

AFRL FIGHT'S ON!

THE AIR FORCE RESEARCH LABORATORY

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Graphic by Mr. Will Graver

SUPPORTING COMACC IN AUGMENTED AND VIRTUAL REALITY INNOVATION

Augmented and virtual reality has truly come a long way over the years. Here at the Warfighter Interactions and Readiness Division (RHW), we are currently supporting two previous COMACC taskers through innovation of the AR/VR experience: Air Force Training and Readiness Technologies and AR/VR Training Effectiveness.

Air Force Training and Readiness Technologies (SBIR Phase III) is aiming to develop a searchable, web-based repository that will allow training content developers, instructional designers, and instructors to share 3D models, source code, executable code, etc. with one another. The intended outcome is that the repository will facilitate development and fielding of AR/VR-based solutions more quickly and cost-effectively by not having to “reinvent the wheel” every time a new application is developed. By surveying tactical air and maintenance units in the Combat Air Force (CAF), this allows for identifying critical features and functionality, in addition to designing/developing the system using an “agile development” approach. We are 6 months into a 12-month effort of surveying air and maintenance units within the CAF to identify/prioritize end user needs. Interactive software design and development is to begin summer of 2021.

AR/VR Training Effectiveness focuses on documenting the science and best practices for using and evaluating AR/VR technologies for training. The ideal result of this training is for framework and guidelines to assess AR/VR instantiations. Henceforth, the application of this framework is to establish a knowledge base from published literature to inform future research in AR/VR technology for training and derive empirically sound principles.

The method can be broken down into three phases:

- Identify and document published AR/VR effectiveness studies and additional relevant research.
- Populate the knowledge base with structured information based on training effectiveness framework, while iteratively evolving framework.
- Derive general principles and lessons learned on the use of AR/VR for training and identify research gaps.

We've reviewed 70+ AR/VR effectiveness empirical studies, developed an initial framework and structure, modified a framework based on relevant science and research, and had several discussions with AR/VR SMEs. We are 5 months into an 18-month effort. Work is proceeding on schedule, and framework is set to be delivered in the spring of 2022. ★

Dr. Winston “Wink” Bennett, Readiness Product Line Lead, 711 HPW/RHW

WELCOME NEW RESEARCH LEADERSHIP!



DR. MEGAN MORRIS

Cognitive Models CRA

Dr. Megan Morris is a Research Psychologist in the Cognitive Models branch (RHWM). She received her Ph.D. from Wright State University in 2014 in Human Factors and Industrial/Organizational Psychology. Her graduate work mainly focused on individual difference effects on workplace outcomes and workplace-related research on the Lesbian, Gay, Bisexual, Transgender, and Queer community. She began her career with the Air Force Research Laboratory as a contractor with Ball Aerospace in 2015 where she supported research efforts related to data visualization, information throughput, and cognitive modeling for fatigue, vigilance, and workload assessment and prediction. She then became a civilian in 2019 and leads the Fatigue and Sustained Attention Performance Impacts line of effort. She strives to advance fatigue modeling technology and push for individualization techniques in this effort and others, such as those within the Multiscale Models for Cognitive Performance project. ★



MS. JENNIFER WINNER

Personalized Learning and Readiness Sciences CRA

Ms. Jennifer Winner is a Research Psychologist in the Continuous Learning branch (RHWL). She received her M.S. from Arizona State University in 2007 in Applied Psychology. Her graduate work focused on measures of team cognition and shared interpretation of commander's intent. She began supporting the Air Force Research Laboratory in 2008 in Mesa, Arizona as a contractor with Lumir Research Institute, focusing on performance assessment in simulation-based training and implementation of survey tools to assess training outcomes for large flag-level training exercises. After relocating with the team to Wright-Patterson Air Force Base in 2011, she helped establish and grow the science, technology, engineering and mathematics (STEM) mentoring program in the Gaming Research Integration for Learning Lab (GRILL®). In 2015, she accepted a civilian position and continued to support the application of assessment tools across Air Force training contexts. She completed an M.B.A. program at Wright State University in 2017. She currently leads the Realism, Assessment, and Team Dynamics line of effort and serves as the Lead for the Personalized Learning and Readiness Sciences (PLRS) core research area. ★



DR. LESLIE BLAHA

Acting Training CTC Lead

From Dec 2020 through May 2021, Dr Leslie Blaha is serving as the Acting Lead for the Training CTC. She is a Senior Research Psychologist in the Continuous Learning Branch and leads the AFRL operating location at Carnegie Mellon University, where she is embedded full time. Dr. Blaha imagines a future where intelligent machines use cognitive models of human teammates to transform the ways we work and train. She leads fundamental science collaborations with academic partners in areas of cognitive modeling and cognitive science for human-autonomy teaming. Her current research interests emphasize laying a rigorous, measurable foundation for mutual understanding between humans and machines, advancing cognitive modeling capabilities for operator state assessment, interactive task and machine learning, and methods for validating learning systems. Dr. Blaha was awarded an Early Career Impact Award from the Federation of Associations for Brain and Behavioral Sciences in 2018. She serves as the Secretary/Treasurer of the Society for Mathematical Psychology and is a co-founder of the Women of Mathematical Psychology. And whenever possible you can find her globetrotting. ★

CALAMITYVILLE

Air Force Research Laboratory's (AFRL) Live, Virtual, and Constructive (LVC) Simulation Research Facility in downtown Fairborn

Except for the aliens famously purported to be housed in Area B, perhaps Wright-Patterson Air Force Base's best kept secret is Calamityville. Located in Fairborn Ohio, the former Southwest Portland and Cemex cement plant lives on as a research, testing, and training environment set on more than 50-acres. Owned and operated by Wright State University and only a 10 minute drive from Area B, it provides an austere, all-hazard, actual conditions training environment for first responders (law enforcement, fire, and EMS), first receivers (physicians, nurses, mid-level providers, and hospital staff), Department of Defense (DoD) Special Operations and tactical combat medical specialists, and civilian populations. As such, Calamityville is an exciting facility for research and development.

The Continuous Learning Branch, 711th Human Performance Wing (711 HPW/RHWL), has had an onsite presence at Calamityville for approximately 10 years via an Educational Partnership Agreement, most recently renewed in 2016. At Calamityville, RHWL experiments with a number of different LVC technologies and tests training data collection methods in an operationally representative environment. Recently, RHWL expanded its presence to accommodate the Performance Enabled Operational Training Environment (PEOTE) line of effort. PEOTE is transforming mission training through a focused application of LVC simulation technologies, individual and mission performance metrics, and exploitation of current and emerging data architectures. PEOTE seeks to optimize the use of LVC simulation components in varied training conditions in multiple domains with a focus on austere environments. As part of its research mission, PEOTE partners with the Gaming Research Integration for Learning Laboratory (GRILL) to apply emerging AR and VR technologies in live scenarios to determine the limits of these technologies, the boundary conditions that limit their effectiveness, and to frame future requirements for uses in training.

PEOTE also collaborates with Sensors Directorate's Sensing and Effects Analysis Branch (AFRL/RVAA) and their Cyber-Physical Sensing Sub CTC to create the Cyber-Physical Exploitation for Disaster and Emergency Response (CEDER) laboratory. A goal of CEDER is to exploit cyber-physical ("internet of things") devices in non-traditional ways to better understand and characterize the environments (physical, cyber, electronic, etc.) in which these devices operate. By capitalizing on advances in sensor exploitation via the CEDER collaboration, training environments can be much more efficiently and thoroughly described – vital to understanding the effect of training interventions on mission performance outcomes. The CEDER collaboration connects Calamityville and the Playas Training and Research Environment in New Mexico – a Secretary of the Air Force Concepts Development and Management Office (SAF/CDM) and AFRL research facility priority. This connection enables more advanced developmental tests of CEDER proofs of concept, tests of cloud computing and networking, and data sharing for rapid tech advancement. ★

Mr. Dave Malek, Senior Research Psychologist, 711 HPW/RHWL

Mr. Ted Harmer, Electronics Engineer, 711 HPW/RHWL



Constructive UH-1 Target



Live Explosion Effect

As the constructive UH-1 target is destroyed in simulation, a live explosion effect marks the result in the live simulation space.

711TH HPW/RHW

Hails

Maj David Smalenberger • Mike Tolston • Mike Lambert
Michael Chase • Maj Peter Leestma • Olivia McCormick
Matt Scharf • Lt Col Alfredo Rivera • Deirdre Mahle
MSgt Jeffrey Held • Dave Malek • Sean Kennedy
2Lt Samuel Braudt • Capt Robert Floyd • Ryan Tibbett
Kirsten Rice • David Liu • Ian Joyce • Casey Phillips
2Lt Daniel Liszka • Maj Kyle Knight • Sandra Felt

Farewells

2Lt Levi Lott • 2Lt Rebecca Reynolds • 2Lt Grace Smith
Ryan Kramer • Lt Col Wanda Parham
Lt Col Thomas Adams • Maj Miguel Valle • Lt Noah Scott
Capt Dave Clement • Lindsey Montano
Maj David Panboon • MSgt Durrell Lawton
Kevin Gluck • Maj Daniel Johnston • Sam Griffith
Julia Jagers • Lt Col Jose Fadul • Kaylee Eakins
Robert Eggleston • Erin Issler • 1Lt Dylan Hyder
Capt Jon Roeber



U.S. Air Force photo by Capt. Kip Sumner

SUBJECTIVE AND PHYSIOLOGICAL METRICS OF FATIGUE IN FIGHTER PILOTS

The Fatigue and Sustained Attention Performance Impacts line of effort recently received approval for their 711th Human Performance Wing (HPW) Studies and Analysis Intramural program proposal, "Subjective and Physiological Metrics of Fatigue in Fighter Pilots" (\$279K). The effort has two goals: 1) to further our understanding of fighter pilot fatigue and fatigue management during non-combat operations, and 2) to provide real-time, individualized, objective situational awareness of fatigue for the fighter pilot community. The effort will involve collecting self-report fighter pilot data on fatigue antecedents and consequences, experiences of fatigue, and current fatigue mitigation strategies, as well as collecting physiological data from wearable devices to derive objective fatigue values during operations. Findings from this work will directly support fatigue risk management processes for the fighter community and inform the continued development of our mobile fatigue application. Specifically for the physiological integration component we will integrate raw physiological metric data from the commercial fitness watch into our mobile fatigue application using available state-of-the-art algorithms and methods in the literature to personalize objective fatigue estimates. The effort will involve a collaboration with the 54th Fighter Group at Holloman Air Force Base (AFB), the 388th Operations Group at Hill AFB, and the 4th Fighter Wing at Seymour Johnson AFB to collect data. ★

Dr. Megan Morris, Cognitive Models CRA, 711 HPW/RHW



Published quarterly since 2001, Fight's ON! continues to serve as the Division publication for our partners and features innovative science and technology that is accelerating and revolutionizing readiness.

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RECOGNITIONS

2020 ANNUAL AWARDS

711 HPW

Daniel Repperger Mentor of the Year
Dr. Leslie Blaha

Administrative Excellence Award
Ms. Annette Armstrong

Collaboration
Gaming Research Integration for Learning Laboratory® (GRILL®) Team
Dr. Winston "Wink" Bennett, Lt Dave Clement,
Mr. Jon Diemunsch, Ms. Kaylee Eakins,
Mr. Quintin Oliver

RH

Scientific Technical Technician Individual
Mr. Quintin Oliver

2020 FIRST QUARTER AWARDS

RH

72nd Annual Arthur S. Flemming Award
Dr. Tiffany Jastrzembksi

2020 SECOND QUARTER AWARDS

RH

Noncommissioned Officer
SSgt Nathaniel Payne

Civilian Category I
Mr. Nathan Stover

2020 THIRD QUARTER AWARDS

RH

Collaboration
Gaming Research Integration for Learning Laboratory® (GRILL®) Team
Dr. Winston "Wink" Bennett, Lt Dave Clement,
Mr. Jon Diemunsch, Ms. Kaylee Eakins,
Mr. Quintin Oliver

2020 FOURTH QUARTER AWARDS

711 HPW

Laboratory Scientist of the 4th Quarter
Dr. Megan Morris

RH

Collaboration
RHW Support SKYBORG Team
Mr. Phillip Peppler, Mr. Brandon Nolan,
2nd Lt Lauren Gallego

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711 HPW/RHW Core Research Areas:

- Cognitive Models
- Personalized Learning and Readiness Sciences
- Systems Analytics
- Collaborative Interfaces and Teaming
- Multisensory Perception and Communication