

**MARS SURFACE ANALOG PROJECT: PREPARING FOR ASTRONAUTS' FIRST HOURS ON MARS.**

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**Introduction:** Astronaut missions to Mars may be decades in the future, but contemporary estimates of the physical capabilities of the crewmembers upon arrival after prolonged transit can guide development of operational requirements to be imposed on them. Requirements for functional capacities will differ depending on whether they land in a spartan ascent vehicle or in a well-equipped habitat, but each of those options brings with it certain operational risks. Rehabilitation will be an important factor for crew health, safety and efficiency after the multi-month transit from Earth. Specific recommendations will be stipulated for the time to be allotted for on-planet rehabilitation before the first planned surface excursion, such as the transfer from the ascent-lander to the habitat-lander.

**Methods:** Three sequential workshops (the third including extramural experts in appropriate fields) examined the likely capabilities of crewmembers shortly after landing on Mars, the predicted operational requirements they will face, and the near-term steps to close the gap between the requirements and capabilities.

**Results:** Workshop participants agreed that the crewmember activities immediately after the landing of the sixth International Space Station (ISS) crew demonstrated that surface activities are possible immediately after landing on Mars. However, given that all three crewmembers exhibited reduced capabilities, the participants endorsed additional studies, including those on ISS crewmembers during the immediate post-landing period to infer the capabilities of future Mars astronauts. Long-duration crewmembers in attendance agreed that "a couple of days" for recovery would be advisable, with one crewmember predicting that one in ten Mars astronauts will need up to 10 days of on-surface recovery. The consensus was to recommend seven days of habitation support for rehabilitation inside any vehicle in which the crew lands before any scheduled Mars surface excursion, including transfer to Habitat. The panel also acknowledged that contingency scenarios requiring earlier surface EVA can be accomplished if a higher risk level is accepted.

**Discussion:** The crew-landing vehicle should support post-landing rehabilitation for the most affected crewmember, including a conservative margin for off-nominal or unanticipated events, to avoid unnecessary haste in executing surface excursions.