Paper ID: 9933
student

44th SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES (D5)
A Big Challenge : Safety in Aerospace Missions (1)

Author: Ms. Jennifer Mindock
Colorado Center for Astrodynamics Research, University of Colorado, United States

Prof. David Klaus
Colorado Center for Astrodynamics Research, University of Colorado, United States

COUPLING SAFETY AND LIFE SCIENCES TO MITIGATE RISK DURING HUMAN SPACE MISSIONS

Abstract

In addition to the inherent technical, cost, schedule and political challenges posed by any space mission, human spaceflight introduces additional demands in terms of protecting the crew and utilizing their capabilities to enable mission success. As such, adding this 'human system' to the spacecraft also introduces certain risks. The NASA Johnson Space Center (JSC) Safety and Mission Assurance (SMA) organization is undertaking efforts to mitigate human system risk through quantitative analysis techniques aimed at supporting risk-informed decisions. Within JSC's Space Life Sciences (SLS) organization, work is similarly underway to mitigate human system risks, but in this case by managing research efforts involving various aspects of human health and performance in space. This paper describes ongoing efforts directed at combining these two organizations' areas of expertise applied to a common goal of risk mitigation.

From a technical perspective, the specific purpose of this work is to identify and quantify human system risks within the context of spacecraft operations. Factors influencing human performance in space are identified and organized in a manner that supports quantitative analysis and research management applications. This set of factors is intended to contribute to Human Reliability Analysis (HRA) and Probabilistic Risk Assessment (PRA) techniques. The current HRA and PRA techniques use a terrestrially based set of factors that do not address the unique conditions of spaceflight, and this research is aimed at developing factors appropriate for use in spaceflight applications.

From a programmatic perspective, one objective of this effort is to establish inclusive working relationships between organizations who share related goals, but have differing areas of expertise - namely SMA's quantitative risk analysis experience and SLS's understanding of human health and performance in space. The process of defining and characterizing those factors that influence human performance in space and their associated risk impacts has been facilitated through obtaining individual inputs from the two organizations and engaging in technical interactions involving both.

A strategy for quantification of the ensuing risks that can arise from factors influencing human performance in space will also be discussed, taking into account the SMA experience in framing risk quantification problems along with the SLS experience in measuring human health and performance in space. Areas for further discussion include the benefits and challenges of developing regular collaborations and maintaining effective communication between two different organizations that share a common goal of mitigating risks in human spaceflight.