Martian Moons eXploration (MMX) – Category III, V(u)
  - Continued engagement with JAXA for Planetary Protection Requirements as an International partner delivering the P-Sampler
  - Flight unit shipped to JAXA in 2022
- The Escape and Plasma Acceleration and Dynamics Explorers (EscaPADE), Category III
  - Dual-spacecraft mission to study ion and sputtered escape from Mars, <90kg mass, solar powered
  - Approved PP Plan August 2021, Critical Design Review ~Mar/April 2022
- Dragonfly, Category II
  - Robotic rotorcraft to surface of Titan with a 2027 launch
  - Mission drafting PP Categorization Proposal

Mission Highlights (4 of 4)

- Europa Clipper, Category III
  - Assembly, Integration and Testing phase underway
    - Hardware biological cleanliness performance remains within specification. Mission has bioassayed ~40m2 of hardware surfaces to-date
    - Independent verification assays from Office of PP continue to demonstrate alignment with PP process. Sampled over >18m^2 in 4 key events.
  - Flacon Heavy launch vehicle selected
  - October 2024 Launch
- Other Mission Activities
  - Mission PP Categorizations
    - Global Lyman-alpha Imagers of the Dynamic Exosphere (GLIDE) Category I, SunRISE Category I & Solar Cruiser Category I
  - Reports
    - Lucy (PP Pre-launch Report) – Launch Oct 16, 2021
    - JUNO End-of-Mission Report Approval - Ganymede, Europa, and Io flybys.



Credit: Johns Hopkins APL/Ed Whitman

Mihaela Ballarotto samples Europa Clipper's propulsion module for planetary protection cleanliness prior to harness installation.