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Addressing Army Aviation Collective Training Challenges with Simulators and Simulations Capabilities

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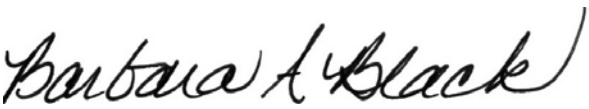

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ADDRESSING ARMY AVIATION COLLECTIVE TRAINING CHALLENGES WITH SIMULATORS AND SIMULATIONS CAPABILITIES

EXECUTIVE SUMMARY

Research Requirement:

As the U.S.Army continues development of a Live-Virtual-Constructive Integrated Training Environment, the reliance on aviation simulators and simulations will take on more importance in the overall aviation collective training mission. The primary objective of the research reported here was to identify Army aviation collective training challenges and to compare those needs to current (and planned) collective simulation capabilities. The specific gaps among collective training challenges, simulation capabilities, and simulation utilization can be used to inform simulation development and to guide training development.

Procedure:

Training challenges were identified across 27 senior trainers (i.e., unit Leaders and instructor pilots) from three different combat aviation brigades. The training challenges were verified by 58 additional senior trainers from across the Army. The current and planned capabilities and utilization of aviation simulation-training resources were then determined with interviews and surveys of 12 experts in simulation-based collective training. Based on the results of this work, a decision-support tool was developed. The tool was vetted by a small panel of aviation Leaders and simulation-training subject-matter experts.

Findings:

Seventeen aviation collective-training challenges were identified and prioritized. Army aviation Mission Essential Task List and associated Training Objectives were mapped to each training challenge in order to illustrate the relevance of the challenges. Four categories of collective-simulation resources emerged from the interviews: (1) Fidelity in Simulation Environment; (2) Aircraft Systems (Hardware and Software); (3) Products and Processes; (4) Training Support. The list of simulation-training resources that belonged to each category was then aligned to application of the relevant collective-training challenges. Ratings of difficulty associated with modifying each of the simulation-training resources indicated slight to moderate difficulty in meeting the collective-training challenges. Finally, most of the simulation-resource gaps in meeting the identified collective-training challenges were the result of resource utilization rather than resource capability. The utilization gaps were mostly the result of trainers not understanding the full scope of simulation capabilities, but some cost factors also influenced utilization.

Utilization and Dissemination of Findings:

A decisions-support tool was developed that combined all data results from this effort and provided a meaningful format for use in aviation collective training. The Aviation Collective Training Simulators and Simulations (ACTSS) Analysis Tool can be used by unit trainers, training planners, and training developers to determine the appropriate use of simulation-training resources for a given training objective. The ACTSS Analysis Tool can also be used by simulation and simulator developers to plan system capabilities and upgrades. The ACTSS Analysis Tool is available from Army Research Institute (ARI) – Fort Benning Research Unit. The results of the research effort and the use of the ACTSS Analysis Tool were briefed to the United States Army Aviation Center of Excellence Directorate of Simulation.

ADDRESSING ARMY AVIATION COLLECTIVE TRAINING CHALLENGES WITH SIMULATORS AND SIMULATIONS CAPABILITIES

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ADDRESSING ARMY AVIATION COLLECTIVE TRAINING CHALLENGES WITH SIMULATORS AND SIMULATIONS CAPABILITIES

Introduction

Background

As the U.S. Army continues development of a Live-Virtual-Constructive Integrated Training Environment, the reliance on aviation simulators and simulations will take on more importance in the overall aviation training mission. Consequently, refinement of requirements for simulators and simulations capabilities and their effective utilization are essential. This is especially true for collective training because Army Aviation leadership has mostly been addressing functional training requirements of simulators for individual as opposed to collective training (e.g., visual displays, software flight models, and motion cuing). As collective integrated training environments further emerge such as those at the U. S. Army Aviation Warfighting Simulation Center (AWSC) at Fort Rucker, it is essential to identify collective training challenges and how simulation can best be leveraged to improve collective training.

Currently, simulation meets some but not all of the training requirements for aviation collective tasks. However, optimizing aviation collective training simulation has proven challenging, especially in situations where simulators are electronically networked. Challenges also exist for the integration of future aviation simulators and simulations into the training mission. Moreover, beyond technical development and integration alone, optimizing the training effectiveness of aviation collective simulators is likely related to how they are used rather than to their capabilities. As a result, decisions will need to be made to guide the development and utilization of aviation collective simulators and simulations as their role in the training mission evolves. To facilitate these decisions, there is a requirement for a better understanding of the gaps between aviation collective training challenges and simulation capabilities and utilization.

The development of new simulators and simulations is usually guided by the mistaken belief that the greater the physical fidelity, the greater the training effectiveness (e.g., Nullmeyer & Laughery, 1980; Salas, Bowers, & Rhodenizer, 1998). However, simulators with lesser fidelity have been shown to be effective trainers when used in an appropriate training program (e.g., Stewart, Barker, Weiler, Bonham, & Johnson, 2001; Stewart, Dohme, & Nullmeyer, 2002). For example, Stewart, et al. (2001) demonstrated that a low-cost PC-based trainer was just as effective at imparting instrument flight skills to Army student pilots as an expensive motion-based instrument trainer. Rather than physical fidelity, functional fidelity is required for effective simulation training. Functional fidelity is the degree to which a simulator or simulation "acts" like the real situation and the degree to which the training utilizes the appropriate types of skills (e.g., procedural or cognitive) in a realistic way (Allen, Hays, & Buffardi, 1986; Lintern, 1991). Functional fidelity targets specific skills that need to be trained. As a result, a simulator can have high functional fidelity without high physical fidelity. In the context of collective training, functional fidelity is related to skills that allow aircrews to interact with other aircraft, tactical operations centers (TOC), and maneuver units on the ground (e.g., Stewart, Johnson, & Howse, 2008).

Research Objectives

The primary objective of the research reported here was to identify Army aviation collective training challenges and to compare those needs to the current (and planned) collective simulation capabilities. The specific gaps among collective training challenges, simulation capabilities, and simulation utilization can be used to inform simulation development and to guide training development. To achieve this goal, several steps were taken. First, several Aviation units were surveyed regarding their collective training challenges. The intent was to document the types of collective skills and training events that are difficult to execute at home station given current training resources. Ostensibly, these training challenges could be addressed by simulation training. Next, the current and planned capabilities and utilization of simulators and simulations for Army aviation collective training were documented. This step was intended to define the possible solutions available to meet the training challenges. Finally, an analysis of gaps between training challenges and current and planned capabilities of training simulation was conducted. This analysis was intended to specify how simulation can address training challenges and to identify directions for future simulation-based training development.

The research objectives are conceptualized in Figure 1. As depicted in blue, a broad set of aviation collective training challenges likely exists. Likewise, there is some set of current simulation-training capabilities depicted by the yellow circle that can address the training challenges. The green circle represents the belief that only a subset of the current simulation-training capabilities is utilized in collective training. Accordingly, current simulation capabilities address a portion of the training challenges such that the difference between the yellow and blue circles represents gaps in simulation capabilities. Equally important is the difference between the green circle and the yellow circle, which represents the potential for increasing simulation utilization. As a result, the research objective was to provide an assessment of what constitutes the blue, yellow, and green areas in order to identify how best to align training challenges and simulation capabilities while increasing simulation utilization with respect to tactical unit-level training.

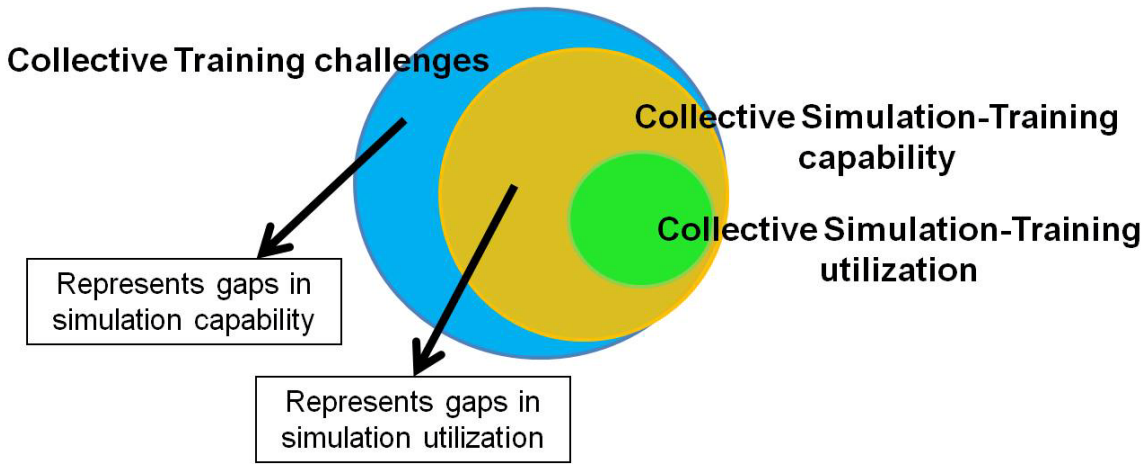

Figure 1. Aligning collective training challenges and simulation capabilities and utilization.

Overview of Research Procedure

In order to identify collective training challenges, a series of interviews with aviation unit Leaders, instructor pilots, and senior aviators was conducted. Emergent themes from these interviews were used to develop a set of training challenges. The set of training challenges was then prioritized using a questionnaire delivered to a second sample of aviation unit Leaders, instructor pilots, and senior aviators. Documenting aviation collective training simulator and simulation capabilities was accomplished by a series of interviews with technical experts. The interviews initially identified current and planned simulation capabilities and then were used to associate given capabilities with the collective training challenges. The analysis of capabilities gaps and utilization gaps was accomplished by compiling the results of the previous two research tasks (i.e., identifying collective training challenges and documenting collective simulation capabilities). The result of this analysis was a decision-support matrix to facilitate the identification of ways to improve the development and use of simulation for achieving Army aviation collective training objectives.

Overall, our findings suggested that while current aviation collective simulators and simulations address many training challenges, some capability gaps exist. In addition, opportunities to increase utilization and effectiveness given current capabilities also existed. Much of the results suggested that collective training events, such as Aviation Training Exercises (ATXs) as conducted at the AWSC at Fort Rucker, currently fulfill critical training needs while having the potential to further improve opportunities for tactical unit-level training. The findings presented here provide an independent analysis that can be used to guide simulator and simulation investment and employment decisions.

Collective Training Challenges

The first task completed in this effort was the identification of critical Army aviation collective training challenges. To accomplish this task, focus groups were conducted with Subject Matter Experts (SME) from multiple Combat Aviation Brigades (CABs) to document collective challenges currently facing Soldiers. Questionnaires were then distributed to pilots to evaluate the relevance and importance of the identified collective challenges.

Method

Participants. For the current research effort, a series of focus groups were conducted with Army Aviation SMEs from three different Army installations within the continental United States (CONUS) at different stages in the deployment cycle process. Following these focus groups, questionnaires were distributed during two ATXs at Fort Rucker, AL. At each installation, between six and twelve active duty Army aviators participated for a total of 27 workshop participants. SMEs backgrounds varied by role within a CAB (e.g., Instructor Pilot, Standardization Pilot, Company Commander [CO CDR], Brigade (BDE) S3, etc.) as well as by platform (OH-58D, AH-64D, UH-60A/L, CH-47D/F), and by rank (Chief Warrant Officer 3 to Lieutenant Colonel). While the majority of SMEs were experienced active duty OH-58D and AH-64D pilots, the variation in SME background provided a variety of perspectives from those executing mission tasks in the cockpit to those managing the planning and execution of those

tasks from the TOC. This mixture of participant backgrounds ensured consideration of a variety of viewpoints. The questionnaire respondents were Army National Guard and active duty pilots from various CABs participating in ATXs at Fort Rucker, AL between July and November 2011. Respondents included pilots similar in background to those participating in the focus groups. Pilots represented each of the current Army aviation platforms in a variety of roles and in varying levels of leadership. Altogether, 58 pilots completed the collective challenge importance questionnaire.

Procedure.

***Structured focus groups*.** The structured focus groups took place from 20-22 April, 27-28 April, and 27-28 July 2011with pilots from three CABs. A total of nine separate half-day focus groups were conducted, and each focus group was composed of between two and six pilot participants. The structured focus group approach was applied to guide the interview process and ensure an unbiased identification of collective challenges. An interview protocol was developed with specific questions pertaining to training objectives, collective challenges, and teamwork training based on observations during ATX to identify training objectives, challenges, and teamwork skills and to gather information about how ATX supports aviation collective tasks (see Appendix A for the protocol). The structured interviews were constructed to be adaptable to a variety of different SME levels of experiences including CO CDRs, CO level pilots, and Battalion level officers and Chief Warrant Officers as each of these groups was expected to have different perspectives and degrees of insight into the different topic areas. Focus group content was thus tailored to the experience levels and anticipated knowledge of those participating in each session. While questions and content were tailored to the experience and knowledge of SME participants, the same general approach was applied in each of the focus groups and there were three primary objectives for each focus group: (1) identify current collective challenges, (2) understand how simulators and simulations are used to train these challenges, and (3) identify how pilots would like to use simulators and simulations to train collective skills.

For the first objective (i.e., identifying current collective training challenges), questions were designed to elicit collective training objectives, challenges, and teamwork skills being trained prior to deployment. Pilots were also asked to indicate collective training challenges experienced upon arrival to theater. During each focus group, participant comments were documented and displayed in real-time so that pilots could refer back to the challenges, objectives, and teamwork skills throughout the interview. Participants were also asked how important each identified challenge was in the overall training mission as well as how frequently the challenges were discussed during unit training.

The second focus group objective was to obtain an understanding of how simulators and simulations are currently used for training each of the identified challenges and training objectives. Questions were developed to identify pilots' perspectives on how well home-station simulators (e.g., Aviation Combined Arms Tactical Trainer [AVCATT]) and large scale collective training events (e.g., ATX) prepare their units for deployment, as well as what impacts this training has on mission readiness. As relevant collective training challenges and objectives were identified in the focus groups, specific questions regarding simulators and simulations were designed to determine where technology capability or utilization could be improved.

The third and final focus group objective (i.e., identifying how pilots would like to use simulators and simulations to train collective skills) was only applied if time remained and pilot SMEs exhibited a high degree of understanding of the training objectives for aviation units. These questions focused on development of collective training objectives and training plans and how simulators, simulations, and other resources could be used in meeting these objectives. This discussion of training objectives and challenges and how pilots would like to use them for achieving mission readiness was anticipated to help facilitate the analysis of collective simulation-training resource utilization in particular. All but one group provided information for the third objective.

Collective challenge importance questionnaires. Based on content identified during the various focus groups, a brief questionnaire was developed for SMEs to indicate the relative importance of each of the identified collective training challenges. The goal of this questionnaire was to gather quantitative data regarding the importance of each of the training objectives, challenges, and teamwork skills discussed in the focus groups. The questionnaire, which can be viewed in Appendix B, asked respondents to rate collective training challenges according to importance in the first part of the questionnaire and to rank order the top five collective training challenges in the second part of the questionnaire. Respondents were also provided an opportunity to indicate any additional training challenges they felt were important but were not represented in the survey. The questionnaires were distributed to respondents during ATXs. Respondents were given 20 minutes to complete the questionnaires, and researchers collected the forms as they were completed.

Results

Focus group interviews. At the completion of all focus groups, researchers compiled all workshop notes and developed a list of key themes surfacing across focus groups. Key themes often appeared in all three of the focus group objective areas, and, as expected, there was a considerable amount of redundancy observed both within and between focus groups. Many of the resulting critical themes were mentioned by pilots more than once within a single focus group, and many of the same issues were also commonly discussed across multiple focus groups. When importance assessments provided during focus groups were analyzed, a key set of topics were generally indicated to be extremely important in collective Army aviation training. The top 16 interview themes based on frequency of appearance across the nine focus groups are presented in Table 1. The table identifies each theme and in how many of the nine focus groups it was discussed.

Table 1
Key Themes Emerging Throughout Focus Groups and Frequency of Their Occurrences

Theme	Number of focus groups in which theme occurred
Air to Ground integration	6
Battlefield communications	6
Mixed platform mission training	6
Integration with other units at AO (Unmanned Aerial System, United States Air Force, other Army Aviation, International Security Assistance Force)	5
System and sensor usage during target prosecution	5
Battle rhythm	5
AO Familiarity	5
Standard Operating Procedure, Rules of Engagement, and legal issues	4
Team tactics	4
Air Mission Commander and Pilot in Command Development	4
Preparing new pilots	4
Environmental effects	4
Aircraft proficiency	3
Aircraft upgrades	2
Resource supply vs. demand	2
Legal requirements (e.g., talking to the tape)	2

Because of the frequency of occurrence of these 16 themes, they were deemed important enough to include in subsequent questionnaires to determine relative importance. To facilitate comparison between themes, each was refined based on further SME input, reworded to read as a collective training challenge, and provided with an operational definition to ensure proper understanding of meaning. This work produced changes in wording and splitting of one item to improve clarity (i.e., ROE Processes and Procedures, Use of SOPs). A complete list of the resulting 17 collective challenges and their descriptions that resulted from the refinement can be viewed on page 13 of Appendix C.

Collective training challenge importance questionnaire results. As previously indicated, pilots from each of the aviation platforms completed the collective challenge importance questionnaire. As each platform has its own areas of focus and the focus of this effort was specifically on the tactical-unit level, results of the questionnaire were organized into two categories based on general mission functions: attack/scout (AH-64D/OH-58D) and lift/utility (UH-60A/L and CH-47D/F). Pilots were asked to rate the importance of each collective challenge on a four-point scale where zero indicated the challenge was not important and 3 indicated the challenge was very important. All 17 collective challenges were rated as important (minimum mean rating of 1.89 for Legal Requirements [e.g. talking to the tape]) to very important (Maximum mean rating of 2.74 for Air Mission Commander (AMC) and Pilot in Command (PC) Development) across all pilots. While a complete list of average importance ratings by platform can be viewed on page 21 of Appendix C, Table 2 indicates the importance ratings for the six most critical challenges to current AH-64D and OH-58D collective training.

Pilots were also asked to rank order the top five collective challenges, where a rank of one indicated the most important challenge. Because only the top five collective challenges were ranked, a weighted importance rank was computed to ensure each collective challenge was provided a ranking. To compute this weighted rank, a simple weighting was applied to each theme based on the frequency of its appearance within the top five. Weights of five, four, three, two, and one were applied to ranks of one, two, three, four, and five, respectively. The frequency of each ranking was then multiplied by the weights and the products were summed. The item with the highest weighted score was deemed most important according to this calculation, and the weighted scores were all rank-ordered from highest to lowest. A complete list of weighted importance rankings by platform can be viewed on page 21 of Appendix C.

While importance rating and rankings can be viewed for each of the top 17 collective challenges and all 17 challenges were rated as important to pilots, it was necessary to identify the highest ranked challenges for inclusion in a more detailed analysis. To determine the highest ranked challenges, the weighted rankings and average importance ratings for AH-64D / OH-58D pilots as well as all platform results were considered and a natural break in the values occurred after the sixth most important challenge. Thus, these six challenges (see Table 2) were the focus of the remainder of the effort and a more detailed evaluation of these top six collective challenges was applied.

Even though this research analysis focused on the critical collective challenges identified in this effort, it was important to ensure relevance of these challenges to the more commonly discussed collective training objectives per Army doctrine. As a result, Army aviation SMEs provided a mapping of the 17 top collective training challenges to current Army aviation Mission Essential Task List (METL) and associated Training Objectives (Department of the Army, 2006). Eighteen METLs were identified as relevant to the tactical unit-level focus in applied in this effort. The number of METLs mapped to each collective challenge ranged from three (Battle Rhythm) to 18 (AMC and PC development, Battlefield communications, Preparing New Pilots, Use of SOPs, Mixed Airframe Missions, and Team Tactics). Four of the six highest ranked Collective Challenges were relevant in all 18 METLs (AMC and PC development, Battlefield Communications, Preparing New Pilots, and Mixed Airframe Missions. Air to Ground Integration was relevant to 15 METLs, and rules of engagement (ROE) processes and

procedures was relevant to 4 METLs. The full results of this mapping can be viewed on pages 18 and 19 of Appendix C.

Table 2
Six Highest Ranked Current Collective Training Challenges to AH-64D and OH-58D Army Aviation

Collective Challenge	Weighted Importance Ranking	Average Importance Rating
Air to Ground integration	1	2.69
Battlefield communications	2	2.77
AMC and PC development	3	2.92
Mixed airframe missions	4	2.69
Preparing new pilots	5	2.69
ROE processes and procedures	6	2.54

Notes: AMC = Air Mission Commander; PC = Pilot in Command; ROE = Rules of Engagement.

Altogether, focus groups and importance questionnaires with current Army aviators yielded 17 important collective training challenges that currently face Soldiers. Further analysis of these challenges identified the six most critical collective training challenges. The resulting set of collective training challenges was the focus of the remainder of this effort. The next research task was to determine the simulator and simulation capabilities that could address these collective training challenges and to determine what gaps exist in the capabilities.

Simulator and Simulation Capabilities

The purpose of this task was to identify and document the current capabilities and capacities of Army aviation collective simulators and simulations. To accomplish this purpose, a separate series of interviews was conducted and another set of questionnaires were administered with Army aviation collective training and simulation experts. The results of this task facilitate a comparison of how current and planned simulator and simulation capabilities meet current collective training challenges identified in the first task of this effort.

Method

Participants. Eight training and simulation SMEs from the U.S. Army Aviation Center of Excellence Directorate of Simulation (DOS) were interviewed individually or in pairs. The SMEs included two active duty officers who were knowledgeable about ATX operations and simulations, three retired Army aviators with current expertise and knowledge of the AVCATT, unmanned aircraft system (UAS) simulation, and simulation and training operations, and three additional DOS personnel with expertise in virtual systems, simulations, and training Army aviation. Nine training and simulation SMEs and one pilot serving as an Observer-Controller

(OC) during an ATX completed questionnaires about the relevance and difficulty of addressing collective training challenges with given simulators and simulations. These 10 questionnaire respondents included active duty officers, retired officers, and other members of the DOS staff who hold extensive knowledge of simulator and simulation use for collective training and virtual systems.

Procedure. Using data obtained in the Collective Challenge Identification task, an initial set of features available or desired by pilots for use in collective aviation simulation training was developed. This list was then used to prompt discussion during interviews with simulation-training SMEs. The types of information obtained during these interviews included current capabilities and limitations of simulators and simulations, associated resources (e.g., personnel and facilities), technology supporting simulators and simulations, planned upgrades and upgrade processes for simulators and simulations, knowledge of processes for collective training exercises, and relevance of technology features to training collective tasks. Simulator and simulation capabilities interviews occurred on 28-30 June 2011 at Fort Rucker, AL. Data obtained in these interviews provided support for the identification of areas for improvement (if any) that existed for each simulation resource.

Following the identification of a thorough list of simulation resources used in Aviation collective training, a questionnaire was developed to identify: (1) the importance of simulation resources in addressing the identified collective training challenges, and (2) the difficulty of modifying the function, use, or application of each simulation resource. The full questionnaire used in this effort can be viewed in Appendix D. The questionnaires were administered from 18-23 September 2011 at Fort Rucker, AL. Upon completion of data collection, data were analyzed to support the identification of relevance (importance) of each simulation resource to each of the six top-ranked collective training challenges. The data that addressed the difficulty of modification were also analyzed to provide additional context for use in the research task (i.e., Simulations Capability and Utilization Analysis).

Results

Four categories of collective-simulation resources emerged from the interviews: (1) Fidelity in Simulation Environment; (2) Aircraft Systems (Hardware and Software); (3) Products and Processes; (4) Training Support. The first two categories described the technology used in simulation-based collective aviation training. Fidelity in Simulation Environment refers to the infrastructure and tools that are used to create and model the virtual theater of war by linking trainees together in a distributed environment in real time, and Aircraft Systems (Hardware and Software) refers to hardware and software used to simulate aircraft flight and all aspects of the cockpit including electronic communication and aircraft flight models. The final two categories refer to additional important aspects of collective training environments. Products and Processes refers to resources that are utilized for collective training preparation, planning, and debriefing activities, and Training Support refers to the products, scripts, resources, and personnel required by AWSC and CABs to execute scenarios and collective training objectives. A complete list of the collective-training simulation resources identified through these interviews can be viewed on pages 14 and 15 of Appendix C. Collective-

simulation resources in this list are organized by category and a description for each simulation resource is provided.

In addition to the categorized list of simulation resources, results of the interviews produced a set of initial key themes that emerged regarding the capabilities and utilization of simulation resources for training collective objectives. These key themes were identified through a qualitative analysis of interview content and the frequency of which topics were discussed throughout interviews. Each of these initial key themes cut across multiple collective challenges. The initial key themes were:

- Flight teams can likely obtain more training value out of collective training simulations than typically occurs.
- Collective training simulations may contain more capability than is often employed during routine training.
- Concurrency upgrade processes are complicated, slow, and there is rarely enough funding for important upgrades
- Training Support Packages (TSPs) are the key to ATXs.
- DOS tries to obtain authentic white cell role players but United States Army Forces Command (FORSCOM) supplies them

While only initial key themes, the information obtained during simulation SME interviews was an essential step in the overall analysis process, and it was believed that these key themes would re-surface in the final analysis.

When asked to indicate the level of difficulty associated with modifying each of the simulation-training resources, considering cost, upgrade processes, etc., SMEs indicated an overall average of 2.3 (slightly difficult) on a scale of 1 to 5, where 1 indicated *Not at All Difficult* and 5 indicated *Impossible*. The minimum difficulty assigned was an average of 1.6 (*Slightly Difficult*), and the maximum assigned difficulty was an average of 3.8 (*Very Difficult*). Table 3 indicates the average difficulty associated with each simulation-training resource category, and the full results of the Difficulty of Modification questionnaire are presented on page 22 of Appendix C.

Table 3
Average Difficulty of Modification by Simulation-Training Resource Category

TADSS Resource Category	Average Difficulty	Associated Scale Label
Fidelity in Simulation Environment	2.8	Moderately Difficult
Aircraft Systems (Hardware and Software)	2.6	Moderately Difficult
Products and Processes	1.8	Slightly Difficult
Training Support	2.2	Slightly Difficult

Again, the end result of the Simulator and Simulation Capabilities research task was an organized list of simulation-training resources that work together to create the simulated collective training environment in which Army aviators train prior to deployment, and an initial

set of key themes regarding the capabilities and capacities of these resources. For each resource identified through interviews with simulation and training SMEs, the perceived difficulty was identified through questionnaires. Through these questionnaires it was found that simulation-training resources in the Products and Processes and Training Support categories were generally less difficult to modify than simulation-training resources in the Fidelity in Simulation Environment and Aircraft Systems (Hardware and Software) categories. By obtaining a thorough understanding of the capabilities and capacities of the simulation-training resources that comprise simulated collective training environments, an analysis of capabilities and utilization of these resources for training the previously identified critical collective training challenges was possible.

Simulations Capabilities and Utilization Analysis

The purpose of the Simulations Capabilities and Utilization Analysis task was to determine areas of improvement (if any) for training each of the critical collective training challenges by combining the results of previous two research tasks. To accomplish this goal, an analysis of all interview and questionnaire data collected in this effort was conducted and a four-step process to identifying areas for improvement was applied. Analysis results were then presented to training and simulation experts for review and refinement. The end result of this task was the Aviation Collective Training Simulators and Simulations (ACTSS) Analysis Tool, a decision-support matrix to facilitate the identification of ways to improve the development and use of simulation-training resources for achieving Army aviation collective training objectives.

Method

Participants. Two active duty Officers knowledgeable of ATX operations and simulations, three retired Army aviators with current expertise and knowledge of the AVCATT, UAS simulation, and simulation and training operations, and two additional DOS personnel with experience in virtual systems, simulations, and training Army aviation served as SMEs for a validation workshop. The majority of workshop participants also participated in Simulator and Simulation Capabilities interviews and questionnaires (i.e., previous research task). As a result, they were already familiar with the research process.

Procedure. The result of this research task was the development and validation of the ACTSS Analysis Tool, which was a tool for aggregating all data results in this effort and combing results into a meaningful decisions-support matrix for use in aviation collective training. There were two phases to accomplish this purpose. The first phase was to construct the analysis tool from the results of the previous research tasks, and the second phase was a workshop to validate the analysis tool. The analysis tool was constructed as a spreadsheet with separate sheets summarizing the results of each of the previous research tasks:

- Collective Challenge Descriptions
- ACTSS Resources Descriptions
- Challenges by METLs and Training Objectives
- Collective Training Challenge Importance Rankings and Ratings

- Difficulty to Modify ACTSS Resources

For each of the top six ranked collective training challenges, a four-step analysis was applied: (1) training challenge importance, (2) simulation-training resource availability, (3) assessment, (4) conclusions.

In determining training-challenge importance, the AH-64D / OH-58D ranking and ratings were computed given the tactical unit-level focus of this effort. As previously described, rankings were ordered with the most important challenge ranked '1' and the least important challenge was ranked '17'. Ratings were provided on a scale from zero to three, as previously described, such that zero indicated *Not Important* and three indicated *Very Important*.

In the second step, simulation-training resource availability, the relevance, capability, and utilization of each simulation-training resource was determined. First, results from interviews and from the ACTSS Resource Importance Questionnaire were used to identify which simulation-training resources were relevant to each collective challenge (Priority, in Figure 2). Next, for those simulation-training resources that were determined to be relevant to a given challenge, two questions were asked: (1) What is the state of its capability? (Capability, in Figure 2), and (2) What is the state of its utilization? (Utilization in Figure 2). To assess the Capability, a simple "yes" or "no" was assigned based on interview content. A "yes" was assigned when capability currently exists in some form. A "no" was assigned when no capability currently exists. For items that were determined to have current Capability, an assessment of the utilization was then made (Utilization, in Figure 2). To assess the Utilization, a "yes" or "no" was first determined. A "yes" was assigned if, based on interview content, the feature is believed to be appropriately used up to the level of capability provided. A "no" was assigned either when (a) the feature is available for use but is often not requested by pilots (Not Requested, in Figure 2) or (b) it is cost prohibitive to use this feature (Cost Prohibitive, in Figure 2), or (c) a planned upgrade is in progress (Planned Upgrade, in Figure 2). The reason for the "no" being assigned (e.g., Not requested, Cost, Planned Upgrade) was also listed. Finally, for each relevant simulation-training resource, a comment was entered into the ACTSS Analysis Tool to describe the nature of the relationship and the state of the simulation-training resource given capability and utilization for training the collective challenge.

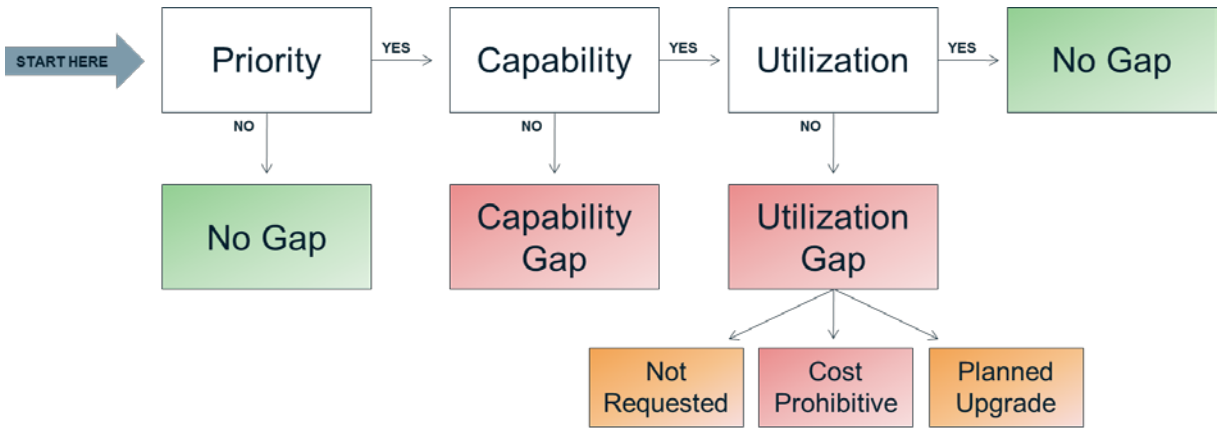

Figure 2. Decision-tree applied in the simulation-training resource availability analysis.

In the assessment step, all information provided in the second step was considered and a determination was made regarding whether or not there an opportunity for improvement was present. In general, if there were any types of capability or utilization gaps identified in the analysis an area for improvement was deemed present. If an opportunity for improvement was determined, the type of improvement (e.g., Capability, Utilization -- Not requested, Cost, Planned Upgrade) was classified. For this classification, a summary of the frequency of times the Capability was lacking (i.e., "no" in that cell), and the number of times each type of utilization gap was used (a, b, c) was presented.

For those challenges to which an improvement was deemed possible, Step 3c consisted of the identification of key themes. Researchers and Army aviation SMEs evaluated all material obtained through both interviews and questionnaires for each challenge and identified between two and four key themes for how to improve the training of each collective challenge using simulation-training resources. Specific simulation-training resources relevant to each key theme were identified and listed, and the difficultly of modifying each of those relevant resources was also listed. A description of the nature of the difficultly was also provided based on interview and questionnaire content with simulation and training experts.

The final step in the analysis process was Conclusions. In this step, a high level bulleted list of conclusions regarding the ability of ACTSS to train each pilot identified collective challenge was generated based on the identified key themes for improvement. Each of these analyses is contained in its own section in the ACTSS Analysis Tool (Appendix C):

- Air to Ground Integration ACTSS Resources Analysis (pages 24 - 28)
- Battlefield Communications ACTSS Resources Analysis (pages 29 -33)
- AMC and PC Development ACTSS Resources Analysis (pages 34 - 38)
- Mixed Airframe Missions ACTSS Resources Analysis (pages 39 - 43)
- Preparing New Pilots ACTSS Resources Analysis (pages 44 - 49)
- ROE Processes and Procedure ACTSS Resources Analysis (pages 50 - 54)

To ensure the accuracy, relevance, and utility of the research analysis results each of the analysis pages was presented to a group of simulation and training experts. During this workshop, researchers and SMEs worked through each step of the process for each of the top six challenges editing content in real-time as required. The contents and language of every item from ACTSS resource to key theme was reviewed with SMEs to ensure accuracy. Following completion of this workshop, minor editing and aesthetic revisions were applied to the ACTSS Analysis Tool as required. Additionally, several new sections were created to summarize the results of this effort and enhance the usefulness of the ACTSS Analysis Tool (Appendix C):

- Title Page
- Table of Contents
- Process Summary
- Training Aids, Devices, Simulators, and Simulations (TADSS) Resources Relevance to ATX and AVCATT
- Challenges by METLs Sorter
- Summary Results by Collective-Training Challenge

The Title Page, Table of Contents, and Process Summary tabs serve as organizational and informational guides to using the ACTSS Analysis Tool. The Table of Contents summarized the purpose of each page in the ACTSS Analysis Tool and provides a hyperlink to that page. The Process Summary tab presents an overview of the research process applied in this analysis, as described in this research report. This information is hyperlinked as relevant to other tabs in the ACTSS Analysis Tool to provide understanding to the user regarding from where the data and information in the analysis was obtained. The ACTSS Resource Relevance to ATX and AVCATT tab provides a mapping of which ACTSS Resources are applicable to each of the current ACTSS in use in Army aviation collective training. While it draws from information contained in the Challenges by METLs and Training Objectives tab, the Challenges by METLs Sorter allows the ACTSS Analysis Tool user a way to quickly and easily identify which METLs are relevant to each of the Army aviation collective challenges identified in this effort. Finally, the Summary Results by Collective Challenge tab provides a high level summary of the results and recommendations provided in each of the Critical Challenge Analyses tabs.

Results

As a result of applying the four-step analysis to each of the six most critical collective challenges and validating findings with SMEs in a one-day workshop, opportunities for improvement of all six of the top ranked collective challenges were identified. The majority of the recommendations were centered on the utilization of various simulation-training resources, but several capability gaps were also identified. Table 4 summarized the types of improvements identified for each challenge.

Table 4
Capabilities Improvements by Utilization Gap Type for Each Collective-Training Challenge

Collective-Training Challenge	Capability Gaps	Utilization Gaps	Utilization Gap Type			
			Not Requested	Cost	Planned Upgrade	Other
Air to Ground integration	1	11	5	3	1	2
Battlefield communications	2	9	4	3	0	2
AMC and PC development	2	15	7	3	2	3
Mixed airframe missions	1	8	3	3	0	2
Preparing new pilots	3	20	8	7	2	3
ROE processes and procedures	1	7	4	0	1	2
Totals	10	70	31	19	6	14

Notes. AMC = Air Mission Commander; PC = Pilot in Command; ROE = Rules of Engagement.

The specific results of each Collective-Training Challenge's resource analysis and associated recommendations are presented in Appendices N to S. While each challenge had its

own key themes and recommendations, several key themes were common to the all six of the challenges:

- Taking full advantage of resources provided
- Arriving to collective training exercises with clear unit level training objectives
- Applying standardized evaluation metrics to aircrews
- Providing constructive feedback to inform collective task performance development
- The importance of concurrent representations of aircraft systems in collective training environments

Each of these key themes will be discussed further in the Discussion and Recommendations.

Summary of Products

The end product of this task and the broader research effort was the ACTSS Analysis Tool, which is shown in Appendix C. The ACTSS Analysis Tool is a decision-support matrix to facilitate the identification of ways to improve the development and use of simulators and simulations for achieving Army aviation collective training objectives. The tool provides a summary of the results of each major step in the research process and was designed to help unit leaders and Army training specialists identify ways to enhance current collective training of critical challenges using current and planned simulation-training resources. The ACTSS Analysis Tool also provides results that can be used by Army simulation-training experts to identify areas for future improvement of simulator and simulation technologies and resources.

Discussion and Recommendations

The opportunity for CABs and their supporting units to conduct collective training exercises is limited. The unit's home station AVCATT and the ATX at Fort Rucker currently offer a cost-effective opportunities to perfect the unit's aviation-centric planning and execution capabilities in a collective training forum. The ATX is especially well-designed to support BDE CDR and BDE Staff training objectives, while flight teams can collectively train in both home station AVCATTs and at the ATX. The research reported here reinforces this importance and availability of collective training in simulated environments and illustrates that many simulation-based training capabilities exist to train aviation brigades at various levels. As the Army mission evolves and technology changes, however, there are improvements that can be made to improve the effectiveness of simulation-based collective training. The findings presented in this report indicated that while current collective simulation-training resources address many training challenges, some capability gaps still exist (e.g., realistic manned-unmanned teaming, cockpit concurrency, better air-ground integration, and enhanced synthetic and constructive ground force representation). In addition, several opportunities to increase the utilization and effectiveness of the simulation-training resources also exist given the current capabilities and design of collective training. As an example of one of the greatest areas for improvement in the utilization of simulated collective training, pre-training preparation by the CAB that includes a METL crosswalk and training plans analysis at all unit levels would aid in the design, resourcing, and staffing of simulated collective-training events. Taken as a whole, current collective simulation-training resources do address the majority of collective-training challenges, but some capability

gaps and many utilization gaps exist. The following sections will describe these gaps as they are relevant to critical collective-training challenges currently facing aviators and will conclude with a discussion of recommendations to aviators and simulation-based training experts that result from this research.

Overall Themes

Throughout, this research focused on the capabilities and utilization of simulation-training resources for Army aviation collective training. In analyzing the most critical collective-training challenges currently facing aviators, several overarching themes that spread across each of the collective-training challenges were identified. As these themes underpin the current findings and recommendations, the overall themes will be summarized before providing a discussion of the findings for each individual collective-training challenge.

The first overall theme to emerge was leveraging distributed simulation infrastructure to create more realistic collective training environments. There are multiple individual and collective simulators in use throughout the different branches in the Army. During the present research effort, leaders at all levels within CABs reported a desire to link the different simulators such as the Close Combat Tactical Trainer (CCTT) and the AVCATT, several individual helicopter simulators, or a mix of individual and collective simulators to produce a more realistic full spectrum training environment in order to replicate combat conditions.

The second overall theme was that the unit is responsible for identifying specific training needs and building collective training plans. Currently, ATX and other large-scale collective training needs are focused around the Brigade TOC and their subordinate Battalion TOCs. As AWSC integrates higher levels of feedback to tactical-level units at ATX, these units must provide training objectives to their chain of command to support inclusion of these unit-level objectives into the ATX. CO CDRs and Aviation leaders interviewed during the present research all indicated a need for designing training plans around their aircrews. However, these CDRs may not fully recognize their own role both in planning and execution during an ATX in order to accomplish their own training objectives. Related to this, the simulation experts and facilitators at exercises like ATX must also ensure that these tactical-level leaders are fully aware of the tools and resources available to them during simulated collective-training events.

The third overall theme to emerge was incorporating the use of structured evaluation and performance measurement throughout collective training environments. Current feedback and take-home products at ATX are generally centered on the TOCs' primary training objectives. Aviators receive feedback in the traditional form of "hot washes" after each mission. However, CO CDRs interviewed across multiple CABs asked for more feedback and a take away packet that links the performance of individuals, aircrews, and performance trends for the entire CO as a baseline to guide improvement of collective-task performance. The development of a consolidated feedback tool for use by OCs as well as unit Leaders surfaced as a possible means to this end. Such a tool would ensure that feedback provided to tactical unit leaders are based on standardized, useful, and relevant performance metrics.

The fourth and final overall theme to emerge was maintaining the concurrency of cockpit systems. Aviators interviewed across the OH-58D, AH-64D, UH-60A/L, and CH-47D/F airframes indicated a variety of aircraft upgrades continually occurring throughout Army Aviation. If pilots must learn or re-learn an older version of the aircraft software to actively participate in collective training events, negative transfer (i.e., training that occurs in a simulator will *impede* performance in the real aircraft) is a real possibility. In the current research effort, veteran pilots indicated they found it difficult when first starting to train in collective simulators because the simulators were often behind in upgrades. Hence, it often took even veteran pilots several flights to remember how the older version software worked. Junior pilots indicated older systems may lead to skill degradation because the pilots had to learn to new procedures that differed from the aircraft currently being flown or those that would be flown once deployed. Further, if aviators struggle to perform individual tasks because of old systems, it will be very difficult to achieve proficiency in collective task performance, which can assumes proficiency on individual tasks. Interviews with pilots in the current effort suggested that if pilots were not provided the opportunity to practice individual tasks using appropriate systems within the overall collective task, they often experienced a steeper learning curve once in theater.

Taken together, these findings reveal that improving collective training for Army aviators requires a mixture of simulation and simulator capabilities improvements and changes to the ways in which simulation-training resources are utilized. While further research is likely required to develop specific action plans resulting from the findings of this research, this report is intended to provide a platform from which the Army can continue discussions regarding how simulation-training resources can best be leveraged for training collective challenges in today's environment and beyond. The following is presents an overview of the main training challenges and how they may be addressed.

Individual Collective-Training Challenges

Air-to-ground integration. The first identified collective-training challenge, Air to Ground Integration, was defined as communicating using mutually understood key words and phrases to provide support to ground units. There were 22 simulation-training resources that were found to be relevant to the training of Air to Ground Integration. Of the 22 resources, only Evaluator Training was found to lack capability in collective training environments. Evaluators in simulated collective training exercises are typically not provided training on how to evaluate teams and provide specific and constructive feedback. Of the remaining twenty-one resources, ten were deemed to have the appropriate utilization, and eleven were identified as having utilization areas for improvement. Specifically, three resources were found to be underutilized for cost considerations: Compatibility With Other/Offsite ACTSS, Ballistic Models for Ordnance, and Radio Representation. Five resources were underutilized because they are often not requested by pilots: Aircrew Training, ATX Preparation, Close Air Support (CAS), Company-Level Training Objectives, and Radio Propagation. One additional resource, Blue Force Tracker (BFT), is underutilized but there is a planned upgrade in progress. The exact findings for each simulation-training resource related to Air-to-Ground Integration can be found in the comments column on pages 24 – 28 of Appendix C.

Several key themes for the Air-to-Ground Integration collective-training challenge emerged in the analysis. First, a better match of collective training resources (e.g. white cell, collective players, and collective training devices) in simulated missions would provide a more realistic interaction between the Air and Ground forces. As an example, interactions between white cell member or role players and aircrews may not be as authentic as with uniformed personnel with recent ground combat experience. Thus, it is important for aviation units to request support from ground units and unit personnel that reflect the type of missions the unit will be supporting in theater. This request may include non-combat-arms units executing convoys, or it may include combat-arms units executing missions. This type of authentic interaction in simulated training environments would not only benefit the aircrews but give ground personnel collective training experience with their supported unit prior to deployment. Another way to achieve more authentic white cell interactions would be to connect flight teams in collective simulators with ground unit trainers, such as the CCTTs, at offsite facilities. This networked training would allow the right personnel to participate in collective training events without the need to physically be present for the duration of the training.

The second key theme in the Air-to-Ground Integration collective-training challenge was the prioritization and communication of collective training objectives within all unit levels and exercise coordinators prior to exercise participation. For example, there are many opportunities to train aircrews during an ATX. However, given other focuses of such exercises (i.e., TOC), it is up to the unit to develop specific training plans that address unit needs. Unit leaders at all levels within the organization should develop training plans and training plan resource requirements should be passed through the organization as well as to exercise coordinators prior to arrival for the start of exercise. Specific examples of this coordination include the inclusion of CAS or Company-Level Training Objectives by the Unit CDRs in pre-exercise coordination between the CAB and supporting training elements (e.g. DOS), which would lead to improved training opportunities for the aircrews.

Another key theme for Air-to-Ground Integration was a better use of tools to support air to ground interactions. One of the main aspects in Air-to-Ground Integration is the communication between the cockpits and the ground. Therefore, the representation and propagation of radios is paramount. Currently, the correct propagation of radios in simulated collective training environments is hindered because of the configuration. While the capabilities generally exist to replicate radio propagation as it will occur in theater, the line of sight feature, for example, is usually turned off for training because it increases the complexity of the training. That is, pilots may believe the simulator is malfunctioning because they cannot communicate with elements with which they believe they should be able to communicate when in fact they are out of sight and that is why they are unable to communicate. When it is important for TOCs and crews, among other entities, to communicate clearly to facilitate the collective training, leaving the line of sight feature on may introduce a level of complexity some may argue is not beneficial to the success of the unit's performance. Hence, it is up to the unit leader to determine if this type of communication is a critical training objective. At ATX, for example, line of sight communication can be turned on by a commander specifically requesting it in the exercise. Another important aspect of radio communication is how systems are represented in the collective trainers. In both AVCATT and Reconfigurable Collective Training Device (RCTD), radio simulation technology replicates the baseline radios well (e.g., UHF, VHF, and FM).

However, some radios used in combat (i.e. Satellite Communications, Tactical Satellite) are not represented on all devices. Finally, pilots lack the ability to change volume for different frequencies in some collective trainers. This situation creates challenges for communication with ground and other entities in simulator training because aircraft pilots often use different volumes to ensure proper communication (i.e. being able to selectively hear relevant entities).

After considering the key themes emerging for the Air-to-Ground Integration training challenge, several conclusions were drawn. Collective training of the Air-to-Ground Integration training challenge may be improved by: (1) a systematic match of air and ground personnel to replicate anticipated theater interactions, (2) pre-exercise coordination and negotiation of required on-site personnel throughout Army hierarchy, and (3) targeted use of distributed simulation infrastructure to replicate actual environment conditions.

Battlefield communications. The second most important collective-training challenge to current attack/recon units, Battlefield Communications, was defined as communicating the right information to the right person on the right frequency/communication system at the right time. Altogether 20 simulation-training resources were found to be relevant to the training of Battlefield Communications in simulated collective-training environments. Of these 20, two were identified as not containing the appropriate capability: Cockpit Concurrency and Evaluator Training. Eleven resources were identified as possessing the appropriate utilization and nine were identified as having utilization areas for improvement. Specifically, three of the simulation-training resources were found to be underutilized due to cost considerations: Cockpit Concurrency, Radio Representation, and Company-Level Training Objectives. An additional four resources were identified as areas where pilots typically do not request the resources that are available to them: CAS, ATX Preparation, Aircrew Training, and Radio Propagation. The exact findings for each simulation-training resource can be found in the comments column on pages 29 – 33 of Appendix C.

Three key themes were identified for the Battlefield Communications training challenge. First, a more concurrent representation of electronic communications would improve the aviator's collective training experience and decrease the opportunity for negative transfer of training. Typically, collective training environments replicate BFT and Digital Messaging as realistically as possible given simulator and training environment constraints. At ATX, there is a planned upgrade to the simulation engines that control the training environment (i.e., OneSAF and SE Core) that will make the representations of electronic communications more realistic for the OH-58D/AH-64D platforms (UH-60A/L/M and CH-47D/F are accurate with respect to the real aircraft as currently employed using electronic kneeboard cards). While planned upgrades will improve the aviator's experience, simulator platforms are presently not as current as the aircraft in theater and this does impact the aircrews' ability to train Battlefield Communications objectives.

Second, a better use of tools (i.e. radios) to support battlefield communications in simulated collective-training environments was possible. As in the Air-to-Ground Integration training challenge, communication with aircrews and between aircrews and the ground are critical. Therefore, the representation and propagation of radio communications is again paramount.

Like the second theme, the third key theme for Battlefield Communication was similar to a theme described in the Air-to-Ground Integration challenge. The third key theme for collectively training Battle Communications was the prioritization and communication of collective training objectives within all unit levels prior to beginning training exercises. While the ATX, for example, is primarily a TOC-focused exercise, additional opportunities for collective aircrew training at all unit levels during ATX exist. Participating units should develop specific training plans and push request to and through the BDE prior to arrival at collective training events.

After reviewing key themes in the Battlefield Communications training challenge, three conclusions on how to improve Army aviation collective training in simulated environments were identified: (1) maintaining the exact versions of electronic communication systems as found in the cockpit, (2) training with the most realistic settings for communication tools in the simulation environment, and (3) pre-exercise coordination and negotiation within BDE to include training events focused on aircrew battlefield communications.

AMC and PC development. The third most important collective training challenge indented in this effort was defined as developing newer pilots' familiarity/skills in order to assume air-mission commander (AMC) and pilot-in-command (PC) roles. There were 28 simulation-training resources found to be relevant to the training of AMC and PC Development. Of these 28 simulation-training resources, two were identified as having capability areas for improvement: Evaluator Training and After Action Reviews. Thirteen resources were identified as having the appropriate utilization for training AMC and PC Development, and 15 resources were found to have utilization-focused areas for improvement. Specifically, three resources were underutilized due to cost considerations: Company-Level Training Objectives, Mission Planning, and Ballistic Models for Ordnance. Seven resources were found to be underutilized due to not being requested by pilots: Environmental Effects, Radio Propagation, Training Support Packages, Aircrew Training, ATX Preparation, CAS, and White Cell. Additionally, two resources were currently underutilized but were scheduled for upgrades: BFT and Digital Messaging. Finally, current capabilities that exist for the resource Exercise Performance Feedback are not utilized in AMC and PC Development in simulated collective aviation training environments but a specific source for this lack of utilization was not identifiable. Complete findings for each simulation-training resource can be found in the comments column on pages 34 – 38 of Appendix C.

Several key themes were also identified for the AMC and PC Development training challenge. First, a lack of prioritization and/or communication of specific AMC and PC development training objectives exist during collective training events. Current simulation-training resources could be used to address the challenge of AMC and PC Development, but unit trainers must develop a detailed plan to train AMCs and PCs in the collective-training environment and then communicate that plan to their leadership and the training support hierarchy. Second, the development of training plans, evaluation criteria, and feedback for AMC and PC Development must be developed prior to and throughout the exercise. For example, at ATX, the large-scale AARs do not tend to focus on flight teams or AMC and PC decision-making. The AARs often lack constructive feedback for AMCs and PCs tied to specific mission performance. The informal "hotwash" immediately following a mission only captures a single mission and does not show AMC or PC development over time against a set training plan.

After reviewing these key themes, two primary conclusions were drawn regarding how to improve simulation-based collective aviation AMC and PC Development training: (1) a renewed focus by CO CDR's on the development of training plans and evaluation criteria prior to the exercise and the use of targeted feedback throughout the exercise, and (2) prioritization and communication of the CO training plans within all unit levels and DOS prior to collective training events.

Mixed airframe missions. Mixed Airframe Missions, the fourth collective-training challenge facing aviators today, was defined as coordinating and conducting missions with other types of air platforms. The key to this training challenge was incorporating the planning and execution of the mission while taking into account the capabilities and limitations of each aircraft given that two different aircraft types are involved in the same mission. Nineteen simulation-training resources were found to be relevant to training Mixed Airframe Missions in simulated collective aviation training. Of these 19 simulation-training resources, only one resource had a capability-focused area for improvement: Evaluator Training. Eleven resources were identified to possess the appropriate amount of utilization, and six resources were identified as having the existing capability but not being utilized appropriately. Three resources were found to be underutilized due to cost considerations: Compatibility with Other/Offsite Resources, Company-Level Training Objectives, and UAS. Three resources were also identified as being underutilized due to pilots not requesting them: Training Support Packages, Aircrew Training, and ATX Preparation. The exact findings and data for each simulation-training resource can be found in the comments column on pages 39 – 43 of Appendix C.

Key themes identified for the Mixed Airframe Missions training challenge focused on the priority of missions, distributed simulation capabilities, and UAS capabilities. The first theme in Mixed Airframe Missions was a theme that commonly occurred throughout our six challenges. That is, Mixed Airframe Missions was not a priority during collective training events. Current simulation-training resources could be used to address the challenge of training Mixed Airframe Missions, but to do so, unit trainers must develop a plan to incorporate multiple types of aircraft in a mission or flight and then communicate that plan (and the mission priority) to their leadership and the training support hierarchy. This procedure could include additional pilots and specific mixed airframe scenarios that would then facilitate the planning and mission execution that must occur to be successful during a Mixed Airframe Mission.

The second Mixed Airframe Missions theme involved utilizing distributed simulation capabilities to perform Mixed Airframe Missions. At one point, simulators at ATX, for example, were capable of distributing part of the exercise using a unit’s home station AVCATT and Battle Command Training Center (BCTC). However, recent upgrades to the AVCATT platform created simulators that are no longer compatible with the RCTDs at ATX. The capability to link RCTDs to home station AVCATTs would allow multiple aircraft platforms to participate in the collective training event without the need for pilots to travel to collective training locations. As a result, collective training events could have access to more pilots in more aircraft platforms in order to perform Mixed Airframe Missions.

The third and final key theme for Mixed Airframe Missions was the ongoing process of representing UAS capabilities given future Concepts of Operation (CONOPS) and cockpit technology insertions. As CONOPS and cockpit technology for UAS are further developed, collective training environments must replicate these features in order to keep pilot training as realistic and relevant as possible.

After reviewing these key themes, two primary conclusions were drawn regarding how to improve simulation-based collective aviation training of the Mixed Airframe Missions challenge: (1) utilizing, linking, and configuring collective training distributed simulation environments to replicate the diversity of mixed airframe missions, and (2) ensuring the concurrency of simulator cockpit technology as UAS CONOPS are developed and implemented.

Preparing new pilots. The fifth training challenge, Preparing New Pilots, was defined as developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills. There were 29 simulation-training resources found to be relevant to the challenge of Preparing New Pilots. This category had the greatest number of applicable simulation-training resources among each of the top six collective challenges. Of the 29 simulation-training resources, three were identified as lacking the required capability to effectively train new pilots in a collective simulation environment: Cockpit Concurrency, After Action Reviews, and Evaluator Training. Newer pilots using non-concurrent simulator cockpits may struggle to perform functions in the simulator as they would in the actual aircraft unlike AMCs and PCs who are more likely to use workarounds in the simulators. Specifically, if new pilots cannot perform individual tasks due to technology differences, it is unlikely pilots would be able to focus on collective training objectives. Also, current capabilities that exist for After Action Reviews and Exercise Performance Feedback in the collective training environments were not utilized in Preparing New Pilots in the collective training environments. Nine resources were found to possess appropriate capability as well as utilization, and 20 resources were identified as having the existing capability in some form but were found to be underutilized. Seven resources were underutilized due to cost considerations: Company-Level Training Objectives, Mission Planning, Radio Representation, Ballistic Models for Ordnance, Terrain Representation, and Accuracy of Geography. Eight resources were underutilized due to pilots not asking for them: White Cell, Stealth Room, ATX Preparation, Aircrew Training, Training Support Packages, Radio Propagation, Digital Messaging, and Environmental Effects. Additionally, two resources that were found to be underutilized were scheduled for planned upgrades: BFT and Digital Messaging. The exact findings for each simulation-training resource can be found in the comments column on pages 44 – 49 of Appendix C.

Several key themes were identified for the Preparing New Pilots training challenge. First, improved accuracy of terrain and geography for pilots new to an area of operations (AO) would enhance learning. For new pilots who have not been to theater, accurate geography is critical because it promotes an understanding of the location of objects in theater and improves situational awareness prior to deployment. To completely and perfectly accurately replicate geography, however, is likely not worth the cost. Methods currently employed (i.e., tinning, adding more realism each iteration, etc.) are cost-effective solutions to replicate geography as

accurately as possible within a reasonable cost. However, the more accurate the terrain and geography the more positive impact the training may have on a new pilot.

The second theme was maintaining cockpit concurrency for new pilots. A struggle in collective training events for new pilots often revolves around cockpit concurrency issues because an older or different cockpit configuration is enough to limit the training value new pilots receive in a collective training event. The pilots may be focused on relearning individual skills because the tools or cockpit are different, which limits newer pilot's ability to focus on collective training objectives. Cockpit concurrency in simulated collective trainers was in line with funding allotted but still remains a challenge. Until upgrades are available to collective trainers, workarounds were often employed (as possible) to simulate features of the new systems until the upgrade is implemented. The potential negative impact of employing different cockpit systems and functionality is likely the greatest for new pilots.

Both the third and fourth key themes for Preparing New Pilots have already been mentioned in the discussion of other important challenges. A renewed focus on the insertion and accomplishment of new-pilot developmental training objectives into the collective training exercise is required to maximize the training opportunities provided in simulated collective training environments. Units should perform a METL cross-walk and a training needs analysis on their less experienced pilots and assess if incorporating specific training objectives into collective training events specific training objectives could be beneficial. Finally, evaluation and feedback during the exercise is essential for developing new pilots. If a training plan was developed prior to a collective training event, then trainers would have criteria to use to record constructive feedback for new pilots tied to specific mission performance. Trends could be evaluated for new pilots and CO CDRs could be provided take-home packages for areas for further focus identified in new pilots.

After reviewing these key themes, two conclusions for how to improve simulated collective training for the Preparing New Pilots training challenge were drawn: (1) replicating the environment, geography, terrain, and cockpit as accurately as resources and technology allow, and (2) a renewed focus by CO CDR's on the development of training plans and evaluation criteria prior to the exercise for new pilots.

ROE processes and procedures. The sixth and final challenge, ROE Processes and Procedures, was defined as understanding what rules of engagement are and how the rules impact decision making during the mission. Eighteen simulation-training resources were found to be relevant to the training challenge of ROE Processes and Procedures. Of these 18 simulation-training resources, only one was identified as lacking capability: Evaluator Training. Eleven resources were found to possess the appropriate level of utilization, and six were identified as having capability but being underutilized for one reason or another. Specifically, four resources were found to be underutilized because pilots do not request them: Radio Propagation, Company-Level Training Objectives, Stealth Room, and Theater SME's. One resource, BFT, is currently underutilized but is scheduled for an upgrade that should address this utilization assessment. One additional resource was identified as being underutilized, but a suitable category of underutilization was not identifiable: Exercise Performance Feedback. The

exact findings for each simulation-training resource can be found in the comments column on pages 50 – 54 of Appendix C.

Two key themes were identified for the ROE Processes and Procedures training challenge. The first theme in ROE Processes and Procedures was that Semi-Automated Forces (SAF) are ambiguous by design and hostile intent is not always explicit. Modeling coalition and enemy forces was done as effectively as possible in an unclassified setting. Because of the difficulty of identifying specific features, pilots must apply a decision making strategy within the flight team much like they would in combat. The uncertainty pilots face regarding SAF modeling facilitates ROE discussions and ensures pilots go through the appropriate processes to determine hostile intent, for example. Yet, the white cell is always available to duplicate and create training conditions to exercise specific ROE Processes and Procedures that may be of concern. The second theme was that a renewed focus on the development of training plans and company-level training objectives prior to executing collective training events would improve the overall training opportunity for aviators. As expressed in previous training challenges, unit leaders within the organization should identify specific training objectives related to the application of ROE Processes and Procedures which they would like incorporated into the training and coordinate with the supporting training element prior to the exercise. This would lead to improved training opportunities for the aircrews.

After reviewing these key themes, one conclusion was drawn regarding how to improve simulation-based collective aviation training of the ROE Processes and Procedures training challenge: (1) the unit leaders should ensure pre-exercise coordination and negotiation of required on-site personnel to serve as live role players in place of constructive SAFs if specific behavior is required to exercise certain ROE Processes and Procedures. The use of a person to control a simulated insurgent would facilitate more specific and direct behaviors that could be used to train aviators on ROE Processes and Procedures.

Recommendations

After reviewing the data and the common themes that emerged over the course of this research effort, a number of recommendations for various audiences surfaced. The two primary audiences for these recommendations are: (1) the simulation training developers and collective training exercise facilitators, and (2) unit leaders and trainers participating in collective training exercises.

First, for training developers and collective training exercise facilitators, we recommend that they:

- Use the most realistic settings and configurations for communication tools (e.g. Line of Sight).
- Replicate the environment, geography, terrain, and cockpit as accurately as resources and technology allow.
- Ensure AO is accurate as possible to enhance transfer to theater operations.
- Provide realistic match of ground personnel to replicate anticipated interactions in theater.

- Develop capability to link aviation collective simulators to other entities for more authentic off-site training opportunities.
- Ensure planned upgrades (OneSAF/SE Core) are completed to enhance realism of electronic communications.
- Develop and apply standardized evaluation metrics to ensure relevant, useful, and targeted feedback on unit level mission performance.
- Develop a take-home package for CO CDRs or unit leaders summarizing areas for focus within their flight teams, based on mission performance throughout simulated training events.
- Work with units to ensure company-level training objectives (as available) are incorporated into TSPs.
- Develop and implement UAS technology in accordance with how UAS is implemented and integrated into the Army training mission.

Second, for unit leaders and trainers participating in simulated collective training exercises, we recommend that they:

- Develop specific training plans and conduct METL crosswalks prior to participation in collective training exercises.
- Work with unit leaders to ensure CO level training objectives are understood and passed to exercise coordinators well in advance of arrival for exercises.
- Communicate specific unit-level AO-related objectives to training developers prior to exercise.
- Bring experienced aviators and/or unit leaders to collective exercises to evaluate flight team's progress throughout training.
- Ensure correct personnel (e.g. AMCs, PCs, Instructor Pilots, etc.) participate in collective training exercises and are appropriately matched to training objectives in order to develop personnel.
- During collective exercises, coordinate with exercise coordinators and evaluators to ensure specific personnel receive appropriate training experiences and developmental opportunities.
- If authentic white cell interactions are desired, work with unit leaders to request Division resources to support request as possible.
- Use and/or bring Judge Advocate General personnel to collective training events if ROE Processes and Procedures is a focus of training.
- Incorporate unit level training objectives into overall BDE training plan.

Taken together, these recommendations suggest the need for a way to significantly increase simulation-training resource utilization. One potential way to increase simulation-training resource utilization, and thereby increase unit readiness, would be to provide unit commanders a planning aid that is based on the ACTSS Analysis Tool and that identifies simulation-training resources that match unit METL and that informs the commander how to best utilize those resources in collective training. In addition, the planning tool could provide information on how to acquire relevant simulation-training resources and how to plan training events to best utilize available simulation-training resources. The planning aid could be used to plan daily home-station training and to plan for larger-scale collective training events such as an

ATX. The planning aid would also help commanders develop TSPs or scenarios for simulation-based training. It would be desirable that commanders have access to such a collective-training planning aid "on demand" whenever training decisions need to be made (i.e., point-of-need delivery).

The ACTSS Analysis Tool can be used by a number of personnel including unit trainers, training planners, and training developers, as well as simulations and simulator developers and program managers. Two potential use cases are now described. The first potential use case would be a program manager that is (1) allocating their new yearly budget and is required to decide between two types of technology upgrades or (2) requesting resources for a training facility upgrade. They can use the ACTSS Analysis Tool to review the highest priority training challenges as identified by Army Aviators. The user could then review the current capabilities and capacities of aviation collective simulators and simulations and the difficulty to modify rankings. Finally, the user could review the crosswalk between the individual training challenge and the resource availability and utilization to decide which technology upgrade or replacement would have the most impact on collective training. The second potential use case would be a unit trainer that is deciding how to get the most effective training out of the available training environments. They could use the ACTSS Analysis Tool to review the ways in which TADSS resources impact collective training challenges on Preparing New Pilots or on AMC Development, as an example.

The findings of this research effort were briefed to the U.S. Army Aviation Center of Excellence Director of Simulation. The Directorate of Simulation provided feedback on the final ACTSS Analysis Tool (Appendix C) and supported the idea of developing a simulation-training planning tool. The final ACTSS Analysis Tool will be disseminated to supporting units and will be available from the Army Research Institute – Fort Benning Research Unit.

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Acronyms

AAR	After Action Review
ACTSS	Aviation Collective Training Simulators and Simulations
AMC	Air Mission Commander
AO	Area of Operation
ARI	Army Research Institute
ATX	Aviation Training Exercises
AVCATT	Aviation Combined Arms Tactical Trainer
AWSC	Aviation Warfighting Simulation Center
BCTC	Battle Command Training Center
BDE	Brigade
BFT	Blue Force Tracker
CAB	Combat Aviation Brigades
CAS	Close Air Support
CCTT	Close Combat Tactical Trainer
CDR	Commander
CO	Company
COL	Colonel
CONOPS	Concept of Operations
CONUS	Continental United States
DOS	Directorate of Simulation
FORSCOM	United States Army Forces Command
IP	Instructor Pilot
METL	Mission Essential Task List
OC	Observer-Controller
PC	Pilot in Command
RCTD	Reconfigurable Collective Training Device
ROE	Rules of Engagement
SAF	Semi-Automated Forces
SATCOM	Satellite Communications
SME	Subject Matter Expert
SOP	Standard Operating Procedure

TADSS	Training Aids, Devices, Simulators, and Simulations
TOC	Tactical Operation Center
UAS	Unmanned Aerial System

APPENDIX A

FOCUS GROUP PROTOCOL FOR AVIATION COLLECTIVE TRAINING CHALLENGE IDENTIFICATION

Date/Time:
CAB:

INTRODUCTIONS

PROJECT BACKGROUND

TRAINING OBJECTIVES AND CHALLENGES

When thinking about your upcoming (or previous)deployment….

1. What formal collective training objectives (doctrinal, flight, or brigade and above designated) do you have for your upcoming deployment? (*Document in projected list as discussed)*
    a. What challenges do you anticipate?
    b. In previous deployments, what collective challenges came as a surprise?

2. What informal collective training objectives (implied tasks, unit goals, flight team training tasks) do you have for your upcoming deployment? (*Document in projected list as discussed)*
    a. What challenges do you anticipate?
    b. In previous deployments, what collective challenges came as a surprise?

3. Let's review the list of training objectives (*read over list*).
    a. Are there any other key collective) training objectives (i.e. as flight teams, BNs, and/or BDEs) that you'd like to add?
    b. As you have been preparing for your upcoming deployment, what challenges have you faced in training at the collective level?

4. Of all these training objectives (informal or formal), which do you feel least 'prepared' to perform in combat?
    a. What do you think makes it difficult to prepare for?

5. Which of these training objectives do you feel most prepared to perform?
    a. Why do you think you feel especially prepared in this objective?

6. As you think about all the challenges you mentioned (*read over list*), what do you anticipate to be your biggest challenge (or challenges)? Why?
    a. How did you identify this as a challenge (heard from other units; learned in previous deployments, identified at ATX, etc.)
    b. Once you recognized this challenge or potential challenge, how did you (or do you) train/prepare for it?
    c. If time and resources were not issues, how would you like to train for this challenge?

7. Altogether, you identified ___ training objectives. If you were to (as a group) rank order these challenges in order from most important (1) to least important (___), how would you rank them? (*Document in projected list as discussed*).

8. Altogether, you identified ___ challenges. If you were to (as a group) rank order these challenges in order from biggest challenge (1) to least challenge (___), how would you rank them? (*Document in projected list as discussed*).

TEAMWORK SKILLS

9. When talking about collective tasks and collective training, one way to think about it is to identify the required skills a team must perform to be successful. There are undoubtedly a number of individual skills each person must do to perform within a team, but there are also a number of things you must do as a team in order to be successful. What are some key team skills for flight teams? (*Document in projected list as discuss*)
    a. *Examples (only offer if absolutely necessary – best to have them develop list):*
        - *Communication (clear, concise, accurate, timely, etc.)*
        - *Shared Situation Awareness*
        - *Adaptability/Flexibility*
        - *Crew Coordination*
        - *Leadership*
        - *Supporting Behavior*
        - *Information Exchange*
        - *Proactively pushing information*
        - *Mutual trust*
        - *Shared mental models*
    b. Are there any other team skills you can think of?
    c. How often would you say you think about or discuss each of these concepts when training as flight teams? (*Document in projected list as discuss)*
    d. Can you describe a time you were training, and one of these terms/concepts came up?
    e. What do you think is most important as you train collectively prior to deployment? (*Document in projected list as discuss)*
    f. Which of these things are easier to train than others?
    g. How do you train them?

ATX FOCUSED

Think back to the ATX you recently attended…

10. How well do you believe ATX prepared you for performing collective tasks in your deployment?
    a. How would you rate it on a scale of 1 to 10, where 1 = poorly prepared, 10 = could not be better prepared.
    b. In what ways do you think it could have prepared you better?

11. Did you have any training objectives for flight teams (formal or informal) going in to the ATX?
    a. What types of skills (individual or team) did you focus on most during ATX (communicating with ground, shared SA, applying ROEs, etc.)

b. What were some lessons learned during ATX regarding collective task performance? (i.e. were there challenges or areas of improvement you identified as a result of ATX?)

12. Do you think the ATX flight simulator and simulation environment allows you to accomplish the training objectives discussed previously?
    a. What attributes of the ATX simulator are good for training the *flight team*?
    b. What attributes of the ATX simulator training could be improved?
    c. What attributes of the ATX simulator training are missing that could be incorporated to provide a better training experience?
    d. List one specific part of the ATX simulation training (e.g. flight environment, cockpit instrumentation, communications, weapons systems, gunnery environment, AH64 TADS, NVG (Night Vision Goggles) Simulation, EDMs (Electronic Kneeboards), UAS integration, etc) that you felt had a direct impact on your top training objective listed above.

13. During AARs and hotwashes, we often hear folks talk about "simisms." What kinds of simisms did you experience? How did it impact your ability to train as a flight team, or as a CAB?

14. If you could design ATX in any way you wanted, what would you change to support flight team level team training? (technology, white cell, mission types, etc.)

15. What did you think of the UAS integration in ATX?
    a. Based on your experiences in theater, how can the UAS integration aspect of ATX be improved to be more like what you experience in theater?

16. What did you think of the COMMS in ATX?
    a. Are there ways the comms in ATX could be improved?
    b. For example:
        i. In the real world (at least in Afghanistan) you will use SATCOM for the majority of your radio comms. In ATX, you did not have SATCOM. Is this something that presents an unnecessary challenge for you, or do you think the communications simulated in ATX are sufficient to train as a flight team?
        ii. We have also heard that comms may be better (and less hectic) in ATX than in theater. Would degraded communications injects (i.e. intentionally jamming) at ATX help to simulate real-life better? Would it help flight teams learn how to deal with the pace and magnitude of comms experienced in theater, or is it better for other collective training objectives that comms be "clearer" during ATX?

17. What did you think of the white cell ground forces in ATX?
    a. How were the storyboards used throughout the missions?
    b. Were the ground forces and/or storyboards convincing enough, or did they make you realize/think it wasn't "real"?
    c. Are there ways the white cell ground forces could be improved?

18. How would you describe the feedback you received on your performance in ATX?
    a. How constructive was that feedback?
    b. Are there ways the feedback could have been more helpful?

19. We recently observed an ATX and noticed that several senior instructor pilots and some company commanders wanted to sit in the god's eye view rooms with OCs to watch how their flight teams were doing. How helpful would it be to have a similar room designated for folks from the unit going through the exercise, where you could tune in to any aspect of the training you wanted to observe?
        i. What types of things would you want to observe?
        ii. Are there any other tools that would be helpful for you (as senior IPs, CO CDRs, etc.) to evaluate your unit's collective training proficiency?

IDENTIFICATION OF DEEPER UNDERSTANDING OF EACH TRAINING OBJECTIVE

For each identified key training objective, ask the following questions:

20. In the case of informal collective training objectives, how was this training objective developed?
    a. Where in the deployment cycle should units focus on this training objective (post-deployment, reconstitution/reset, train-up/preparation, mobilization, deployment, redeployment)?
    b. How is this accomplished (class room, simulator, cockpit, etc.)?

21. How does the CAB evaluate learning/development of this training objective?
    a. *Examples:*
        i. Formal training evaluation documents from FMs, TMs, TCs
        ii. Informal training evaluation documents such as AARs, Hot Washes
        iii. Oral Feedback with no written documentation)

22. What resources are needed to develop this training objective?
    a. Examples:
        i. Classrooms, manuals, IMI
        ii. low fidelity/desktop simulators (replicate environment, flight controls/cockpit replication)
        iii. High fidelity simulators (full motion, full cockpit instrumentation), Unit Flight Training (flight teams, company level)
        iv. Live Unit Exercises (STX Lanes, CTC rotations, Field Exercises, Bn level or above)

23. Of all the exercises and training you have completed in preparation for your deployment, what has been the most helpful in training collectively? What about it was so helpful?

CONCLUDING REMARKS

Are there any other elements of your experiences with flight team training and/or with TADSS you would like to share with us today?

APPENDIX B

AVIATION COLLECTIVE TRAINING CHALLENGE IMPORTANCE QUESTIONNAIRE

Air Platform:_____ Approx. # Flight hrs:_____ Role(s) (IP, PC, SP, CC, etc.):_____

PART I – RATING THE IMPORTANCE

The following is a list of collective challenges identified by pilots, Company Commanders, and Senior Leaders. Please rate each of the challenges in the table below in terms of their **impact on mission success** using the following scale:

0 = Not important
1 = Somewhat Important
2 = Important
3 = Very Important

Rate each item independently—do not compare to other challenges. For each item, answer the following question using the scale provided:

How significantly does *[Challenge]* impact mission success?

#	Challenge	Importance (0, 1, 2, or 3)
1	**Mixed airframe missions:** Coordinating and conducting missions with other types of air platforms.	
2	**AMC and PC development:** Developing newer pilots' familiarity/skills in these roles.	
3	**ROE processes and procedures:** Understanding what they are and how they impact decision making during the mission.	
4	**Legal requirements (e.g., talking to the tape):** Talking through the decision process to engage a target	
5	**System and sensor usage during target prosecution:** Using aircraft systems (e.g., MTADS, GPS, IHADSS, BFT) to prosecute targets.	
6	**Battlefield communications:** Communicating to the right person, on the right frequency/communication system, at the right time.	
7	**Air to Ground integration:** Communicating using mutually understood key words and phrases to provide support to ground units.	
8	**Environmental effects:** Knowledge of how to operate in challenging environmental conditions (e.g., altitude, terrain, dust landings).	
9	**AO Familiarity:** Knowledge of key terrain or map features (e.g., borders, villages, key terrain, ground unit sectors).	
10	**Aircraft proficiency:** Knowledge of aircraft operation, chapters 5 and 9, and other procedures and operations related to the specific airframe. Demonstrating a capability to fly the aircraft and not have the aircraft fly you.	
11	**Team Tactics:** Knowledge and use of doctrinal and TTP tactics within the flight teams.	
12	**Use of SOPs:** Difficulty applying SOPs because they are too general or not tailored to the AO.	
13	**Preparing new pilots:** Developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills.	
14	**Aircraft upgrades:** Adjusting to new, unfamiliar systems, upgrades and in-theater modifications and integration of these into mission operations.	
15	**Integration with other units at AO:** Knowledge of other agencies (other Army Aviation, AF, NATO) operating in AO; awareness of their tactics, resources, etc. prior to deployment.	
16	**Battle rhythm:** Preparing for the rapid pace of planning and execution of operations in theater.	
17	**Resource supply vs. demand:** Managing operational demands vs. aircraft availability and pilots' flight hour limits.	

PART II – RANKING THE IMPORTANCE

From the list above, select the five most important collective challenges and rank order them from 1 to 5. (1 = greatest challenge to mission success, 5 = fifth greatest challenge to mission success).

1. _____
2. _____
3. _____
4. _____
5. _____

In the space below, please indicate *why* your top ranked item is the greatest challenge to mission success:

_____
_____
_____
_____
_____
_____

PART III – ADDITIONAL COLLECTIVE CHALLENGES

Are there any other collective challenges critical for mission success not listed in this survey?

YES NO

If YES, please list/describe:

_____
_____
_____
_____
_____
_____

Thank you for your time and assistance!

APPENDIX C

ACTSS ANALYSIS TOOL

Addressing Army Aviation Collective Training Challenges with Simulators and Simulations Capabilities

This effort was funded by the U.S. Army Research Institute (ARI) and is supported by the Directorate of Simulation (DOS) at Ft Rucker.

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The findings in this document are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

Table of Contents

CONTENT PAGES	PAGE DESCRIPTION
Process Summary	Detailed summary of the process applied in this research effort.
Collective Challenge Descriptions	Detailed descriptions of the critical collective Army aviation challenges identified in this effort.
ACTSS Resource Descriptions	Detailed descriptions of the aviation collective training simulators and simulations (ACTSS) resources identified in this effort.
ACTSS Resource Relevance to ATX and AVCATT	Table indicating the relevance of ACTSS resources to current Army ACTSS.
RESULTS PAGES	
Challenges by METLs and Training Objectives	Table mapping critical collective Army aviation challenges identified in this effort to relevant METLs and Training Objectives.
Challenges by METLs Sorter	Sorting tool that allows for the quick identification of METLs relevant to each critical collective Army aviation challenge identified in this effort.
Collective Challenge Importance Rankings & Ratings	Sortable importance ranking and rating results of the collective training challenges identified in this effort.
Difficulty to Modify ACTSS Resources	Table presenting the difficulty associated with modifying each ACTSS resources identified in this effort.
ANALYSIS PAGES	
Air to Ground Integration by ACTSS Resource Analysis	Detailed analysis of current and planned ACTSS resource capability and utilization in support of training Air to Ground Integration; Summary of key areas for improvement in training Air to Ground Integration.
Battlefield Communications by ACTSS Resource Analysis	Detailed analysis of current and planned ACTSS resource capability and utilization in support of training Battlefield Communications; Summary of key areas for improvement in training Battlefield Communications.
AMC and PC Development by ACTSS Resource Analysis	Detailed analysis of current and planned ACTSS resource capability and utilization in support of AMC and PC Development; Summary of key areas for improvement in AMC and PC Development.
Mixed Airframe Missions by ACTSS Resource Analysis	Detailed analysis of current and planned ACTSS resource capability and utilization in support of training Mixed Airframe Missions; Summary of key areas for improvement in training Mixed Airframe Missions.
Preparing New Pilots by ACTSS Resource Analysis	Detailed analysis of current and planned ACTSS resource capability and utilization in support of Preparing New Pilots; Summary of key areas for improvement in Preparing New Pilots.
ROE Processes and Procedure by ACTSS Resource Analysis	Detailed analysis of current and planned ACTSS resource capability and utilization in support of training Battlefield Communications; Summary of key areas for improvement in training Battlefield Communications.
Summary Results by Collective Challenge	Summary of analysis results and recommendations for improving collective training of the most critical challenges identified in this effort.

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Step 3: Validated Findings with Experts

Process Goals

Primary Objective of this Research: To identify potential areas for improving aircrew collective training prior to deployment.

To achieve this objective, three primary tasks were conducted:

1. Identify critical Army aviation collective training challenges.

2. Evaluate current and planned capabilities and utilization of Army aviation collective training simulators and simulations (ACTSS).

3. Analyze critical challenges in light of current and planned capabilities and utilization of ACTSS.

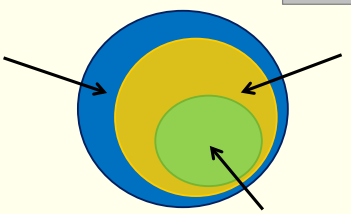
Process Overview

Detailed descriptions of each of these steps are provided in this section.

Hint: For more information on a particular topic, click on the desired hyperlink at the top of this page or in the bulleted list in this section.

STEP 1: Identified critical collective training challenges

- Reviewed existing literature
- Interviewed Army aviators in CABs
- Surveyed Army aviators in CABs



STEP 2: Evaluated current and planned capabilities and utilization of ACTSS

- Reviewed existing ACTSS documentation
- Interviewed simulation and training experts
- Surveyed simulation and training experts

STEP 3: Analyzed critical challenges in light of current and planned ACTSS capabilities and utilization

- Created decision-support matrix combining data from all steps
- Analyzed all results, providing a prioritized list of recommendations
- Validated findings with simulation and training experts in group workshop

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Potential Outcomes of this Research

1. Description of the role of ACTSS in the aviation training mission.

2. Identification of potential areas for ACTSS development.

3. Recommendations for maximizing use of current and planned ACTSS.

4. Support for requesting for additional funding to enhance critical ACTSS capabilities and capacities.

Detailed Description of Process

STEP 1: Participants | **Participants**

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For the current research effort, a series of focus groups were conducted with Army Aviation SMEs from three different Army installations within the continental United States (CONUS) at different stages in the deployment cycle process. Following these focus groups, questionnaires were distributed during two ATXs at Fort Rucker, AL. At each installation, between six and twelve active duty Army aviators participated for a total of 27 workshop participants. SMEs backgrounds varied by role within a CAB (e.g., Instructor Pilot, Standardization Pilot, Company Commander [CO CDR], Brigade (BDE) S3, etc.) as well as by platform (OH-58D, AH-64D, UH-60A/L, CH-47D/F), and by rank (Chief Warrant Officer 3 to Lieutenant Colonel). While the majority of SMEs were experienced active duty OH-58D and AH-64D pilots, the variation in SME background provided a variety of perspectives from those executing mission tasks in the cockpit to those managing the planning and execution of those tasks from the TOC. This mixture of participant backgrounds ensured consideration of a variety of viewpoints. The questionnaire respondents were Army National Guard and active duty pilots from various CABs participating in ATXs at Fort Rucker, AL between July and November 2011. Respondents included pilots similar in background to those participating in the focus groups. Pilots represented each of the current Army aviation platforms in a variety of roles and in varying levels of leadership. Altogether, 58 pilots completed the collective challenge importance questionnaire.

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STEP 1: Identified critical collective training challenges

Interviewed Army aviators in CABs

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The structured focus groups took place from 20-22 April, 27-28 April, and 27-28 July 2011with pilots from three CABs. A total of nine separate half-day focus groups were conducted, and each focus group was composed of between two and six pilot participants. The structured focus group approach was applied to guide the interview process and ensure an unbiased identification of collective challenges. An interview protocol was developed with specific questions pertaining to training objectives, collective challenges, and teamwork training based on observations during ATX to identify training objectives, challenges, and teamwork skills and to gather information about how ATX supports aviation collective tasks (see Appendix A for the protocol). The structured interviews were constructed to be adaptable to a variety of different SME levels of experiences including CO CDRs, CO level pilots, and Battalion level officers and Chief Warrant Officers as each of these groups was expected to have different perspectives and degrees of insight into the different topic areas. Focus group content was thus tailored to the experience levels and anticipated knowledge of those participating in each session. While questions and content were tailored to the experience and knowledge of SME participants, the same general approach was applied in each of the focus groups and there were three primary objectives for each focus group: (1) identify current collective challenges, (2) understand how simulators and simulations are used to train these challenges, and (3) identify how pilots would like to use simulators and simulations to train collective skills.

For the first objective (i.e., identifying current collective training challenges), questions were designed to elicit collective training objectives, challenges, and teamwork skills being trained prior to deployment. Pilots were also asked to indicate collective training challenges experienced upon arrival to theater. During each focus group, participant comments were documented and displayed in real-time so that pilots could refer back to the challenges, objectives, and teamwork skills throughout the interview. Participants were also asked how important each identified challenge was in the overall training mission as well as how frequently the challenges were discussed during unit training.

The second focus group objective was to obtain an understanding of how simulators and simulations are currently used for training each of the identified challenges and training objectives. Questions were developed to identify pilots' perspectives on how well home-station simulators (e.g., Aviation Combined Arms Tactical Trainer [AVCATT]) and large scale collective training evens (e.g., ATX) prepare their units for deployment, as well as what impacts this training has on mission readiness. As relevant to collective training challenges and objectives identified in the focus groups, specific questions regarding simulators and simulations were designed to determine where technology capability or utilization could be improved.

The third and final focus group objective (i.e., identifying how pilots would like to use simulators and simulations to train collective skills) was only applied if time remained and pilot SMEs exhibited a high degree of understanding of the training objectives for aviation units. These questions focused on development of collective training objectives and training plans and how simulators, simulations, and other resources could be used in meeting these objectives. This discussion of training objectives and challenges and how pilots would like to use them for achieving mission readiness was anticipated to help facilitate the analysis of collective simulation-training utilization in particular.

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STEP 1: Identified critical collective training challenges

Surveyed Army aviators in CABs

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Go to Collective Challenge Importance Rankings & Ratings

Based on content identified during the various focus groups, a brief questionnaire was developed for SMEs to indicate the relative importance of each of the identified collective training challenges. The goal of this questionnaire was to gather quantitative data regarding the importance of each of the training objectives, challenges, and teamwork skills discussed in the focus groups. The questionnaire, which can be viewed in Appendix B, asked respondents to rate collective training challenges according to importance in the first part of the questionnaire and to rank order the top five collective training challenges in the second part of the questionnaire. Respondents were also provided an opportunity to indicate any additional training challenges they felt were important but were not represented in the survey. The questionnaires were distributed to respondents during ATXs. Respondents were given 20 minutes to complete the questionnaires, and researchers collected the forms as they were completed.

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STEP 2: Participants — Participants

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Eight training and simulation SMEs from the U.S. Army Aviation Center of Excellence Directorate of Simulation (DOS) were interviewed individually or in pairs. The SMEs included two active duty officers who were knowledgeable about ATX operations and simulations, three retired Army aviators with current expertise and knowledge of the AVCATT, unmanned aircraft system (UAS) simulation, and simulation and training operations, and three additional DOS personnel with expertise in virtual systems, simulations, and training Army aviation. Nine training and simulation SMEs and one pilot serving as an Observer-Controller (OC) during an ATX completed questionnaires about the relevance and difficulty of addressing collective training challenges with given simulators and simulations. These 10 questionnaire respondents included active duty officers, retired officers, and other members of the DOS staff who hold extensive knowledge of simulator and simulation use for collective training and virtual systems.

STEP 2: Evaluated current and planned capabilities and utilization of ACTSS — Interviewed simulation and training experts

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Using data obtained in the Collective Challenge Identification task, an initial set of features available or desired by pilots for use in collective aviation simulation training was developed. This list was then used to prompt discussion during interviews with simulation-training SMEs. The types of information obtained during these interviews included current capabilities and limitations of simulators and simulations, associated resources (e.g., personnel and facilities), technology supporting simulators and simulations, planned upgrades and upgrade processes for simulators and simulations, knowledge of processes for collective training exercises, and relevance of technology features to training collective tasks. Simulator and simulation capabilities interviews occurred on 28-30 June 2011 at Fort Rucker, AL. Data obtained in these interviews provided support for the identification of areas for improvement (if any) that existed for each simulation resource.

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STEP 2: Evaluated current and planned capabilities and utilization of ACTSS

Surveyed simulation and training experts

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Go to Difficulty to Modify ACTSS Page

Following the identification of a thorough list of simulation resources used in Aviation collective training, a questionnaire was developed to identify: (1) the importance of simulation resources in addressing the identified collective training challenges, and (2) the difficulty of modifying the function, use, or application of each simulation resource. The full questionnaire used in this effort can be viewed in Appendix F. The questionnaires were administered from 18-23 September 2011 at Fort Rucker, AL. Upon completion of data collection, data were analyzed to support the identification of relevance (importance) of each simulation resource to each of the six top-ranked collective training challenges. The data that addressed the difficulty of modification were also analyzed to provide additional context for use in the research task (i.e., Simulations Capability and Utilization Analysis).

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STEP 3: Participants

Participants

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Two active duty Officers knowledgeable of ATX operations and simulations, three retired Army aviators with current expertise and knowledge of the AVCATT, UAS simulation, and simulation and training operations, and two additional DOS personnel with experience in virtual systems, simulations, and training Army aviation served as SMEs for a validation workshop. The majority of workshop participants also participated in Simulator and Simulation Capabilities interviews and questionnaires (i.e., previous research task). As a result, they were already familiar with the research process.

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STEP 3: Analyzed critical challenges in light of current and planned ACTSS capabilities and utilization

Analyzed all results, providing a prioritized list of recommendations

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For each of the top six ranked collective training challenges, a four-step analysis was applied: (1) Challenge Importance, (2) ACTSS Resource Availability, (3) Assessment, (4) Conclusions.

In the first step, Challenge Importance, each collective training challenge importance is estimated. Specifically, the AH-64D / OH-58D ranking and ratings were computed given the tactical unit-level focus of this effort. As previously described, rankings were ordered with the most important challenge ranked '1' and the least important challenge was ranked '17'. Ratings were provided on a scale from zero to three, as previously described, such that zero indicated Not Important and three indicated Very Important.

In the second step, ACTSS Resource Availability, the relevance, capability, and utilization of each ACTSS resource was determined. First, results from interviews and from the ACTSS Resource Importance Questionnaire were used to identify which ACTSS Resources were relevant to each collective challenge. Next, for those ACTSS Resources that were determined to be relevant to a given challenge, two questions were asked: (1) What is the state of its capability? and (2) What is the state of its utilization? To assess the Capability, a simple yes or no was assigned based on interview content. A yes was assigned when capability currently exists in some form. A no was assigned when no capability currently exists. For items that were determined to have current Capability, an assessment of the utilization was then made. To assess the Utilization, a yes or no was first determined. A yes was assigned if, based on interview content, the feature is believed to be appropriately used up to the level of capability provided. A no was assigned either when (a) the feature is available for use but is often not requested by pilots or (b) it is cost prohibitive to use this feature, or (c) a planned upgrade is in progress. The reason for the no being assigned (e.g., Not requested, Cost, Planned Upgrade) was also listed. Finally, for each relevant ACTSS resource, a comment was entered into the Analysis matrix to describe the nature of the relationship and the state of the ACTSS resource given capability and utilization for training the collective challenge.

The third step in the analysis was Assessment. In this step, all information provided in Step 2 was considered and a determination was made regarding where or not there an opportunity for improvement is present. In general, if there were any types of capability or utilization gaps identified in the analysis an area for improvement was deemed present. If an opportunity for improvement was determined, the type of improvement (e.g., Capability, Utilization -- Not requested, Cost, Planned Upgrade) was classified. For this classification, a summary of the frequency of times the Capability was lacking (No in that cell), and the number of times each type of utilization gap was used (a, b, c) was presented.

For those challenges to which an improvement was deemed possible, Step 3c consisted of the identification of key themes. Researchers and Army aviation SMEs evaluated all material obtained through both interviews and questionnaires for each challenge and identified between two and four key themes for how to improve the training of each collective challenge using ACTSS. Specific ACTSS resources relevant to each key theme were identified and listed, and the difficultly of modifying each of those relevant resources was also listed. A description of the nature of the difficultly was also provided based on interview and questionnaire content with simulation and training experts.

The final step in the analysis process was Conclusions. In this step, a high level bulleted list of conclusions regarding the ability of ACTSS to train each pilot identified collective challenge was generated based on the identified key themes for improvement.

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STEP 3: Analyzed critical challenges in light of current and planned ACTSS capabilities and utilization

Validated findings with simulation and training experts in group workshop

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To ensure the accuracy, relevance, and utility of the research analysis results each of the analysis pages was presented to a group of simulation and training experts. During this workshop, researchers and SMEs worked through each step of the process for each of the top six challenges editing content in real-time as required. The contents and language of every item from ACTSS resource to key theme was reviewed with SMEs to ensure accuracy. Following completion of this workshop, minor editing and aesthetic revisions were applied to the ACTSS Analysis Tool as required.

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Aviation Collective Training Challenge Descriptions

Title	Description
Air to Ground integration	Communicating using mutually understood key words and phrases to provide support to ground units.
Aircraft proficiency	Knowledge of aircraft operation, limitations, emergency procedures, and other procedures and operations related to the specific airframe. Demonstrating a capability to fly the aircraft and not have the aircraft fly you.
Aircraft upgrades	Adjusting to new, unfamiliar systems, upgrades and in-theater modifications and integration of these into mission operations.
AMC and PC development	Developing newer pilots' familiarity/skills in these roles.
AO Familiarity	Knowledge of key terrain or map features (e.g., borders, villages, key terrain, ground unit sectors).
Battle rhythm	Preparing for the rapid pace of planning and execution of operations in theater.
Battlefield communications	Communicating the right information, to the right person, on the right frequency/communication system, at the right time.
Environmental effects	Knowledge of how to operate in challenging environmental conditions (e.g., altitude, terrain, dust landings).
Integration with other units at AO	Knowledge of other agencies (other Army Aviation, AF, NATO) operating in AO; awareness of their tactics, resources, etc. prior to deployment.
Legal requirements (e.g., talking to the tape)	Talking through the decision process to engage a target.
Mixed airframe missions	Coordinating and conducting missions with other types of air platforms.
Preparing new pilots	Developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills.
Resource supply vs. demand	Managing operational demands vs. aircraft availability and pilots' flight hour limits.
ROE processes and procedures	Understanding what they are and how they impact decision making during the mission.
System and sensor usage during target prosecution	Using aircraft systems (e.g., MTADS, GPS, IHADSS, BFT) to prosecute targets.
Team Tactics	Knowledge and use of doctrinal and TTP tactics within the flight teams.
Use of SOPs	Difficulty applying SOPs because they are too general or not tailored to the AO.

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Aviation Collective Training Simulators and Simulations (ACTSS) Resource Descriptions

FIDELITY IN SIMULATION ENVIRONMENT	
Accuracy of Geography	Location of objects and terrain (i.e., rivers, mountains, valleys, buildings, villages, etc.) matches actual location in AO.
Compatibility With Other/Offsite TADSS	The ability to seamlessly link other TADSS (i.e. LCT, AVCATT, CCTT, etc.) to ATX systems.
Environmental Effects	Modeling and behavior of environmental effects (i.e., dust, wind, snow, fog, high altitude, illumination, etc.) replicates real-world conditions.
SAF Representation	Semi-automated forces (SAF) look and feel. Extent to which simulated people (i.e., coalition, enemy, indigenous, etc.) and objects (weapons, vehicles, tools, etc.) appear as they would in AO.
Terrain Representation	Look and feel of terrain. Extent to which terrain (i.e., rivers, mountains, valleys, buildings, villages, etc.) is represented compared to the actual topography or structures in AO.
AIRCRAFT SYSTEMS (HARDWARE AND SOFTWARE)	
Aircraft Lighting	Representation of aircraft lighting (i.e. IR strobes, Position Lights, Search Lights, etc.).
Ballistic Models for CMWS	Modeling of CMWS from ejection to burnout matches real-world systems.
Ballistic Models for Ordnance	Modeling of ordnance from weapon release through path of flight and ending at impact matches real-world systems.
Blue Force Tracker	Ability to input BFT data (e.g., drop icons for targets, friendly forces, etc.).
Cockpit Concurrency	Simulated cockpit has updated version of aircraft software (i.e. current block and lot, digital cockpit, kneeboard vs. integrated into cockpit) and/or can be modified to unit's version.
Digital Messaging	Digital messaging replicates aircraft systems and/or processes.
Radio Propagation	Radio communications (FM, UHF, VHF, HF, SATCOM) function the same as in the aircraft (i.e., line of sight, bandwidth, satellite).
Radio Representation	Extent to which pilots are able to control radio volume and frequencies as in the aircraft. Radios present in simulator (FM, UHF, VHF, HF, SATCOM) match radios present in unit aircraft.
PRODUCTS AND PROCESSES	
Accuracy of Products	Products (e.g., AMR, mission packets, briefs, etc.) developed within collective training events are identical to those developed in AO.
After Action Reviews	AARs and hotwashes provide accurate and timely feedback that links to commander's training objectives for aviator performance.
Battle Rhythm	Replicates the OPTEMPO of combat environment.
Exercise Performance Feedback	Notes and observations throughout the exercise are provided to improve unit performance (e.g., Oral AAR, written take-home packages, or other customized feedback requested by commanders).
Mission Planning	Replicates the company planning cycle in combat.
Planning Tool Availability	Access to planning materials and systems (e.g., AMPS, Imagery, etc.) available in AO for use in mission planning.
Scenario Injects	Extent to which injects are appropriately placed (time and space) in the environment to support training objectives.
SOP Validation	Extent to which unit performance is rated in accordance with its SOPs. Based on feedback and lessons learned at collective training events, unit's ability to adjust SOPs.
Training Support Packages	TSPs accurately represent scenarios units may encounter in theater.

TRAINING SUPPORT	
Aircrew Training	Exercise facilitates aircrew training objectives such as decision making, communication, and situational awareness.
Airspace Considerations	Representation of dynamic changes in airspace (i.e. SOF Operations, blue rain, etc.).
Collective Training Preparation	All unit levels within the CAB understand training opportunities available at collective training events and provide training objectives for their specific need(s).
Aviator Equipment	Replication of weight, bulk, and other restrictions associated with Aviation Life Support Equipment (ALSE) and other gear aviators wear in the cockpit.
CAS	Ability of aircrews to utilize Close Air Support (CAS) in mission execution.
Company Level Training Objectives	Ability of CO CDRs to implement their training objectives during collective training events.
Evaluator Training	Availability of training and/or tools to facilitate constructive feedback to improve unit performance.
Logistical Considerations	Accurate representation of FARPs and the ability to incorporate logistical considerations in or during mission planning.
SAF Behavior	Semi-automated forces (SAF) behavior. Extent to which simulated people (i.e., coalition, enemy, indigenous, etc.) and objects (weapons, vehicles, tools, etc.) behave as they would in AO.
Stealth Room	CABs ability to monitor aviator performance through access to stealth room(s).
Theater SMEs	Availability of theater SMEs to answer questions about current AO, enemy tactics, and TTPs and to provide feedback on unit performance.
UAS	Ability to integrate UAS in mission execution. In the future, replicating MUM teaming.
White Cell	Accurate representation of air and ground elements during gameplay (language, size, and capability, etc.)

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Challenge by METLs Sorter

This tool allows for the quick identification of METLs/Training Objectives relevant to each collective Army aviation challenges identified in this effort. Choose a collective challenge from the drop-down menu below, then click the **List METLs** button to view relevant METLs/Training Objectives.

3. Preparing new pilots | List METLs | Print

Collective Challenge and Description:	3. Preparing new pilots	Developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills.	Number of Relevant METLs:	18

ID #	METLs	Training Objectives
K1	01-2-5179 Perform Aerial Deliberate Attack Operations	Destroy Enemy or force them to withdraw
K2	01-2-5183 Perform Tactical Air Movement Operations	The unit performed tactical air movement operations within the specified time constraints and according to the commander's guidance.
K3	01-2-5184 Perform Aerial Holding Area (HA) Operations	The unit moved undetected to the holding area and was able to be employed at the time specified in the operation order (OPORD). The unit maintained 360 degrees security at all times while in the holding area (HA).
K4	01-2-5188 Conduct Aerial Battle Handover/Relief on Station	Battle handover/relief operations were conducted according to the unit's tactical standing operating procedures (TACSOP) and current fragmentary order (FRAGO); contact with the enemy is not lost and units are undetected by opposing forces (OPFOR). The tactical situation was not degraded as a result of poor battle handover procedures.
K5	01-2-5189 Perform Aerial Area Reconnaissance Operations	All pertinent tactical information was collected within the specified time requirements. The company/troop's mission was not compromised and friendly forces were not decisively engaged.
K6	01-2-5190 Perform Aerial Zone Reconnaissance Operations	The unit performed aerial zone reconnaissance operations according to the tactical standing operating procedures (TACSOP) and the commander's guidance. The unit conducted reconnaissance to determine the enemy situation. If enemy contact was made, the situation was rapidly developed and enemy forces were bypassed or destroyed according to the operation order (OPORD) or commander's directive. The commander reported all information according to the time specified in the OPORD and the tactical standing operating procedures (SOP).
K7	01-2-5191 Perform Aerial Route Reconnaissance Operations	The unit reconnoitered the route to gather information about the designated route, lateral routes, and adjacent terrain from which the enemy can influence the route. The assigned route is physically and visually checked for specific information, such as surface conditions, trafficability, bypass condition, bridge classification, and enemy activity. Communications restrictions and graphic control measures are observed. The unit was never decisively engaged. The company/troop commander reports all information in a timely and accurate manner according to time frames specified in the operation order (OPORD).
K8	01-2-5192 Perform Actions on Contact in Support of Tactical Operations	The company/troop continued tactical operation while observing graphic control measures. Elements reported contact with OPFOR and maintained contact. Unit commander issued orders to maintain contact, bypass, or engage and destroy. Unit commander kept higher headquarters informed of situation. Fratricide is not committed.
K9	01-2-5193 Perform Aerial Hasty Attack Operations	The company/troop conducted the attack and achieved the commander's intent. All opposing forces (OPFOR) elements were destroyed or forced to withdraw. Elements remained undetected from OPFOR optical and radar measures. The company/troop experienced minimal or no losses, maintained the momentum for future operations and do not commit fratricide.
K10	01-2-5194 Perform Air Assault Security Operations	The company/troop is integrated into the scheme of maneuver and employed to perform air assault security operations. The unit provided immediate intelligence, early warning, and maneuver space for the air assault task force (AATF). It responded quickly to enemy contact and prevented the enemy from interdicting the AATF prohibiting them from disrupting the air assault operation.
K11	01-2-5195 Perform Aerial Movement to Contact Operations	The attack reconnaissance helicopter company/troop planned and performed aerial movement to contact operations. The company/troop established contact with the objective enemy force and took actions on contact as directed by the higher headquarters or established a screen along the limit of advance. The mission ended in an attack, a screen along a limit of advance, or security operations supporting a larger ground force establishing a hasty defense. All reports to higher headquarters were sent accurately and quickly.

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Details on Data Collection

Difficulty to Modify Aviation Collective Training Simulators and Simulations (ACTSS) Resources

Considering cost, upgrade processes, etc., how difficult is it to modify each of the following resources?

Scale used in this analysis:

5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

	Average	Mode
FIDELITY IN SIMULATION ENVIRONMENT		
Accuracy of Geography	2.9	3.0
Compatibility With Other TADSS	3.6	4.0
Environmental Effects	2.2	2.0
SAF Representation	2.8	2.0
Terrain Representation	2.8	3.0
AIRCRAFT SYSTEMS (HARDWARE AND SOFTWARE)		
Aircraft Lighting	2.5	2.0
Ballistic Models for CMWS	2.9	3.0
Ballistic Models for Ordnance	2.9	3.0
Blue Force Tracker	2.3	2.0
Cockpit Concurrency	3.8	4.0
Digital Messaging	2.6	3.0
Radio Propagation	2.0	2.0
Radio Representation	2.1	2.0

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Details on Data Collection

Difficulty to Modify Aviation Collective Training Simulators and Simulations (ACTSS) Resources

Considering cost, upgrade processes, etc., how difficult is it to modify each of the following resources?

Scale used in this analysis:
5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

	Average	Mode
PRODUCTS AND PROCESSES		
Accuracy of Products	2.2	2.0
After Action Reviews	1.8	2.0
Battle Rhythm	1.9	2.0
Exercise Performance Feedback	1.6	1.0
Mission Planning	1.7	1.0
Planning Tool Availability	1.7	1.0
Scenario Injects	1.7	2.0
SOP Validation	1.8	2.0
Training Support Packages	2.1	2.0
TRAINING SUPPORT		
Aircrew Training	2.0	2.0
Airspace Considerations	1.8	2.0
Collective Training Preparation	2.7	3.0
Aviator Equipment	1.9	2.0
CAS	2.3	3.0, 2.0
Company Level Training Objectives	1.9	2.0
Evaluator Training	1.8	2.0
Logistical Considerations	2.3	2.0
SAF Behavior	2.9	3.0
Stealth Room	1.9	2.0
Theater SMEs	2.5	3.0
UAS	2.4	3.0
White Cell	2.2	2.0

Description of codes:

Rating: 0 = Not Important, 1 = Somewhat Important, 2 = Important, 3 = Very Important
Ranking: 1 = Most Important Challenge, 17 = Least Important Challenge

Capability: YES indicates a capability exists in some form. NO indicates no capability currently exists.
Utilization: YES indicates this feature is used appropriately up to the level of capability provided. NO indicates either (a) the feature is available for use but is often *not requested* by pilots or (b) it is cost prohibitive to use this feature, or (c) a *planned upgrade* is in progress.

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Air to Ground Integration by Aviation Collective Training Simulators and Simulations (ACTSS) Resource Analysis

Hide Not Applicable

CHALLENGE

Air to Ground Integration: Communicating using mutually understood key words and phrases to provide support to ground units.

STEP 3 - ASSESSMENT

Is there an opportunity for improvement?	**Yes**
Improvement Types	**Capability: 1** **Utilization: 11** **Not Requested:** 5 **Cost**: 3 **Planned Upgrade:** 1 **Other**: 2

Description of Difficulty Scale:

5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

STEP 3a. IF YES, KEY THEMES:

Key themes	Relevant TADSS Resources	Difficulty of Modification
Better match of collective training resources (i.e. white cell, collective players, collective training devices, etc.) to mission.	**White Cell**	**Slightly Difficult:** FORSCOM provides resources for role players in ATX; Relevant MOS increases realism and provides increased training value.
	Compatibility With Other/Offsite TADSS	**Very Difficult:** Communication infrastructure to link facilities is expensive; Classification issues; Compatibility issues between simulator operating systems (although SeCORE is helping); Extensive coordination and planning is required.
Prioritization and communication of collective training objectives within all unit levels and DOS prior to ATX.	**Training Support Packages**	**Slightly Difficult:** Time is required to modify (real-time changes during ATX are difficult), 120 day planning process is critical; Threading of events throughout mission is challenge.
	Aircrew Training	**Slightly Difficult:** Time required for unit to develop specific aircrew training plans prior to collective training event.
	Collective Training Preparation	**Moderately Difficult:** Current deployment cycle severely limits available time to prepare for ATX.
	Company Level Training Objectives	**Slightly Difficult:** Incorporation of CO training objectives requires a CO level training plan for ATX; Communication of those objectives prior to all levels prior to arriving at ATX.
Better use of tools (i.e. radios) to support air to ground interactions.	**Radio Propagation**	**Slightly Difficult:** Simulator concurrency (e.g. SATCOM); Pilot training required to overcome perceived simisms.
	Radio Representation	**Slightly Difficult:** Pilot training required to overcome perceived simisms (e.g. LOS); Radio simulation is not completely accurate (e.g. individual channel volume control does not exist).

STEP 4 - CONCLUSIONS

Collective training of the air to ground integration challenge may be improved by:

- Systematic match of air and ground personnel to replicate anticipated theater interactions.
- Pre-exercise coordination and negotiation of required on-site personnel across echelons involved in ATX event.
- Targeted use of distributed simulation infrastructure to replicate actual environment conditions.

Description of Ratings:

Rating: 0 = Not Important, 1 = Somewhat Important, 2 = Important, 3 = Very Important
Ranking: 1 = Most Important Challenge, 17 = Least Important Challenge

Capability: YES indicates a capability exists in some form. NO indicates no capability currently exists.
Utilization: YES indicates this feature is used appropriately up to the level of capability provided. NO indicates either (a) the feature is available for use but is often *not requested* by pilots or (b) it is cost prohibitive to use this feature, or (c) a *planned upgrade* is in progress.

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Battlefield Communications by Aviation Collective Training Simulators and Simulations (ACTSS) Resource Analysis

Hide Not Applicable

CHALLENGE

Battlefield communications: Communicating the right information, to the right person, on the right frequency/communication system, at the right time.

STEP 3 - ASSESSMENT

Is there an opportunity for improvement?	**Yes**
Improvement Types	**Capability: 2** **Utilization: 9** **Not Requested:** 4 **Cost**: 3 **Planned Upgrade:** 0 **Other**: 2

Description of Difficulty Scale:

5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

STEP 3a. IF YES, KEY THEMES:

Key themes	Relevant TADSS Resources	Difficulty of Modification
More concurrent representation of electronic communications.	**Blue Force Tracker**	**Slightly Difficult:** Simulator concurrency funding cycles; Cockpit technology dependent on platform (OH/AH/UH/CH); OneSAF/SeCORE upgrades to infrastructure will improve representation.
	Digital Messaging	**Moderately Difficult:** Simulator concurrency funding cycles; Cockpit technology dependent on platform (OH/AH/UH/CH).
Better use of tools (i.e. radios) to support battlefield communications.	**Radio Propagation**	**Slightly Difficult:** Simulator concurrency (e.g. SATCOM); Pilot training required to overcome perceived simisms.
	Radio Representation	**Slightly Difficult:** Pilot training required to overcome perceived simisms (e.g. LOS); Radio simulation is not completely accurate (e.g. individual channel volume control does not exist).
Prioritization and communication of collective training objectives within all unit levels and DOS prior to ATX.	**Stealth Room**	**Slightly Difficult:** Communication of guidelines, requirements, and best practices for Stealth Room use by pilots.
	Company Level Training Objectives	**Slightly Difficult:** Incorporation of CO training objectives requires a CO level training plan for ATX; communication of those objectives prior to all levels prior to arriving at ATX.
	Collective Training Preparation	**Moderately Difficult:** Current deployment cycle severely limits available time to prepare for ATX.
	Aircrew Training	**Slightly Difficult:** Time required for unit to develop specific aircrew training plans prior to collective training event.

STEP 4 - CONCLUSIONS

Collective training of the battlefield communications challenge may be improved by:

- Maintaining the exact versions of electronic communication systems as found in the cockpit.
- Training with the most realistic settings for communication tools in the simulation environment.
- Pre-exercise coordination and negotiation within BDE to include training events focused on battlefield communications.

Rating: 0 = Not important, 1 = Somewhat Important, 2 = Important, 3 = Very Important.
Ranking: 1 = Most Important Challenge, 17 = Least Important Challenge

Capability: YES indicates a capability exists in some form. NO indicates no capability currently exists.
Utilization: YES indicates this feature is used appropriately up to the level of capability provided. NO indicates either (a) the feature is available for use but is often *not requested* by pilots or (b) it is *cost* prohibitive to use this feature, or (c) a *planned upgrade* is in progress.

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AMC and PC Development by Aviation Collective Training Simulators and Simulations (ACTSS) Resource Analysis

Hide Not Applicable

CHALLENGE

AMC and PC development: Developing newer pilots' familiarity/skills in these roles.

STEP 3 - ASSESSMENT

Is there an opportunity for improvement?	**Yes**
Improvement Types	**Capability: 2** **Utilization: 15** **Not Requested:** 7 **Cost**: 3 **Planned Upgrade:** 2 **Other**: 3

Description of Difficulty Scale:

5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

STEP 3a. IF YES, KEY THEMES:

Key themes	Relevant TADSS Resources	Difficulty of Modification
Prioritization and communication of specific AMC and PC development training objectives within all unit levels and DOS prior to ATX.	**Aircrew Training**	**Slightly Difficult:** Time required for unit to develop specific aircrew training plans prior to collective training event;
	Collective Training Preparation	**Moderately Difficult:** Current deployment cycle severely limits available time to prepare for ATX;
	Training Support Packages	**Slightly Difficult:** Time is required to modify (real-time changes during ATX are difficult), 120 day planning process is critical; Threading of events throughout mission is challenge.
	Company Level Training Objectives	**Slightly Difficult:** Incorporation of CO training objectives requires a CO level training plan for ATX; Communication of those objectives prior to all levels prior to arriving at ATX.
	White Cell	**Slightly Difficult:** FORSCOM provides resources for role players in ATX; Relevant MOS increases realism and provides increased training value.
	Theater SMEs	**Moderately Difficult:** FORSCOM provides theater SMEs for a unit's full disposal during ATX.
	Scenario Injects	**Slightly Difficult:** Requires OC understanding of company level training objectives and relationship to overall BDE training objectives; Impacted by free play.
Development of training plans, evaluation criteria, and feedback of AMC/PC development prior to and throughout the exercise.	**Evaluator Training**	**Slightly Difficult:** Comprehensive evaluator training is not provided; Evaluator training is available prior to collective training events focused on available tools.
	After Action Review	**Slightly Difficult:** Focus on AMC and PC development.
	Exercise Performance Feedback	**Not at all Difficult:** Understanding of available tools; Request for additional information.

STEP 4 - CONCLUSIONS

Collective training of AMC/PC development may be improved by:

- A renewed focus by CO CDR's on the development of training plans and evaluation criteria prior to the exercise and the use of targeted feedback throughout the exercise.
- Prioritization and communication of the CO training plans within all unit levels and DOS prior to a collective training event.

Description of Scales:

Rating: 0 = Not Important, 1 = Somewhat Important, 2 = Important, 3 = Very Important
Ranking: 1 = Most Important Challenge, 17 = Least Important Challenge

Capability: YES indicates a capability exists in some form. NO indicates no capability currently exists.
Utilization: YES indicates this feature is used appropriately up to the level of capability provided. NO indicates either (a) the feature is available for use but is often *not requested* by pilots or (b) it is cost prohibitive to use this feature, or (c) a *planned upgrade* is in progress.

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Mixed Airframe Missions by Aviation Collective Training Simulators and Simulations (ACTSS) Resource Analysis

Hide Not Applicable

CHALLENGE

Mixed airframe missions: Coordinating and conducting missions with other types of air platforms.

STEP 3 - ASSESSMENT

Is there an opportunity for improvement?	Yes
Improvement Types	**Capability: 1** **Utilization: 8** **Not Requested:** 3 **Cost**: 3 **Planned Upgrade:** 0 **Other**: 2

Description of Difficulty Scale:

5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

STEP 3a. IF YES, KEY THEMES:

Key themes	Relevant TADSS Resources	Difficulty of Modification
Prioritization and communication of collective training objectives within all unit levels and DOS prior to ATX.	**Training Support Packages**	**Slightly Difficult:** Time is required to modify (real-time changes during ATX are difficult), 120 day planning process is critical; Threading of events throughout mission is challenge.
	Company Level Training Objectives	**Slightly Difficult:** Incorporation of CO training objectives requires a CO level training plan for ATX; Communication of those objectives prior to all levels prior to arriving at ATX.
	Collective Training Preparation	**Moderately Difficult:** Current deployment cycle severely limits available time to prepare for ATX.
	Aircrew Training	**Slightly Difficult:** Time required for unit to develop specific aircrew training plans prior to collective training event.
	Logistical Considerations	**Slightly Difficult:** Incorporation of logistical considerations is required prior to arriving at ATX (at TSP development).
Utilizing distributed simulation capabilities in performance of collective training objectives.	**Compatibility With Other/Offsite TADSS**	**Very Difficult:** Communication infrastructure to link facilities is expensive; Classification issues; Compatibility issues between simulator operating systems (although SeCore is helping); Extensive coordination and planning is required.
Representing UAS given future conops and technology.	**UAS**	**Moderately Difficult:** Army UAS SOPs currently do not exist; (2) Simulator concurrency, though workarounds exist.

STEP 4 - CONCLUSIONS

Collective training of the mixed airframe missions challenge may be improved by:

- Utilizing, linking, and configuring collective training distributed simulation environments to replicate the diversity of mixed airframe missions.
- Ensuring the concurrency of simulator cockpit technology as UAS conops are developed and implemented.

Description of Scales:

Rating: 0 = Not Important, 1 = Somewhat Important, 2 = Important, 3 = Very Important
Ranking: 1 = Most Important Challenge, 17 = Least Important Challenge

Capability: YES indicates a capability exists in some form. NO indicates no capability currently exists.
Utilization: YES indicates this feature is used appropriately up to the level of capability provided. NO indicates either (a) the feature is available for use but is often *not requested* by pilots or (b) it is *cost* prohibitive to use this feature, or (c) a *planned upgrade* is in progress.

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Preparing New Pilots by Aviation Collective Training Simulators and Simulations (ACTSS) Resource Analysis

Hide Not Applicable

CHALLENGE

Preparing new pilots: Developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills.

STEP 3 - ASSESSMENT

Is there an opportunity for improvement?	Yes
Improvement Types	**Capability: 3** **Utilization: 20** **Not Requested:** 8 **Cost**: 7 **Planned Upgrade:** 2 **Other**: 3

Description of Difficulty Scale:

5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

STEP 3a. IF YES, KEY THEMES:

Key themes	Relevant TADSS Resources	Difficulty of Modification
Improved accuracy of terrain and geography for pilots new to an AO.	**Accuracy of Geography**	**Moderately Difficult:** Dependent on classification; More detailed geography requires a pre-specified area of operation by BDE; Requires time to update terrain databases; Limited by simulator bandwidth and visual processing power.
	Environmental Effects	**Slightly Difficult:** Unable to localize the environmental effects (applied to global environment); May impact overall mission BDE training objectives.
	Radio Representation	**Slightly Difficult:** Pilot training required to overcome perceived simisms (e.g. LOS); Radio simulation is not completely accurate (e.g. individual channel volume control does not exist);
	Terrain Representation	**Moderately Difficult:** Unable to localize the terrain effects (e.g. LOS); More detailed terrain requires a pre-specified area of operation by BDE; Requires time to update terrain databases;
Maintaining cockpit concurrency for new pilots.	**Ballistic Models for Ordnance**	**Moderately Difficult:** Changing ballistic models of ordnance through updates to the constructive software model is expensive and requires PEO-STRI involvement.
	Blue Force Tracker	**Slightly Difficult:** Simulator concurrency funding cycles; Cockpit technology dependent on platform (OH/AH/UH/CH); OneSAF/SeCORE upgrades to infrastructure will improve representation.
	Cockpit Concurrency	**Very Difficult:** Collective training devices are last on list in funding cycle for concurrency upgrades; Reconfigurable trainers simulate multiple cockpit platforms.
	Digital Messaging	**Moderately Difficult:** Simulator concurrency funding cycles; Cockpit technology dependent on platform (OH/AH/UH/CH).
	Radio Propagation	**Slightly Difficult:** Simulator concurrency (e.g. SATCOM); Pilot training required to overcome perceived simisms.
Insertion and accomplishment of new pilot developmental training objectives into the exercise.	**Mission Planning**	**Not at all Difficult:** Appropriate number of BDE personnel.
	Training Support Packages	**Slightly Difficult:** Time is required to modify (real-time changes during ATX are difficult), 120 day planning process is critical; Threading of events throughout mission is challenge.
	Aircrew Training	**Slightly Difficult:** Time required for unit to develop specific aircrew training plans prior to collective training event.
	Collective Training Preparation	**Moderately Difficult:** Current deployment cycle severely limits available time to prepare for ATX.
	Company Level Training Objectives	**Slightly Difficult:** Incorporation of CO training objectives requires a CO level training plan for ATX; Communication of those objectives prior to all levels prior to arriving at ATX.
	Stealth Room	**Slightly Difficult:** Communication of guidelines, requirements, and best practices for Stealth Room use by pilots.
Renewed focus on development of training plans, evaluation criteria, and feedback of new pilot development throughout the exercise.	**After Action Reviews**	**Slightly Difficult:** Focus on new pilot development.
	Exercise Performance Feedback	**Not at all Difficult:** Understanding of available tools; Request for additional information.
	Evaluator Training	**Slightly Difficult:** Comprehensive evaluator training is not provided; Evaluator training is available prior to collective training events focused on available tools.

Preparing New Pilots by Aviation Collective Training Simulators and Simulations (ACTSS) Resource Analysis

Hide Not Applicable

CHALLENGE

Preparing new pilots: Developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills.

STEP 4 - CONCLUSIONS

Collective training of new pilots may be improved by:

- Replicating the environment, geography, terrain, and cockpit as accurately as resources and technology allow.
- A renewed focus by CO CDR's on the development of training plans and evaluation criteria prior to the exercise for new pilots.

Description of Codes:

Rating: 0 = Not Important, 1 = Somewhat Important, 2 = Important, 3 = Very Important
Ranking: 1 = Most Important Challenge, 17 = Least Important Challenge

Capability: YES indicates a capability exists in some form. NO indicates no capability currently exists.
Utilization: YES indicates this feature is used appropriately up to the level of capability provided. NO indicates either (a) the feature is available for use but is often *not requested* by pilots or (b) it is *cost* prohibitive to use this feature, or (c) a *planned upgrade* is in progress.

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ROE Processes and Procedures by Aviation Collective Training Simulators and Simulations (ACTSS) Resource Analysis

Hide Not Applicable

CHALLENGE

ROE processes and procedures: Understanding what they are and how they impact decision making during the mission.

STEP 3 - ASSESSMENT

Is there an opportunity for improvement?	**Yes**
Improvement Types	**Capability: 1** **Utilization: 7** **Not Requested:** 4 **Cost**: 0 **Planned Upgrade:** 1 **Other**: 2

Description of Difficulty Scale:

5 = Impossible
4 = Very Difficult
3 = Moderately Difficult
2 = Slightly Difficult
1 = Not at all Difficult

STEP 3a. IF YES, KEY THEMES:

Key themes	Relevant TADSS Resources	Difficulty of Modification
SAFs are ambiguous by design and hostile intent is not always explicit.	**SAF Behavior**	**Moderately Difficult:** Changing SAF behavior through updates to the constructive software model is expensive and requires contract modifications; SAF behavior can be controlled by white cell role players when requested.
	SAF Representation	**Moderately Difficult:** Based on current TTPs from theater and built into TSPs leading up to ATX; Often intentional to make pilots work to determine hostile intent.
Renewed focus on development of training plans and company level training objectives during collective training events.	**Aircrew Training**	**Slightly Difficult:** Time required for unit to develop specific aircrew training plans prior to collective training event;
	Company Level Training Objectives	**Slightly Difficult:** Incorporation of CO training objectives requires a CO level training plan for ATX; Communication of those objectives prior to all levels prior to arriving at ATX.
	Collective Training Preparation	**Moderately Difficult:** Current deployment cycle severely limits available time to prepare for ATX.
	Theatre SMEs	**Moderately Difficult:** FORSCOM provides theater SMEs for a unit's full disposal during ATX.
	White Cell	**Slightly Difficult:** FORSCOM provides resources for role players in ATX; Relevant MOS increases realism and provides increased training value.

STEP 4 - CONCLUSIONS

Collective training of the ROE processes and procedures challenge may be improved by:

- Pre-exercise coordination and negotiation of required on-site personnel if specific SAF behavior is required.

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Summary Results by Collective Challenge

Hint: For more information on a certain topic, click on the blue hyperlinks or cell text in the table below.

Importance Ranking	Challenges	Opportunity for Improvement	Key Themes	Recommended Action
1	**Air to Ground Integration** Communicating using mutually understood key words and phrases to provide support to ground units. Click here for more information.	Yes	Better match of collective training resources (i.e. white cell, collective players, collective training devices, etc.) to mission. Prioritization and communication of collective training objectives within all unit levels and DOS prior to ATX. Better use of tools (i.e. radios) to support air to ground interactions.	• Systematic match of air and ground personnel to replicate anticipated theater interactions. • Pre-exercise coordination and negotiation of required on-site personnel across echelons involved in ATX event. • Targeted use of distributed simulation infrastructure to replicate actual environment conditions.
2	**Battlefield Communications** Communicating the right information, to the right person, on the right frequency/ communication system, at the right time. Click here for more information.	Yes	More concurrent representation of electronic communications. Better use of tools (i.e. radios) to support battlefield communications. Prioritization and communication of collective training objectives within all unit levels and DOS prior to ATX.	• Maintaining the exact versions of electronic communication systems as found in the cockpit. • Training with the most realistic settings for communication tools in the simulation environment. • Pre-exercise coordination and negotiation within BDE to include training events focused on battlefield communications.
3	**AMC and PC Development** Developing newer pilots' familiarity/ skills in these roles. Click here for more information.	Yes	Prioritization and communication of specific AMC and PC development training objectives within all unit levels and DOS prior to ATX. Development of training plans, evaluation criteria, and feedback of AMC/PC development prior to and throughout the exercise.	• A renewed focus by CO CDR's on the development of training plans and evaluation criteria prior to the exercise and the use of targeted feedback throughout the exercise. • Prioritization and communication of the CO training plans within all unit levels and DOS prior to a collective training event
4	**Mixed Airframe Missions** Coordinating and conducting missions with other types of air platforms. Click here for more information.	Yes	Prioritization and communication of collective training objectives within all unit levels and DOS prior to ATX. Utilizing distributed simulation capabilities in performance of collective training objectives. Representing UAS given future conops and technology.	• Utilizing, linking, and configuring collective training distributed simulation environments to replicate the diversity of mixed airframe missions. • Ensuring the concurrency of simulator cockpit technology as UAS conops are developed and implemented.
5	**Preparing New Pilots** Developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills. Click here for more information.	Yes	Improved accuracy of terrain and geography for pilots new to an AO. Maintaining cockpit concurrency for new pilots. Insertion and accomplishment of new pilot developmental training objectives into the exercise. Renewed focus on development of training plans, evaluation criteria, and feedback of new pilot development throughout the exercise.	• Replicating the environment, geography, terrain, and cockpit as accurately as resources and technology allow. • A renewed focus by CO CDR's on the development of training plans and evaluation criteria prior to the exercise for new pilots.
6	**ROE Processes and Procedures** Understanding what they are and how they impact decision making during the mission. Click here for more information.	Yes	SAFs are ambiguous by design and hostile intent is not always explicit. Renewed focus on development of training plans and company level training objectives during collective training events.	• Pre-exercise coordination and negotiation of required on-site personnel if specific SAF behavior is required.

APPENDIX D

ACTSS RESOURCE QUESTIONNAIRE

BACKGROUND ON THIS EFFORT

This effort is funded by the U.S. Army Research Institute (ARI) and is supported by the Directorate of Simulation (DOS) at Ft Rucker. The effort is titled "Addressing Army Aviation Collective Training Challenges with Simulators and Simulations (ACTSS) Capabilities."

The effort developed out of a need a previous DOS director identified to investigate ways in which ACTSS (like AVCATT and ATXs) can better prepare Army aviators preparing for deployment. To this end, we seek to identify ways in which ACTSS can be used and if needed, modified and enhanced, to facilitate better training for flight teams particularly at ATX but also in home station training.

DIRECTIONS FOR COMPLETING THIS QUESTIONNAIRE

First review the brief descriptions of eight (8) collective challenges identified by pilots. Then based on the descriptions you just reviewed, please complete the following two sections of questions:

- In **PART I** you will be asked to indicate how important each resource is to training collective challenges.
- In **PART II** you will be asked to indicate the difficulty of modifying resources to train collective challenges such as those identified in Part I.

On the last page of this questionnaire you will be able to indicate any additional comments you have on the use of ACTSS in training Army aviation collective training.

CHALLENGE TITLE	DESCRIPTION
Air to Ground integration	Communicating using mutually understood key words and phrases to provide support to ground units.
AMC and PC development	Developing newer pilots' familiarity/skills in these roles.
Battlefield communications	Communicating to the right person, on the right frequency/communication system, at the right time.
Mixed airframe missions	Coordinating and conducting missions with other types of air platforms.
Preparing new pilots	Developing mission readiness (i.e., teaching the use of mission equipment on the aircraft and execution of tactics) in new pilots beyond basic piloting skills.
Resource supply vs. demand	Managing operational demands vs. aircraft availability and pilots' flight hour limits.
ROE processes and procedures	Understanding what they are and how they impact decision making during the mission.
Use of SOPs	Difficulty applying SOPs because they are too general or not tailored to the AO.

PART I: Referring to the descriptions of the collective training challenges as needed, indicate whether or not each identified resource is important for training each listed collective training challenge.

*Put an 'X' in every box where the ACTSS Resource **is IMPORTANT** for training collective challenges.* *ACTSS RESOURCE* / *COLLECTIVE CHALLENGE*	Air to Ground integration	AMC and PC development.	Battlefield communications	Mixed airframe missions	Preparing new pilots	Resource supply vs. demand	ROE processes and procedures	Use of SOPs
FIDELITY IN SIMULATION ENVIRONMENT								
Accuracy of Geography: Location of objects and terrain (i.e., rivers, mountains, valleys, buildings, villages, etc.) matches actual location in AO.								
Compatibility With Other ACTSS: The ability to seamlessly link other ACTSS (i.e. LCT, AVCATT, CCTT, etc.) to ATX systems.								
Environmental Effects: Modeling and behavior of environmental effects (i.e., dust, wind, snow, fog, high altitude, illumination, etc.) replicates real-world conditions.								
SAF Representation: Semi-automated forces (SAF) look and feel. Extent to which simulated people (i.e., coalition, enemy, indigenous, etc.) and objects (weapons, vehicles, tools, etc.) appear as they would in AO.								
Terrain Representation: Look and feel of terrain. Extent to which terrain (i.e., rivers, mountains, valleys, buildings, villages, etc.) is represented compared to the actual topography or structures in AO.								

Put an 'X' in every box where the ACTSS Resource ***is IMPORTANT*** *for training collective challenges.*

ACTSS RESOURCE / *COLLECTIVE CHALLENGE*

	Air to Ground integration	AMC and PC development.	Battlefield communications	Mixed airframe missions	Preparing new pilots	Resource supply vs. demand	ROE processes and procedures	Use of SOPs
AIRCRAFT SYSTEMS (HARDWARE AND SOFTWARE)								
Aircraft Lighting: Representation of aircraft lighting (i.e. IR strobes, Position Lights, Search Lights, etc.).								
Ballistic Models for CMWS: Modeling of CMWS from ejection to burnout matches real-world systems.								
Ballistic Models for Ordinance: Modeling of ordinance from weapon release through path of flight and ending at impact matches real-world systems.								
Blue Force Tracker: Ability to input BFT data (e.g., drop icons for targets, friendly forces, etc.).								
Cockpit Concurrency: Simulated cockpit has updated version of aircraft software (i.e. current block and lot, digital cockpit, kneeboard vs. integrated into cockpit) and/or can be modified to unit's version.								
Digital Messaging: Digital messaging replicates aircraft systems and/or processes.								
Radio Propagation: Radio communications (FM, UHF, VHF, HF, SATCOM) function the same as in the aircraft (i.e., line of sight, bandwidth, satellite).								
Radio Representation: Extent to which pilots are able to control radio volume and frequencies as in the aircraft. Radios present in simulator (FM, UHF, VHF, HF, SATCOM) match radios present in unit aircraft.								

Put an 'X' in every box where the ACTSS Resource ***is IMPORTANT*** *for training collective challenges.*

ACTSS RESOURCE / COLLECTIVE CHALLENGE	Air to Ground integration	AMC and PC development.	Battlefield communications	Mixed airframe missions	Preparing new pilots	Resource supply vs. demand	ROE processes and procedures	Use of SOPs
PRODUCTS AND PROCESSES								
Accuracy of Products: Products (e.g., AMR, mission packets, briefs, etc.) developed within ATX are identical to those developed in AO.								
After Action Reviews: AARs and hotwashes provide accurate and timely feedback that links to commander's training objectives for aviator performance.								
Battle Rhythm: Sequence and timing of events mimics conditions in combat.								
Battlefield Communications: Communicating the correct information to the right people at the right time, using the appropriate tools (voice, digital).								
Exercise Performance Feedback: Notes and observations throughout the exercise are provided to improve unit performance (e.g., Oral AAR, written take-home packages, or other customized feedback requested by commanders).								
Mission Planning: Replicating the high OPTEMPO 24- to 48-hour company level mission planning cycle.								
Planning Tool Availability: Access to planning materials and systems (e.g., AMPS, Imagery, etc.) available in AO for use in mission planning.								
Scenario Injects: Extent to which injects are appropriately placed (time and space) in the environment to support training objectives.								

*Put an 'X' in every box where the ACTSS Resource **is IMPORTANT** for training collective challenges.* ACTSS RESOURCE / COLLECTIVE CHALLENGE	Air to Ground integration	AMC and PC development.	Battlefield communications	Mixed airframe missions	Preparing new pilots	Resource supply vs. demand	ROE processes and procedures	Use of SOPs
SOP Validation: Extent to which unit performance is rated in accordance with its SOPs. Based on feedback and lessons learned at ATX, unit's ability to adjust SOPs.								
Training Support Packages: TSPs accurately represent scenarios units may encounter in theater.								
TRAINING SUPPORT								
Aircrew Training: Exercise facilitates aircrew training objectives such as decision making, communication, and situational awareness.								
Airspace Considerations: Representation of dynamic changes in airspace (i.e. SOF Operations, blue rain, etc.).								
ATX Preparation: All unit levels within the CAB understand training opportunities available at ATX and provide training objectives for their specific need(s).								
Aviator Equipment: Replication of weight, bulk, and other restrictions associated with Aviation Life Support Equipment (ALSE) and other gear aviators wear in the cockpit.								
CAS: Ability of aircrews to utilize Close Air Support (CAS) in mission execution.								
Company Level Training Objectives: Ability of CO CDRs to implement their training objectives during ATX.								

Put an 'X' in every box where the ACTSS Resource ***is IMPORTANT*** *for training collective challenges.*

ACTSS RESOURCE / *COLLECTIVE CHALLENGE*

	Air to Ground integration	AMC and PC development.	Battlefield communications	Mixed airframe missions	Preparing new pilots	Resource supply vs. demand	ROE processes and procedures	Use of SOPs
Evaluator Training: Availability of training and/or tools to facilitate constructive feedback to improve unit performance.								
Logistical Considerations: Accurate representation of FARPs and the ability to incorporate logistical considerations in or during mission planning.								
Mixed Airframe Missions: Amount of exposure aviators have to planning and flying mixed airframe missions in a flight team.								
SAF Behavior: Semi-automated forces (SAF) behavior. Extent to which simulated people (i.e., coalition, enemy, indigenous, etc.) and objects (weapons, vehicles, tools, etc.) behave as they would in AO.								
Stealth Room: CABs ability to monitor aviator performance through access to stealth room(s).								
Theater SMEs: Availability of theater SMEs to answer questions about current AO, enemy tactics, and TTPs and to provide feedback on unit performance.								
UAS: Ability to integrate UAS in mission execution. In the future, replicating MUM teaming.								
White Cell: Accurate representation of air and ground elements during gameplay (language, size, and capability, etc.)								

PART II

For the following items, refer to the descriptions provided in Part I as needed. Considering cost, upgrade processes, etc., rate the level of difficulty associated with modifying each of the following resources. In other words, **how difficult is it to modify each of the follow resources?**

How difficult is it to modify...?	Impossible	Very Difficult	Moderately Difficult	Slightly Difficult	Not at all Difficult	COMMENTS (use back of page for additional room)
FIDELITY IN SIMULATION ENVIRONMENT						
Accuracy of Geography	☐	☐	☐	☐	☐	
Compatibility With Other ACTSS	☐	☐	☐	☐	☐	
Environmental Effects	☐	☐	☐	☐	☐	
SAF Representation	☐	☐	☐	☐	☐	
Terrain Representation	☐	☐	☐	☐	☐	
AIRCRAFT SYSTEMS (HARDWARE AND SOFTWARE)						
Aircraft Lighting	☐	☐	☐	☐	☐	
Ballistic Models for CMWS	☐	☐	☐	☐	☐	
Ballistic Models for Ordinance	☐	☐	☐	☐	☐	
Blue Force Tracker	☐	☐	☐	☐	☐	
Cockpit Concurrency	☐	☐	☐	☐	☐	
Digital Messaging	☐	☐	☐	☐	☐	

How difficult is it to modify...?	Impossible	Very Difficult	Moderately Difficult	Slightly Difficult	Not at all Difficult	COMMENTS (use back of page for additional room)
Radio Propagation	☐	☐	☐	☐	☐	
Radio Representation	☐	☐	☐	☐	☐	
PRODUCTS AND PROCESSES						
Accuracy of Products	☐	☐	☐	☐	☐	
After Action Reviews	☐	☐	☐	☐	☐	
Battle Rhythm	☐	☐	☐	☐	☐	
Battlefield Communications	☐	☐	☐	☐	☐	
Exercise Performance Feedback	☐	☐	☐	☐	☐	
Mission Planning	☐	☐	☐	☐	☐	
Planning Tool Availability	☐	☐	☐	☐	☐	
Scenario Injects	☐	☐	☐	☐	☐	
SOP Validation	☐	☐	☐	☐	☐	
Training Support Packages	☐	☐	☐	☐	☐	
TRAINING SUPPORT						
Aircrew Training	☐	☐	☐	☐	☐	
Airspace Considerations	☐	☐	☐	☐	☐	

How difficult is it to modify...?	Impossible	Very Difficult	Moderately Difficult	Slightly Difficult	Not at all Difficult	COMMENTS (use back of page for additional room)
ATX Preparation	☐	☐	☐	☐	☐	
Aviator Equipment	☐	☐	☐	☐	☐	
CAS	☐	☐	☐	☐	☐	
Company Level Training Objectives	☐	☐	☐	☐	☐	
Evaluator Training	☐	☐	☐	☐	☐	
Logistical Considerations	☐	☐	☐	☐	☐	
Mixed Airframe Missions	☐	☐	☐	☐	☐	
SAF Behavior	☐	☐	☐	☐	☐	
Stealth Room	☐	☐	☐	☐	☐	
Theater SMEs	☐	☐	☐	☐	☐	
UAS	☐	☐	☐	☐	☐	
White Cell	☐	☐	☐	☐	☐	

What is your area of expertise at DOS, if applicable?

Please list any additional comments regarding CTSS use in aviation collective training needs in the space below:

Thank you for your time!