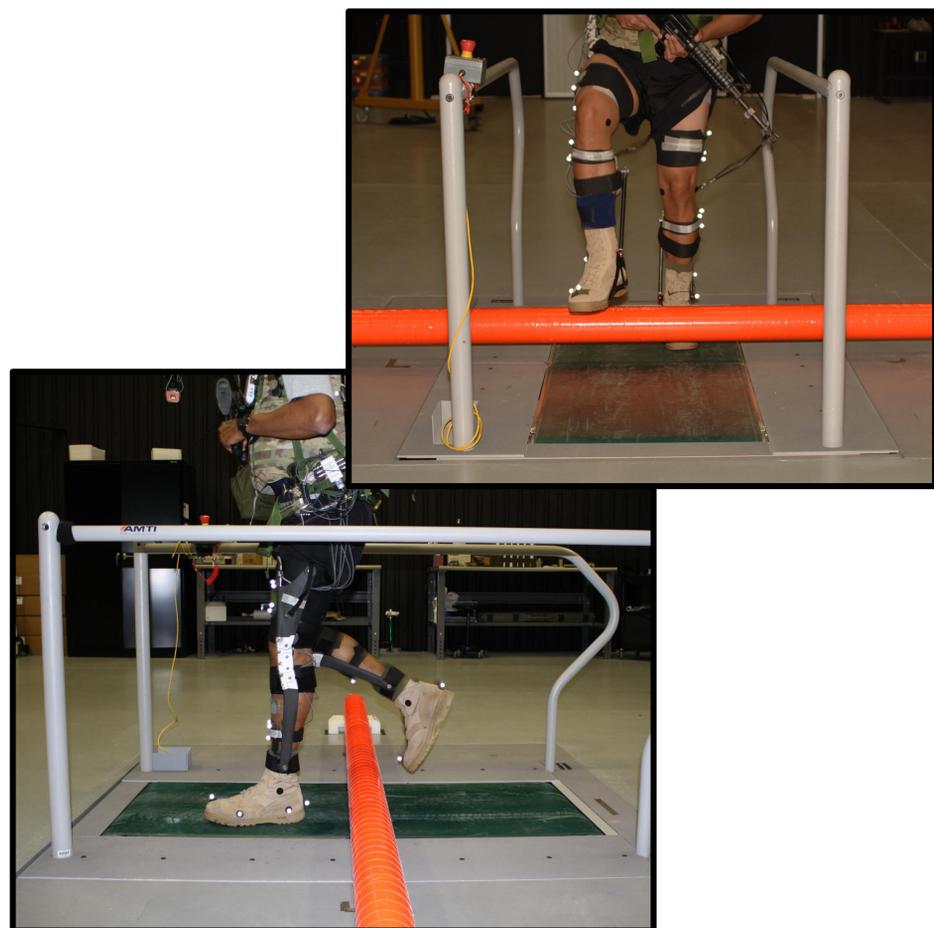


S&T Campaign: Human Sciences
*Human Capability Enhancement
Augmentation*

H. Philip Crowell, PhD
(410) 278-5986
harrison.p.crowell.civ@mail.mil

Research Objective

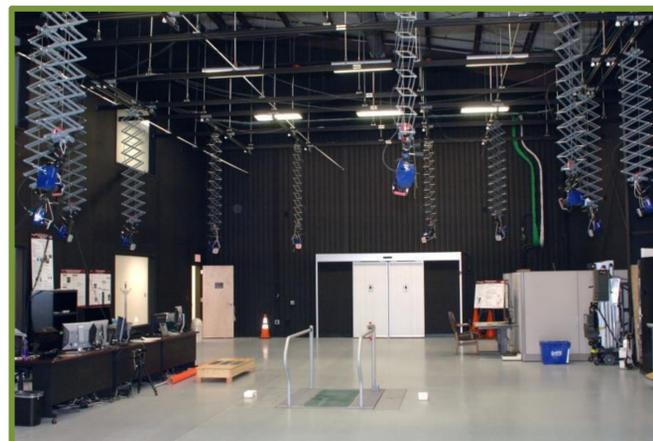
- Identify the control parameters that affect human gait so that effective control algorithms can be developed for exoskeletons and other personal augmentation systems for Soldiers
- Understand the parameters used to control human gait under the conditions and in the environments in which dismounted Soldiers operate (e.g., carrying a heavy rucksack and walking up and down hills or tactical movements on uneven terrain)



Examples of personal augmentation devices developed for the DARPA Warrior Web program

ARL Facilities and Capabilities Available to Support Collaborative Research

- **Soldier Performance and Equipment Advanced Research (SPEAR) Facility at APG, MD**
 - Biomechanics Laboratory
 - Instrumented Obstacle Course
 - Cross Country Course with WiFi Network
- **Portable Cardiopulmonary Exercise Testing Equipment**
- **Electromyographic Systems (Surface and Indwelling Electrodes)**



Soldier Performance and Equipment Advanced Research (SPEAR) Facility (Clockwise from the top: Biomechanics Laboratory, Obstacle Course, Cross Country Course)

Challenges

- Identifying all of the parameters that control gait and understanding which parameters take priority in specific situations
- Understanding how anatomical and physiological differences among individuals affect a particular control strategy
- Developing models of human gait that incorporate various control parameters and apply them in ways that are appropriate for the conditions and environments that Soldiers encounter

Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Theoretical and experimental motor control researchers
- Pattern recognition and machine learning specialists
- Human performance modelers
- Control algorithm developers