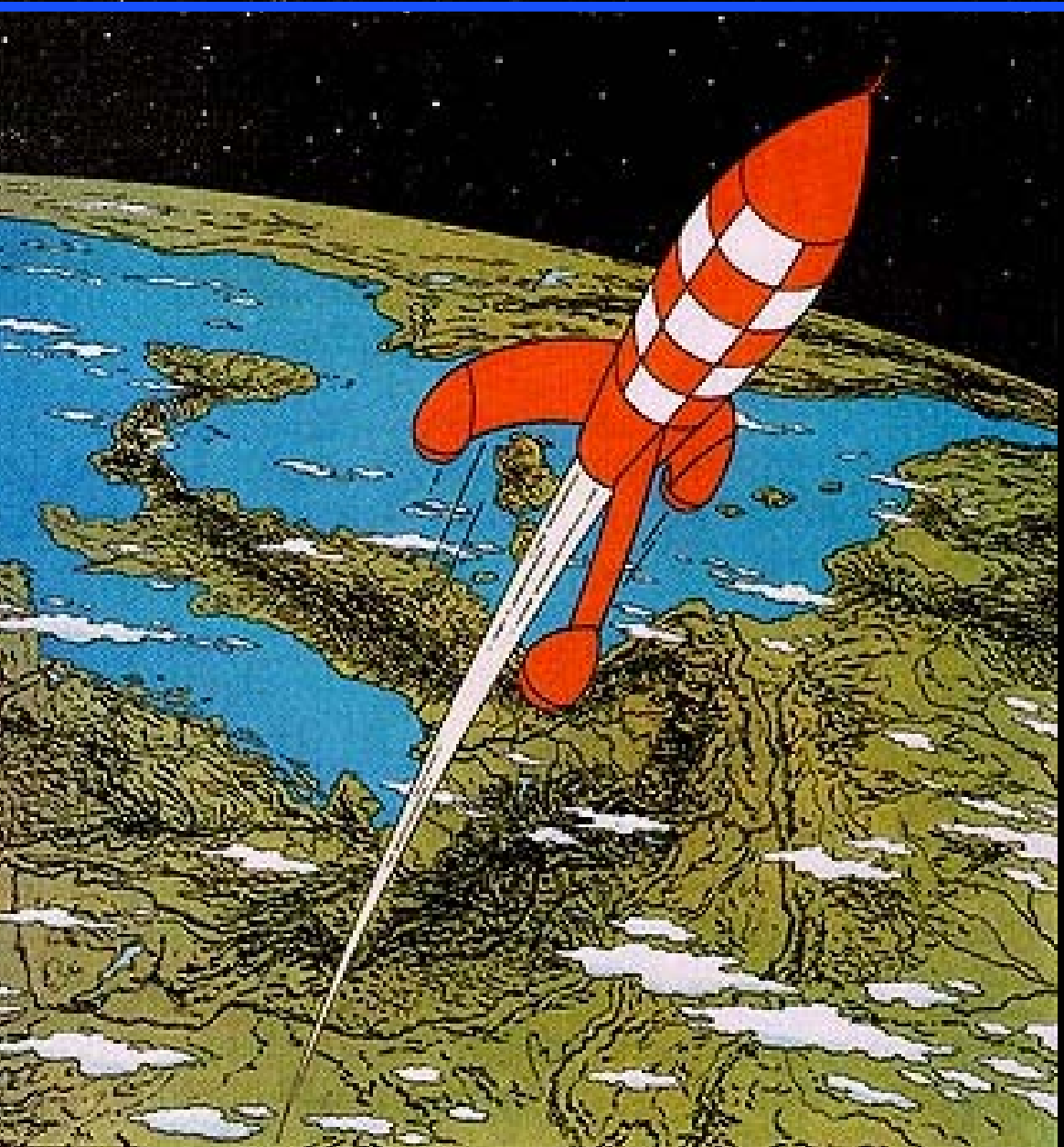
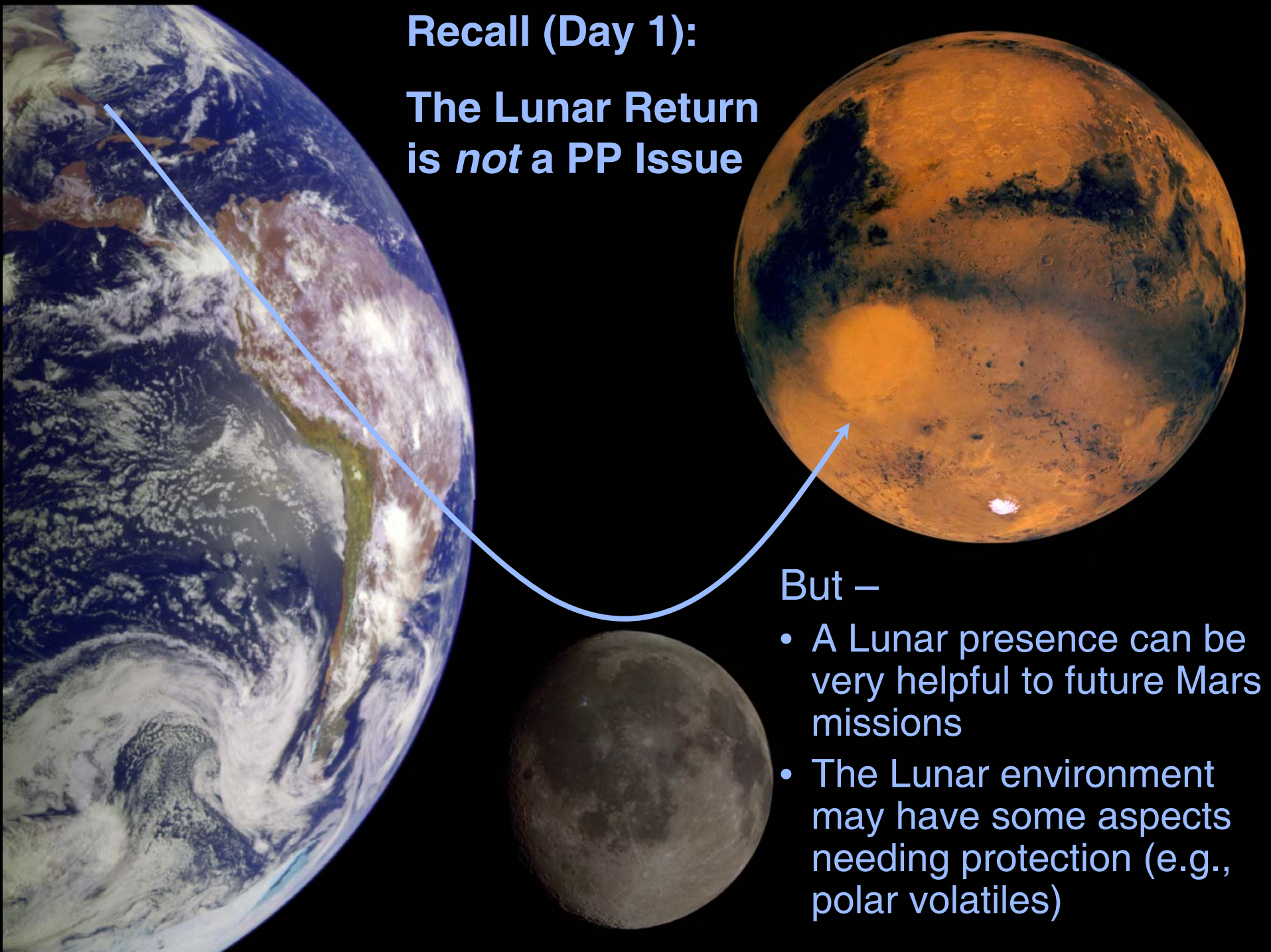


Planetary Protection Subcommittee Recommendations:

Lunar Science

John D. Rummel
NASA HQ

2 March 2007


Recall (Day 1):
The Lunar Return is *not* a PP Issue
But –
• A Lunar presence can be very helpful to future Mars missions
• The Lunar environment may have some aspects needing protection (e.g., polar volatiles)

Inputs to Lunar Architecture Matrix with Assigned Priorities

GOAL 1) Use of the Moon and lunar transit / orbits as testbeds for Planetary Protection procedures and technologies involved with implementing human Mars mission requirements, prior to Mars missions

A) HIGH Future *in situ* investigations of a variety of locations on the Moon by highly sensitive instruments designed to search for biologically derived or other organic compounds

- Valuable “ground truth” data on *in situ* contamination of samples supports future Mars sample return missions (sample integrity)

Inputs to Lunar Architecture Matrix with Assigned Priorities (cont.)

GOAL 1) cont.

B) MEDIUM Conduct chemical and microbiological studies on the effects of terrestrial contamination and microbial survival

- During lunar robotic and human missions (dedicated experiments and “natural” experiments in a variety of lunar environments/depths, etc.) *At and around the Outpost*
- During the Apollo missions (study Apollo sites) *Requires sorties to Apollo sites*

Inputs to Lunar Architecture Matrix with Assigned Priorities (cont.)

GOAL 1) cont.

c) LOW [later] Use the lunar surface as a Mars analogue site, to test proposed life detection systems in a sterile environment that are designed to go to Mars

- This is similar to Antarctic analogue field tests for Viking used to ensure a lack of false positives and evaluate how sensitive the system was to human contamination
- Detection at varying distances from human activity could shed light on movement of materials that could help establish the distances for “quarantine zones” around special regions.

Inputs to Lunar Architecture Matrix with Assigned Priorities (cont.)

GOAL 2) Prepare for human exploration of Mars through the use of new technologies on the Moon

A) HIGH Study lunar space suit competency, containment, and leakage issues, and the ability of evolving suit requirements to affect Mars suit / PLSS / habitat design and requirements

B) MEDIUM Develop technologies for effective containment of samples collected by humans to feed forward into designs that will help prevent forward and backward contamination during Mars missions.

Inputs to Lunar Architecture Matrix with Assigned Priorities (cont.)

GOAL 3) HIGH Understand possible contamination of lunar ices with non-organically-clean spacecraft (mission-science and resource contamination concerns)

Points / Issues from PPS Sessions

- Operations on the Moon are not constrained by current Planetary Protection restrictions
  - This makes the Moon an optimal location to establish the magnitude of contamination associated with human exploration
  - The lunar return can facilitate development and testing of equipment and technologies designed to limit human-associated contamination.
- Contamination control technologies for Planetary Protection must be developed before human missions to Mars can be permitted.
- Technologies and experimental equipment to perform PP assays will need to be included in up-mass to the lunar science laboratory
  - Crews will need to be trained in operation of the equipment.

Points / Issues from PPS Sessions (cont.)

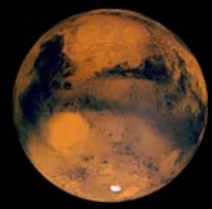
- A substantial amount of technology relevant to PP and other scientific questions has been developed by NASA through the advanced technology programs (ASTEP, ASTID, MIDP, PIDDP, etc.)
  - These technologies and instruments should be reinvestigated for relevance to human exploration requirements.
- Commercial off-the-shelf technologies are not rated for spaceflight, and modification requires expensive retooling.
- Lunar volatiles in polar deposits are susceptible to contamination during exploration, either robotic or human.
  - These regions may become protected at a level greater than Category I during future COSPAR policy discussions regarding contamination of regions of interest to the study of prebiotic chemical evolution and the impact history of the Earth-Moon system.

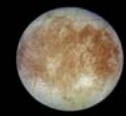
Points / Issues from PPS Sessions (cont.)

- A separate, follow-on meeting to explore opportunities in biological sciences in partial gravity and at a pressurized Lunar Outpost is suggested.

- Planetary Protection technologies to reduce contamination from human missions must be supported at an appropriate budget level if human missions to Mars are to be properly planned and implemented.

Questions





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