

Controlled Resistance & Aerobic Exercise Countermeasure

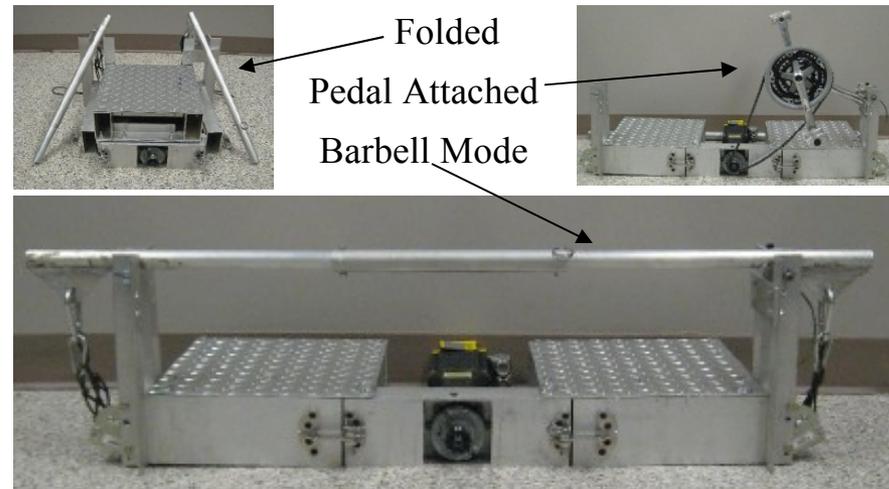
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Identification and Significance of Innovation

- Spaceflight adaptations include muscle atrophy, decreased bone mineral density and reduced aerobic capacity
- Effective resistance exercise countermeasure hardware supports safe and successful space exploration
- Real-time control is applied to an electric servo-motor to provide resistance and aerobic exercise in a lightweight, compact, and reconfigurable design with self-contained power generation
- Builds on previous work for terrestrial applications



Technical Objectives

- Easily configured and stowed
- Pedal generator & minimal power to operate
- Instrumented to document exercise sessions
- Whole body axial loading & individual joint resistive loading that simulates free weights / eccentric overload
- Load adjustable to 2.5 kg maintains strength & bone
- Aerobic exercise with pedal attachment

Work Plan

- Design prototype and optimize motor control
- Develop quasi-inertia / eccentric overload control software
- Instrument system
- Demonstrate validity and reliability
- Demonstrate performance with human testing
- Develop preliminary design for phase 2 prototype

NASA Applications

- Provides resistance & aerobic exercise
- Portable design applicable in virtually any aspect of spaceflight (extended use on ISS, short-term lunar sortie missions, and future Mars exploration)

Non-NASA Applications

- Controlled resistance exercise for athletic training
- Neuromuscular rehabilitation (stroke, spinal cord injury)
- In-home personal training and physical therapy with tele-presence of recorded exercise session parameters

Firm Contacts

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