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PLANETARY PROTECTION ISSUES AND HUMAN EXPLORATION OF MARS

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A key feature of the Space Exploration Initiative announced last year by the President involves human missions to Mars. The report describing the initiative cites the search for life on Mars, extant or extinct, as one of five science themes for such an endeavor. Because of this, concerns for Planetary Protection (PP) have arisen on two fronts: 1) forward contamination of Mars by spacecraft-borne terrestrial microbes which could interfere with exobiological analyses, and 2) back contamination of Earth by species that may be present in returned Mars samples. The US is also signatory to an international treaty designed to protect Earth and planets from harmful cross-contamination during exploration. Therefore, it is timely to assess the necessity for, and impact of, PP procedures on the mission set comprising the human exploration of Mars.

A recent Workshop addressed PP questions of this type. The following ground-rules were adopted: 1)information needed for PP must be obtained during the robotic precursor phase prior to human landings, 2) returned samples will be considered biologically hazardous until proven otherwise, 3) deposition of microbes on Mars is inevitable when humans land, and 4) human landings are unlikely until it is demonstrated that there is no harmful effect of martian materials. These considerations drove the adoption of a conservative PP strategy for precursor missions as follows: 1) for forward contamination prevention, all orbiters will have Mars Observer-like controls on assembly, trajectory, and lifetime. All landers will have Viking-like controls on assembly, sterilization, and bioshield, and 2) for back contamination prevention, all sample return missions will have controls including hardware sterilization, bioshield, fail-safe sample sealing, break contact chain with surface, and Earth containment and quarantine analysis. In addition, the Workshop produced several recommendations for dealing with forward and back contamination concerns from non-scientific perspectives, including public relations, legal, regulatory, international, and environmental.