



T0030-P Microgravity Healthcare

Problem Statement

- Visual changes and symptoms experienced by long duration ISS crewmembers are consistent with increased intracranial pressure (ICP)
- Non-invasive measurement of ICP changes are not available on ISS
- Parabolic flights will allow validation of the technology and methods and establish flight readiness of non-invasive ICP monitoring
- NASA research, Medical Operations, and terrestrial medicine are potential users

Technology Development Team

- Scott Dulchavsky, MD, PhD, Henry Ford Hospital, SDULCHA1@hfhs.org
- Wyle, Science, Technology & Engineering Group
- NASA Human Research Program – Visual Impairment/Intracranial Pressure
- Holds promise for broad terrestrial medical and military applications, as well as NASA.

Proposed Flight Experiment

Experiment Readiness:

Spring 2014

Test Vehicles:

Parabolic aircraft

Test Environment:

CCFP and DPOAE have not flown in a reduced gravity environment; parabolic flights are requested to validate this hardware

Test Apparatus Description:

Cerebral and Cochlear Fluid Pressure analyzer (CCFP)

- Spontaneous or evoked methods measure displacement of the tympanic membrane, reflecting changes which correlate with ICP



Distortion Product Otoacoustic Emissions (DPOAE)

- Handheld device measures otoacoustic emissions from the ear
- Standard method of hearing testing that has recently been reported to relate to ICP



iCare rebound tonometer

- Handheld rebound measurement of intraocular pressure (IOP)
- Does not require anaesthetization of the eye



Technology Maturation

- In order to elevate the TRL level of these devices and methods, they must be tested in a relevant environment
- Barring unforeseen technical issues, the deliverable would be a technology and methodology solution investigated at TRL 4-5 and delivered at TRL 7-8
- This hardware suite is currently being considered for flight to ISS in January 2015; validation testing should occur well in advance

Objective of Proposed Experiment

- Validate non-invasive ICP and IOP monitoring technology and methods in altered gravity
- Recommend equipment modifications, training, ergonomic tips, and other operationally relevant information to stakeholders
- Collect physiological information about ICP and IOP changes in altered gravity environments