COE CST Sixth 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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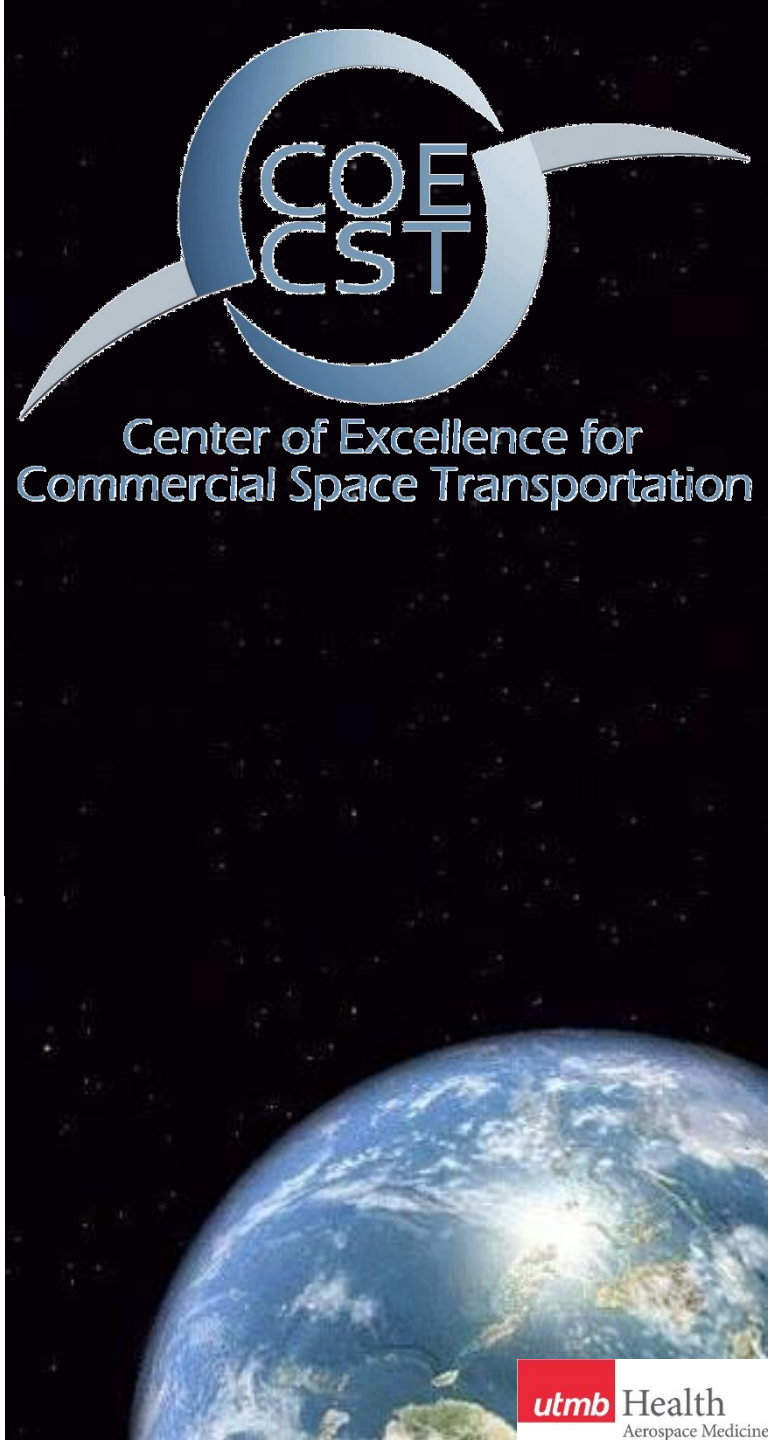
Las Cruces, NM



Agenda

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

Team Members

- Rebecca S. Blue, MD, MPH; James M. Vanderploeg, MD, MPH; Johnené L. Vardiman, MS; Charles Mathers, MD, MPH; Tarah L. Castleberry, DO, MPH
- Collaborators: ; Frederick Bonato, PhD; Kimberly Seaton, PhD; Andrea Bubka, PhD
- Students: Rahul Suresh, MD

- Organizations
  - University of Texas Medical Branch
  - National AeroSpace Training and Research Center (NASTAR)
  - Montclair State University
  - St Peter's University

Task Description

- In commercial suborbital spaceflight, anxiousness could become mission-impacting, causing negative experiences or endangering the flight itself.

- It is important to identify and mitigate anxiety in spaceflight participants (SFPs) before it becomes problematic. However, there are currently no known effective methods to best identify or mitigate significant SFP anxiety in commercial spaceflight.

Preliminary Studies

- Multiple previous studies designed to provide understanding of layperson physiological response to hypergravity/acceleration (2012-2014)

- Blue RS, Pattarini JM, Reyes DP, Mulcahy RA, Garbino A, Mathers CH,Vardiman JL, Castleberry TL, Vanderploeg JM. Tolerance of Centrifuge-Simulated Suborbital Spaceflight by Medical Condition. Aviat Space Environ Med 2014; 85(7): 721-9.
  - 86 subjects, 20-78y, participated in centrifuge trials
  - 3 subjects voluntarily withdrew from testing for anxiety reasons
  - 12 subjects with anxiousness that interfered with experience or disrupted training

Schedule

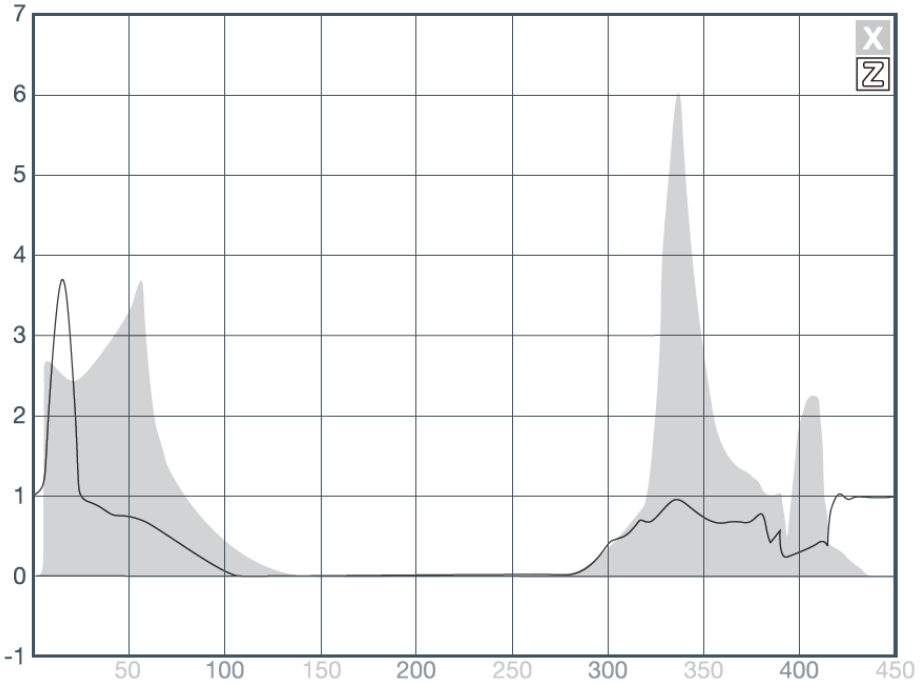
- Literature review: completed in 2015, published Oct 2016
  - Mulcahy RA, Blue RS, Vardiman JL, Castleberry TL, Vanderploeg JM. Screening and mitigation of layperson anxiety in aerospace environments. Aerosp Med Hum Perform. 2016; 87(10): 1-8.
  - Addressed methods of screening and mitigating anxiety during analogue and high stress environments
  - Provided background and literature supporting development of follow-on study protocol

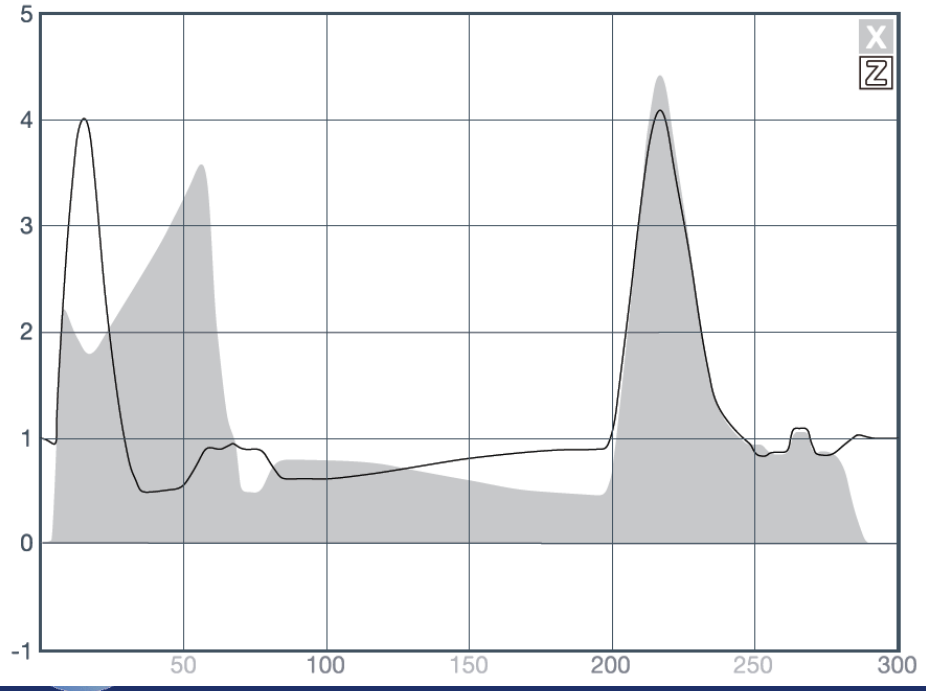
Schedule

- 2015-2016: Evaluation of Training Effects on Anxiety and Task Performance in Simulated Suborbital Spaceflight
  - Study design:
    - Comparison of training techniques, including alterations of length of training, didactics, psychological training and mitigation strategies, calming exercises
    - Evaluation of techniques to identify subject anxiety, predictors or factors related to high anxiety or subject withdrawal
  - Centrifuge trials: began Nov 2015; completed June 2016
  - Data analysis: June 2016-present

Centrifuge Profiles

- Centrifuge profiles:
  - Single-directional acceleration
    - +Gz (head-to-toe)
    - +Gx (chest-to-back)
  - Combined profiles
    - Designed to simulate flight





Goals

- Identify factors related to poor psychological tolerance of simulated spaceflight experience
- Provide data on how individuals with high anxiety levels can best be identified and prepared for suborbital spaceflight through training and anxiety mitigation techniques.
- Develop recommendations for optimal training protocols to reduce anxiety prior to and during suborbital flight

Results

- 157 subjects recruited for participation in centrifuge trials
  - 29 subjects identified by investigators as concerning for poor tolerance or anxiety
  - 10 subjects opted out of one or more centrifuge runs secondary to poor tolerance (generally related to anxiety, motion sickness, or both)
  - Most successful training techniques include high-fidelity simulation independent of length of training; sequential and repetitive exposure can improve comfort
  - Few factors indicate a subject's ability to tolerate experience
  - Subjects most likely to report anxiety-related symptoms in anonymous format

Conclusions and Future Work

- SFP anxiety, panic, and withdrawal, and identifying those at greatest risk, will continue to be a challenge for the suborbital spaceflight industry.
- Training techniques should be designed to be as high-fidelity as possible
- Calming techniques may have some role in reducing anxiety

- Analysis ongoing –
- Presentation and publication of significant findings – anticipated 2017
- Presentation anticipated: Aerospace Medical Association Annual Scientific Meeting 2017, Denver, CO

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

utmb Health
Aerospace Medicine

PROJECT AT-A-GLANCE

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

RELEVANCE TO COMMERCIAL SPACE INDUSTRY

- Psychological stressors can be significant challenges in the operational environment, and laypersons with minimal training are at risk for high anxiety and potentially mission-impacting psychological sequelae during commercial flight.
- This study aims to evaluate the risk of anxiety during commercial spaceflight activities and to develop effective mitigation techniques and identify and best assist those at greatest risk.

STATEMENT OF WORK

- Identify individuals with high anxiety levels through screening questionnaires and psychological testing
- Develop risk mitigation strategies and training techniques for individuals with higher levels of anxiety
- Develop recommendations for optimum training protocols to reduce anxiety prior to and during suborbital flight

STATUS

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

FUTURE WORK

- Presentation and publication of significant findings – publication anticipated 2017, presentation expected at Aerospace Medical Association Annual Scientific Meeting 2017, Denver, CO