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Author: Ms. Sona Rustam
Azerbaijan State Pedagogical University (ASPU), Azerbaijan

Mrs. Nigar Rustam
Azerbaijan State University of Economics, Azerbaijan
Ms. Leman Safarli
Baku Engineering University, Azerbaijan
Mr. Safarali Safarli
Massachusetts Institute of Technology (MIT), Azerbaijan

SMART BED SYSTEM FOR ASTRONAUTS IN SPACE: HEALTHCARE, STABILITY, AND RESOURCE RECYCLING

Abstract

The expansion of space exploration and the implementation of long-term missions pose new challenges for the health of astronauts. In microgravity, serious changes are observed in the physiological functions of the human body, which affects the quality of life and work capacity of astronauts, and innovative approaches are required to solve these problems. The smart bed system is designed to ensure the stability of astronauts in microgravity, improve their sleep quality, regulate blood pressure, and optimize resource use by recycling waste. This system helps protect not only the physical health of astronauts, but also their psychological well-being. The smart bed system combines several features, such as magnetic levitation or vacuum-based stabilization technology, which allows astronauts to remain stable on the bed, which prevents them from accidentally hitting any part of the ship and causing injury. At the same time, the body position adjustment feature allows them to sleep in different positions, thereby maintaining blood circulation and muscle function. The main function of the bed is to provide the astronaut with Sleep Monitoring and Optimization and to perform the function of a drug dispenser by constantly measuring blood pressure. By analyzing the sleep stages with sensors, we can measure the depth and quality of sleep throughout the night based on the astronaut's brain waves, heart rate and respiratory indicators. This analyzes the astronaut's biological rhythms and wakes him up at the most optimal time. This helps to reduce sleep disturbances in space and improve the astronaut's psychological state. Blood pressure is also constantly monitored and if abnormal conditions are detected, the drug dispenser delivers the appropriate drug to the astronaut. Another function of the bed is to recycle waste and optimize resource use. A system similar to the urine purification technology on the International Space Station (ISS) converts urine into clean water and oxygen through an electrolysis process. A special anaerobic fermentation process produces biomethane from waste, which can be used as an energy source. This also helps to maximize the potential for waste treatment. The main application area of the smart bed is the space and military industry. The bed can be used to protect the health of astronauts and people operating in extreme conditions during long-term colonization missions and to ensure efficient waste management. This technology, in addition to protecting the health of astronauts, helps to recycle and efficiently manage resources in space.