



Activity Monitoring for Parabolic Flight

Problem Statement

- Bone loss due to microgravity may have serious consequences during and after long-duration space flight missions. This project offers a non-invasive predictive approach to the monitoring and maintenance of bone health during space missions.
- This flight will validate our activity monitoring system, tri-axial accelerometers with Bluetooth wireless communication, in microgravity.
- Potential users of the matured technology include NASA health personnel, exercise specialists, the aging population, osteoporotic patients and elderly care personnel.

Technology Development Team

- Peter Cavanagh, PhD, PI
Department of Orthopaedics and Sports Medicine, University of Washington
cavanagh@uw.edu
- Funded by National Space Biomedical Research Institute BioScience Research Collaborative
6500 Main Street, Suite 910
Houston, TX 77030-1402
(713) 798-7412
- Partners in technology development:
NASA Glenn Research Center,
ZIN Technologies

Proposed Flight Experiment

Experiment Readiness:

- The experiment will be ready for flight by September 2012.

Test Vehicles:

- Parabolic aircraft (Boeing 727)

Test Environment:

- The sensor hardware has flown briefly on a Zero G Corporation parabolic aircraft. The system performed well during a single proof-of-concept test. We have been approved through Flight Opportunities, to perform testing of our experiment using a Boeing 727 or similar aircraft during parabolic flight.

Test Apparatus Description:

- Small sensors will be worn on the test subject's ankle and mid-lower back during exercises performed on a treadmill. The sensor, an example attachment site, and the treadmill setup can be seen below.



Technology Maturation

- The system is currently at a TRL of 5. The system components are well-integrated and the technology has been thoroughly tested in a simulated environment using the enhanced Zero-G locomotion simulator at NASA Glenn.
- The deadline, to mature the technology to TRL 6 or higher is December 31, 2012 based on NSBRI funding.
- Testing during parabolic flight will move the TRL forward to 7, allowing demonstration in an operational environment. Testing during parabolic flight is anticipated in October 2012.

Objective of Proposed Experiment

- The main goal for this parabolic flight is to simulate as many activities as possible which could occur on the International Space Station on a daily basis (both exercise and activities of daily living) for activity recognition and bone health monitoring purposes.
- The data retrieved from this experiment will give us the necessary acceleration/force relationships needed for skeletal loading predictions. The data will also verify our activity recognition algorithms in a zero-g environment.

List the applicable Technology Areas addressed by your technology: TA06 Human Health, Life Support and Habitation Systems