**Senior Leader Perspective:** The last few years have marked an exciting time for those who perform personnel sciences research in DoD and the Army. Both the *National Defense Strategy* (2018) and the *Army Strategy* (2018) highlight the importance of talent management. Specifically, the *Army Strategy* notes, "We must overhaul our current personnel management system to attract, develop, and retain exceptional Leaders and Soldiers. We will more effectively manage careers through a new talent management system, and we will structure the force appropriately to place talent in the right echelons."

In line with the Army's vision to revolutionize its approach to talent management, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has embarked on four lines of scientific research. First, ARI is conducting groundbreaking research in personnel testing and assessment—key to providing the Army with the capability to identify the talents of its Soldiers. The validated assessments developed by ARI will result in improvements to Army accessions and assignment for enlisted and officers. Second, ARI is exploring applications of data science to develop completely new approaches to personnel science and management (e.g., new approaches to job analysis and test creation). Third, the Army has always had a strong commitment to developing its officers and NCOs, and ARI is executing research to enable the Army to assess and accelerate the acquisition of leader competencies *across* the Soldier lifecycle. Fourth, while the performance of individual Soldiers is clearly important, we cannot overlook that Soldiers operate in teams. Lethality is largely a team-based concept. However, the Army's current personnel system does not adopt optimal approaches to build, develop, and field the flexible, high-performing teams required for the dispersed and extended autonomous operations anticipated in the future. As such, ARI is exploring methods to improve personnel assignment to teams, as well as approaches to assess and improve team effectiveness for multi-domain operations.

I look forward to collaborating with you all during this exciting time for DoD and the Army! *Dr. Michelle Zbylut, HS CoI Army Lead and Director, ARI*

## Hails & Farewells

**Hail -** Dr. Patrick Baker, Director of Lethality, Survivability and Human Systems Integration CCDC - Data and Analysis Center, is a new Steering Group member. Welcome to the CoI!

**Hail** - Dr. Jessie Chen, Sr. Research Scientist for Soldier Performance in Socio-Technical Systems; is new to our Working Group

**Hail** - Ms. Rachel Weatherless, Human Research and Engineering Directorate at ARL, is also new to the Working Group.

**Farewell** - Dr. Marty Bink of ARI has taken an industry position. Marty provided outstanding insight into Army programs and has been replaced on the WG by ARI's Dr. Richard Hoffman, Team Lead Programs, Budget, & Strategies. Welcome to all!

**News -** Dr. Patrick Mason is the new S&T Advisory Group Lead for the ASBREM CoI which is great for strong collaborations!

## HUMAN SYSTEMS CoI

https://defenseinnovationmarketplace.dtic.mil/communities-of-interest/human-systems/

**Vision:** Develop & deliver technologies to enable, sustain, enhance and quantify human performance for measurably improved mission effectiveness

**Mission:** Enhance mission effectiveness through: 1) Integrated simulations for mission training and experimentation, 2) Human-machine designs for mission effectiveness, 3) Assessment of operator effectiveness, 4) Operating through battlespace stresses and 5) Mastering the PMESII battle space.

**Key Products:** Integrated service roadmaps; CoI taxonomy, budget & programs; seedling and tri-service ARAP proposals, collaboration opportunities; success stories.

**Feedback:** Please send comments to our Newsletter Editor: Alan.Livada.ctr@us.af.mil

| Key Personnel |
| --- |
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| COI Chair: Dr. Kevin Geiss, AF |
| Navy Lead: Dr. John Tangney |
| Army Lead: Dr. Michelle Zbylut |
| Army Lead: Dr. Corde Lane |
| Army Lead: Dr. Robb Wilcox |
| Army Lead: Dr. Patrick Baker |
| SOCOM Rep: Ms. Lisa Sanders |
| WG Chair: Ms. Roxanne Constable, AF |
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# Human Systems Community of Interest (HS CoI) Newsletter

## CoI Highlights - *Past Events*

**NDIA Human Systems Conference and Human Factors Engineering Technical Advisory Group (HFE TAG).** On April 16/17, the DOD HFE TAG and NDIA Human Systems Division co-hosted their annual meetings for the first time. Many CoI members were in attendance and the meeting provided a unique opportunity for collaboration among groups that work in a similar problem space, but rarely interact: DOD strategic leadership, DOD lab leadership, industry and academic performers. *Highlights:* presentations by BG Gallivan (U.S. Army Futures Command), Dr. Pharmer (Naval Air Warfare Center), and CAPT Minor (Space and Naval Warfare Systems Command). Over 100 human systems experts participated in roundtable discussions, panel sessions (including Dr. Geiss as the HS CoI Chair), and a lively poster session that allowed researchers to interact in small groups to discuss the challenges and opportunities in human systems design and evaluation. A big thank you to those who enabled the wonderful event by taking on leadership roles within both organizations. POC: Kelly Hale, Design Interactive. kelly@designinteractive.net

| Major Annual Events/Activities 2019 | |
|---|---|
| Reliance 21 Annual Overview | Jan |
| NSRDEC Army Hosted Lab Visit by SG | Feb |
| NDIA Human Systems Conference and Human Factors Engineering TAG | Apr |
| NDIA S&ET Conference | Apr |
| DoD Lab Day/ARAP Winner Announced | Jun |
| Seedling Proposal Data Call | Jun |
| IR&D Technical Interchange | Jun |
| COI Steering Group/All Hands | Sep |
| COI Roadmap Review | Oct |
| I/ITSEC | Nov |

**National Defense Industrial Association (NDIA) S&ET Conference.** The event was held in San Diego CA with the theme "Enabling the National Defense Strategy through Science & Technology". Our CoI gave an overview presentation that was well received in addition to engaging in a poster session with industry that demonstrated the impact of your outstanding technical efforts. POC: Katie Smith Stilling, Strategic Analysis, Inc. kstilling@sainc.com

**Army Hosted Lab Familiarization Visits for Steering Group.** The first was at the Combat Capabilities Development Command Soldier Center (CCDC – Soldier Center) in Natick Massachusetts where they saw first-hand some key Army research facilities and capabilities. *Key Natick Activities*: Soldier Performance Optimization Overview, MASTR-E, Cognitive Laboratory, Exoskeleton discussion, Biomechanical Laboratory, Biological Sciences Overview, Joint Clothing, Collaborative DoD Combat Feeding Overview, Climatic Chambers, Gut Microbiome Lab, USARIEM tour and TUFTS Center for Applied Brain Cognitive Sciences. Dr. Geiss thanked everyone for a very informative visit and how great it was to hear the COI collaboration concept is working well with scientists referring to partnering on each other's efforts. The second visit was to Aberdeen Proving Ground and the facilities at the CCDC - Army Research Lab. *Key ARL Activities*: Organizational overview, Human-Autonomy Teaming ERP, Information for Mixed Squads (INFORMS), HIL Reinforcement Learning, Human Interest Detector/Intelligent Weapons System, Innovation Commons, HVP/ Neuro Demos, and Strengthening Teamwork for Robust Operations in Novel Groups (STRONG). Dr. Lane both explained the changes that are surfacing with the standing-up of the Combat Capabilities Development Command and informed our CoI roadmap process immensely as a result of this lab visit. POC: Katie Stilling, Strategic Analysis, Inc. kstilling@sainc.com

**DoD Lab Day.** Held April 25th at the Pentagon Courtyard, the theme was "Rapidly Solving Tomorrow's Problems Today". This event showcased the innovative work performed by the scientists and engineers within the Defense Laboratory Enterprise including the laboratories, warfare centers and engineering centers across the world -- work that ultimately gives the warfighter a technical edge. The winning Applied Research for the Advancement of S&T Priorities (ARAP) proposal of Topologically Enabled Devices (TEDs) was announced at the event. POC: Katie Smith Stilling, SA Inc. kstilling@sainc.com

**DoD Biotechnology Data and Analytics Infrastructure Modernization Workshop.** The CoI, in alignment with the priorities of the Office of the Director for Biotechnology, hosted a Workshop on 10-11 Jun in Alexandria, VA for a Joint Interoperable Big Data Ecosystem: Towards a Future Architecture. *Goal*: Explore requirements and needs for an integrated DoD-wide biological data repository and bioanalytics Infrastructure, and identify how current and future data and research needs would inform the development of this infrastructure. *Key agenda items*: Current Biotechnology Data Infrastructure Status, Within and Across the Services; DoD Vision & Gaps for Biotechnology Data such as Human Performance, Medical/Genomics, Microbiome/Environmental Health and Synthetic Biology; and DoD Vision for Data from the Analytics Perspective. There were break out groups on vision, gaps and ways forward for each discipline, challenges for data integration, transfer, sharing, policy, ethics and training. During the group sessions, individuals also discussed current resources and future data needs, as well as lessons learned from past efforts. POC: Ms. Laura Kallal at Strategic Analysis, Inc, laura.m.kallal.ctr@mail.mil

**Human Systems and ASBREM CoI's Independent Research & Development (IR&D) TIM.** The inaugural co-sponsored IR&D TIM met 25-27 Jun in Arlington Virginia to review industry IR&D efforts for potential collaboration with the COIs. With approximately 100 government and industry participants, the new format of industry choosing the technical efforts to brief as part of their IR&D Portfolio was a success. There were a number of excellent ideas from the 12 companies that generated great real-time feedback on how the CoI might connect with their efforts. Many thanks to the AFRL/XPP staff and Strategic Analysis Inc. for all the excellent logistical support! POC: Al Livada, 711 HPW, alan.livada.ctr@us.af.mil

## CoI Highlights - " Next Up "

**Advanced Distributed Learning (ADL) iFest.** The National Training and Simulation Association (NTSA), in collaboration with the ADL Initiative, is hosting iFEST 2019 at the Hilton Alexandria Mark Center in Alexandria, VA on 26-28 August 2019. iFEST provides unique opportunities for military, government, industry, and academic professionals to share the latest challenges and innovations in distributed learning. Some of the priority themes for presentations and posters are: Specifications and Standards; Development, Gaps, and Governance; Learner Profiles in Practice; and finally Cyber Security and Personal Information. POC: Katie Smith Stilling, Strategic Analysis, Inc. kstilling@sainc.com

**Annual Human Systems Steering Group Meeting.** We're gearing up for another session on September 18-19 at Strategic Analysis Inc in Alexandria VA. The meeting objectives are to review FY19 accomplishments, discuss FY20 strategy, provide guidance, and engage in a series of presentations between the CoI and its partners and stakeholders to hopefully find new collaboration opportunities. POC: Katie Smith Stilling, Strategic Analysis, Inc. kstilling@sainc.com

**Roadmap Briefing.** Dr. Geiss will brief the latest HS CoI roadmap to OSD staff in Oct/Nov as part of the plan for all CoIs to brief over an 18 month cycle. Our project team is currently working on a draft version with the subarea leads for a July review with Dr. Geiss and follow on to the Steering Group. POC: Katie Smith Stilling, Strategic Analysis, kstilling@sainc.com

## Other Noteworthy News

**Air Force Completes their 2030 S&T Strategy.** Just recently finished, this document outlines three key objectives that support the vision of an Air Force that dominates time, space, and complexity in future conflict across all operating domains:

⇒ Develop/Deliver Transformational Strategic Capabilities: Global Persistent Awareness; Resilient Information Sharing; Rapid, Effective Decision-Making; Complexity, Unpredictability, & Mass; Speed/Reach of Disruption & Lethality

⇒ Reform the Way S&T Is Led and Managed, and

⇒ Deepen and Expand the S&T Enterprise

More data coming on strategy implementation. POC: Ms. Roxanne Constable, 711 HPW, winona.constable@us.af.mil

**Human Performance Community of Practice - Another Group in the Human Systems Arena!** Recently, the Close Combat Lethality Task Force (CCLTF) initiated monthly meetings for the Human Performance Community of Practice (HP CoP). To alleviate any confusion between the CoP and our CoI, here's a brief outline of the new CoP:

⇒ Purpose: improve human performance, and strengthen relationships and collaborations

⇒ Desired outcomes are better understanding of stakeholder needs, amplified operational connectivity and relevance, teamwork and collaboration among HP labs, investment recommendations for HP programs, and help moving HP programs up to higher Technology Readiness Levels

⇒ Who's in the CoP? Practitioners who are actively working toward creating solutions for optimizing human performance. Meanwhile, the HS CoI includes members who are researching or interested in human systems while focusing on improving mission effectiveness by developing and delivering new human-centered technologies via simulations, assessments, and designs. The HP CoP aligns with the HS CoI in that both communities provide collaboration opportunities with regard to human considerations.

⇒ How often they meet, agenda items: Monthly meetings include stakeholder, OSD or Service policy updates, highlights from relevant programs, and information on recently funded projects. Recent topics include the Army Center for Initial Military Training and Army Training and Doctrine Command Holistic Health & Fitness Industry day/Exposition, the Naval Special Warfare Human Performance Program, Joint Service Combat Feeding Technology and Gut Microbiome Optimization, and the Air Force Research Lab's Signature Tracking for Optimized Nutrition and TraininG (STRONG) performance profiling and performance integration technology program. POC: Dr. Ben Petro, OUSD(R&E), james.b.petro.civ@mail.mil

**More From the Close Combat Lethality Task Force (CCLTF).** The CCTLF held its inaugural Human Performance (HP) workshop in Jan 19 in Rosslyn, VA, and the Human Systems Directorate provided support. The purpose of this workshop was to identify ways to improve human performance within close combat formations. Participants separated into groups to identify requirements and objectives, discuss gaps and challenges, and find ways to both improve physical preparedness and mitigate the cognitive demands of close combat.

Solutions proposed covered both physical topics (e.g., nutrition, sleep, data collection and management, facilities requirements, staffing/manning, and policy) and cognitive topics (e.g., performance metrics and assessments, psychological resilience and recovery, cognitive skills and performance, Cognitive Proving Grounds (CPG)).

*Solution highlights*:

- Establish installation policy with contracting requirements that mandate healthy food options
- Add operational nutrition education to schools' curricula
- Consider modular or tailored rations; develop nutritional products tailored to range of OEs/missions
- Sponsor scientific research to understand the mechanism of restorative sleep; conduct a survey of COTS-based sleep monitoring equipment
- Develop objective, evidence-based metrics for physical readiness for combat that would include biological and human performance data
- Clearly define HP in context of mission success and establish education and training programs at all levels of leadership
- Create job codes and billets for HP instructors; draft and publish a DoD-wide policy to direct the creation of HP professional teams
- Develop adaptive DoD policy to ensure that HP facilities are adequately funded
- Develop a taxonomy of the components of cognitive fitness to reach a common vocabulary
- Develop and provide access to mental health care services – telehealth and peer support services – to ensure that all Service members have access to mental health services
- Conduct research & training to develop a suite of tools to enable teams with humans, AI, and autonomous assets
- Incorporate just-in-time interventions based on mission and squad requirements to enhance situation awareness and decision-making as the mission unfolds
- Create the CPG using validated cognitive theories to train the trainers to create and teach leaders the necessary cognitive techniques to enhance lethality at the squad level
- Create or leverage current service force-on-force initiatives (e.g. Adaptive Threat Force in the USMC) and use these to test and validate cognitive theories and HP theories; request that DoD laboratories and outside researchers monitor all force-on-force engagements

For more information about the CCLTF HP Workshop, contact Dr. Ben Petro, OUSD(R&E), james.b.petro.civ@mail.mil

**New CoI Established: Directed Energy – Non Lethal Weapons (DE-NLW).** OSD has created another CoI under the Reliance 21 structure. The Directed Energy – Non Lethal Weapons CoI has four key Technology Areas: 1) High Energy Lasers; 2) High Power Microwave; 3) Non-Lethal Weapons and 4) Neutral Particle Beam. Our CoI looks forward to collaborative opportunities with the new member of the CoI club. POC: Katie Smith Stilling, Strategic Analysis, Inc. kstilling@sainc.com
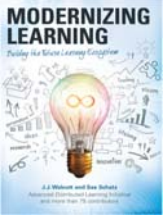
## From Our Partners

**The ADL Initiative Research Releases New Book, "Modernizing Learning".** The ADL Initiative recently released *Modernizing Learning: Building the Future Learning Ecosystem*. This open-access publication examines the shift needed to our systems and society to enable lifelong, experiential, interconnected learning journeys. The book is the outcome of a multi-year study with a vision for a learning ecosystem that spans technology, learning science, policy, and organizational factors. More than 85 stakeholders across Defense, government, academia, K-12, and industry contributed to bring together perspectives on what we need to build for tomorrow to empower our children, workforce, society, and military personnel to achieve. Download the book at: https://bookstore.gpo.gov/products/modernizing-learning-building-future-learning-ecosystem.
POC: Sae Schatz, sae.schatz@adlnet.gov

**HS CoI Members Exchange Insights With Canadian Armed Forces** The Canadian Armed Forces Military Personnel Generation (MILPERSGEN) hosted their Individual Training and Education symposium the first week of May. Brigadier General Virginia Tattersall, Commander MILPERSGEN, opened the event followed by a keynote from Dr. Sae Schatz, Director of the ADL Initiative and a CoI member. Dr. Schatz spoke about the promise—and potential risks—of the future learning ecosystem, specifically discussing the risks of cognitive overload and highlighted ways learning and development professionals could help mitigate these pitfalls. Several other CoI members participated on a panel which highlighted research initiatives from the NATO Human Factors and Medicine working group aimed involving Adaptive Instructional Systems. Other presentations: keynote from Stephen Downes of the Canadian National Research Council who described many new and emerging open-source technologies and open-architecture specifications for educational technologies; Dr. Bernadette Dececchi, Queen's University, discussed andragogy in military learning, and Chris Allison, Director General at Canada School of Public Service, shared updates on the Canadian Government's Digital Academy, an effort to upskill the government workforce in areas such as data science, AI, and web coding. Resources from the Digital Academy are available for free and open reuse at https://www.canada.ca/en/treasury-board-secretariat/news/2018/10/government-of-canada-launches-digital-academy.html. POC: Sae Schatz, sae.schatz@adlnet.gov

## International Corner

**AF 711 HPW/RH Attends Joint NATO (IST-141 and SAS 139) Wargaming Meeting**: Dr. Kristen Liggett participated in a joint NATO meeting that served as an opportunity for members of IST-141 Exploratory Visual Analytics and SAS-139 Analytical War Gaming to discuss mutual areas of interest. Specifically, members of SAS-139 were interested in learning about visual analytics techniques that might be applied to war gaming data and members of IST-141 were interested in learning about how to apply analytics to new data sets and visualization techniques to current war gaming challenges. After the joint meeting, IST-141 held their spring meeting and planned a workshop to be held in October entitled "Big Data Challenges Situation Awareness and Decision Support". The call for papers was released in May and abstract submissions are due 12 Aug 19. POC: Dr. Kristen K. Liggett, 711 HPW, kristen.liggett@us.af.mil

**AF 711 HPW/RH Battlespace Visualization Branch Provides Human Factors Support to U.S. DoD Symbology Standards Management Committee (SSMC) and NATO Joint Symbology Panel (JSP)**. Dr. Gina Thomas attended the SSMC/JSP 19-1 committee meeting hosted by the Air Force in Hampton VA as a Human Factors (HF) expert. The meeting's purpose was to make determinations regarding U.S. and NATO Symbology change proposals and address other topics related to the use and management of military symbology standards, including new standard proposals on development of those required for cyber effects. Dr. Thomas has provided regular HF support in adjudicating updates to MILSTD 2525 symbology and as a result of her briefing on the importance of HF in symbology design and usage, future change requests will include them as part of the adjudication process. POC: Dr. Gina Thomas, 711 HPW, gina.thomas.2@us.af.mil

## International Corner (Cont'd)

**AF 711 HPW/RH Researcher Participates in NATO Panel IST-157 Meeting.**  Dr. Chris Brill attended the NATO Panel for Information Systems Technology (IST-157) on Human Considerations of Artificial Intelligence (AI) for Command and Control.  The panel is planning an experiment using an AI tool in the Command Center during a major NATO Exercise (Jupiter-Jackal 2020).  Dr. Brill will help lead the experiment and conduct trust evaluations of the AI tool.  The panel's next face-to-face meeting will occur in September 2019 in France.  POC:  Dr. John "Chris" Brill, 711 HPW, john.brill.2@us.af.mil

**NATO Sensors & Electronics Technology (SET) 249, "Laser Eye Dazzle - Threat Evaluation/Impact on Human Performance" Panel Meeting:**  Dr. Leon McLin and Lt Col Wes Kinerk of 711 HPW attended the NATO SET-249 Panel Meeting in February.  The main goals were: 1) share presentations on country specific research conducted since the previous meeting, 2) present results from the Moonraker trial conducted by the group in October 2018, and 3) design a laser dazzler simulator for use in a laser dazzle human task performance trial scheduled for spring 2020.  The meeting was held at the Fraunhofer Institute of Optronics, System Technologies, and Image Exploration (IOSB), Ettlingen, Germany with representatives from the UK, Belgium, Sweden, Germany, and France attending.  For interest in laser eye exposures and laser eye dazzle, please contact POC Dr. Leon McLin, 711 HPW, leon.mclin@us.af.mil

## Other COI Accomplishments

**Secure LVC (Live-Virtual-Constructive) Advanced Training Environment Advanced Technology Demo (SLATE ATD)**, is a successful proof-of-concept prototype LVC architecture which includes  an AFRL-developed, government-owned, fifth-generation advanced training waveform and National Security Agency certified encryption and hardware enablers.  The team designed the prototype to inject real-time Virtual and Constructive entities into live aircraft for advanced operational training.  The SLATE team demonstrated, evaluated, analyzed and reported current LVC critical enabling technologies readiness levels during these three phases of the 40-month ATD:

*Phase I* - Two-week initial capability assessment to ensure SLATE could process, collect and protect classified F-15E data.

*Phase II* - First test evaluated live system data integrity on the airborne subsystem pod and into an architecture with different security levels.  Phase II also demonstrated the encrypted Air Combat Maneuvering Instrumentation (ACMI) capability of the SLATE pods when carried on aircraft without modified Operational Flight Program software.

*Phase III—* A "graduation exercise" to stress the LVC system capabilities at the secure operating level through Large Force Employment scenarios, including 16 Live aircraft, four Virtual players (simulators) and 80+ Constructive entities.

SLATE results fully address the Congressional National Defense Authorization Act regarding a Joint LVC training capability, and successfully allow the Combat Air Force to "train like we fight" against realistic threat replications in a secure, high-fidelity live-fly training environment.  POC:  Mr. John "Moses" Noah, 711 HPW, john.noah.4@us.af.mil

## FOCUS ON THE ARMY

**Army Human Systems Integration Mission Moves.** In his Senior Leader Perspective in February's issue, Dr. Corde Lane discussed some of the changes as a result of the establishment of the Army Futures Command (AFC). As the Army builds AFC, several other Army organizations are taking this as an opportunity to better align themselves within the Future Force Modernization Enterprise. The U.S. Army Combat Capabilities Development Command (CCDC) Data and Analysis Center (DAC) merged three existing organizations into one to form the Army's largest in-house analytical capability.

On February 4, U.S. Army Materiel Systems Analysis Activity, formerly a Separate Reporting Unit to Army Materiel Command; Research Development and Engineering Command (RDECOM) Survivability & Lethality Analysis Directorate (SLAD); and Army Research Laboratory (ARL) Human Research and Engineering Directorate (HRED) Human Systems Integration (HSI) joined forces to create one integrated analysis center. Its mission is to deliver objective analysis, experimentation and data across the entire life cycle to ensure readiness today and a more lethal future force tomorrow.

With this merger, the Army HSI mission that was previously performed in HRED has now moved to the CCDC Data and Analysis Center, while the Human Sciences foundational research remains with HRED. The Army HSI mission is to provide analysis and applied research in cognitive and physical demands; complex control and decision making; future ground operations in socio-cultural diverse contexts; and network science to inform the design of Army systems. It also supports program managers and the U.S. Army Test & Evaluation Command by conducting HSI Assessments, system usability assessments, and modeling assessments. The HSI practitioners have merged with the former RDECOM SLAD to become the CCDC Data and Analysis Center, Lethality, Survivability, and HSI Directorate.

◊ "*Bringing these teams together as a new integrated organization directly supports the unity of effort and agility the Army needs in order to modernize. Our staff will dynamically team with Future Force Modernization Enterprise (FFME) programs as they mature from initial laboratory concepts to fielding so we can better empower senior leaders to make more evidence-based decisions. Being able to flex as needed and converge the Data and Analysis Center's diverse capabilities on Army priorities at the best points in a technology's or system's life-cycle will lead to greater capability, more timely development and fielding, and more return on investment for our Soldiers,*" said Dr. Patrick Baker, Director, Lethality, Survivability, and HSI Directorate of the DAC.

The DAC has a vast array of capabilities, including integrated analysis from concept to fielding, cyber and electronic warfare vulnerability and resiliency, kinetic lethality and vulnerability, authoritative models and data for modernization decisions, user-centered performance design impacts, and weaponeering tools for multi-domain operations. As the Army's authoritative source of integrated analytical solutions for the Soldier and FFME, including Army HSI, DAC will ensure the Army decisively defeats any adversary, anytime, anywhere, including support to modernization priorities. POCs Jen Adair and Josephine Wojciechowski, ARMY CCDC, josephine.q.wojciechowski.civ@mail.mil

**Army Physical Augmentation (Exoskeleton) Program Update**. The Army has gained critical knowledge over the last two decades that has helped define research gaps within the Physical Augmentation (PA) field. These gaps were validated at the April 2018 DoD/OUSD (R&E) Exoskeleton Technical Interchange Meeting co-hosted by OUSD and CCDC Soldier Center. Future areas of research were identified as critical to further advance wearable exoskeleton systems for use in close combat scenarios where exo-human symbiosis is an absolute necessity. The following CCDC Soldier Center and CCDC ARL – HRED research areas are being pursued to address specific gaps identified by the Exoskeleton Research and Development Communities and will inform the ongoing Advanced Technology Development – Physical Augmentation Enhanced Movement & Maneuver/Sustain Exoskeleton effort:

CCDC Soldier Center

⇒ Adaptation & Training: Evidence-based interventions to maximize Soldier-PA system performance
⇒ Movement Initiation & Intent: Smart Adaptive Controls that sense/adapt to individual movements promoting coordination, fluency and embodiment
⇒ Human-In-The-Loop Controls Optimization: Reduce guesswork of control tuning and variability between users for immediate and highly impactful Soldier-PA system performance

## FOCUS ON THE ARMY (Cont'd)

*Army Physical Augmentation (Exoskeleton) Program Update (Continued)*

<u>CCDC ARL</u>

⇒ Tools & Techniques: Scientifically validated, robust approach to assess dismounted Soldier performance and perform trade-off analyses within the context of dismounted operations

⇒ Analysis Methods: Fundamental understanding of relationships between human variability and performance to support advanced design and control approaches related to improved human-system integration

⇒ Design Guidance: Evidence-based requirements and design guidelines to enable focused and accelerated development of physical augmentation technologies

<u>Advanced Technology Development</u>

The Physical Augmentation Enhanced Movement & Maneuver/Sustain Exoskeleton effort is focused on vetting, demonstrating, and transitioning high TRL exoskeleton technologies to Improve Soldier lethality & mission readiness while reducing the impact of load and physical burden on Soldiers performing difficult and high stress/high strain tasks.  CCDC-SC is working to accomplish this by:

⇒ Identifying user challenges through iterative Soldier Touch Points (STP's) and working closely with CCDC-ARL, SL-CFT, 10th MTN DIV, MCoE, & PEO-Soldier

⇒ Demonstrating disruptive & innovative technology.  First users are: infantry, engineers, artillery, and combat medics

The initial program focus is on demonstrating high mobility capabilities providing increased endurance augmentation and mission readiness.  The second focus will be to demonstrate low or medium mobility sustainment capabilities providing increased strength and productivity augmentation and injury risk reduction during lifting, loading, unloading, and transporting tasks.  With high value on Soldier feedback, FY19 has been scheduled with five Soldier Touch Points through the Fiscal Year.  These events allow us to look at both familiarizing the 10th MTN DIV Soldiers with exoskeleton technology, and allowing them to perform operational scenarios/tasks.  The CCDC-SC Mission Equipment & Systems Branch Exoskeleton Team is currently preparing for STP #4, to be held at Ft Drum NY in late June.  This STP is focused on a Platoon level attack utilizing Movement & Maneuver and Field Artillery Scenarios and there will be 10-15 each of two different technologies provided by two companies. The focus is on Soldier perception of the capability and the mission/task performance evaluations with preparation/dry run for STP #5 in the September time frame.  There will be a 1 X Combined Arms PLT sized element with MOSs 11B, 12B, 13B, 68W.  POC:  Ms. Karen Gregorczyk, USARMY CCDC, karen.n.gregorczyk.civ@mail.mil

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