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FROM 2001: A SPACE ODYSSEY TO TOMORROW'S REALITY: EVOLVING ARTIFICIAL
GRAVITY THROUGH STRATEGIC DEVELOPMENT

Abstract

If mankind is ever to set foot on Mars and beyond, a more sustainable countermeasure against the harmful effects of weightlessness must first be developed. While the current crew exercise and pharmaceutical regiment may suffice at the present time, weightlessness-induced physiological system damage such as vision degradation, bone demineralization, and muscular atrophy will most certainly deter the progress of manned space exploration. Artificial gravity offers a promising solution; however, a variety of challenges has slowed its advancement. Cost, design and launch complexity, and a limited understanding of the fundamental science have led many to dismiss the concept of artificial gravity as a science fiction dream as opposed to a plausible reality. Due to the mounting urgency for a sustainable, safe solution for long-term space exposure, the astronautics community must rise to the challenge of rethinking the “impossible.” This paper discusses a variety of artificial gravity concepts and dissects priorities for future development. Tangible progress will require strong partnerships between industry, academia, and government, and supporting technologies and scientific advancements offer a wealth of shorter-term objectives. Artificial gravity milestones can be paired with Earth-bound consumer needs and research inquiries, and these “lily pads” offer a lower risk path toward high-impact innovation. Ultimately, artificial gravity offers a thrilling vision for the future of space exploration, and the efforts of today can bring this vision into focus.