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Author: Dr. Ilaria Cinelli
Space Generation Advisory Council (SGAC), Austria

CLASSIFICATION OF ANALOGUE MISSIONS: A REFERENCE FOR MISSION DESIGN AND
IMPLEMENTATION

Abstract

Simplified human activities in austere environmental conditions are run for investigating hazards to human life on celestial bodies and for implementing mitigation strategies. Such activities are called analogue missions being the facility, the environmental conditions and the crew's life-style analogous to that anticipated for humans living on Mars or on the Moon.

Yet, there are no formal guidelines or rules for running an analogue mission. Researchers and space enthusiasts can make various decisions while respecting local rules of safety of the facility. So, missions differ in (i) mission design, (ii) execution and (iii) management.

Such context (i)-(iii) leads to inter- and intra-variability between missions. Indeed, the advantage of simulating a large variety of possible future scenarios impacts the quality of scientific outcomes as long as decisions will be made on personal will.

The lack of formal guidelines, valid internationally, impacts research leading to possible dramatic long-term implications for incoming crewed missions. In medical sciences, outcomes of human studies are hard to compare between missions as the context (i)-(iii) is unstructured.

This work proposes a classification of analogue missions to be used as a reference when designing a mission. Here, a mission is identified based on the level of fidelity (low, medium or high-fidelity) and the class (class I, II and III). *Fidelity* refers to specific dangers that can become a threat to human life (such as lack of resupplies or level of oxygen), while *class* refers to the duration of a mission.

By doing so, it is possible to target key human factors of the adaptation to confinement and isolation in extreme environments. Hence, the mission design becomes a tool *itself* for revealing or containing operational stressors (like mental workout and decision-making process).

The significance of this work lays on increasing the scientific values of analogue missions, starting by addressing the design of the same. In such a way, corresponding guidelines on execution can be easily set. Although this work focuses on mission design, details on the implementation are also discussed.