TREATMENT OF SOLID ROCKET MOTORS THAT COMPLIES WITH ESTABLISHED PROTOCOLS TO ENSURE PLANETARY PROTECTION

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ABSTRACT

This presentation discusses recent work being conducted by the National Aeronautics and Space Administration (NASA) at Marshall Space Flight Center (MSFC) to evaluate various methods that could be employed to provide for planetary protection of those solar system bodies that are candidates for extraterrestrial life, thus preventing contamination of such bodies. MSFC is presently involved in the development phase of the Europa Lander De-Orbital Stage (DOS) braking motor. In order to prevent bio-contamination of this Jovian satellite, three paths are currently being considered. The first is (1) Bio-Reduction of those microscopic organisms in or on the vehicle (in this case a solid rocket motor (SRM)) that might otherwise be transported during the mission. Possible methods being investigated include heat sterilization, application or incorporation of biocide materials, and irradiation. While each method can be made to work, effects on the SRM's components (propellant, liner, insulation, etc.) could well prove deleterious. A second path would be use of (2) Bio-Barrier material(s). So long as such barrier(s) can maintain their integrity, planetary protection should be afforded. Under the harsh conditions encountered during extended spaceflight (vacuum, temperature extremes, radiation), however, such barrier(s) could well experience a breach. Finally, a third path would be to perform (3) Pyrotechnic Sterilization of the SRM during its end-of-mission phase. Multiple pyrotechnic units would be triggered to ensure activation of such an event and provide for a final sterilization before vehicle impact. In light of Europa's stringent bio-reduction targets, the final and best choice to minimize risk will probably be some combination of the above.