



Load Bearing Equipment for Bone and Muscle

PROJECT MANAGEMENT Linda Shackelford 281-483-7100 or Linda.C.Shackelford@nasa.gov;
Bryan Griffith 281-483-8117 or Bryan.K.Griffith@NASA.gov

HAT: 6.3.c TA: 6.3 Human Health and Performance – long duration health TRL: start 2 / current 4

OVERVIEW

Resistance exercise on ISS has proven effective in maintaining bone mineral density and muscle mass. Exploration missions require exercise with similar high loads using equipment with less mass and volume and greater safety and reliability than resistance exercise equipment used on ISS (iRED, ARED, FWED). Load Bearing Equipment (LBE) uses each exercising person to create and control the load to the partner.

INNOVATION

The frame supports controlled variable resistance to optimize force and increase safety while minimizing risk of astronauts striking each other. Astronauts push against each other using foot plates linked by cords running through conduits between the astronauts.

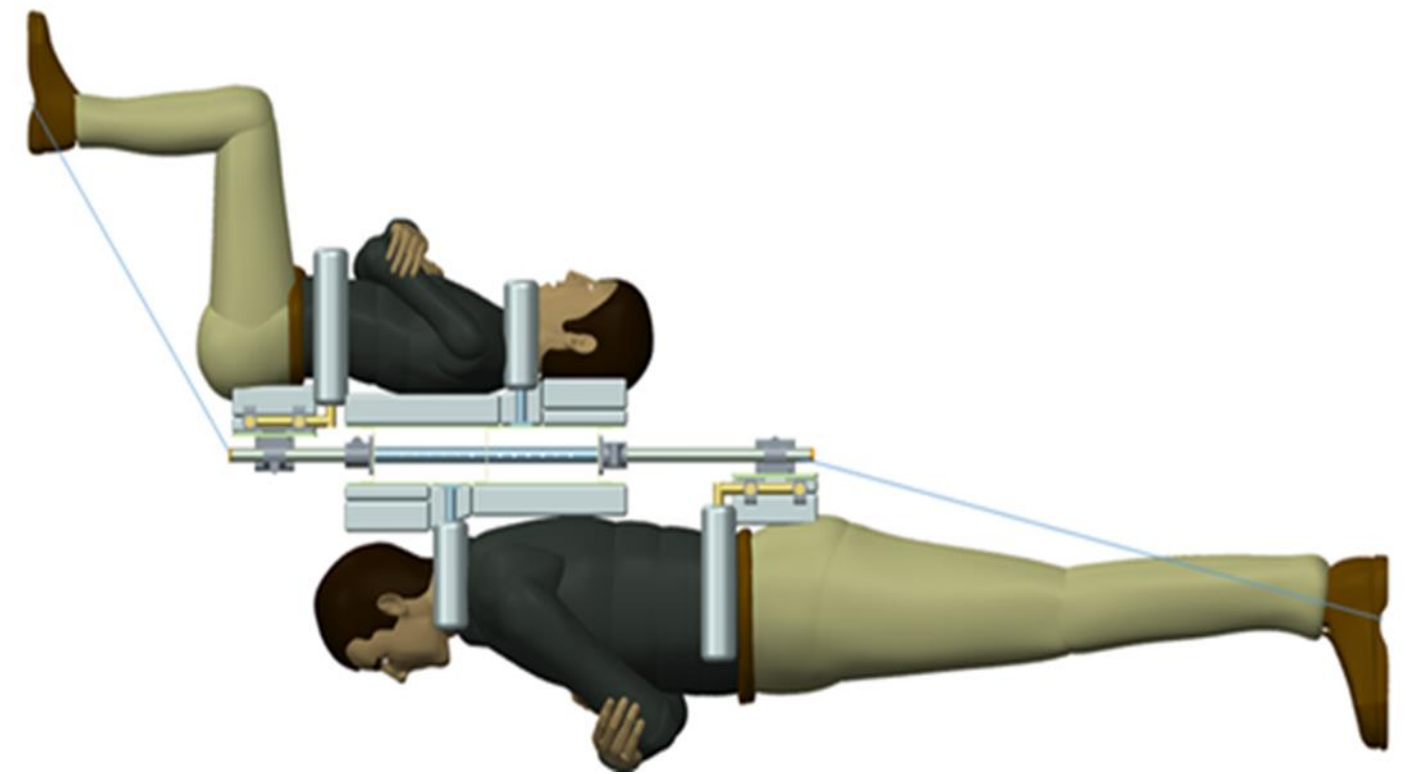
Astronauts serve as both motor and controller as they exercise each other. Configuration allows exertion of maximal force with minimal discomfort from man-equipment interface and minimizes exercise volume.

OUTCOME

- PDR was completed and a ground test article was built.
- Preliminary testing by the investigators indicates functionality.
- Test volunteers have been recruited to test range of motion and comfort with variable body sizes.

INFUSION SPACE / EARTH

- This technology may be used on space craft with an available exercise volume of 2.75 X.75X.75 meters when in use.
- The ground based test frame configuration (supine and head to head) has potential use for home based resistance exercise and rehabilitation exercise.



PARTNERSHIPS / COLLABORATIONS

This technology was developed through collaboration across two directorates at JSC, Engineering (ER) and Human Health and Performance (SD).

PAPERS / PRESENTATIONS

Preliminary design review presentation July 23, 2015 was approved. Fit and range of motion test plan was submitted to IRB chair for expedited review and was approved. The completed article was reviewed by JSC safety office at the test readiness review presentation October 13, 2015.

FUTURE WORK

The ground based configuration testing for range of motion and fit will be followed by strength testing with instrumentation for load measurement (in line or foot/shoe interface load cell measurements). Full IRB review will be required for this testing.

Successful completion of ground configuration testing will lead to neutral buoyancy testing of a flight configuration unit that will be built with design changes indicated by the ground configuration testing.

