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Radiation Fields, Effects and Risks in Human Space Missions (5)

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PROTECTIVE BODYSUIT TO REPEL HARMFUL LARGE PARTICLE RADIATION FOR
LONG-TERM USE**Abstract**

Deep space exploration will expose astronauts to high amounts of radiation, including solar proton events (SPE) and galactic cosmic radiation (GCR), to which there does not exist a protective garment for regular use. Astronauts exposed to high amount of radiation are more susceptible to serious health complications, including organ damage and failure. Previous radiation protection methods fail to address the secondary radiation created when ionizing radiation is dispersed. This project aims to develop a garment to protect against high energy, high charge radiation (HZE), continued protection against short length electromagnetic radiation, and addresses the concern of the harmful secondary radiation created from contemporary protection methods. This lightweight bodysuit would provide an everyday, extended-use protective suit, which increases protection against harmful particles while providing a reduction in mass from current Al 2219, Polyethylene, Lead, and Tungsten materials. The design utilizes a blend of Boron-based fibre and specialized rubber to create a woven composite base layer which acts as the first line of defense, as well as a collective backstop for deadly radiation. In addition to this base, pockets which sit above vital organs will house a multi-layer composite composed of an epoxy blend supplemented with carbon fibre reinforcement. All materials are light enough to consider as a replacement for simple clothing worn on an everyday basis that will act as a preventative measure and add protection in areas of unknown radiation exposure outside of EVA operations. Such garments may also be considered for operating apparel on an extraplanetary base. This bodysuit may marginally reduce payload weight by helping to shrink current EMU suit designs by reducing the need for layers of aluminized Kevlar and other protective layers. The protection of astronauts from radiation is crucial in continuing the research and exploration of deep space beyond the Moon.