SECURE LIVE-VIRTUAL-CONSTRUCTIVE ADVANCED TRAINING ENVIRONMENT ADVANCED TECHNOLOGY DEMONSTRATION

The Secure LVC (Live-Virtual-Constructive) Advanced Training Environment Advanced Technology Demonstration, known as SLATE ATD, is a successful proof-of-concept prototype LVC architecture, including an Air Force Research Laboratory-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. This capability will allow the Combat Air Force to "train like we fight" against realistic threat replications in a secure, high-fidelity live-fly training environment.

The SLATE team demonstrated, evaluated, analyzed and reported the current LVC critical enabling technologies readiness levels during three phases of the 40-month advanced technology demonstration. Phase I was a two-week initial capability assessment. Its purpose was to ensure SLATE could process, collect and protect classified F-15E data. At the conclusion of Phase I, there was improved consistency in data processing and system stability.

The purpose of Phase II was to apply Phase I lessons learned to prove or disprove the ability to share the system's mechanical, electrical and functional characteristics data across dissimilar security enclaves at levels that meet Military Standards 1553. Phase II was the first test evaluating Live system data integrity on the airborne subsystem pod and into the processing of the Multiple Independent Levels of Security (MILS) architecture at different security levels. Although there was only modest success initially, the SLATE team learned where and how to better manage and compartmentalize the data inside and across MILS. 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.

The purpose of the Phase III "graduation exercise" was 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. Phase III fulfilled the SLATE Charter "Six Pillars."
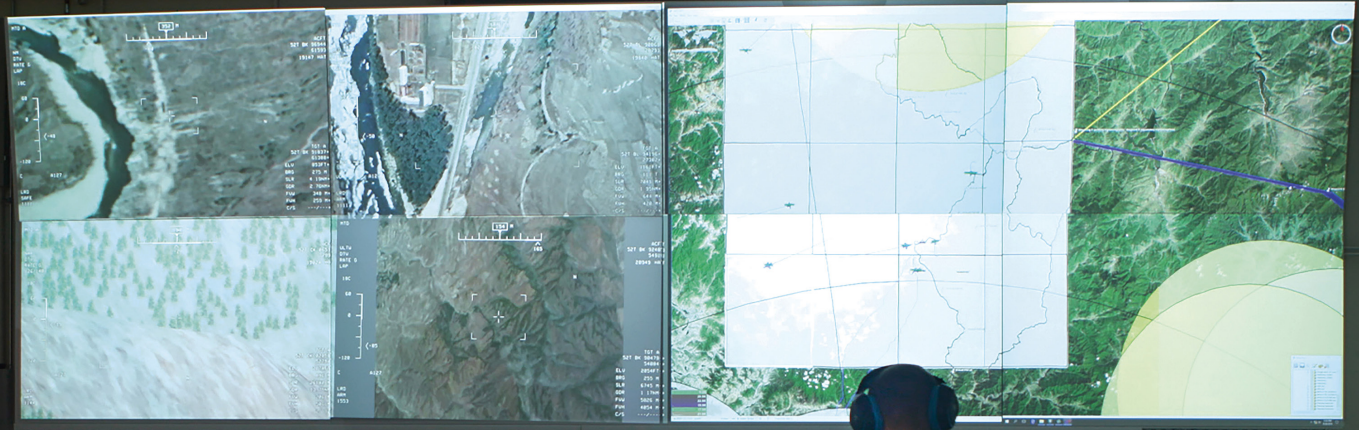
Photo by Mr. Will Graver

THE SIX PILLARS

1. Validate LVC infrastructure, interface control and data standards in a government-owned, non-proprietary architecture

2. Demonstrate MILS encryption technology and rule sets

3. Evaluate alternative large throughput, MILS capable encryptor, radio, data-link and fifth-generation advanced training waveform

4. Validate MILS

5. Develop select weapon system Operational Flight Program changes with vendors, based upon clear guidelines and resulting in direct risk reduction for the Program of Record

6. Document training effectiveness benefits and opportunities with integrated LVC capabilities

All three phases of the SLATE ATD validated the effectiveness of the LVC training construct that supports Air Combat Command and Air Force Materiel Command directives. SLATE's capstone Six Pillar results fully address the fiscal year 2018 Congressional National Defense Authorization Act regarding a Joint LVC training capability. SLATE successfully demonstrated that the ability to connect operational Fast-Jets to a Distributed Mission Operations environment is a "future faster" way toward Combat Air Force combat readiness. ☆

Dr. Winston "Wink" Bennett, Readiness Product Line Lead, RHA

Mr. John "Moses" Noah, Program Manager, RHAS

Ms. Suzette Westhoff, RHA

711th Human Performance Wing (HPW), Airman Systems Directorate, Warfighter Readiness Research Division (RHA)

> **NITE-REX represents a quantum leap in ISR training capability.**
>
> **Col Hugh Ragland,**
> USAF Warfare Center A2 and
> 365th ISR Group Commander

INTELLIGENCE TRAINING EXERCISE INTEGRATES AIR FORCE OPERATIONS

On 24–28 September 2018, the Air Force Research Laboratory's Warfighter Readiness Research Division conducted the Networked Integrated Tactical Environment Research Exercise, known as NITE-REX 18-2. Forty-six Airmen from more than a dozen units, representing the core functions of Globally Integrated ISR (intelligence, surveillance and reconnaissance); Global Strike; Air Superiority; and Command and Control (C2), attended the multi-domain training exercise.

The focus of NITE-REX 18-2 was to study the integration of Air Force personnel in a team-of-teams environment using realistic, operationally relevant scenarios that incorporated anti-access, area-denial challenges.

As the largest and most diverse LVC (Live-Virtual-Constructive) intelligence-focused exercise to date, NITE-REX 18-2 spanned the operational to the tactical levels of war. Based on the Combined Air Component Commander's guidance, the Laboratory's team designed a scenario that tasked MQ-9 and F-16 aircrews to plan and execute realistic missions against a near-peer competitor using intelligence derived from a unified training environment and delivered by squadron and wing-level analysts with real-time support from the Distributed Common Ground System and Air Operations Center. Distributed Common Ground System members from three separate sites, conducting analysis in different areas-of-responsibility, came together and delivered timely and accurate products to satisfy the commander's intent for good effects in the battle space.

Division researchers developed comprehensive research objectives for each of the five iterations of the exercise to measure readiness, scenario relevance and training effectiveness. Additionally, the Laboratory's team validated methods required to conduct multi-domain C2ISR training, including the integration of operational and exercise management tools during the exercise.

NITE-REX 18-2 featured a new open-infrastructure and modular ISR testbed designed to enhance exercise management and scenario realism. This system, which operators can rapidly configure for more than ten different crew positions, is specifically designed to generate stimuli necessary for intelligence analysts to participate in a dynamic multi-domain training scenario with other distributed players. This emerging capability also provides a unique venue for testing and validating new cutting-edge human-centered intelligence, surveillance and reconnaissance operational tools. ☆

Capt Nicholas Attillo, C4ISR Team Lead, RHAS

Ms. Suzette Westhoff, RHA

ONGOING FATIGUE RISK-MANAGEMENT STUDIES FOR AIR MOBILITY COMMAND

Researchers from the Cognitive Science, Models and Agents Branch collaborate with Air Mobility Command (AMC) as members of their Fatigue Management Working Group. In a previous study conducted at Travis Air Force Base with the 21st Airlift Squadron, researchers learned about aircrew sleep patterns and fatigue mitigation approaches. The Branch will conduct two new studies with C-17 pilots at Joint Base Charleston (JBC) to build upon this work. In the first study, researchers will compare a commercial smartwatch to a research actigraphy watch to determine which will provide the most utility to aircrew. The second study will focus on pilots with a mission profile that makes it difficult to get adequate amounts of sleep.

In the study at Travis Air Force Base, participants wore actigraphy watches to better understand sleep patterns during missions. Activity data from the watches were compared to mission effectiveness graphs for the crews to identify strengths and weaknesses in AMC's fatigue model, which has had limited operational validation. Researchers also used questionnaires to document crew fatigue mitigation strategies and opinions on Air Force fatigue-management policies. The results suggest that the model in AMC's current implementation provides useful constraints in constructing mission plans, but may not accurately capture fatigue risks as they emerge during operations. Updates to accommodate individual differences and changes during missions will make the model more useful to pilots and other aircrew.

Participants in the watch comparison study at JBC will wear both the research watch and the commercial alternative over two weeks to compare their sleep estimation and activity monitoring capabilities. Researchers will use the results to inform future research efforts, including the design of follow-on studies. Similar to the Travis Air Force Base study, researchers will use the activity data and questionnaires from participants in the JBC fatigue study to determine the pilots' effectiveness levels throughout their missions. However, because of differences in the mission sets and profiles, many of the assumptions key to AMC's fatigue model may not be applicable to these pilots. Therefore, this population needs tailored fatigue-mitigation techniques. Findings from these studies will help inform fatigue risk-management policy changes that will make missions safer for both this population and the mobility community as a whole. ☆

Dr. Glenn Gunzelmann, Core Technical Competency Lead, 711 HPW/RHA

2d Lt Alex Gaines, Lead Analyst for Fatigue Modeling, RHAC

Dr. Megan Morris, Human Factors Professional, RHAC

Collaboration with Carnegie Mellon University

Dr. Leslie Blaha has joined the Cognitive Science, Models and Agents Branch as a Senior Research Psychologist. She heads up the new operating location at Carnegie Mellon University to foster strong branch-university collaborations in cognitive modeling, interactive task learning, and model validation and verification techniques. Dr. Blaha returns to the Air Force Research Laboratory from the Pacific Northwest National Laboratory, where she served as the Chief Scientist of the Analysis in Motion Initiative for interactive streaming analytics at scale. She is also deeply involved in the Society for Mathematical Psychology and Women of Math Psych. Dr. Blaha invites interested individuals to contact her via email at leslie.blaha@us.af.mil.

In Memoriam: Ms. Reem Hassan

It is with great sadness that the Warfighter Readiness Research Division shares the passing of Ms. Reem Hassan, Biomedical Engineer for the Cognitive Science, Models and Agents Branch's Multiscale Modeling Team. She was a graduate of Wright State University and was instrumental in developing a toluene-substance detection system. Her expertise in this area made a significant contribution to this new research conducted by the team. Our deepest sympathies to her husband, Ez Hassan, and her family. She is missed!

Ongoing research aims to develop stronger fatigue risk-management techniques for mobility aircrew, such as C-17 pilots who often fly long missions across multiple time zones.

U.S. Air Force Photo by Tech. Sgt. Gregory Book

RHA 4TH QUARTER WINNERS

Company Grade Officer: Lt Julian Barriga

Field Grade Officer: Maj Kristen Grasser

Civilian Category III: Ms. Jennifer Winner

Chuck Norris Award: Lt Col Fadul

RHA ANNUAL WINNERS

Company Grade Officer of the Year:
Capt Michael Dooley

Company Grade Officer Individual Mobilization Augmentee (IMA) of the Year: Capt Stephen Bell

Field Grade Officer of the Year: Maj Thomas Adams

Administrative Excellence: Ms. Julia Lee

Supervisory Award: Maj Kristen Grasser

Civilian Category II of the Year: Mr. Brandon Nolan

Civilian Category III of the Year: Dr. Leah Rowe

James W. Brinkley Leadership Award:
Lt Mitchell Lichtenwald

International Award: Dr. Kevin Gluck

Harry G. Armstrong Scientific Excellence Award:
Dr. Tiffany Jastrzembski

Innovation Award: Lt Julian Barriga

Collaboration Award: Dr. Glenn Gunzelmann

Commander's Cup-Senior Individual:
Dr. Tamara Chelette

Commander's Cup-Junior Individual:
Capt Daren Hoover

Commander's Cup-Special Recognition Junior Individual: Ms. Rachel Vickhouse

Commander's Cup Team: SLATE Team
Mr. John Noah | Maj Thomas Adams | Dr. Winston Bennett
Capt Michael Dooley | Dr. Donald Duckro | Capt Darin Hoover
Maj Miguel Valle

Commander's Cup Special Recognition Team:
ICOTT Team
Ms. Rachel Vickhouse | Maj Kristi Buczek
Dr. Brad Schlessman

RH 3RD QUARTER WINNER

Company Grade Officer: Capt Darin Hoover

RH 4TH QUARTER WINNER

Field-Grade Officer: Maj Kristen Grasser

AUSTRALIAN RESEARCH AND OPERATIONS EXERCISE BLACK SKIES 16 TEAM

Dr. Winston Bennett | Dr. Christopher Cerasoli
Dr. Gregory Funke | Dr. Jamie Levy
Dr. Leah Rowe | Mr. Steven Symons | Mr. Eric Watz

RH ANNUAL WINNERS

Company Grade Officer of the Year: Capt Michael Dooley

Field Grade Officer of the Year: Maj Thomas Adams

Administrative Excellence Award: Ms. Julia Lee

Commander's Cup-Senior Individual: Dr. Tamara Chelette

Commander's Cup-Team: SLATE ATD Team

Category III Civilian of the Year: Dr. Leah Rowe

Company Grade Officer IMA of the Year: Capt Stephen Bell

711 HPW 4TH QUARTER WINNER

Collaboration: Dr. Tiffany Jastrzembski

711 HPW ANNUAL WINNERS

Company Grade Officer IMA the Year: Capt Stephen Bell

Field Grade Officer of the Year: Maj Thomas Adams

Commander's Cup (Team): SLATE ATD Team

Commander's Cup Special Recognition Junior Individual: Ms. Rachel Vickhouse

AFRL ANNUAL WINNERS

Company Grade Officer IMA the Year: Capt Stephen Bell

Commander's Cup Junior Individual (Richard J. Neal Special Recognition): Ms. Rachel Vickhouse

711 HPW/RHA

Hails

Dr. Sarah Bibyk
Ms. Shania Bishop
Dr. Leslie Blaha
Ms. Janice Bradford
Maj Kristi Buczek
Ms. Cayley Dymond
Mr. Kent Fagan
Mr. Frank Feldmann
Mr. Dave Greschke
Ms. Beth Hartzler
Ms. Olivia Leung
Ms. Molly Liechty
Maj Jason Lingle
Dr. Luke Nelson
Mr. Dave Neufang
Mr. Nicholas Oyler

Farewells

Mr. Frank Beafore
Mr. Shaun Bowden
Mr. Austin Carter
Mr. Eric Chancey
Ms. Reem Hassan
Capt Darin Hoover
Ms. Stephanie Logan
Mr. Jack Marvin
Ms. Lauren Menke
Mr. Dave Neufang
Capt Chuck Ruddek
1st Lt Joseph Scutaro
Mr. Andy Waddel
Mr. Jason Wooten