

# CAVS

## LAW ENFORCEMENT RESEARCH INITIATIVE

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## 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



1955

2007



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:

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