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Quality and Safety, a challenge for all in Space (1)

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MANAGING AN INTUITIVE RISK ASSESSMENT TOOL FOR FUTURE SPACE MISSIONS: THE RISK CUBE CONCEPT

Abstract

In preparation for future extraterrestrial missions and exploration plans, space agencies and companies need to address the following human health-related risks:

- Performance decrements and/or errors;
- Behavioural inadequacies (due to multiple factors);
- Psychiatric conditions and mental breakdowns.
- Work overload.

It is important to remark that there still are human inattentions that prevent risk analysts to wholly identify unexpected events through conventional risk analysis methods (e.g., FMEA, FTA, HAZOP) in a closed and remote environment.

It is of primary importance to prevent health risks and damage, to improve the outcomes, and to reduce the missions costs. For this reason, analog field-testing results are vital for the assessment of the risks connected to these types of failure in hostile and distant settings, where most of the issues are challenging. Analog missions represent an excellent exercise to further implement already existing safety procedures and risk analysis methods. The aspects covered by analog simulations also consider the simulation of narrow/confined living habitats for the crew. Numerous analog space simulations have already been carried out on Earth. In fact, by learning from mistakes and improving the procedures, it is possible to gather and use the available information to craft reliable systems and mission guidelines.

In this paper, we provide a general but innovative risk evaluation method for analog simulation missions, in terms of identification of potential hazards and risks which could affect the positive outcome of the mission. The Risk Cube method is a useful live-editable 3D tool that can be applied to. It is characterized by the simplest approach available, for it features a high level of abstraction, and it can be digitally unfolded on a 2D plane. Throughout its use, the analyst could identify what he/she may require in a precise instant as well as the next (or parallel) phase at the same time. By presenting this method, we want to produce evidence for a wide range of analog-related situations (i.e., equipment failure, behavioural risk peformance, etc.). Most importantly, our aim is to define a knowledge-based approach to help mission-simulated analysists to ensure that all the risks and needed operations are targeted and evaluated easily. The added value lies in its inherent and easy approach, for it is possible to identify all the domains of occurrence of the risks, to visualize their interconnection, and to contribute to create a mental map.