COE CST Tenth Annual Technical Meeting

Task 400 - Development of Commercial Space Occupational Medicine Health Standards

Ed Powers, MD, MS

Agenda

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

Team Members

Principle Investigator

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Working together to work wonders.™

Team Members

Industry and Research Partners

- Center for Polar Medical Operations at UTMB
- Environmental Tectonics Corporation (ETC)
  National Aerospace Training and Research (NASTAR)
- Danish Aerospace Company
- Axiom Space

Team Members

Center for Polar Medical Operations

Center for Polar Medical Operations (CPMO) at UTMB serves the National Science Foundation's US Antarctic Program, enabling vital scientific research from the most remote places on earth. The CPMO is responsible for the medical screening of all participants who travel to Antarctica each year, as well as providing the healthcare providers (physicians, mid-levels and various other clinical roles), resupplying the stations with medical supplies and medications, and real-time medical support via telemedicine and other assets.

Team Members

Environmental Tectonics Corporation (ETC)
National Aerospace Training and Research (NASTAR)

ATFS-400 Human Centrifuge

Team Members

Environmental Tectonics Corporation (ETC)
National Aerospace Training and Research (NASTAR)

Altitude Chamber

Team Members

Danish Aerospace Company

Danish Aerospace Company (DAC) is a high-tech company operating in the area of advanced medical instrumentation and other engineering fields primarily within space applications.

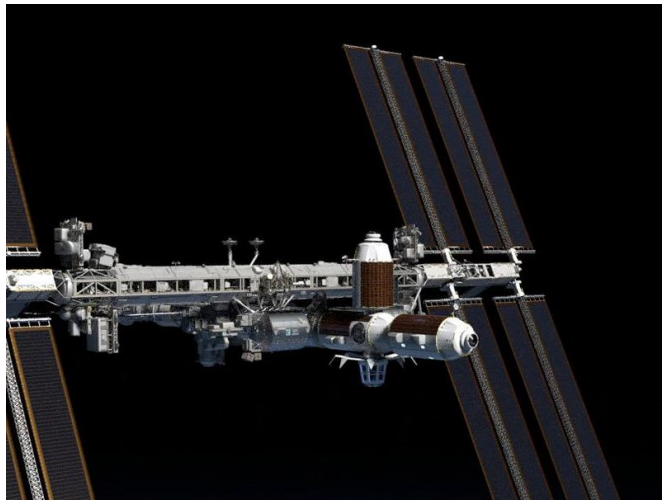
Team Members

Danish Aerospace Company

1993: Anthorack was launched and used on Space Shuttle Columbia (D-2 STS-55)
1993: First Damec Shuttle ergometer launched on Space Shuttle Endeavour
1995: RMS-II equipment launched on Progress vehicle for the Russian Space Station Mir
2001: First CEVIS ergometer launched to ISS
2003: ARMS-equipment launched and operated on Columbia (STS-107)
2005: PFS equipment was launched for ISS
2006: The first of three MELFI Freezer with Damec parts was launched for ISS
2009: Portable PFS equipment launched for ISS
2010: The final MELFI freezer with Damec parts was launched for ISS
2015: SDM Mission with Andreas Mogensen – 2 pcs of hw & 6 experiments supported
2016: First ASA Aquaporin Water recovery contract with ESA

Team Members

Axiom Space



“Missions to the International Space Station today. The world’s first commercial space station tomorrow.”

Task Description

The task is intended to review occupational standards for various populations working in environments analogous to that found in a sub-orbital or orbital flight, to develop occupational medicine standards for space workers and to develop or determine the appropriate medical tests and medical monitoring required. Wearable medical monitoring technology will be analyzed and tested in extreme conditions analogous to spaceflight.

This protocol will include collaboration with industry for portions of assessing human factors and electronic device usability. Collaboration may include use of the ETC/NASTAR centrifuge gondola, sensor hardware and software assistance from Danish Aerospace Company, and a testing environment platform from Axiom Space, Inc.

Task Description

Phase 1

Review current literature regarding medical standards for populations analogous to a group of scientists performing experiments and survival-related tasks in an orbital/suborbital environment (at a lesser qualification standard than astronaut).

Define the human factors that would jeopardize participant health or mission completion and perform a preliminary review of appropriate monitoring and testing hardware and software.

Task Description

Phase 2

Based on the literature review and identified human factors of interest defined in Phase 1, develop or determine appropriate tests and monitoring technologies (such as wearable monitors). Monitoring procedures will be established and tested under extreme conditions such as high G and hypobaric atmospheres.

Additionally, in support of the aims above we will solicit industry participation in the process to ensure consensus and outcome applicability to the extent possible.

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 appropriate monitoring methods and technologies

July-October 2021 – Testing of selected technologies

November/December 2021 – Production of written products

December 31, 2021 - Deadline for completion of project

Goals

The goal of this task is 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

Results from this study are pending.

Publications, Presentations, Awards, & Recognitions

Results from this study are pending.

Conclusions and Future Work

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.