

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Interactive Presentations - IAF SPACE SYSTEMS SYMPOSIUM (IPB)

Author: Mr. Daniel Akinwumi
In-Space Missions Ltd., United Kingdom

DESIGN AND ANALYSIS OF THE TECHNICAL INFRASTRUCTURE FOR A SELF-SUFFICIENT
AND SUSTAINABLE INTERGALACTIC HUB

Abstract

This research examines the design and technical challenges of creating a viable and sustainable long-term space habitat, specifically focusing on a conceptual design, the Intergalactic Hub (I-HUB). As humanity stands on the precipice of a new era of space exploration, a comprehensive understanding of the complexities of prolonged human habitation in outer space is pivotal.

The study conducts an in-depth analysis of the key design parameters of I-HUB, including advanced life support systems, artificial gravity, food production, habitat structural design, and autonomous operations. It illuminates the critical aspects of these parameters and elucidates the challenges each presents, such as efficient resource recycling, sustainable energy provision, radiation protection, psychological well-being, and habitat resilience.

The research further identifies potential areas for future exploration and investigation essential to advancing space habitat design. Emphasizing multidisciplinary design optimization, the study proposes synergies across multiple disciplines to address these challenges, including bioengineering, environmental science, nanotechnology, astrophysics, sociology, and more.

Moreover, it offers impeccable recommendations to overcome these identified challenges, integrating state-of-the-art technologies and innovative design principles. By integrating forward technologies, leveraging AI-driven power management, harnessing artificial gravity, and incorporating a human-centered design approach, this study provides a blueprint for effectively addressing the critical needs of a self-sufficient and sustainable space habitat.

Through this detailed investigation, the thesis underscores the significance and potential impact of pursuing research in these areas and their implications for sustainable human spaceflight. It offers valuable insights into the broader objectives of space exploration and the vision of transitioning humanity from mere space explorers to established denizens of the cosmos.