

# REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHB-21-01

## CHARACTERIZATION OF THE AIRMEN RESPONSE TO SUSTAINED HIGH-G

**PROJECT DESCRIPTION:** Aircraft technology is constantly evolving and demanding more of pilots to be able to use the full capability of the systems. While the mechanics of the aircraft are well characterized and tracked, little is known about the physiologic and biomechanical stresses placed upon the pilot during different phases of flight. G-forces are one of the largest stressors to a pilot during flight, training for which is carried out on man-rated centrifuges. However, training remains subjective and reliant upon the experience of a small handful of expert's observations. This project will leverage the ongoing training in the centrifuge located at WPAFB along with a variety of sensing technologies to better characterize a pilot's performance during High-G maneuvers. Data collected from load cells and accelerometers on the seat to understand how the pilot is interfacing with the structure, while high speed cameras will be used for eye tracking and 3D motion capture. Eye tracking will focus not only on the pilot's attention and gaze, but also physiologic indicators such as pupil dilation and tracking. Merging all of this information into a cohesive story will allow for improved training for pilots as well as new insights into objective measures of the effects of G's and G-tolerance.

**ACADEMIC LEVEL:** Bachelors, Masters, PhD

### DISCIPLINE NEEDED:

- Computer, Information, and Data Sciences
  - Data Science
  - Graphics and Visualization
  - Human Computer Interaction
- Engineering
  - Bioengineering and Biomedical Engineering
  - Computer and Systems Engineering
  - Engineering (General)
  - Systems Engineering
- Life Health and Medical Sciences
  - Physiology

**RESEARCH LOCATION:** Wright-Patterson AFB Dayton, OH

**RESEARCH ADVISER:** Chris Dooley, MS  
Mechanical Engineering, Johns Hopkins University, 2016

Chris Dooley, MS, is a biomedical engineer within the Warfighter Medical Optimization Branch of the Air Force Research Laboratories 711th Human Performance Wing. Mr. Dooley conducts and oversees research in a multitude of disciplines all focused on ameliorating the biomedical impact of flight on both healthy and unhealthy airmen. Mr. Dooley brings experience in biomechanics, injury mitigation, biodynamics, and physiologic sensing. He received his Bachelor's in Biomedical Engineering from Ohio State where he focused on biomechanics and biomaterials while writing his undergraduate thesis on thoracic impacts during motor vehicle crashes. His Master's in Mechanical Engineering was awarded through Johns Hopkins University with a focus in biomechanics and kinematics where he completed a

Master's Thesis characterizing spinal motion and injury association during under body blast events. Before joining AFRL, Mr. Dooley worked at Johns Hopkins University Applied Physics Lab combining data from a multitude of sources (i.e. accelerometers, acoustic sensors, 3D motion tracking, CT, high speed video and X-ray, etc.) to better understand and protect warfighters from both blast, ballistic, and blunt impact threats.