

COE CST Eleventh Annual Technical Meeting

Task 400 - Development of Commercial Space Occupational Medicine Health Standards

**William (Ed) Powers, MD, MS
Rebecca Blue, MD, MPH**



Center of Excellence for
Commercial Space Transportation



Agenda

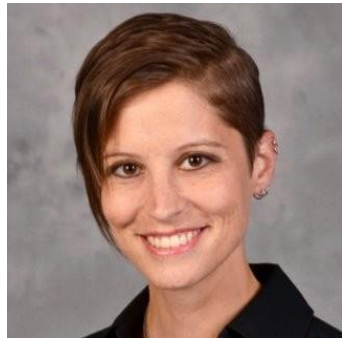
- Team Members
- Task Description
- Schedule
- Goals
- Results
- Conclusions and Future Work

Team Members

- Principal Investigators



- William (Ed) Powers, MD, MS



- Rebecca Blue, MD, MPH



Working together to work wonders.™

Team Members

- Students

- Michael Rhode, MD, MBA, MPH



- William Fernandez, MD, MPH



- John Marshall, MD, MPH



Team Members

- Students

- Quinn Dufurrena, MD, MPH

- Karen Ong, MD, PhD

- Kristy Ray, DO, MPH



Team Members

- Students
 - Bashir El-Khoury, MD
 - Brian Hanshaw, DO
 - Isaiah Reeves, MD



Team Members

- Industry and Research Partners
 - Center for Polar Medical Operations at UTMB
 - Environmental Tectonics Corporation (ETC)
National Aerospace Training and Research (NASTAR)



Team Members

Environmental Tectonics Corporation (ETC)

National Aerospace Training and Research (NASTAR)



ATFS-400 Human Centrifuge

Task Description

The original task was intended to develop occupational medicine standards for space workers and to develop or determine the appropriate medical tests and medical monitoring required. However, due to a variety of circumstances, the time allotted for this project was reduced and the original plan was modified.

The most common medically disqualifying medical conditions for spaceflight were identified. Appropriate monitoring technology was determined. Fifty human test subjects were selected for testing in the extreme environment of simulated space launch and landing utilizing a human centrifuge. The test subjects consisted of a group of fit men and women and a group of people who had medical issues that are currently disqualifying for spaceflight.

The test subjects were medically monitored during the extreme environment experience to observe the effect on their medical status.

Task Description

Prior UTMB Work Funded by FAA COE CST:

- Design and Operational Considerations for Human Space Flight Occupant Safety
- Suborbital Spaceflight Participant Anxiety Assessment
- Increasing Cabin Survivability in Commercial Spacecraft
- Suborbital Pilot Training Assessment
- Wearable Biomedical Monitoring Equipment
- Centrifuge Testing/Testing and Training of Personnel and Hardware in High-G Profiles Using the NASTAR Center Centrifuge
- Development of Minor Injury Severity Scale for Orbital Human Spaceflight

Schedule

Phase 1

August/September 2020 – Initial organization and discussion of project and assignment of research topics to various graduate students

October/November/December 2020 – Literature search and mining of population data from Polar Medical Operations and various other resources

Schedule

Phase 2

January-June 2021 – Determination of medical conditions to monitor and selection of appropriate monitoring methods and technologies

July 2021 – September 2021 – Advertisement for test subjects and selection of appropriate test subjects

October 2021 - March 2022 – Testing in the human centrifuge

April 2022 and forward – Production of written products

May 31, 2022 - Deadline for completion of project

Goals

The original goal of this task was to produce occupational medical standards for the population of future space workers based on the ability to monitor various medical conditions that have previously been disqualifying for flight.

The results of this study will provide the commercial space industry with guidelines for the evaluation of space workers and reduce the risk of flying those individuals who would have previously been disqualified for flight. Collaboration with industry for assessing human factors and electronic device usability is crucial. The analysis of wearable medical monitoring technology will establish a new standard for commercial spaceflight.

Results

50 test subjects were attached to monitoring devices that included continuous electrocardiography and glucose monitoring. The test subjects were given centrifuge run profiles that duplicated conditions for capsule based launch and landing (Gx forces) and winged spacecraft launch and landing (Gx and Gz forces).

Data from this study are currently being analyzed.

Publications, Presentations, Awards, & Recognitions

PRESENTATION

- **Abstract was presented at the 2021 Aerospace Medical Association Annual Meeting in October, “Development of Commercial Space Occupational Medicine Health Standards”**

Conclusions and Future Work

Review of raw data from this study shows that the forces associated with launch and landing of space vehicles does not have a significant negative effect on individuals with medical conditions that have historically been disqualifying.

Data from previous tasks funded by the FAA COE CST will be compiled with data from this study to provide analysis of over 300 test subjects who have experienced simulated spaceflight launch and landing conditions.

Future work includes applying wearable technologies to astronauts or commercial space travelers when they embark on a space journey in order to further evaluate medical monitoring capability in the space environment.