National Aeronautics and Space Administration

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NASA Planetary Protection Independent Review Board (PPIRB) & Report

Summary Briefing

Alan Stern
PPIRB Chair

PPIRB Background (1 of 2)

- Chartered: By NASA/SMD AA Zurbuchen.
- Charter Summary: “An assessment to include analysis of the scientific, engineering, industrial, legal, and program management aspects of planetary protection (PP). Results of the assessment will be documented in a non-consensus final report presentation.”
- Term: July-September 2019
- Membership: A dozen planetary scientists, biologists, private and civil sector space reps.
- Meetings/Telecons: 4 in person multi-day meetings; 11 working telecons.
- Report: Reviewed within NASA prior to delivery. Released 18 Oct 2019.
- Briefed: SMD, NASA Administrator, EOP/Space Council Staff, and NAC.

PPIRB Background (2 of 2)

PPIRB Membership (SSB Members Highlighted Below)

Dr. Alan Stern, PPIRB Chair	Southwest Research Institute
Dr. Edward (Beau) Bierhaus	Lockheed Martin
Dr. Wendy Calvin	University of Nevada-Reno
Dr. Amanda Hendrix	Planetary Science Institute
Dr. Christopher H. House	Pennsylvania State University
Dr. Hernan Lorenzi	J. Craig Venter Institute
Mr. Tommy Sanford	Commercial Spaceflight Federation
Dr. Erika Wagner	Blue Origin
Dr. Andrew Westphal	University of California at Berkeley
Mr. Charles Whetsel	Jet Propulsion Laboratory
Mr. Paul Wooster	SpaceX
Dr. T. Jens Feeley, Study Manager	NASA Headquarters (Ex Officio)

PPIRB Report Overview

Approximately 80 PP Findings and Recommendations, Including:

- Clarifying and Streamlining Processes within NASA
- Advancing Protocols with More Modern Technology
- Reducing Burdens on Missions
- Advancing Policies for Private Sector Missions

Report Topics:

- Planetary Protection Categorization
- Human Spaceflight
- Private Sector Initiatives and Missions
- Robotic Mars Sample Return
- Ocean Worlds Exploration
- COSPAR

Selected Findings & Recs: PP Evolution

Major Finding: The context in which PP is conducted is profoundly and rapidly changing…The PPIRB findings and recommendations presented in this report apply to the current era and generally are made with a 3-5 year horizon in mind.

Major Recommendation: NASA should reassess its PP guidelines at least twice per decade with an IRB-like body.

Major Recommendation: NASA should establish a standing forum for the discussion and resolution of emergent PP issues that includes input from government, private sector, and perhaps even non-US private sector enterprises.

Selected Findings & Recs: PPO

Major Finding: The PPIRB applauds the recent revamping of the PPO and the work of the new PP Officer, increasing communication, clarity, and responsiveness to community needs and concerns.

Major Recommendation: NASA should establish explicit processes such as an ongoing independent review to ensure that PPO policies and procedures are consistently applied regardless of specific PPO personnel.

Selected Findings & Recs: Process Controls

Major Finding: Although NASA is not a regulatory agency, the Agency can exercise a degree of control over non-NASA US missions by linking PP compliance to current or future NASA business or NASA support.

Supporting Recommendation: For space activities without significant NASA involvement (including private sector robotic and human planetary missions), NASA should work with the Administration, the Congress, and private sector space stakeholders to identify the appropriate US Government agency to implement a PP regulatory framework.

Selected Findings & Recs: PP Categorization

Major Recommendation: NASA should study how much of the Moon's surface and subsurface could be designated PP Category I versus Category II.

Major Recommendation: NASA should reconsider how much of the Martian surface and subsurface could be Category II vs. IV.

Selected Findings & Recs: Mars (MSR)

Major Recommendation: Planning for a Mars Sample Receiving Facility (MSRF) should be accelerated, and should be kept as pragmatic as possible so as not to unduly drive the cost or schedule of MSR.

Selected Findings & Recs: Mars (Humans)

Major Finding: Human missions to Mars will inevitably introduce orders of magnitude more terrestrial micro-organisms to Mars than robotic missions have done or will do.

Major Finding: Human missions to Mars will create new opportunities for science and exploration.

Major Finding: NASA's current policies for robotic Category V Restricted Earth Return from Mars appear to be unachievable for human missions returning from Mars.

Major Recommendation: NASA should invest in developing more informed, backward contamination PP criteria.

Selected Findings & Recs: Mars (Humans cont.)

Major Finding: PP planning for human missions to Mars and the communication of those plans to the public are presently immature.

Major Recommendation: NASA should begin…preparing for the public communication of all aspects of PP planning for human missions to Mars, and should pay special attention to public PP concerns, similar to NASA's proactive treatment of NASA missions involving radioisotope power systems.

Example Future PPIRB Report Briefings

Nov 15 House Science Committee (WebEx)

Nov 18 NAC Science Committee (DC); Joint with R&P Committee?

Dec 04 COSPAR PP Panel (Vienna, Austria)


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Backup Charts: Topics

- PP Modernization
- Ocean Worlds

Selected Findings & Recs: PP Modernization

Supporting Finding: Anachronistic and sometimes unrealistic PP requirements (e.g., delivery of <1 viable organism to Europan liquid water for Europa Clipper) have driven a great deal of costly and sometimes questionable effort, often involving requirements or implementation waivers.

Supporting Finding: The PPIRB encourages flexible ways to address PP intent using novel methods.

Supporting Recommendation: The PPO should exploit new discoveries and new technologies to better categorize exploration targets, create better forward and backward PP implementation protocols, and lower PP cost and schedule impacts on projects.

Selected Findings & Recs: Ocean Worlds

Major Finding: The fraction of terrestrial microorganisms in spacecraft bioburdens that has the potential to survive and amplify in ocean worlds is likely to be extremely small. Further, any putative indigenous life in subsurface oceans on Europa, Enceladus, or Titan is highly unlikely to have a common origin with terrestrial life. Any such life would be readily distinguishable from terrestrial microorganisms using modern biochemical techniques. As a consequence, the current bioburden requirements for Europa and Enceladus missions (i.e., <1 viable microorganism) appear to be unnecessarily conservative.

Major Recommendation: The PP requirements for ocean worlds exploration should be reassessed in light of this.