Credibility Assessment of Deterministic Computational Models and Simulations for Space Biomedical Research and Operations

Lealem Mulugeta[1], Marlei Walton[2], Emily Nelson[3] and Jerry Myers[3]

1. Universities Space Research Association, Division of Space Life Sciences, Houston, TX
2. Wyle Science, Technology & Engineering Group, Houston, TX
3. NASA Glenn Research Center, Cleveland, OH

Human missions beyond low earth orbit to destinations, such as to Mars and asteroids will expose astronauts to novel operational conditions that may pose health risks that are currently not well understood and perhaps unanticipated. In addition, there are limited clinical and research data to inform development and implementation of health risk countermeasures for these missions. Consequently, NASA's Digital Astronaut Project (DAP) is working to develop and implement computational models and simulations (M&S) to help predict and assess spaceflight health and performance risks, and enhance countermeasure development. In order to effectively accomplish these goals, the DAP evaluates its models and simulations via a rigorous verification, validation and credibility assessment process to ensure that the computational tools are sufficiently reliable to both inform research intended to mitigate potential risk as well as guide countermeasure development. In doing so, DAP works closely with end-users, such as space life science researchers, to establish appropriate M&S credibility thresholds. We will present and demonstrate the process the DAP uses to vet computational M&S for space biomedical analysis using real M&S examples. We will also provide recommendations on how the larger space biomedical community can employ these concepts to enhance the credibility of their M&S codes.