Human Systems CoI Taxonomy/Mission

HSCoI Sub Areas: Personalized Assessment, Education & Training

Dr. Elizabeth Uhl (Army)

1.0 Personalized Assessment, Education, and Training

Right Person with the Right Training in the Right Job on the Right Team at the Right Time

VISION

A readiness ecosystem to identify and develop knowledge, skills, competencies, and experiences to be mission ready for the 21st century operating environment

Metrics: Selection, Assignment, and Learning Assessment

Models: Readiness, Learning, and Performance Monitoring

Practices: Learning Sciences adapted to Military Needs

Technologies: Virtual, Augmented, Mixed Reality, and Intelligent Tutors across the Training Spectrum

OPERATIONAL OPPORTUNITIES:

- Synthetic operational training and test infrastructure capability that enables us to Train-as-we-fight with advanced warfighting capabilities and complex joint-all-domain environments
- Individualized proficiency-based learning environments, technologies, and training paradigms for mission ready multi-capable warfighters
- Personalized assessments and data-driven analytics of training, education, readiness, and mission effectiveness for career-long talent management, individual learning, and organizational learning
- Environments enabling sophisticated autonomous systems and human operators to train as teams in operationally relevant contexts

ENDURING CHALLENGES (OPERATIONAL CONSTRAINTS):

- Inadequate ranges and training infrastructure for advanced weapon system capabilities
- Live training potentially exposes capabilities and tactics
- Dynamic, evolving operational environments and adversaries
- Limited resources for manpower, training, and education
- Increased technological parity with adversaries

PAE&T Taxonomy

1.1 Personnel Selection and Assignment

1.1.1: Individualized Measures of Aptitude and Competencies *

1.1.2: Career-Long Outcome Measures *

1.1.3: Predictive Models of Performance, Learning, Counterproductive Behaviors, and Retention

1.2 Instruction/Training Design, Assessment, and Readiness Monitoring

1.2.1: Data, Advanced Analytics, and Learning Sciences

1.2.2: Cognitive and Performance Modeling

1.2.3: Innovative Instructional Design and Methodologies

1.3 Advanced Learning Technologies

1.3.1: VR/AR/MR and Integrated Simulation Systems

1.3.2: Intelligent Tutoring and Assessment Systems

1.3.3: Training for Human-Machine Teams *

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Human Systems CoI Taxonomy/Mission

HSCoI Sub Areas: Systems Interfaces & Cognitive Processes

Dr. Mark Draper (Air Force)

2.0

Systems Interfaces & Cognitive Processes

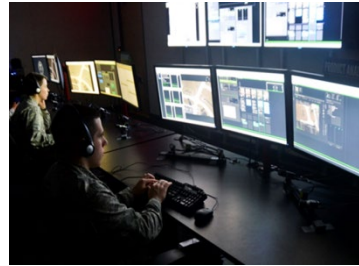*Effective, Natural Human-Machine Teaming*

VISION

Supporting Warfighter teams with agents and machines through intuitive, individualized, and adaptive interactions.
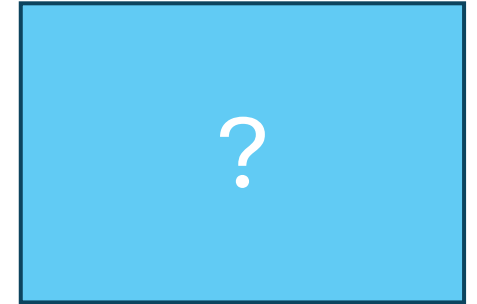

Joint-All-Domain Operations

Team Performance Assessment

Human-Machine Teaming

Quantified Warrior

Special Project: OHIO

OPERATIONAL CAPABILITY OPPORTUNITIES:	ENDURING CHALLENGES/NEEDS:
• Maximize performance by coupling humans & intelligent machines	• *Metrics & baselining, joint cognitive systems*
	• *Robust, reliable natural language interfaces*
• Continually optimized warfighter performance	• *Real-time assessment & prediction of warfighter performance & functional state*
• Intuitive & contextually aware decision aiding & courses of action	• *Robust cognitive models & architectures for autonomous agents*
	• *Dynamic calibration of system transparency*
• Agile response to unexpected events	• *Intelligent task/attention management aids and processes*
• Manage perceptual abilities to exploit information throughput	• *Multisensory adaptive interfaces that enhance, not interfere*
• Interfaces that adapt to individual differences	• *Identification of reliable individual difference factors for design*
• Highly effective distributed Teams	• *Workflow models & tools to dynamically assess team performance*
	• *Team collaborative/communication tools & coordination methods*

2.0 SICP Taxonomy

2.1 Understanding Human/Cognitive Processing [WITHIN HUMAN]

2.1.1: Perception (Unitary and Multi-sensory) *

2.1.2: Dynamic Operator Functional State Assessment *

2.1.3: Cog Neuroscience/Performance Augmentation *

2.2 Human-Machine Interaction and Aiding [HUMAN-MACHINE]

2.2.1: Advanced Interface Methods (Adaptive, Multi-modal)

2.2.2: Intelligent Decision Aiding/Support

2.2.3: Dynamic/Adaptive Task Allocation and Authority Transfer (*)

2.2.4: Trust Calibration & Transparency

2.3 System Level Interfaces & Teaming [HUMAN-SYSTEM]

2.3.1: System Analyses and HSI (Organization) *

2.3.2: Teams: Processes, **Decision Aids**, Performance & Metrics (Shared SA;Cohesion) (*)

2.3.3: Data Analytics/ Socio-Cultural Analytics/ Exploitation Tools *

2.3.4: System Interface Design and Application

(*) Previous Gap

* Previous and Current Gap

* New Gap

Human Systems CoI Taxonomy/Mission

HSCoI Sub Areas: Protection, Sustainment,
and Warfighter Performance

Dr. Logan Williams (Air Force)

Protection, Sustainment, and Warfighter Performance
Ensuring Warfighter Safety and Survivability

VISION

Enable superiority of Warfighters by understanding and overcoming key operational degradation stressors and providing protection from environmental threats.

Nutrition and Sustainment

Physical &Cognitive Augmentation

Wearable sensor technology

Protection and performance optimization

OPERATIONAL CAPABILITY GOALS & OPPORTUNITIES:

- Ubiquitous, unobtrusive real-world, real-time performance assessment will maintain peak warfighter readiness.
- Leveraging individual differences maximizes warfighter performance and protection.
- Enhanced technologies to optimize physical & cognitive performance, recovery, and reduce operational stressors produce a more ready/lethal force.
- Optimized nutrition to modulate and enhance health and performance sustains performance and readiness; 6.1 and 6.2 from BioTech feeds this area

ENDURING CHALLENGES:

- Lack of tri-service data repository, data standards, and authority to operate commercial wearable sensors prevents the collection of large-scale data and analysis
- Accounting for human variability to optimize mission performance by understanding how individual differences impact mission performance and warfighter readiness.
- Difficulties fully "stress-testing" performance interventions in simulated environments that don't replicate "fog of war"
- Transitioning from correlative biological measures to causative performance outcomes though robust testing & analysis.

3.0 PSWP Taxonomy

3.1 Sensing, Monitoring, and Assessment

3.1.1: Sensing and Monitoring (Incl. Wearables)

3.1.2: Assessment

## 3.2 Sustainment and Enhancement Technologies and Techniques

3.2.1: Training Enhancements

3.2.2: Physical & Cognitive Augmentation

3.2.3: Nutraceutical Interventions & Treatments

TECH/CAPABILITY GAPS:

- (3.1.1) Ubiquitous sensor technology and data collection/analysis infrastructure will provide real-time real-world performance data, to inform, predict, and optimize unit readiness (physical & psychological)
- (3.1.2) Advanced algorithms that account for the influence of human variability allow system optimization for human interactions, including human-machine teaming with semi-autonomous assets
- (3.2.1/3.2.2) Understanding the who, what, when, and how allows targeted development of materiel/non-material sustainment and enhancement interventions which maximize protection and performance (e.g. neurostimulation, nutrition, fatigue management, training, etc.)
- (3.2.3) Understanding how the gut responds to military stressors & nutrient intake may lead to meaningful interventions which optimize warfighter performance
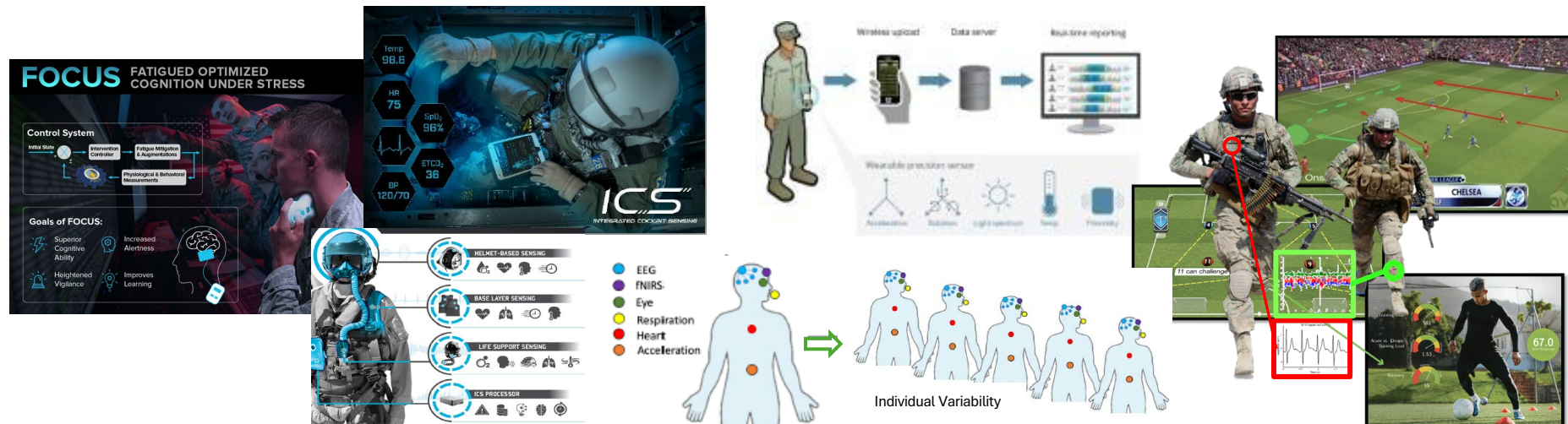
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Q&A

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