SPACE LIFE SCIENCES SYMPOSIUM (A1)
Life Support and EVA Systems (6)

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DEVELOPMENT OF A COMPREHENSIVE ASTRONAUT SPACESUIT INJURY DATABASE

Abstract

Extravehicular Activity (EVA) is among the most challenging activities in human spaceflight. Maintaining astronaut health and comfort inside the spacesuit is critical to accomplish the tasks required for the mission. However, the current Extravehicular Mobility Unit (EMU) spacesuit causes many astronauts minor musculoskeletal trauma injuries and discomfort, which could lead to suboptimal EVA performance and have a potential impact on mission success.

The purpose of this work is to highlight our effort to create a spacesuit injury and discomfort database to better track injuries and countermeasures. The database development is framed under our broader project called "Spacesuit Trauma Countermeasure System Development". This project strives to improve future spacesuit design by contributing to injury analysis in three different areas, the first of which is the already mentioned database development. The second area attempts to develop a human-spacesuit interaction model that will reproduce the motion of the human inside the spacesuit to simulate the mechanisms of spacesuit injuries. Finally, the third aspect strives to design new prototype protection devices that will address the underlying causes of astronaut injuries elucidated by the database and modeling work.

The primary objective of the astronaut spacesuit injury database is to gain insight into the mechanism of spacesuit injuries. Data analysis will identify the incidence of particular injuries, the form of injuries (e.g., frequency and severity), and possible trends, both in training and in-flight. In addition, application of current countermeasures will be tracked in order to assess their effectiveness. Additionally, we will use this knowledge to develop a better and more realistic human-suit interaction model.

The database will leverage from existing sources of information, such as the Injury Tracking System (ITS), the Longitudinal Study of Astronaut Health (LSAH), the Astronaut Strength and Conditioning and Rehabilitation Program (ASCR), and oral histories and astronaut debriefs amongst others. However, our work will go beyond these sources of information, including both clinically documented injuries and some of the more subtle aspects of physical discomfort felt during EVA. Existing injury sources are not specific to spacesuit injuries, and some of them do not include all phases of spaceflight. The new database will include pre-, in-, and post-flight injury information. Finally, the database will be open-source, thus

allowing future researchers, spacesuit designers and engineers, medical personnel, and other stakeholders to gain new insight into the problems associated with EVA injury and discomfort.