Human space flight is associated with losses in muscle strength, bone mineral density and aerobic capacity. Crewmembers returning from the International Space Station (ISS) can lose as much as 10-20% of their strength in weight bearing and postural muscles. Likewise, bone mineral density is decreased at a rate of ~1% per month. During future exploration missions such physiological decrements represent the potential for a significant loss of human performance which could lead to mission failure and/or a threat to crewmember health and safety. The ability to perform motion capture and kinematic analysis on-orbit to understand the similarities and differences of exercising in microgravity, estimate the physical cost of exploration tasks, monitor crew health and fitness, and to provide effective hardware for exercise countermeasures use will be valuable in supporting safe and successful space exploration. In this solicitation, Exercise Systems is seeking technologies to enable 3-D kinematic analysis of exercise sessions in-flight, and analyzed by research teams on the ground. Visit the following for additional information: [http://hacd.jsc.nasa.gov/projects/ecp.cfm](http://hacd.jsc.nasa.gov/projects/ecp.cfm), [http://hacd.jsc.nasa.gov/projects/eva.cfm](http://hacd.jsc.nasa.gov/projects/eva.cfm).