Designing the M.A.R.S. Suit

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The proposed engineering design was purposed to complement material spacecraft shielding already in place to mitigate the equivalent radiation dosage from galactic cosmic radiation and secondary particles accumulated by astronauts on an extended deep space mission. The proposed engineering design in a multi-layer fabric, composed of 95 sheets of Kevlar® XP and 86 sheets of Dyneema® ultra-high-molecular-weight-polyethylene, interiorly lined with temperature-regulating Outlast® fabric and exteriorly lined with industrial, PVC-coated polyester. The amount and ratio of Kevlar to Dyneema were calculated via inequality functions with constraints derived from data provided in the literature to optimize the hypothesized performance of the fabric. Concerning its implementation, dubbed the "M.A.R.S. Suit," the fabric would be used to shield body regions most vulnerable to deep space ionizing radiation, suggesting the future design of apparel much like that already used in law enforcement, including at least a vest and helmet to be worn inside the spacecraft an over regular in-flight apparel. Future implementations, dependent on the effectiveness of the fabric, would include sleeping bags in the spacecraft. The M.A.R.S. suit fabric, according to the current body of literature, is theorized to provide effective additional shielding. This design requires further testing for the evaluation of its hypothesized effect, whether through simulation via space transport codes like HZETRN and GRNTRN, or through direct evaluation in a particle accelerator.

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