Paper Title: Evolving Aviation Live Training in the Future

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ABSTRACT

Army Aviation is evolving from over a decade of training aircrews with aircraft using analog systems to an era of digitization, simulation, and embedded processing. Training Centers are adapting to this changing environment characterized by a common operating environment by reusing hardware and software across platforms. This evolving environment not only enhances individual aircrew skill levels, but collective air to ground integrated (AGI) operations training.

The Army's Aviation Tactical Engagement Simulation System (Aviation TESS) is capable of conducting individual, crew, and collective training to facilitate unified land and air operations training at the Combat Training Centers (CTCs) and Home Stations. Aviation TESS material developers must plan for life-cycle upgrades to adapt and integrate new technology, new tactics, techniques, and procedures (TTPs), and new training venues. Aviation TESS is currently used to collect aviation data across existing Army Aviation platforms (Apache, Black Hawk, Kiowa, and Chinook) and, in the future, from the ground component of the Unmanned Aircraft Systems (UAS).

This paper provides information on current aviation training capabilities, challenges faced by live aviation training stakeholders, and how PM TRADE will use the principles of Better Buying Power to evolve training systems to meet long-term Army aviation training requirements.

ABOUT THE AUTHORS

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Evolving Aviation Live Training in the Future

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OVERVIEW

Army Aviation is undergoing a restructure in light of returning forces from war and the reduction in forces mandated by the budget. Additionally, Army Live Aviation Training Systems are evolving from over a decade of training aircrews with analog systems to an era of digitization, increased use of simulation to create the Live-Virtual-Constructive Integrated Training Environment (LVC-ITE), and embedded processing on airframes. Training Centers are adapting to this changing environment by creating a LVC common operating environment, reusing hardware and software across platforms, and standardizing data interfaces. This evolving environment must work to not only enhance individual aircrew skill levels, but also train collective air to ground integrated (AGI) operations.

The Army's Aviation Tactical Engagement Simulation System (Aviation TESS) instruments platforms so position, location, and engagement data can be transmitted for exercise control and after action review. Aviation TESS can be used to conduct individual, crew, and collective training to facilitate unified land and air operations training at the Combat Training Centers (CTCs) and Home Stations. Aviation TESS material developers must perform Long Range Investment Analysis (LIRA) to adapt and integrate new technology, new tactics, techniques, and procedures (TTPs), and new training venues.

This paper provides information on current live aviation training capabilities, challenges faced by live aviation training stakeholders, and how PM TRADE, as a member of the Aviation Data Capture Integrated Product Team (ADC IPT) will use the principles of Better Buying Power to evolve training systems to meet long-term Army aviation training requirements.

Aviation Data Capture Integrated Product Team (ADC IPT)

The ADC IPT was chartered in 2010 by General Martin E. Dempsey (then Commander of the US Army Aviation Center of Excellence at Ft Rucker) to find a modular, reusable data capture solution for integrated Force-on-Force (FOF) and Force-on-Target (FOT) air and ground training. Initially focused on FOT gunnery scoring, the group evolved to work common solutions for FOT and FOF for all air vehicles, at all types of training venues. The group consists of stakeholders from Program Executive Offices, TRADOC Capability Managers, Material Developers, and Directors of Training at all levels. Additional participants include industry and training centers. They meet quarterly, work to resolve issues, report to a Board of Directors semi-annually, and report to PEO Aviation and PEO Simulation, Training, and Instrumentation (STRI) annually. Using the basis of existing training capabilities, the IPT develops strategies to ensure aircrews are ready and trained in the future.

CURRENT LIVE AVIATION TRAINING CAPABILITIES

Multiple Integrated Laser Engagement System/ Air Ground Engagement System

The Apache Multiple Integrated Laser Engagement System/Air Ground Engagement System (MILES/AGES) is a legacy live training system developed in the late 1980s. MILES/AGES equipment is added to the airframe to facilitate tracking Apache participation on live training ranges. Ground players equipped with MILES transmitters shoot laser beams instead of live ammunition. AGES belts with laser detectors receive the laser beams, and signal the aircrew that the aircraft was "hit," "killed" or has a "near miss" through audio and visual cues. The legacy

MILES/AGES does not integrate with any instrumentation system on the ground. While Apache aircrews train at Home Station and collect Real Time Casualty Assessment (RTCA) data using the MILES/AGES, they must land, download data and replay it on a computer for key cause and effect events.

Common Aviation TESS

In response to customer requirements to integrate Apache battalions with other instrumented forces, MILES/AGES was integrated with a new Modular SMart Onboard Data Interface Module (M-SMODIM) which transmits data via a repeater network on the ground to an Exercise Control (EXCON) and to other targets. The M-SMODIM represents a significant advancement in instrumented training in that it contains an embedded telemetry transceiver, internal GPS, and a data recorder allowing integrated and interactive operations in a fully instrumented environment. This M-SMODIM is the integrated data capture solution that forms the basis for a modular reusable component across aviation platforms (i.e., Apache, Chinook, Black Hawk, and Kiowa Warrior) training at all types of venues. Each platform uses the M-SMODIM configured with unique software, brackets, and cables.

The Army is in the process of qualifying an Advanced SMODIM (A-SMODIM) which addresses obsolescence issues such as aging technology, adding encryption, increasing processor capacity, memory expansion, and improving weapon fly-out models, and video. It will also standardize the communications design to accommodate various radios (Free Wave to encrypted radios) by allowing interchangeable Radio Frequency (RF) transceivers. The A-SMODIM will be a form/fit replacement for the M-SMODIM beginning in Fiscal Year 2017.

Longbow Apache Tactical Engagement Simulation System (LBA TESS)

LBA TESS is an advanced aircrew training system with a high level of integration between the training system components and the Longbow Apache aircraft systems. LBA TESS is fully MILES compatible. It uses MILES eye-safe laser designators to replicate employment of aircraft primary weapons (Semi Active Laser Hellfire and 30mm Area Weapons System) while integrating with the aircraft's tactical Laser Warning Receiver (AVR-2A/B) for detecting MILES Laser input (i.e. be killed capability). The LBA TESS also uses geometric pairing to replicate RF Hellfire engagements using 2.75" Folding Fin Aerial Rockets (FFAR). Figure 1 shows current LBA TESS components installed on the platform for training purposes. The back half (also known as the B-kit) is standard on all air platforms for position / location while the front half (also known as the A-Kit) is unique to the Apache helicopter for training engagements.

Figure 1. LBA TESS Components

The TESS kit uses embedded aircraft functions and appended TESS hardware, providing weapons emulations plus TESS subsystem controls and displays for warnings and event results, as follows:

FRONT – A-Kit

- TESS Training Missile (TTM) includes an Aircraft Kill Indicator (AKI) and a Flash Weapon Effects Signature Simulator.
- Eye Safe Laser Rangefinder Designator (ESLR/D), located in the Target Acquisition and Display System (TADS), determines range to target and transmits MILES code messages to simulate the Hellfire engagement.
- TESS Gun Control Unit (TGCU) simulates 30mm gunfire in single or burst rates when triggered.

BACK – B-Kit

- M-SMODIM processes signals from the aircraft laser sensors and TESS components to calculate RTCA and to communicate with the instrumentation system.

- TESS Antenna, allows the M-SMODIM to communicate with the training instrumentation on the range.
- Global Positioning System (GPS) antenna provides positioning data to the M-SMODIM.

Aviation TESS for Other Platforms

By reusing M-SMODIM technology and developing the brackets, cables, and interfaces unique to each platform, the Army is able to instrument aircraft for CTC training exercises. These "kits" combine with MILES/AGES components to transmit and receive signals. Most recently analog versions of the UH-60 and CH-47 were updated to digitized platforms with corresponding updates to the TESS components. The OH-58F Program Office worked with PM TRADE to implement digitized TESS components imperative to successful platform testing through Fiscal Year 2014.

Force on Force LBA TESS Home Station Instrumentation

LBA TESS supports dynamic Home Station Force on Force (FoF) training as shown in Figure 2. Each LBA TESS instrumented entity communicates directly with other instrumented entities and stores all transmitted data at the Mobile Mission Control Center. Ground entities consist of mobile and stationary targets. LBA TESS uses an embedded transceiver that transmits position, location, weapons and RTCA data over the Home Station Instrumentation (HSI) network. The HSI network is a Time Division Multiple Access (TDMA) network operating in broadcast mode. Every instrumented entity reports position and player ID data on the HSI network within its dedicated TDMA slot. Network repeaters configured specifically for each training area provide coverage of the exercise area and transmit data to a Modular Mobile Control Center (M2C2) which tracks all players in real time.

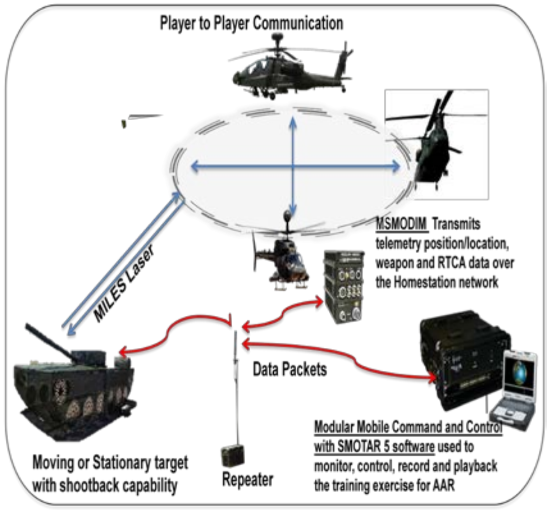

Figure 2. Home Station FOF Configuration

The M2C2 not only provides an integrated display in the command center of all instrumented players and their interaction, it stores all data to facilitate After Action Review (AAR) development. It also provides differential GPS corrections to network players and controls commands to kill, resurrect, and reset players.

Force on Force Combat Training Center Aviation Infrastructure

The aviation network infrastructures at the National Training Center (NTC), Joint Readiness Training Center (JRTC) and the Joint Multi-National Training Center (JMRC) provide interfaces between instrumented aviation platforms and the Core Instrumentation Systems (CIS) via unique radio communication systems and frequencies (see Figure 3). A data translator interfaces between the aviation infrastructure and the CIS using standard Distributed Interactive Simulation (DIS) or Range Data Measurement System (RDMS) Protocol Data Units (PDU) to communicate aviation telemetry and event data to the CIS. All CTCs have fixed range infrastructures equipped with a permanent CIS, a telemetry repeater/relay RF network system, an in-ground fiber network, player to CIS communications with centralized adjudication of

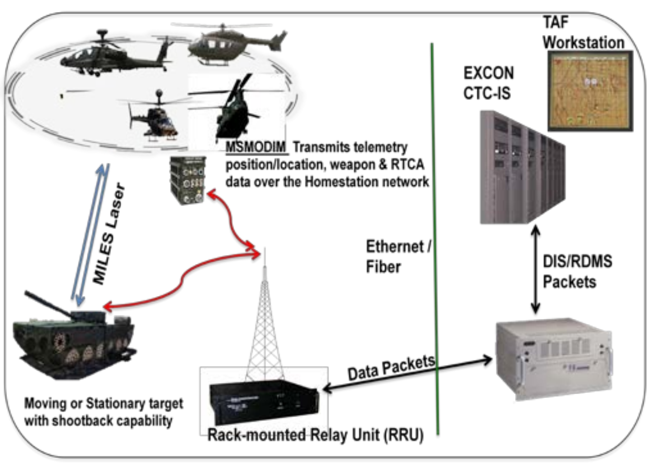

Figure 3. Combat Training Center FOF Configuration

targets for RF Hellfire engagements, as well as support for artillery and direct fire engagements. The CTCs use data captured through the data translator to present either separate Aviation AARs or Air-Ground Integrated (AGI) AARs.

Force on Target Range Interoperability

Today, Aviation TESS effectively interfaces with the Digital Range Training System (DRTS)/Digital Air Ground Integration Range (DAGIR) during Force on Target (FoT) training events (see Figure 4). Aircrews receive aviation gunnery qualification and training prior to CTC events. DAGIR facilities provide targets, field cameras, aviation integrated target villages, and communication infrastructures needed to develop gunnery skills and record each aviation scenario with the integrated Aerial Weapon Scoring System (AWSS) for AAR. After the event, analysts combine data from the aircraft's removable memory module and the AWSS for the AAR and take home package.

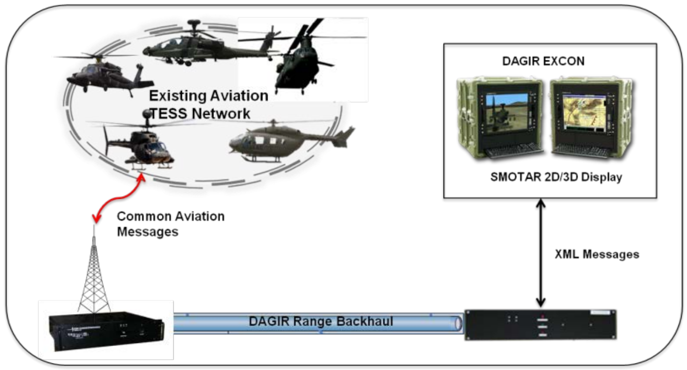

Figure 4. FOT Range Interoperability

CHALLENGES IMPACTING FUTURE LIVE AVIATION TRAINING

Army Aircrews will face challenges as they return from operations and maintain readiness at ranges, Home Stations, and CTCs. Perhaps the largest challenge is increasing availability of Home Station instrumentation for Apaches, Chinooks, and Black Hawks to meet training demands. Integrating air and ground training information as well as manned and unmanned training information to provide a MUM-T After Action Review (AAR) is currently unavailable. Developing integrated Manned-Unmanned Team (MUM-T) training scenarios using live-virtual-constructive entities in an integrated environment could be done now with a reasonable investment. (Kemper, Parrish, Sotomayor, Harrison, Voung, Grosse, Garcia, Szurgot, 2013) As Army Aviation PMs budget for these shortfalls, material developers must address cost/schedule/performance challenges resulting from lags between airframe updates and associated TESS updates. Sustainers are continually challenged to keep life cycle costs affordable especially proprietary systems. Future procurements must weigh the upfront investment for Government Owned/Government Operated systems against the anticipated overall lifecycle cost reduction. These challenges are described in further detail below. Budgetary and technical challenges create the gaps in FoT and FoF training venues, training systems and across platform variants detailed below in Table 1.

Table 1. Army Aviation Training Gaps

Aircraft / Training Venue	NTC FOF	JRTC FOF	JMRC FOF	HS FOF	HS FOT Gunnery	DRTS/ DAGIR FOT
AH64D/E				Requires Integration	TESS Available / can capture video	TESS Available / can capture video
OH58D (58F Terminated)	POS / HIT -KILL ONLY	POS/ HIT -KILL ONLY	Infrastructure Available; no OH-58Ds	Requires Integration	TESS Available /video integration	Requires Integration
UH60L/M (New) Universal TESS Set (UTS)	PEO STRI provided UTS	PEO STRI provided UTS	60L UTS / 60M TESS unfunded	No available platform data	No available platform data	No available platform data
CH47D/F (New) Universal TESS Set (UTS)	47D UTS / Cargo funded 47F Audio Cable	47D UTS / Cargo funded 47F Audio Cable	47D UTS / 47F TESS unfunded	No available platform data	No available platform data	No available platform data
Gray Eagle	Requires Integ'n, need Ph2 funds	Requires Integration	Requires Integration	Requires Integration	Requires Integration	Requires Integration
Shadow	Requires Integration	Requires Integration	Requires Integration	Requires Integration	Requires Integration	Requires Integration
Puma/Raven	Requires remote video integ'n & funds	Requires remote video integ'n	Requires remote video integ'n	Requires remote video integ'n	Requires remote video integ'n	Requires remote video integ'n

Green: Capability Available
Amber: On-going Integration and funded
Red: Training Need exists but not funded

The Aviation Data Capture Integrated Product Team (ADC IPT) developed the above chart to depict capabilities as of 2014. Efforts from this group are beginning to show progress as Aviation PMs work together with Training Directors and Material Developers to address training gaps with common solutions.

Lack of Home Station Aviation Training Assets and Connectivity

Other than Longbow Apache, aircrews are unable to conduct instrumented training at Home Station in preparation for CTC exercises and mission rehearsals. In addition to a lack of AGI Home Station training feedback, aviation TESS is unavailable at Home Stations. The CTCs maintain and store their unique TESS. Insufficient quantities cannot support all training venues to meet all skills training requirements. Future readiness depends on leadership decisions to document requirements, equip and support training venues, and fund for training system obsolescence and technology refresh.

Synchronizing Data for Air-Ground Integrated Training Feedback

CTCs track air and ground entities on separate instrumentation systems at different update rates. A data translator integrates the two infrastructures to feed the CIS and the Common Operating Picture (2D Map). Aircraft position/location updates at one Hz (one update per second for approximately 100 aircraft) while normal ground entity tracking occurs at a slower rate, (two to four updates per minute for 10,000+ entities). The resulting data reporting lag impacts target selection and adjudication in the CIS. Until the next generation infrastructure can handle the added load of aviation data, the low risk approach is to keep aviation data on a separate network. The Army's future Training-Instrumentation System (TIS) program will establish a standardized approach to infrastructure across CTCs, Home Stations, and ranges and address aviation and ground data. TIS will begin development in FY2017 under the current funding cycles.

Manned-Unmanned Team (MUM-T) Training

MUM-T is the synchronized employment of manned and unmanned air and ground vehicles, robotics, and sensors to achieve enhanced situational understanding, greater lethality, and improved survivability. MUM-T training is a new concept in the live training arena and faces significant challenges. These challenges include the addition of unmanned asset tracking, switched control, video output capture/replay for AAR purposes, and incorporation of mobile ground station into the training infrastructure. Training requirements stakeholders are working on the best approach for MUM-T training given the following challenges:

- No training unique software or hardware installed on a UAS.
- Limited requirements for the type of data and information required for AARs.
- High bandwidth and storage requirements for video data from multiple UASs.
- Mobility and connectivity of the ground control station to facilitate data transmission to/from the CIS.
- Switching control between air platform and ground station (e.g., simulate, emulate) for realistic training purposes. In addition, switching control from one ground station to another. Also simulating the UAS hit/kill - loss of video/communications.

Data Translator Configuration Control

A data translator formats the Aviation training data into compatible DIS PDUs. Depending on the training venue, the Exercise Control (EXCON), CIS, Protocols, and levels and types of data captured may differ. Therefore, maintaining a data translator baseline and keeping it updated for Information Assurance vulnerabilities is a challenge. Recent efforts succeeded in standardizing data translator configurations across FoT training venues. As the CTC Range Communication System (RCS) transitions and matures, additional investigation into the cost-benefit of standardizing data translators will be undertaken prior to eliminating them altogether when TIS is implemented.

Impacts of Airworthiness Release (AWR) on Aviation Training Concurrency

Each air platform has a standard M-SMODIM and unique TESS component configuration. This equipment must go through a standard set of environmental and electro-magnetic test requirements to qualify for flight safety. Platform PMs sponsor rigorous testing, certification, qualification and acceptance processes conducted and approved by the

Army Engineering Directorate (AED). The process can be expensive and time consuming (up to twelve months), causing a lag between a platform upgrade fielding and the corresponding training component update. An example is the recent digitization of the UH-60M and CH-47F platforms driving TESS changes. The UH-60M Air Worthiness process began in 2011 and finished in 2014. The CH-47F audio cable required a year and a half to develop and deliver and an additional year to produce with no AWR required. Similarly, a change to training hardware caused by obsolescence or technology refresh may require the TESS to re-qualify through the AWR process. Collaborative planning amongst Aviation PMs, AED and PEO STRI to refine the A-SMODIM qualification test requirements, reuse of results across platforms and future interface implementation standards may improve the AWR process.

Proprietary versus Government Owned/Government Operated Training Systems

Another challenge affecting aviation training system life cycle management is the proprietary nature of the technical data. Without Government furnished data rights, there is limited ability to compete or second source parts for sustainment except with the Original Equipment Manufacturer (OEM). System interfaces that the Government needs to control in order to modify or extend capabilities are proprietary and controlled by the industry developer. These proprietary rights preclude the Government from replacing obsolete components except through sole source contracts to the OEM, often resulting in increased costs by eliminating competition. The proprietary rights can also inhibit the Government from integrating new technologies or migrating to new RF networks. The next opportunity to recompete Aviation TESS and procure full use Government data rights will be with the Army TESS (ATESS) program scheduled to begin development in FY2017.

FUTURE VISION

Although Army live aviation training has a number of challenges, PEO STRI and the aviation community are developing a roadmap to resolve training gaps by:

- Migrating to a common training instrumentation infrastructure
- Adopting the Army's Common Operating Environment (COE)
- Using Vehicular Integration for C4ISR/EW Interoperability (VICTORY) and Future Airborne Capability Environment (FACE^{TM}) standard interfaces
- Developing an aviation training software product line

The end state of the Army's live aviation training vision (Figure 5) is detailed in the paragraphs below. (AUSA Defense Report, 2009)

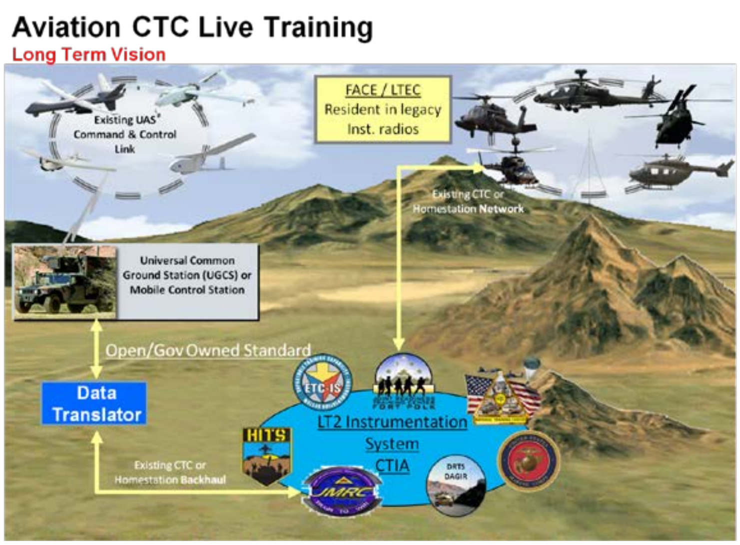

Figure 5. Future Vision for Live Aviation Training

Migrating to a Common Instrumentation Infrastructure

As mentioned above, the Army is supporting multiple networks, Exercise Controls (EXCONs), and data translators across FoT and FoF training venues. (USA Combined Arms Center, 2013)

RF spectrum and the type of TDMA networks constrain the Army's training infrastructure implementation. Air platforms require more bandwidth to track movement and engagements than ground instrumentation systems provide. Additionally, limited video capture capability did not include aircraft or UAS video feeds, which will significantly increase bandwidth and storage requirements. As the CTCs migrate to commercial cellular Long Term Evolution (LTE) networks and continue to explore other types of RF networks as a means to transmit more data and video in support of live exercises, the goal will be one non-proprietary network. The ripple effect will be a new radio in the ASMODIM, which will have to go through AWR qualification testing. Once implemented, long-term sustainment costs should decrease for a single standard network across all training venues.

PEO STRI realized over a decade ago that using a common training architecture would reduce training support costs. Reusing software and common EXCON components underlies the Common Training Instrumentation Architecture (CTIA) core set of infrastructure software services (used across training systems). These services can be instantiated with over 100 common software components to compose a training environment suited to users' requirements. The Army utilized CTIA across the Army as the EXCON and AAR standards for FoF and FoT training. Future aviation training systems will migrate to adopt these CTIA standards providing a common, configurable, scalable AGI AAR at any training venue.

By migrating to a common RF network and to the CTIA, data translators will be a relic of the past. Future initiatives will simplify the technical approach to live aviation training co-existing within the live-virtual-constructive training environment.

Common Operating Environment (COE)

The DoD realizes it cannot afford to develop duplicate or redundant software products at the platform level. In a 24 April 2013 memorandum to all Acquisition Professionals, the Under Secretary of Defense (Acquisition, Technology and Logistics) provided an implementation directive for the Better Buying Power (BBP) 2.0 initiative. (USD(AT&L), 2013) The memorandum outlines guidance and actions required to achieve greater efficiencies and productivity in defense spending. Key tenets of BBP 2.0 include achieving affordable programs, controlling costs throughout the product lifecycle, eliminating unproductive processes, and promoting effective competition. The vision described below for developing live aviation training solutions adheres to the principles of the BBP 2.0.

A key Army BBP initiative aims at reducing development timelines, lowering development costs, and reducing the time to integrate, certify and deploy capabilities in the Army Common Operating Environment (COE). The Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA (ALT)) developed the COE Implementation Plan, which provides a framework and common set of standards for modernizing equipment and weapon systems. (ASA(AL&T), 2011) A key objective of the Army COE is to eliminate stovepipe development efforts that often result in redundancy. In the past, stovepipe development approaches led to higher costs and time-consuming processes for integrating, certifying, and deploying live aviation training capabilities. The plan will be to implement key tenets outlined in the BBP 2.0 initiative and the Army COE to reduce costs and fielding times of future aviation live training systems.

The Army COE is composed of six Computing Environments (CEs), each providing common frameworks, shared infrastructures, and common sets of standards supporting the COE Implementation Plan. The COE defines a service-based architecture and provides crosscutting capabilities to ensure interoperability across computing environments. The Real Time Safety Critical Embedded (RTSCE) CE provides key enablers that can lead to reduced costs and fielding times for live aviation training systems. The primary purpose of the RTSCE CE is to deliver the Real Time Interoperability Framework (RTIF), consisting of four key enablers (ASA(AL&T), 2013):

- Vehicular Integration for C4ISR/EW Interoperability (VICTORY)
- Future Airborne Capability Environment (FACE)

- Ordnance Interface Standard (OIS)
- Engagement Operations (EO)

Only VICTORY and FACE enablers, detailed below, have direct application to the capabilities that the live aviation training community needs to pursue. OIS and EO will not be further described here.

Vehicle Integration for C4ISR/EW Interoperability (VICTORY)

VICTORY is a Program Executive Office Ground Combat Systems (PEO GCS) managed initiative. VICTORY's primary objective is to address size, weight, and power (SWaP) issues associated with ground vehicles. Historically capabilities for ground vehicles have been developed in a stovepipe fashion, resulting in redundant capabilities and systems such as multiple displays, global positioning systems (GPS), etc. Each of these redundant systems increases SWaP and cost and results in a lack of interoperability between systems. The training community often develops training unique systems rather than leveraging existing tactical capabilities and systems. VICTORY addresses these issues by providing a framework and common set of standards for ground vehicle applications. A key tenet of VICTORY is shareable resources leveraged by other systems, such as processing units, displays, input devices, and GPS. The VICTORY data bus (gigabit Ethernet), architecture and specification help to ensure interoperability. Although the VICTORY paradigm pertains to ground vehicle applications, similar methodologies can benefit future aviation training system developments. One such initiative is the Modernized Target Acquisition and Designation Subsystem (MTADS) implementation of the Day Side Video and Laser component for Apache AH-64E phase III. This implementation is a collaborative effort to incorporate the training laser within the operational module, reducing the overall footprint and eliminating a separate training component. Utility and Cargo helicopters will examine possibilities for moving TESS components to the avionics compartment, freeing up passenger and cargo space and protecting TESS components from potential damage.

Future Airborne Capability Environment (FACE)

FACE is a DoD – Industry consortium led by the Open Group since 2010 to address redundancy issues inherent to DoD aviation platforms. According to the Unmanned Aerial Vehicle (UAV) forum, which tracks UAV vendors, there are currently over 200 UAV designs from 80+ companies, academic institutions, and government organizations. (McCormack, E., 2008) Although there are many common functions and requirements across aviation systems, the current DoD acquisition model and the lack of standardization typically result in the delivery of platform unique designs. Unique designs lead to longer development times, increased development and lifecycle costs, an increased logistics footprint, and longer integration, certification and time-to-field times. Unique designs also increase the cost and time required to develop training systems for aviation platforms. The objective of the FACE initiative is to establish a standard common operating environment that supports portability and software re-use across DoD aviation systems. A key tenet of The Open Group's FACE Technical Reference Guide (2014) is adaptation of a common set of open architecture standards enabling software component re-use across the DoD fleet. (The Open Group, 2014) Another key aspect of the FACE architecture is separation between safety critical and non-safety critical applications through software partitioning. (ASA(AT&L), 2013) This will allow modification of non-safety critical applications, such as embedded training, without affecting safety critical applications. This paradigm can significantly reduce the time required for airworthiness certification. The training community cannot realize the benefits of FACE until DoD aviation platforms implement the open architecture and standards. PEO STRI will continue to monitor the progress of the aviation community's adaptation of FACE, and will continue to influence the development of standards needed to support training solutions.

Live Training Transformation (LT2) Software Product Line

Although aviation training systems rely on aviation platforms to implement FACE standards, PEO STRI has long realized the benefits associated with software re-use and a product line development approach. The Live Training Transformation (LT2) product line strategy employed by PEO STRI supports training of dismounts, vehicles, and aviation platforms at Home Station, combat training centers, instrumented live fire ranges, and while deployed. (Dumanoir, P., Rivera, J., 2005) Similar to the FACE paradigm, the LT2 framework provides a common set of core assets, including re-usable software components, architectures and open standards. (Lanman, J., Darbin, R., Rivera, J., Clements, P., Krueger, C., 2013) Prior to the implementation of LT2, live training system acquisitions were similar to the aviation community acquisition model – systems were often unique, developed by multiple vendors, often based on proprietary solutions, and did not realize the benefits of component re-use. To date, PEO STRI reports implementation of the LT2 product line strategy has resulted in cost avoidance of over half a billion dollars. (Clements, P., Gregg, S., Krueger, C., Lanman, J., Rivera, J., Scharadin, R., Shepherd, J., Winkler, A., 2013)

The Live Training Engagement Composition (LTEC) is another initiative based on open standards and re-usable software components to consider when developing TESS. (Janisz, C., Sowden, K., Platt, K., Grosse, J., Hall, K., 2013) Prior to LTEC, the acquisition of TESS capabilities for mounted and dismounted applications consisted of complete, appended systems, with proprietary components, interfaces and software. Although many TESS systems have similar requirements and functionality, the systems-based acquisition strategy resulted in the Government often paying for duplicative capabilities. The lack of commonality among systems, developed by different industry partners resulted in increased life cycle costs and an increased logistics footprint. The proprietary nature of TESS also inhibits implementation of embedded training applications, and precludes platform developers from developing dual-use tactical components for training purposes without significant added cost. LTEC, which is now part of the LT2 product line, provides re-usable, government owned software components to TESS developers. LTEC also enables a component based acquisition approach, which significantly reduces development time, life cycle costs and enables embedded training and dual-use applications. To date LTEC has been successfully demonstrated for dismount and ground vehicle (VICTORY) live training applications. Aviation live training systems developers will exploit lessons learned from these implementations to reuse LTEC principles for aviation training applications as LTEC matures and the aviation live training solutions evolve. (PEO STRI, 2013)

SUMMARY

This paper describes the current state of live aviation training capabilities and some of the challenges the live training community faces incorporating an integrated aviation training capability into its training centers. These challenges include the lack of MUM-T training capability, synchronizing data between systems, supporting multiple data translators and RF networks, the lag between aircraft changes and associated training system updates resulting from the AWR process, and the proprietary nature of systems to date.

PEO STRI is addressing these challenges by adhering to the principles of the Better Buying Power 2.0 initiative, including avoiding the development of redundant systems and software products, promoting effective competition, and controlling lifecycle costs. A key tenet to this approach is developing non-proprietary, portable, and re-usable components (hardware and software) using open standards and architectures. This approach is in-line with key Army and PEO STRI initiatives, including COE, VICTORY, FACE, LT2 and LTEC. Following the Better Buying Power guidelines for promoting competition and acquiring government data rights to control life cycle costs PEO STRI will develop aviation live training solutions in accordance with these key initiatives to significantly reduce the development timeline, lower development costs, and reduce the time to integrate, certify and deploy training capabilities.

Continued focus on these efforts by the ADC IPT will ensure all aviation training stakeholders are informed, involved and continuously contributing to aviation training solutions in the future.

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