Human Systems Community of Interest

VISION

Develop and deliver innovative human-centered technologies to select, train, design, protect, and operate for improved and quantified mission effectiveness

Measurable Mission Effectiveness

GOALS

Enhance mission effectiveness:
Integrated simulations for mission training and experimentation

Human-machine designs for mission effectiveness

Operating through battlespace stresses

Mastering the PMESII* battle space

*political, military, economic, social, infrastructure, and information

Personalized Assessment, Education and Training
Right Person, Right Job, Right Skills

THRUST AREAS

- First Principles for Training Design
- Personnel Selection and Assignment

TECHNICAL CHALLENGES
- Pedagogical models for training development with validated high-resolution mission effectiveness metrics
- Computational models of human cognitive, psychomotor, and perceptual capabilities
- Cross-career performance and behavior metrics

OPERATIONAL OPPORTUNITIES
- Technologies for large scale Live, Virtual and Constructive (LVC) training environments:
  - Better models enable building more realistic synthetic agents to play blue or red forces
- Deliver life long learning:
  - Continuous career field learning and management

ACCOMPLISHMENTS & IMPACT ON CAPABILITY NEEDS
- Tailored Adaptive Personality Assessment System (TAPAS) increased precision of individual assessment - reduced attrition by 5%, initial military training by 3%, and conduct incidents by 5%
- Defined coalition mission essential competencies across the FVEY nations and USA, USAF, USMC - reduced costs by 50%
- Navy F-18 program leveraged a USAF training environment to reduce timeline and costs for Operational Flight Program (OFP) software modifications
- Joint Terminal Attack Controller Training and Rehearsal System (JTAC TRS) provided high-fidelity training environment, which enables transfer of training to the field

Success Story: Joint Terminal Attack Controller Training and Rehearsal System

System Interfaces and Cognitive Processes
Effective, Natural Human-Machine Teaming

THRUST AREAS

- Intelligent, Adaptive Aiding
- Human-Machine Teaming

TECHNICAL CHALLENGES
- Intuitive, multisensory, adaptive interfaces with natural language and gesture control
- Cognitive models and architectures for autonomous agents and synthetic teammates with increased trust calibration
- Tools for functional state assessment and decision support

OPERATIONAL OPPORTUNITIES
- Seamless human-machine interfaces to enable optimized weapon system and warfighter performance in all contested domains and mission environments:
  - Demonstrate highly effective, agile human-machine teaming
  - Create actively coordinated teams of multiple machines
  - Ensure safe and effective systems in uncertain and dynamic

ACCOMPLISHMENTS & IMPACT ON CAPABILITY NEEDS
- Global Mission Scheduling software improved mission planning tool, reducing USTRANSCOM/Air Mobility Command planned flying hours and fuel costs by $37M
- Enhanced Battlefield Airman Effectiveness program produced intuitive airman-centered equipment and interfaces that increased capability and reduce weight by 50%
- Army effort to apply cybernetic approach to human systems integration will achieve tighter control of devices and communication among humans and with machines
- Autonomy Research Pilot Initiative: Realizing Autonomy via Intelligent Adaptive Hybrid Control increased the robustness and transparency of autonomous control for multiple unmanned systems

Success Story: Realizing Autonomy via Intelligent Adaptive Hybrid Control

Protection, Sustainment, and Warfighter Performance
Ensuring Safety and Survivability

THRUST AREAS

- Understanding and Quantifying the Effects of Critical Stressors
- Critical Stressor Mitigation Strategies

TECHNICAL CHALLENGES
- Non-invasive sensors with no influence on performance
- Understanding how human variability affects warfighter performance and responses to stressors and augmentation
- High fidelity models to predict performance and injury, response to critical stressors, and model effects of augmentation

OPERATIONAL OPPORTUNITIES
- Real-time monitoring of Warfighter performance
- Understanding the underlying mechanisms through which performance is influenced
- Model individual responses to critical stressors to enable leveraging of individual variability to improve Warfighter performance

ACCOMPLISHMENTS & IMPACT ON CAPABILITY NEEDS
- Aerospace Physiology & Toxicology research on life support system problems mitigated aircrew risk and addresses safe-to-fly needs for next generation aircraft
- Soldier Systems Engineering Architecture effort was established to identify and develop human performance measures of merit to inform interaction among factors affecting mission performance
- Navy leveraged Army investments to develop underlying physics-based models of human motion that reduced cost and time of gear development
- DARPA's Warrior Web provided light weight physical augmentation that reduces fatigue from heavy physical loads and led to increased physical and cognitive performance

Success Story: Warrior Web

Human Aspects of Operations in Military Environments
Our Forces Prepared for Global Challenges

THRUST AREA

- Exploiting Social Data, Dominating Human Terrain, Effective Engagement

TECHNICAL CHALLENGES
- Advanced modeling and algorithms to process new social data streams for real-time actionable information
- Understanding new social dynamics: cyber-social behavior, global reach, and new social innovations
- Counter-measures, tactics, techniques, and procedures, and resources to guide military engagement in the human domain

OPERATIONAL OPPORTUNITIES
- Predictive, autonomous analytics to forecast and mitigate human threats and events
- Provide real-time situational awareness (SA):
  - Engage and defeat new adversaries and tactics
  - Anticipate human crises & mission problems

ACCOMPLISHMENTS & IMPACT ON CAPABILITY NEEDS
- Navy investment in behavioral and social cultural modeling research allowed USAF to shift an estimated $2M/yr for a program focusing on Intelligence Analysts
- Joint Army/Navy social media analysis and models program provided rapid situational awareness from social media helping discern information for course of action planning
- Developed algorithmic models based on social science theories to forecast geo-political events of interest with 80% accuracy Integrated Worldwide Crisis Early Warning System (W-ICEWS)
- Social Media Analysis Demonstration provided real-time understanding of the social media information environment for strategic communication SA during NATO's Trident Juncture 2015

Source: Knowledge Based Systems, Inc., Multi-Source Network Pulse Analyzer and Correlator

Success Story: Social Media Analysis Demonstration

Focus Going Forward

Five Pillars of 3rd Offset Strategy

HS COI Subareas Support Each Pillar

Learning Machines	Human-Machine Collaboration	Assisted Human Operations	Human-Machine Combat Teaming	Autonomous Weapons
Computational Models of Human Capabilities: *Cognitive *Psychomotor *Perceptual	Human-Machine Team Training Intuitive, Multi-sensory, Adaptive Interfaces Natural Language Interfaces	Predictive Performance Models Intelligent, Adaptive Aiding Physical Augmentation/ Exoskeletons	Trust Calibration and Transparency of System Autonomy Metrics of Mission Effectiveness at Individual and Unit Level	Systems that can take action, when needed Architectures for Autonomous Agents and Synthetic Teammates

Future Military Capabilities on HS COI Roadmaps

Personalized Assessment, Education and Training
- Large Scale LVC Training
- Joint Interoperable Training
- Globally Persistent Coalition Ops
- Optimal Cross-Career Talent Assessment and Management

System Interfaces and Cognitive Processes
- Intuitive Human-Machine Interaction with Natural Interfaces
- Seamless Teaming of Autonomous and Manned Systems
- Cognitive Status Assessment with Adaptive Aiding

Protection, Sustainment, and Warfighter Performance
- Real-Time Monitoring of Warfighter Performance with Individualized Optimization
- Warfighter Off-loading Technologies and Augmentation Devices/Exoskeletons

Human Aspects of Operations in Military Environments
- Mastering the Information Environment
- Mitigate threats by forecasting, indicators and warnings of human intent

Engagement Opportunities

➢ ***Defense Innovation Marketplace*** http://www.defenseinnovationmarketplace.mil

- Learn about DoD R&E investment priorities & tech requirements
- Link to specific solicitations such as Broad Area Announcements (BAAs) and the Small Business Innovative Research (SBIR) Program
- Link to Research & Engineering events, COI data, Technology Interchange Events
- Portal to securely share your HS relevant IR&D projects

➢ ***Human Systems related events to help shape future technologies and roadmaps***

DoD Human Factors Engineering Technical Advisory Group Meeting (HFE TAG): **9-13 May 2016**
- Annual forum for technical exchange on HFE applications and identification of HFE issues/technology gaps

Inter-service/Industry Training, Simulation, & Education Conference (I/ITSEC): **28 Nov-3 Dec 16**
- Annual networking event : government, industry and academia experts in training, sims & training systems

National Defense Industrial Association (NDIA) Human Systems Conference: **Feb 2017**
- Annual event to interact with key DoD leaders, discuss latest COI Roadmaps, and present industry efforts

Joint Human Systems COI Independent Research & Development (IR&D) Interchange: **Mid 2017**
- Bi-annual event with potential for 1-on-1 discussions on how your IR&D efforts can meet warfighter needs