IAF SPACE EXPLORATION SYMPOSIUM (A3) Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Ms. Eman AbuZeitoun Jordan University of Science & Technology, Jordan

> Ms. Renad Abuzetun Jordan Mr. Mazen Abunajem Jordan Ms. Lujain Abuzeitoun Jordan

ENHANCING MARTIAN EXTRAVEHICULAR ACTIVITIES: A MARS DUST MITIGATION AND VIBRATION SYSTEM FOR EVA SPACESUITS

Abstract

As humanity sets its sights on exploring Mars, ensuring the safety and effectiveness of extravehicular activities (EVAs) becomes paramount. One of the challenges posed by the Martian environment is the pervasive presence of fine dust particles, which can compromise the functionality of EVA spacesuits. To address this challenge, we propose the development of a Mars Dust Mitigation and Vibration System (MDMVS) specifically designed for EVA spacesuits.

The MDMVS integrates advanced technologies to detect and mitigate dust accumulation on the exterior surface of the spacesuit. Key components of the system include lightweight vibration pads strategically positioned across the spacesuit, piezoelectric actuators for generating vibrations, and dust detection sensors utilizing optical or electromagnetic methods. These sensors continuously monitor dust accumulation and trigger the activation of the vibration pads when a predefined threshold is reached.

An essential aspect of the MDMVS is its feedback control system, which processes data from the dust detection sensors in real-time. This allows for adjustable settings, enabling astronauts to customize the frequency and intensity of the vibrations based on the type and severity of dust encountered on Mars. Moreover, the system is engineered for low-power operation, utilizing energy harvesting techniques and efficient power management systems to minimize energy consumption during EVAs.

Mechanical resilience is paramount in the design of the MDMVS, ensuring durability and reliability in the harsh Martian environment. Seamless integration with other systems of the EVA spacesuit, including life support, communication, and mobility systems, ensures that the MDMVS does not compromise astronaut safety or mobility.

The Mars Dust Mitigation and Vibration System (MDMVS) represents a promising solution for enhancing the safety and effectiveness of EVAs on Mars. By combining vibration technology with dust detection and control systems, it enables astronauts to maintain clear visibility and optimal functionality of their spacesuits, facilitating the exploration and colonization of the Red Planet.