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COMPREHENSIVE LEADERSHIP MODEL FOR DEEP SPACE MISSIONS

Abstract

The success of a space mission depends on its leadership and management. In history, strong and enthusiastic leaders inspired and motivated people to lead challenging and innovative projects to success, as the US president Kennedy with his famous "We choose to go to the Moon" speech, setting a clear goal with deadline for the landing. The Apollo programme was successful thanks also to the Hierarchical Model (HM) applied by NASA as their main leadership model for the early space missions, in which Mission Control (MC) was the main authority during flight. However, unexpected practical difficulties faced by astronauts highlighted the needs of a different model for mission operations, allowing astronauts of decision making, necessary especially for deep space missions. Then, due to the high risk and complexity, future long-term exploration missions require international collaborations between countries. Thus, it is fundamental identifying an advanced leadership model able to embrace challenges and factors that have not been included before. Nowadays, crewed missions to Mars and beyond are planned around the crew autonomy and the use of autonomous systems. Up to now, the Collective Leadership Model (CLM) is argued to be the most appropriate to be used in this context. Here, the crew leadership role is distributed among individuals based on relevant expertise and competence, while the MC is no longer the main authority. However, the CLM does not cover psychological and behavioral factors, such as mental health issues and depression, that have been shown to occur during isolation. Currently, Analogue Space Missions (ASMs) on Earth have been utilized to study operations and dynamics of future crewed deep space missions. So far, ASMs were conducted similarly to the HM for both, project management and mission operations, or lead according to a different model where each crew member has a pre-assigned position and MC supervises the crew activities only. Thanks to the well-recognized scientific validity of ASMs in anticipating hazards, leadership models should be scaled and adapted to the context of simulated missions for further validation and optimization. This paper aims to identify the leadership requirements in analogue missions for management and mission operations (including MC and crew) with the purpose of establishing comprehensive leadership models to be used in low- and high-fidelity missions and, eventually, real human space missions. The final goal is to increase the quality of mission outcomes, allowing for comparison between analogue missions, having similar boundary conditions.