

Result of ESF Study Background and Draft Conclusions

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Framework Agreement



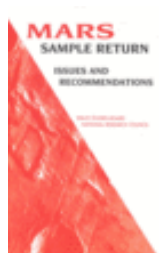
The European Space Agency (ESA)/Committee on Space Research (COSPAR) planetary protection policy states that planetary protection requirements imposed on spaceflight missions be determined following receipt of multidisciplinary scientific advice

The European Science Foundation (ESF) has a unique interface with the European scientific community through its membership organizations and can provide independent advice taking into account a range of scientific disciplines

During their 11th meeting in September 2009 the ESA Planetary Protection Working Group (PPWG) recommended to request that the ESF provide, upon request, ad-hoc scientific advice on specific planetary protection matters

A framework agreement between ESF and ESA (D/TEC) has been signed in March 2010

Scheme is similar to the advice that the NRC-SSB provides to NASA



Current COSPAR Mars Sample Return (MSR) policy statement:

“..., in a subcategory defined as “restricted Earth return,” the highest degree of concern is expressed by the absolute prohibition of destructive impact upon return, the need for containment throughout the return phase of all returned hardware which directly contacted the target body or unsterilized material from the body, and the need for containment of any unsterilized sample collected and returned to Earth.”

Current COSPAR MSR requirements (excerpt):

- “..., the canister(s) holding the samples returned from Mars shall be closed, with an appropriate verification process, and the samples shall remain contained during all mission phases through transport to a receiving facility where it (they) can be opened under containment.
- The mission and the spacecraft design must provide a method to “break the chain of contact” with Mars. No uncontained hardware that contacted Mars, directly or indirectly, shall be returned to Earth. Isolation of such hardware from the Mars environment shall be provided during sample container loading into the containment system, launch from Mars, and any in-flight transfer operations required by the mission.”

Advice from US-NRC (2009) in line with current COSPAR policy and requirements:

–“...samples returned from Mars by spacecraft should be contained and treated as though potentially hazardous until proven otherwise.
–No uncontained martian materials, including spacecraft surfaces that have been exposed to the martian environment, should be returned to Earth unless sterilized.”

- US-NRC and COSPAR recommendations & requirements are a starting point but on their own too general to develop and evaluate engineering solutions
- Need to define qualitative or quantitative approach
- Need to derive requirements to develop engineering solutions, trade-off different options and verify that the solutions can meet the intent of the policy and the requirements

Draft requirement (early 2000):

The probability that a single unsterilized particle of 0.2⁺ micron diameter or greater is released into the Earth environment shall be less than 10⁻⁶

Because of the high visibility and impact on mission design at all levels, this draft requirement needs to be revisited → ESF task: Recommend a level of assurance for preventing an unintended release of a potential martian life form into the terrestrial biosphere

[†]Limit based on US-NRC-SSB 1999 report "Size limit for very small microorganisms".

- The ESF Study Group concurs with the approach adopted in the past and confirms that containment of particles bigger than a given size is an appropriate constraint to be considered when designing the MSR mission.
- The ESF Study Group highlights that considering the knowledge that has been produced over the past years, the 0.2µm diameter value is not valid anymore.
- The ESF Study Group recommends that not only self-replicating free-living biological entities are considered as potentially harmful but also viruses-type and Gene Transfer Agents-types of organisms.
- The release of any particle smaller than 0.01 µm diameter should be considered as acceptable.
- Any release of particles bigger than 0.05µm should not be acceptable.
- It is crucial to understand that for a MSR mission, the required level of assurance for not releasing a particle is not the same as the level of assurance for not contaminating the Earth.
- The level of assurance of 10^{-6} for not releasing a particle is confirmed. Example to explain the concept is Sterility Assurance Level (SAL).

What happens afterwards?



- NASA PPS is invited to comment on the final ESF report & recommendations
- Discuss ESF report & recommendations with ESA PPWG, 29-30 May 2012
- Discuss ESF recommendations at a COSPAR/NASA/ESA colloquium on planetary protection, 31 May-1 June 2012; decide if COSPAR or Agency level implementation of recommendations is warranted and timely
- Present ESF report & recommendations at the COSPAR General Assembly, Planetary Protection Panel 1, 18 July 2012; in case colloquium recommends COSPAR level requirement, present draft requirement and vote
- Discuss detailed formulation of Agency level requirements between ESA and NASA for implementation and applicability at industrial contract level (either identical to COSPAR or self-standing in case requirements are only implemented at Agency level)