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PREPARING FOR THE SOCIO-BEHAVIOURAL CHALLENGES OF A POPULOUS,
SEMI-INDEPENDENT SETTLEMENT ON MARS THROUGH A NEW GENERATION OF
MULTI-TEAM, EMPOWERMENT-ORIENTED MARS ANALOGUE MISSIONS.

Abstract

Purpose: Mars analogue missions are a well-established tool for the investigation of socio-behavioural challenges related to human exploration of Mars. Typically, these simulate the establishment of a scientific outpost, comprise few individuals, and explore challenges related to living and working in confined spaces, compliance to earth-defined protocols, and collaboration within a small team. However, prevailing thinking around Mars settlement is moving away from the paradigm of small outposts. SpaceX, the International Mars Society, and the UAE government are among key actors who are already advocating for the establishment of a self-sustaining city on Mars. The objective of this study is to propose parameters for a new generation of Mars analogues, which more faithfully reflect the forecasted challenges of establishing a human city on Mars.

Methodology: To identify socio-behavioural challenges related to the establishment of a human settlement on Mars we conducted a thematic analysis of 25 finalist conceptual papers of the Mars Society's Colony Design contest. Additionally, we followed up on historical, sociological and anthropological references from these papers, to develop a better understanding of related social and psychological processes. Finally, we transposed these findings onto proposed parameters for an analogue environment that would simulate the establishment of a human settlement on Mars.

Results: We propose that the new generation of Mars analogue missions should include at least 100 participants. To mirror naturalistic processes of inter-group collaboration and societal emergence, participants should be divided into semi-autonomous and spatially separated cooperating villages. Instead of rigid procedures and protocols, participants should be provided with social, psychological and technical skills, as well as raw materials and equipment, while being encouraged to address challenges through collaboration and innovation. Within this analogue environment, experiments can be conducted to determine optimums for: the number of villages; their geographical proximity; the balance between self-sufficiency and inter-dependence; the extent to which villages should be culturally homogeneous or heterogeneous; and the mixture of skills which will be provided to participants. Such analogues should ideally be established in challenging physical environments, such as a desert or a glacier, but with some connectivity to metropolitan centres for simulation of Earth-Mars trade.

Conclusions: For analogue missions to remain relevant to the challenge of large-scale human settlement of Mars, emphasis should shift from investigating small-group teamwork to studying processes of societal emergence, and from overcoming the psychological pressures of protocol adherence to enabling resilience through innovation in hostile environments.