

REQUEST FOR INFORMATION

POSSIBLE ASTROBIOLOGY INSTRUMENTS FOR NASA'S 2009 MARS LANDER

Response due date: Jan. 17, 2003

The Mars Exploration Program requests information on astrobiology-related instruments which may be considered for inclusion in NASA's MSL Mars Lander, which is scheduled to launch in 2009. We specifically encourage both U.S. and non-U.S. instrument teams to respond. We will circulate this request to our largest Mars-related mailing list, but we also encourage you to help by forwarding it to any instrument teams you are aware of, so that we don't inadvertently leave somebody out.

Purpose

We are in the process of establishing the high-level scientific objectives and priorities for this mission, which will form a primary input to the competitive Announcement of Opportunity (AO) process. We need to avoid choosing mission objectives which cannot be achieved because of inadequacies in the set of instruments likely to be available, since it is not possible to back up and re-do the AO process without serious schedule consequences. In the area of astrobiology, we find that we have insufficient knowledge of which instruments exist, and their state of readiness, to do this planning with confidence.

Because we are in a pre-AO period, and we wish to keep all instrument teams on an even competitive footing, we request that you submit summary information only. We specifically request that you NOT submit information which you consider proprietary. Our goal is to learn:

- What is out there
- Its approximate design functionality
- Its approximate design resource needs (especially mass, power)
- Its current state of readiness (defined as of 12-31-02)
- Probable sample requirements, and anticipated sample preparation needs

For the purpose of this request, we are interested only in information on instruments which can make the measurements described in Section A, and can meet the development schedule described in Section B. (Note that other categories of instruments are also of interest to MSL, but we are not requesting information on them at this time).

Section A. Measurements of Interest for this RFI

We are specifically interested in instruments which can make the following astrobiology-related measurements in samples of martian rock, regolith, ice, and/or atmosphere. We are also specifically interested in instruments which may be able to make more than one of the measurements in this list.

1. The nature, abundance, oxidation state, and isotopic properties of C compounds (both organic and inorganic) over a range of molecular weights.
2. Mineralogy and bulk chemistry
3. Microscopic imager (degree of magnification = TBD, type of illumination = TBD)
4. The chemical and isotopic characteristics of elements other than C that are relevant to life (H, N, O, P, S) present in rocks, soils, and the atmosphere.
5. Noble gas concentrations and isotope ratios
6. The abundance and oxidation state of Fe, Mn and other redox sensitive metals, as a basis for understanding the range of potential energy sources available to support biological systems and for inferring geochemical cycles
7. Instrument to test models of martian surface oxidation, including whether oxidation decreases in the martian subsurface, and over what scale
8. Other astrobiology instruments

Section B. Current understanding of Minimum Instrument Development schedule

- December, 2003. Response to instrument AO required (we assume that instruments will need to be at TRL-4-5 in order to provide enough definition to be selectable).
- August, 2005. Mission PDR. Instruments will need to be at TRL-6.
- October 2006. Mission CDR. Instruments will need to be at TRL-7

Section C. Information requested

We request your input in the form of a row in the following table. We recognize that design details for many instruments have not been finalized, and may change significantly. Our request is for your best estimate of what these parameters will be at the point of mission CDR (Oct. 2006). (Please don't be constrained by the size of the cells in this table—expand as needed to communicate your message effectively. If you have file compatibility issues, send the information in any format, and we will compile it.

| Instrument Name | PI (or other contact person) | Measurement Type(s) | Instrument Type (remote sensing, contact, analytic lab, etc.) | Design | | | | TRL (as of 12-31-02) | Sample Requirements | | | | Precision and/or detection limit |
|-----------------|------------------------------|---------------------|---|--------|-------|---------------------|-----------------|----------------------|------------------------------------|-------------------------|---------------------------|---------------------------|----------------------------------|
| | | | | Mass | Power | Time for one sample | Data rate, vol. | | Sample Type (e.g. gas, rock, etc.) | Mass of each sample (g) | # of samples designed for | What kind of sample prep? | |
| | | | | | | | | | | | | | |

Response requested by: Friday, January 17, 2003 in electronic form to:

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What we will do with the information

The information submitted will be compiled and circulated within the Mars Program Office (at HQ and JPL), within the MSL project engineering team, as well as within MSL science advisory

panels chartered by HQ, for use in the mission definition process. It is not our intent to make this information generally available.

We look forward to your response,

Dave Beaty, Manager, Mars Program Science, JPL

Jim Garvin, Lead Scientist, NASA HQ

Dave Lavery, Program Executive, Instrument Technology, NASA HQ

Dan McCleese, Chief Scientist of the Mars Program, JPL

Samad Hayati, Manager, Mars Technology Program, JPL

December 16, 2002