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A NEW PRINCIPLE DESIGN OF ARTIFICIAL GRAVITY SPACE VEHICLE DRIVING BY
ELECTROMAGNETIC LIQUID LOOP

Abstract

For manned deep space exploration missions, long-term exposure to weightlessness leads to a chain-reaction of undesirable physiological adaption, which can have a big influence on astronauts' health. One solution to overcome the weightlessness problem is to provide an artificial gravity environment. This paper gives a new principle design of artificial gravity space vehicle. Artificial gravity arises from centripetal acceleration in the rotating space vehicle, driven by the large electromagnetic liquid loop where the fluid (e.g. ionic liquid) flows under the electromagnetic field. Based on the research of bioastronautics, the influence parameters and conceptual design of artificial gravity space vehicle are illuminated. According to this, we describe the components and the performance of the electromagnetic liquid loop in details. Compared with other artificial gravity equipment, the space vehicle in the paper can produce continuously an artificial gravity environment for more astronauts with lower energy consumption, and it doesn't need a large bearing to provide the rotation. Then we discuss how to keep the stability of the artificial gravity with the three-axial liquid loop control system at the interference of space environment and the influence of astronauts' exercise routine. Finally, significance and challenge faced in future research on the artificial gravity space vehicle are discussed and we believe that it offers a potential avenue to live in space permanently.