NASA SBIR 2018 Phase I Solicitation

H12.03 Crew Worn Accelerometers in spaceflight environment

Lead Center: ARC

Participating Center(s): GRC, JPL, KSC, LaRC, MSFC

Technology Area: TA6 Human Health, Life Support and Habitation Systems

NASA needs an all-in-one data collection system to record crewmember dynamics and kinematics during dynamic phases of flight including launch, pad or ascent abort, atmospheric reentry, descent, and landing. These phases of Soyuz and Commercial vehicle flights are of particular interest due to the sustained vibration (launch), sustained accelerations (launch and reentry), transient accelerations (aborts, descent and landing), and rotational velocities (abort, descent and landing). The sensors must:Â

- Be self-powered with non-volatile memory (onboard data storage).
- Be able to collect at least 30 minutes of data in a 5-hour time span of launch (including time on the pad).
- Be able to sustain the stresses of launch and then be powered off for 6 months to 1 year (with the possibility of charging and off-loading launch data while in-flight).
- Be capable of collecting â‰¥1 hour of data in at least an 8-hour period during entry, descent, and landing (including loiter time).
- Have a customizable trigger based on timing or acceleration sensing.
- Be capable of accurately measuring and storing linear accelerations and angular velocities with sufficient temporal resolution to capture the relevant dynamics in each event (linear X, Y, Z axis; Â±200g range, 0-3000Hz bandwidth, 10,000 Hz sampling rate; angular X & Z - Â±2,000 rad/sec range, 0-300 Hz bandwidth, 5,000 Hz sampling rate, Y - Â±5,000 rad/sec range, 0-300 Hz bandwidth, 5,000 Hz sampling rate).
- Be crew-worn without interfering with other crew-worn equipment.
- Meet SAE J211-1 and SAE J2570 specifications.Â

Â The data collected will be used to quantify crew loading during each phase of flight and improve NASAâ€™s ability to predict dynamic environments through the use of numerical simulation and models. Such sensors could be used to quantify crewmember head and neck dynamics, chest kinematics, and helmet kinematics in relation to the head and neck. These data have not been previously collected during spaceflight and are important to understanding how humans respond to the unique dynamics present in the spaceflight environment.Â