CAVS Overview

- Research Center at Mississippi State University
- ~250 Faculty, Staff and Students
- Major Areas of Research
  - Human Factors and Ergonomics
  - Materials and Computational Manufacturing Design
  - Computer Simulation, Resources, and Training
HFE LAB

- Researchers from many fields
  - Cognitive Psychology
  - Biomechanics
  - Human Factors
  - Ergonomics
- Recent and Current Projects
  - US Army Virtual Soldier Research
  - Automotive Manufacturing Workspaces
  - Automotive Design

What We Do

- Ergonomics
- Usability/Interface design
- Effective Multitasking
- Situation Awareness
- Vision and Memory
- Decision making
- Strategic thinking
- Skill acquisition
- Team Dynamics and Communication
History of Law Enforcement Research

- US Army Virtual Soldier Research
  - Computer simulation of soldier performance
  - Simulations Need Real World Data
- Local Law Enforcement
  - Tactical activities similar to MOUT activities
  - Unique and interesting research issues in Law Enforcement operations

An Example: New Technology

- US Army Future Combat Systems Land Warrior

- Is it reliable?
- Most important, is it the right technology for the task?

The Army's New Land Warrior Gear: Why Soldiers Don't Like It - Popular Mechanics
Real Problems, Real Solutions

- **Applied Research**
  - Partners come to us with issues
  - Work closely with partners to plan research and find funding
  - Work toward practical solutions

- **Basic Science**
  - Applied Projects Can Contribute to Scientific Understanding

Research Opportunities for Law Enforcement

- **LE Operations**
  - Tactical, Patrol, Traffic, Dispatch, etc.

- **Safety**
  - Officer: General well being/long term risk/high risk activities
  - Public: Minimize risk, perception of LE

- **Performance and Reliability**
  - Accuracy, speed, decision making, training, equipment
Current Ongoing Projects

- Evaluating Weapons Qualification
- Evaluating Tactical Team Training
- Analyzing Tactical Planning
- Training Tactical Capabilities for Patrol Officers
- High Performance Driving
- Personal Body Armor and Equipment

Vision During Firing Exercises

Sight Alignment

Target Alignment

Static or Dynamic Shooting Situations

Eye Tracker
Tactical Team Operations

- Making Available Video and Analysis Resources for Tactical Training Operations
- Analyzing Tactical Team Planning/Decision Making

Patrol Officer Active Shooter Training

- Patrol Officer Rapid Response to Active Shooter Scenarios (i.e. Virginia Tech)
  - BJA Proposal for Training Funds
  - Evaluate Train-the-trainer
  - Evaluate effectiveness of training for patrol officer performance
Location-Specific Training

- Use Gaming Environments
  - Build accurate videogame levels based on real-world settings

- Training Tools
  - Officers learn the layout of buildings not usually available for training activities

- Action Planning Tools
  - View layouts of buildings in the field
  - Analyze architecture to identify danger zones

Vision and Memory

- Target Discrimination
  - Visual scanning and memory
  - Low-Light Conditions

- Post-Event Memory
  - Testing memory and debriefing techniques
  - Improve reports/testimony
Visual Scanning During High Performance Driving

- Analyze the driver’s task
  - Observe driver training at MLEOTA
- Identify issues, develop and test solutions

Emergency Response Driving

- Motion-Base Simulator
  - High-fidelity scenario testing
  - Research and training applications
- Multitasking
- Hazard Identification and Avoidance
- Strategies for Tunnel Vision
Body Armor Ergonomics

- Impact on Biomechanics and Task Performance
  - Range of Motion
  - Weapons Handling
  - Dynamic Movements

Extended Coverage

- 3000+ Body Armor Saves
- Serious Design Issues
  - Weak Areas
  - Coverage Focused on Fatal Zones
  - Weight
  - Temperature

- Possible New Designs
  - Protect non-fatal zones
  - Analyze ergonomic impact
  - Improve return-to-work for wounded officers
  - Reduce likelihood of permanent disability
Research Projects on the Horizon

- Team Dynamics
- Vehicle Design
- Attention and Situation Awareness

Team Performance

- Team Dynamics
  - Maintaining Team Communication
  - Impact of Loss of Team Leader
- Tactical Roles in Teams
- Team Decision Making and Tactics
- Interdepartment operations and training
Police Vehicle Design

- Equipment location, storage, and access:
  - Space requirements
  - Ergonomics of cab design
  - Cognitive interface design
- Future capabilities:
  - Heads-up display
  - Augmented reality

Future?}

Vehicle Ergonomics

- Rapid ingress/egress from vehicle
  - Impact of equipment and armor
- Seat Design
  - Comfort
  - Lower back support
Attentional Issues

- Perception + Cognition + Memory
  - What is the officer aware of?
  - What can the officer remember?

- Tunnel vision
  - When is attention narrowed?
  - How can tunnel vision be avoided?

Weapon Focus
  - Inability to attend to anything other than the assailant’s weapon

Tactical Team Competition

- Exploring possibility of co-hosting a small local or state competition
- Primary focus on team-based operations
- May include individual performance competitions
- If successful, following competitions may include keynote speakers and training sessions
Many Projects suggests...
Potential for a Research Center focused on Human Factors and Ergonomics for Law Enforcement

Vision for Research Center

- Research activities focused on providing real answers to real problems
- Collaboration with departments state- and nation-wide
- State-of-the-art facilities available for research and training
  - Simunition shoothouse
  - Video/Audio/Motion recording equipment
  - Biometric/Cognitive measures of performance
- Test and evaluate:
  - Equipment and Vehicle Design
  - Training
  - Tactics
What We Need

- **Partners**
  - Bring us your problems
  - Allow access to officers for research
  - Provide expertise on current training and operations
  - Comment on and review our work

- **Support**
  - If you think we can be helpful, spread the word

Summary

- Researchers at State looking for real-world human factors issues
- Collaborate on proposals for funding
- Possibility for a local tactical team competition
- Potential for a state-of-the-art research center focused on law enforcement
Thanks

- Information on our current research programs available
- Contact info:

Daniel Carruth
Email: dwc2@cavs.msstate.edu
Phone: 662-325-5446