

35th IAA SYMPOSIUM ON SPACE AND SOCIETY (E5)
Space Architecture: Habitats, Habitability, and Bases (1)

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HUMAN FACTORS IN SPACE HABITAT DESIGN: ENHANCING HEALTH, PSYCHOLOGY, AND
OPERATIONAL EFFICIENCY

Abstract

The dynamic and isolated nature of space environments poses unique challenges to human health, psychology, and work efficiency, making the integration of human factors in habitat design paramount. This presentation aims to delve into how space habitats can be optimized to support the well-being and productivity of their inhabitants, focusing exclusively on the influence of architectural and environmental design on human factors. Utilizing a multidisciplinary approach that blends architecture, psychology, ergonomics, and environmental design, this study examines the critical components of habitat design that impact crew health, mental well-being, and operational efficiency in space environments. It draws on empirical data from analog terrestrial habitats and psychological studies, alongside insights from current space missions, to identify design principles that mitigate the negative effects of long-duration space habitation. The core of the presentation will explore innovative habitat design strategies that enhance living conditions in space. These include optimizing spatial layouts to foster social interaction and privacy, incorporating nature-inspired elements to reduce stress and improve mood, and designing for flexibility to adapt to the evolving needs of the crew. Special attention will be paid to lighting, acoustics, and material choices that mimic Earth-like conditions, aiming to create a sense of normalcy and comfort in the extraterrestrial context. Furthermore, the presentation will discuss the integration of technology and automation in habitat design to enhance human efficiency and reduce the cognitive load on astronauts. By providing case studies and design proposals, the presentation will illustrate how habitat environments can be tailored to support complex human needs, ensuring that astronauts not only survive but thrive in space. In conclusion, this research emphasizes the critical role of human factors in the design of space habitats. By prioritizing human health, psychology, and efficiency, space architects can develop environments that not only meet the technical requirements of space habitation but also foster a holistic sense of well-being and productivity. This human-centric approach to space habitat design is essential for the success of future long-duration missions and the expansion of human presence beyond Earth.