

NASA Advisory Council Subcommittee Recommendation

Subcommittee Name: Planetary Science

Chair: Sean Solomon

Date of Public Deliberation: 7 October 2007

Date of Transmission to Science Committee: 15 October 2007

Short title of the proposed Recommendation:

Science impacts of replanning of Mars Science Laboratory

Short description of the proposed Recommendation

The PSS recommends that NASA and the developers of ChemCam make every effort to ensure that this important instrument fly on the MSL mission because of both the instrument's scientific promise and the potential impact of its removal on future international collaboration, as well as the instrument's importance for maximizing the effectiveness of sample caching in preparation for MSR.

Major reasons for proposing the Recommendation

In June, the Mars Science Laboratory (MSL) project estimated that it would need an additional ~\$75M to complete the mission as then currently planned. A variety of sources of cost growth could be identified, including payload instruments, the mechanical design of the rover body, the corer/drill, sample acquisition and handling hardware, thermal protection system testing, parts procurement, and fabrication services and labor.

Because \$75M in funds could not have come from elsewhere in the Mars Exploration Program without shutting down operating spacecraft and cutting research and analysis programs, a multi-pronged mitigation strategy was adopted. An independent science team defined a science floor of instruments, the MSL project and Mars Program recommended a menu of descope options, and the Mars Program allocated new funds from program reserves. The descope options were presented in three groups: a recommended group, a second group of potential descopes "with programmatic implications," and a third group not recommended because high scientific or technical risk would be introduced. A number of descope options were exercised, including nearly all of the options in group 1 plus one of the options from group 2, resulting in a savings of \$26M. Together with the \$36M in new funds from Mars Program reserves, \$62M in added mission capacity was provided, and the payload remained well above the science floor as defined by the independent science team.

The MSL descope that most concerns PSS was the decision not to provide further NASA funds for the Chemistry Camera (ChemCam) instrument. This descope was the only one exercised from the second group of options presented by the MSL project and Mars Program. The ChemCam, which uses laser-induced breakdown spectroscopy for chemical analysis and micro-imaging, is the only MSL instrument that can provide remote elemental chemical information on both dust-free and weathered materials, including the light elements H, Li, Be, B, C, N, and O that are central to issues of past habitability. Instrument development, now within \$2M of completion, has been a partnership between the Los Alamos National Laboratory and the French space agency

(CNES), with the French having contributed \$23M toward development and having agreed to a 50-50 split of instrument operations costs. During discussion, Jim Green emphasized that he hopes that a solution will be found to include ChemCam in the MSL payload, and he added that the MSL budget retains the full cost of integrating ChemCam into the spacecraft as well as the Phase E support for the instrument.

Consequences of no action on the proposed Recommendation

The loss of ChemCam, which uses laser-induced breakdown spectroscopy for chemical analysis and micro-imaging, would result in the inability of MSL to obtain remote elemental chemical information on both dust-free and weathered materials, including the light elements H, Li, Be, B, C, N, and O that are central to issues of past habitability. Given the substantial contribution of CNES to the development of the ChemCam instrument, its loss might also harm NASA-CNES, or even NASA-ESA, cooperation on future space projects.