

Review of the draft test protocol for martian samples returned to Earth

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Obligations for developing a test protocol to evaluate whether samples returned from Mars are hazardous to the terrestrial biosphere and populations (COSPAR):

“For unsterilized samples returned to Earth, **a program of life detection and biohazard testing**, or a proven sterilization process, **shall be undertaken** as an absolute precondition before the controlled distribution of any portion of the sample”

Position has been supported by recommendation #2 in the 2009 NRC-SSB report “Assessment of planetary protection requirements for Mars sample return missions”

→for more details see presentation about planetary protection requirements for Mars sample return missions

Established in a series of workshops between 2000 and 2002

Recommendation in the draft test protocol as well as in the 2009 NRC-SSB report
“Assessment of planetary protection requirements for Mars sample return missions”
ask for a **periodical review**

→ See previous presentation for details

Impact on safety

Reliability of test protocol and associated release criteria are part of the overall MSR risk assessment (currently the working level requirement of 10^{-6} for release of martian particles larger than 0.2 micron)

Impact on science

Sample heterogeneity and statistically significant sampling for the test protocol need to be correlated

Impact on system design

Cleanliness according to a planetary protection category IVb level will be determined by the analysis described in the test protocol

Joint ESA-NASA effort to review, revise and complement the current draft protocol

Based on a small team of around 10-15 experts and a series of working meetings, **targeted analysis**, and workshops in the course of 12 month, starting end of 2010

Output will be consolidated and presented to the COSPAR General Assembly 2012

Starting with:

- Current draft test protocol, NASA/CP-20-02-211842
- 2002 NRC-SSB report “The quarantine and certification of martian samples”
- 2009 NRC-SSB report “Assessment of planetary protection requirements for MSR missions”
- 2008 iMARS report “Preliminary planning for an international MSR mission”



This activity is under the letter agreement concerning cooperation between ESA and NASA on planetary protection activities

Review the draft test protocol, covering:

- Physical and chemical characterization, life detection and biohazard testing describing the measurements needed and indication of associated sample preparation and resources
- Decision tree with criteria at each branching point
- Criteria for release of the martian samples from containment
- Management and supervision to conduct the test protocol

Address especially two key issues:

- Sample heterogeneity and statistically representative sub-sampling
- Confidence level of analytical methods applied

Basic Assumptions

The samples are considered hazardous, until proven otherwise

- The potential risk of large scale effects are primarily associated with replicating biological entities and not toxic effects of the sample (i.e. occupational hazard)
- Samples will be returned in the mid 2020s
- Samples will not be sterilized prior to return
- The test protocol will have to be exercised in containment
- Consider amount and type of sample material and sample heterogeneity
- The amount of sample used must be the minimum amount necessary

Expected Output

Synthesis of all deliberations and recommendations

–Each recommendation supported by references and analysis

–Estimate of confidence level of analytical methods applied

–Assessment of representative sub-sampling with statistical relevance = test protocol sample selection parameter space and strategy

–Identification of requirements to avoid compromising the test protocol, i.e. preventing terrestrial contamination of the samples returned from Mars

–Identification of future research and development needs

