

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
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ADVANCED LAUNDRY SYSTEM FOR MICROGRAVITY ENVIRONMENTS
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Abstract

The Fundamentals of Securing Human Existence in Space Space exploration requires taking calculated risks to advance further. However, it is vital to prioritize the essentials of life that are required to survive in space. Gravity, water, air, food, radiation protection, waste removal, shelter, ambiance and hygiene are basic requirements that cannot be ignored. Disregarding these fundamental needs would impede our progress in space exploration or may result in fatal consequences. Surprisingly, the space program lacks a fundamental piece of technology: washing machines. As a result, germs and bacteria can flourish in the absence of proper sanitation.

Introducing a specially designed laundry and extraction centrifuge tailored for space missions. This advanced system features a high-speed dual drum setup for washing, extracting, and drying tasks. Powered by a sophisticated 6-phase motor system in a gyroscopic suspension structure to reduce vibrations and limit momentum transfer to the spacecraft, maintaining independent orientation, this apparatus enhances operational performance. Enclosed in noise-reducing material, the system ensures minimal disturbance to the spacecraft. It includes capillary draining mechanisms and hydrodynamic water pumps to optimize water movement and flow for peak efficiency. This specialized system is tailored for washing clothes efficiently in space. It includes a centrifuge for water retrieval and utilizes a vacuum method for drying, resulting in reduced power consumption and water usage. The closed-loop setup integrates water storage tanks and reusable filtration systems to support water recycling.

During the washing process, water and detergent are used, and greywater is filtered through a system with a shocking mechanism and filtration cycle for continuous purification. Moreover, an additive is blended with the water during rinsing to cleanse it to a potable level, in conjunction with the centrifuge. This innovative and space friendly solution represents a new era in sustainable laundry practices, reducing the wasteful disposal of clothing, streamlining cleanliness, health and hygiene maintenance for astronauts and space travelers.