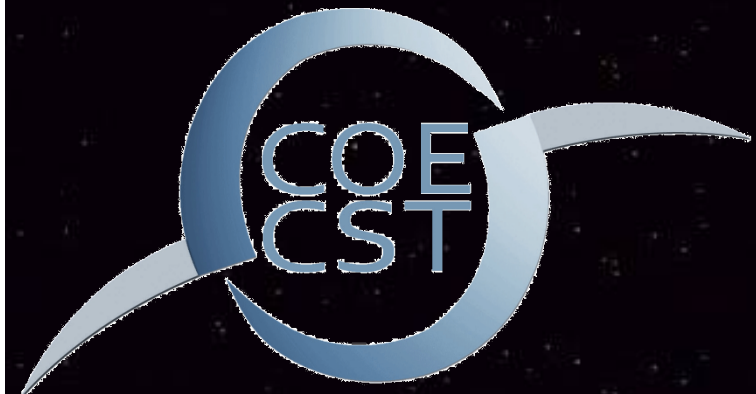


COE CST Seventh Annual Technical Meeting

Task 308: Assessment of Screening and Training Requirements for SFPs regarding Anxiety during Repeated Exposures to Sustained High Acceleration

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*October 10, 2017
Las Cruces, NM*



Center of Excellence for
Commercial Space Transportation

Agenda

- Team Members
- Task Description
- Schedule
- Goals
- Results
- Conclusions and Future Work

Team Members

- Principal Investigator: James Vanderploeg, MD, MPH
- Co-Investigators: Rebecca Blue, MD, MPH; Charles Mathers, MD, MPH; Tarah Castleberry, DO, MPH; Johnene Vardiman, MS
- Collaborators: Frederick Bonato, PhD; Andrea Bubka, PhD; Kim Seaton, PhD
- Students: Rahul Suresh, MD

Organizations

- University of Texas Medical Branch
- NASTAR Training Center
- Saint Peter's University

Task Description

- SFP anxiety or panic attack may present a significant problem for the commercial spaceflight industry
 - Industry depends upon layperson participation
 - Requires a perception that flights are safe and enjoyable
- SFPs likely to have expectations: training and risk mitigation
 - Efforts towards meeting expectations or educating the public: beneficial effects for the industry?
- SFPs may have difficulty performing tasks in stressful scenarios
 - May not fully understand how their own actions affect the risk profile of spaceflight activities

Preliminary Studies

- Multiple studies designed to provide understanding of layperson physiological response to hypergravity/acceleration (2012-2017)
 - 2012: 77 Subjects
 - 2014: 86 Subjects
 - 2016-7: 157 Subjects

Schedule

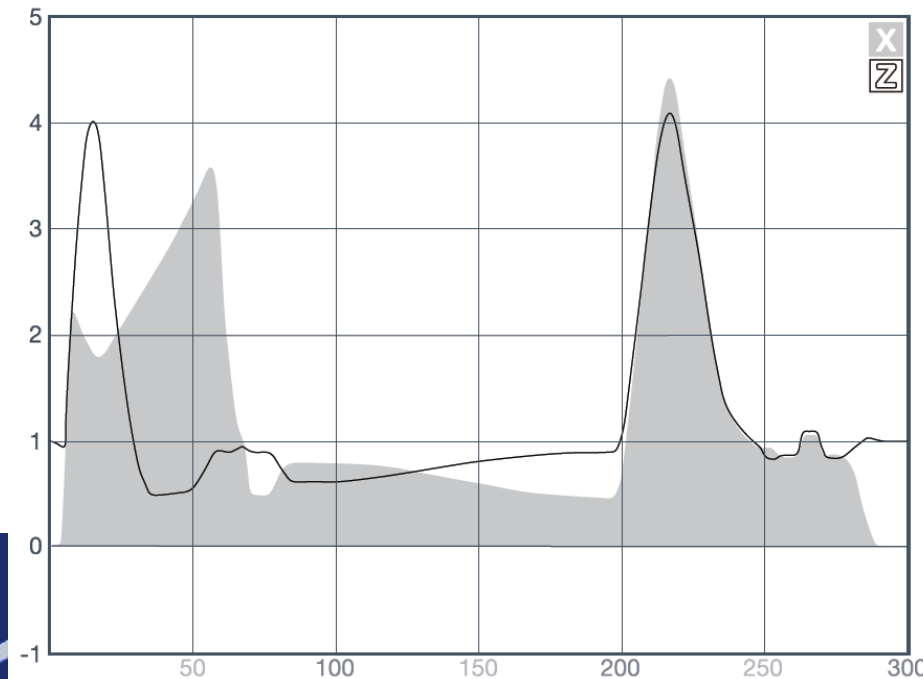
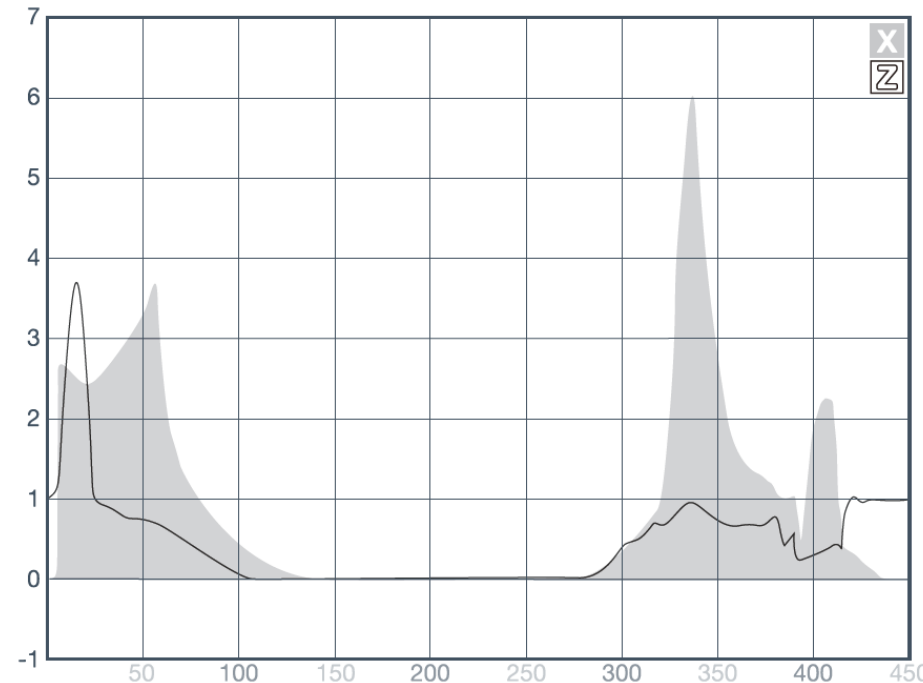
- 2014: Tolerance of Centrifuge-Simulated Suborbital Spaceflight by Medical Condition
- 2014: Subject Anxiety and Psychological Considerations for Centrifuge-Simulated Suborbital Spaceflight
- 2016: Screening and Mitigation of Layperson Anxiety in Aerospace Environments
- 2017: Effects of Training on Anxiety and Task Performance in Simulated Suborbital Spaceflight

Goals

- Understand how minimally trained laypersons perform during simulated emergency scenarios in centrifuge-simulated suborbital spaceflight
- Identify preconceptions of risk, training requirements, emergency preparedness, and the safety of the commercial spaceflight industry
- Identify opportunities for public outreach or SFP education to address risk and better enable the informed consent process

Centrifuge Profiles

- Centrifuge profiles:
 - Single-directional acceleration
 - $+G_z$ (head-to-toe)
 - $+G_x$ (chest-to-back)
 - Combined profiles
 - Designed to simulate flight
 - Simulated Emergency Scenario



Results

In brief:

- Most subjects felt training sufficient
 - Positives:
 - Clear explanations
 - Trainer experience / first-hand knowledge
 - Practice sessions / hands-on training
- 80% believe training should be required

- Emergency task performance:
 - Significant discrepancy between performance and perception
 - Common errors:
 - “Wait to start” commands
 - Task details
 - Harness application
 - 86%: address at more detail, practice before flight / simulation

Results

PUBLICATIONS

- Suresh R, Blue RS, Mathers CH, Castleberry TL, Vanderploeg JM. Dysrhythmias in Laypersons during Centrifuge-Simulated Suborbital Spaceflight. *Aerosp Med Hum Perform* 2017; 88(11)1-8.
- Suresh R, Blue RS, Mathers CH, Castleberry TL, Vanderploeg JM. Sustained Accelerated Idioventricular Rhythm in a Centrifuge-Simulated Suborbital Spaceflight. *Aerosp Med Hum Perform* 2017; 88(8): 1-5.
- Blue RS, Bonato F, Seaton K, Bubka A, Vardiman JL, Mathers CH, et al. The Effects of Training on Anxiety and Task Performance in Simulated Suborbital Spaceflight. *Aerosp Med Hum Perform* 2017; 88(7): 641-650.

PRESENTATIONS

- Aerospace Medical Association Annual Scientific Meeting, Denver, CO, May 2017 – 6 panel presentations
- Aerospace Medical Association Annual Scientific Meeting, Dallas, TX, May 2018 - anticipated

Conclusions and Future Work

- Numerous further publications planned
 - The Role of Public Opinion in the Viability of the Commercial Human Spaceflight Industry
 - Insight and Task Performance in Simulated Suborbital Spaceflight: Implications for Informed Consent
 - Training Effects on Motion Sickness During Simulated Commercial Spaceflight
 - Aggregate Findings of Layperson Tolerance in Centrifuge-Simulated Suborbital Spaceflight
- Follow on Studies
 - Facial Recognition of Anxiety for Early Intervention?

TASK 308. ASSESSMENT OF SCREENING AND TRAINING REQUIREMENTS FOR SFPs REGARDING ANXIETY DURING REPEATED EXPOSURES TO SUSTAINED HIGH ACCELERATION

PROJECT AT-A-GLANCE

- University: The University of Texas Medical Branch
- Principal Investigator: James Vanderploeg, MD, MPH
- Co-Investigators: Rebecca Blue, MD, MPH; Tarah Castleberry, DO, MPH; Charles Mathers, MD, MPH, Johnene Vardiman, MS
- Residents: Rahul Suresh, MD

RELEVANCE TO COMMERCIAL SPACE INDUSTRY

- The viability of the commercial spaceflight industry will be dependent upon layperson participation, which requires a perception that flights are safe and enjoyable.
- Spaceflight participants are likely to have expectations regarding training and risk mitigation; efforts towards meeting expectations or educating the public may have beneficial effects for the industry.
- Spaceflight participants may have difficulty performing tasks in stressful scenarios, but may not fully understand how their own actions affect the risk profile of spaceflight activities

STATEMENT OF WORK

- Understand how minimally trained laypersons perform during simulated emergency in centrifuge-simulated suborbital spaceflight
- Identify preconceptions of risk, training requirements, and commercial spaceflight safety



STATUS

- Project data collection completed
- 157 subjects recruited, centrifuge trials completed June 2016
- Data analysis completed 2017

FUTURE WORK

- Presentation and publication of significant findings – publication anticipated 2018, presentation expected at Aerospace Medical Association Annual Scientific Meeting 2018
- Publication anticipated 2018, *Aerospace Medicine and Human Performance*