PHOBOS: A CRITICAL LINK BETWEEN MOON AND MARS EXPLORATION. Pascal Lee[1] , Stephen Braham[2], Greg Mungas[3], Matt Silver[4], Peter Thomas[5], and Michael West[6], [1]Mars Institute & SETI Institute, NASA Ames Research Center, MS 245-3, Moffett Field, CA 94035-1000, USA, plee@marsinstitute.info. [2]Simon Fraser University, Vancouver, Canada, [3]Firestar Engineering LLC & Mars Institute, [4]Massachusetts Institute of Technology, [5]Cornell University, [6]Mars Institute.

Introduction: Phobos, the inner satellite of Mars, has long been considered a possible stepping stone in the human exploration of Mars [1-8]. However, classical arguments in favor of a human mission to Phobos, which include:

- *Minimal Δv's needed to reach Phobos's surface*
- *Ability to monitor Mars from a stable platform in low Mars orbit (LMO)*
- *Ability to teleoperate robots on Mars without signif cant time delay*
- *Opportunity to advance the scientific investigation of small bodies*
- *Potential of finding H_2O on Phobos which might be used as a resource*

have generally not been compelling enough to create a broad consensus placing Phobos on the critical path of human Mars exploration. We have recently suggested that at least three additional considerations which have matured only in recent years should prompt a review of Phobos's role in human Mars exploration and should position the satellite as a critical next step following the human return to the Moon [9].

Phobos as a "Library of Alexandria" of Mars: As the Earth receives a flux of martian meteorites, Phobos's regolith might hold a record of martian crustal material of meteoritic origin, accumulated throughout Phobos's circum-martian history, having sampled Mars on a global scale, presenting possibly better preservation than even present martian surface materials which may be heavily oxidized, and thus offering possibly unique insights into Mars's geology, evolution, and possible biology. Impact velocities of martian ejecta onto Phobos are high, making survival difficult (B. Gladman, *pers. comm.*). But a preserved meteoritic record on Phobos is a possibility warranting further investigation, through both detailed modeling of impact accretion and direct robotic scouting. If confirmed, humans on Phobos would be able to significantly advance on Phobos our knowledge of Mars itself. Deimos does not present a similar potential.

Phobos as a glove box for Mars: In the context of current and anticipated planetary protection requirements regarding Mars exploration over the next decades, humans established on Phobos would be ideally positioned to teleoperate robotic scouts for an in-depth and aseptic reconnaissance of Mars [10]. A modest infrastructure established on Phobos could also be used to process/quarantine/screen returned martian samples before Earthbound forwarding.

Phobos as a catalyst for human Mars exploration: The bulk of the challenge, specific hardware development, and cost of a human mission to Mars lies in that part of the mission that brings astronauts all the way down to the martian surface, enables their surface ops, and returns them to LMO. If no human journey to Mars were undertaken before humans are ready for a landing on Mars, decades might elapse after our return to the Moon before humans walk on Mars. Phobos offers the following key *programmatic* advantages: a) it is a martian target that is technically achievable in the *immediate* wake of humans returning to the Moon requiring no or only minor adaptations of lunar hardware; b) human missions to Phobos reduce risk by offering opportunities for a stepwise build up to full-up Mars landed missions; c) Phobos enables a steady cadence of exciting, meaningful and tangible near-term missions at Mars, thus ensuring programmatic focus and continued public support.

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