NASA Planetary Protection Updates

NASEM CoPP Fall Follow-up Meeting
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Handbook Update

- Targeting a Spring release with ~250 pages of content!
- Draft version being finalized now, internal agency-wide subject matter expert working group review will start next month.
- Non-contractual, guidance document with the intent to be updated on a regular cadence.

Chapter	Contents
Introduction	Handbook philosophy, bioburden and spore background
Mission Design and Categorization	Categorization process, considerations for special regions and icy worlds transport
General Approach and Risk Assessments	Risk assessment framework, PRA, impact avoidance
Quality Control for Planetary Protection	Quality management system, laboratory assessment process
Assembly, Integration, Test and Launch Facilities	Biological cleanroom control, aseptic cleanroom operations, macroorganisms response
Bioburden Sampling and Laboratory Processing	Lab equipment/consumables, air sampling, rapid bioburden sampling, metagenomics
Bioburden Accounting	Organic inventories and archives, PPEL, bioburden accounting, statistical analysis
Back Planetary Protection	Sample safety assessment, knowledge gaps
Appendices	Definitions, acronym list, NASEM PP Study / Publication links

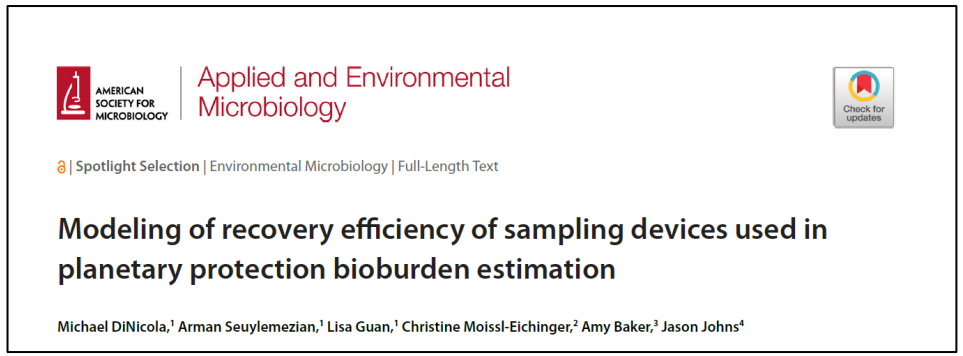
Crewed Moon to Mars PP Policy

- Revised manuscript entitled "Planetary Protection Knowledge Gap Closure Enabling Crewed Missions to Mars“ submitted with Astrobiology.
- PP Research and Technology Steering Group first meeting in March.
- Continued discussions with Moon to Mars Architecture subsystem teams to develop “figures of merit” from architecture concepts and projected engineering performance.
- Continuing internal discussions on Crew Moon to Mars Policy
  - What to do with the NASA Interim Document NID 8715.129?
  - Looking into policy trade space now. Currently considering: Including high level policy objectives into an NPR; Utilizing NASA-STD-8719.29, NASA Technical Requirements for Human-Rating for processes needed to ensure crew safety from the Mars environment, and; Development of a Humans to Mars Program-Level White Paper to provide guidelines on PP for architecture reviews.
- Policy objectives flow can be traced from 5 potential areas

	Forward PP	Backward PP
Crew	A. Mars from Crew	B. Crew from Mars C. Earth Return
Samples	D. Mars from Exploration	E. Earth Return

Updated Tools Supporting the PP Practitioner Community

- Bioburden Accounting Tool now available to support NASA missions.
  - Tool developed to streamline planning, implementing and reporting out compliance of spacecraft hardware biological cleanliness PP requirements for missions with bioburden constraints.
  - Database to capture and track hardware bioburden
  - PP laboratory data information system
- Documentation of sampling device recovery efficiencies
  - ESA / NASA joint publication to document swab and wipe sampling devices used for PP – increased transparency of PP processes.
- Updated launch recontamination model
  - Updates conservative 1989 physics-based model to account for updated adhesion and aerodynamic models and biological parameters.



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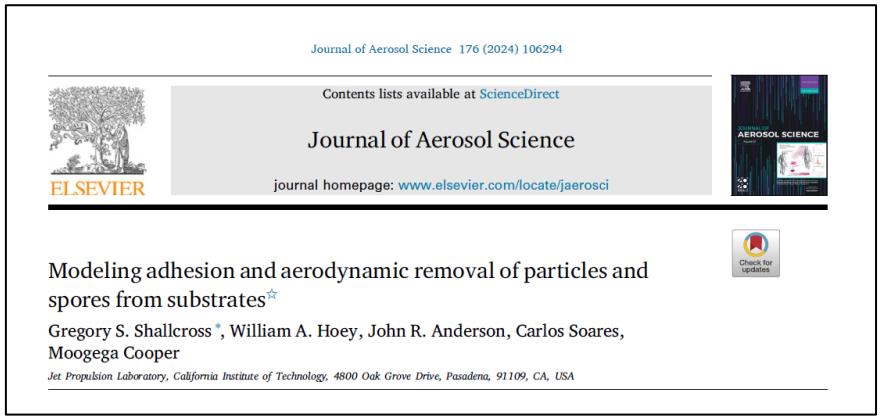
Modeling of recovery efficiency of sampling devices used in planetary protection bioburden estimation

Michael DiNicola,[1] Arman Seuylemezian,[1] Lisa Guan,[1] Christine Moissl-Eichinger,[2] Amy Baker,[3] Jason Johns[4]



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Modeling adhesion and aerodynamic removal of particles and spores from substrates☆

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Key PP Relevant Mission Updates

- MSR
  - Remains unchanged from the Fall 2023 Meeting. Awaiting on IRB updates that are still being worked with SMD.
- Europa Clipper
  - Successful PP implementation and execution leveraging new PP policies and practices!
  - Continuing to work with the Mission Assurance Manager and Team on cleanroom operations and spacecraft cleanliness.
  - Continuing to work with the PP Manager, Art Avila, within JPL's Office of Safety and Mission Success for coordination and planning.
  - Safety Independent Verification Assessment
    - Conducted Independent Verification assays
      - GSFC and APL during the propulsion module buildup in 2021-2022
      - JPL as part of the NSC independent assessment, overall spacecraft health check in 2023
    - NASA Independent Assessment in 2023 captured the activities of the KSC verification laboratory in addition to JPL cleanroom operations and JPL PP laboratory. Built confidence in the process to-date.
    - Plans to conduct independent verification assays at the Cape to assess
      - Clipper Project PP laboratory operations at KSC – temporary lab being setup in the Space Station Processing Facility
      - Spacecraft cleanroom and operations at KSC
      - Launch vehicle cleanliness