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HUMAN FACTORS AND ERGONOMICS CONSIDERATIONS IN SPACE SYSTEM ARCHITECTURE DESIGN: A SYSTEMATIC REVIEW AND ANALYSIS

Abstract

Space exploration and long-duration missions require intricate and complex space systems that are designed to function in extreme environments. However, these systems are ultimately operated by human beings, who must remain productive, safe, and healthy during their time in space. Therefore, the integration of human factors and ergonomics principles in space system architecture design is crucial to optimize human performance and ensure mission success.This systematic review examines the current state of research and practice in human factors and ergonomics considerations in space system architecture design. It explores the challenges faced by human operators in space, including microgravity, radiation exposure, isolation, and communication delays, and discusses how these factors influence the design of space systems. Furthermore, it reviews the principles of human factors and ergonomics, such as human-centered design, workload analysis, and situational awareness, and how they can be applied to space system architecture design.The review also identifies gaps in current research and practice, such as the need for more empirical studies of human performance in space and the integration of emerging technologies, such as artificial intelligence and virtual reality, into space system design. Additionally, it highlights the importance of considering individual differences in human performance, such as age, gender, and experience, when designing space systems.Overall, this review emphasizes the critical role of human factors and ergonomics in space system architecture design and provides insights into how these principles can be integrated to optimize human performance in space. The findings of this review can inform the development of future space systems that are more efficient, effective, and safe for human operators.