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BARCHAN: INTEGRATING THE ATACAMA DESERT LOCAL BUILDING TECHNIQS INTO A  
MARS 3D PRINT HABITAT.

**Abstract**

Enhancing the Technology Readiness Level for extraterrestrial habitats requires a series of steps to solidify confidence in the concepts and related technology. Our previous publication (ICES 2003) detailed the "NEST" concept, an entry in NASA's Mars 3D Printing Challenge. Subsequently, we expanded our exploration with the "BARCHAN" concept, which enhances the habitability and adaptation to living on Mars. Findings from these studies support the potential of a barchan-dune-inspired design for continuous and incremental habitation on Mars, with implications for sustainable human settlements in extreme terrestrial environments. This paper presents a roadmap to achieve a full-scale technological demonstration in the Atacama Desert of Chile, an environment that closely mimics Martian conditions. Focusing on integrating local Atacama native construction techniques, which utilize the indigenous soil in innovative ways to withstand the rigors of the desert, informing and enriching our habitat design. We aim to integrate these time-tested methods with cutting-edge practices, including the use of regolith in 3D printing and the establishment of tent structures for scaffolding in the habitat construction process. This collaborative project envisions the involvement of Chilean institutions, such as local universities, municipalities, and private entities from the mining and aerospace sectors, to harness regional expertise and generate financial support through government funding and strategic partnerships. The ultimate goal is to create a foundational base for Chile's space industry and to expand the repertoire of sustainable construction techniques. By combining traditional Atacama building methods and typologies with modern technological advancements, this initiative stands to not only validate the architectural designs for Martian habitats but also to catalyze sustainable construction that can withstand conditions on both Mars and Earth.