Understanding Army Experimentation

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The advent of the Army 2030 concept combines new concepts, formations, and technologies that require numerous experiments at all levels of warfare. The Army as a custodian of our nation's resources must provide key information to senior leaders to make decisions on how the Army should change. These changes are necessary in a world with technologies that increase Army, the joint force, our allies, and potential adversaries' capabilities. The following article aims to assist commanders and staffs with understanding how the Army designs and executes experiments.

Why are Army Experiments Important to the Operational Force?

The Army conducts experiments to ensure leaders can apply limited resources to reach Army 2030 and even further to Army 2040. Within the priorities of personnel, readiness, and modernization, it is critical for Army leadership to have the necessary understanding and knowledge of what is possible and feasible in concepts, formations, and technologies. These three combined must achieve a force that provides overmatch of potential adversary capabilities. For an operational force that must remain focused on readiness, experiments provide a venue to validate what capabilities increase that readiness. A critical piece of this is having Soldiers and organizations from today's operational force providing feedback on these potential changes. This provides participating operational force units the ability to influence the future of the Army, while providing an additional training venue.

What is Army Experimentation?

The Department of Defense Experimentation Guidebook describes experimentation as “testing a hypothesis, under measured conditions, to explore unknown effects of manipulating proposed warfighting concepts, technologies, or conditions.”[1] In Army operational experimentation, Soldiers participate in a field environment with new technologies, concepts, and organizations. Trained data collectors and operational analysts observe the experiments. These observers based their questions and hypotheses on quantitative and qualitative analysis. Once observations were complete, the collectors provide their data to Army senior leaders in order to assist them with determining capabilities that the future force may employ.

The Difference Between Operational Experimentation and Exercises

There are numerous differences and outcomes between how the Army conducts exercises and experiments. First, exercises improve readiness, have training objectives, a primary training audience, and have “free play” scenarios. Army units conduct exercises to improve readiness. Based upon a unit’s mission essential task list, commanders determine training objectives. The training objectives drive the scenario, participating

units, and other elements necessary to meet readiness goals. In an exercise, participating units are the primary training audience. An example of this is in Joint Readiness Training Center (JRTC) exercises where the primary training audience is the commander of the brigade combat team. In exercises, there is a great deal of free play. For example, the opposing force (OPFOR) may be directed to do some specific things in order to allow units to make choices and respond.

The Army lessons learned community of practice plans collection activities for most major exercises. Based on the exercises' training objectives, these collection activities may include observations of specifically focused areas or on general lessons learned. The Army lessons learned community forms collection teams that may or may not capture the data anticipated, due to the free play between the OPFOR and the participating units. Exercise success if based on what the training audience learned. The observations, insights, and lessons data collected belong to the units in the exercise.

An Army experiment is significantly different than an Army exercise. An experiment design is based upon what a sponsoring organization needs to learn to drive future decisions. A sponsoring organization develops event questions on what needs to be answered. Experiment designers break these questions down further into essential elements of analysis (EEAs) that help the Army understand what must be collected and analyzed to fully answer the event questions. Often, experiments have learning objectives with broad areas requiring answers to drive progress. Furthermore, the designers will break the learning objectives into learning demands. A learning demand is a question identified by a task or directed activity discovered during mission analysis and problem decomposition. The end state is to satisfy the learning demands and various methods that can be used to accomplish this including literature reviews, studies, operations research techniques, and experiments. Finally, designers develop the measures of performance and effectiveness to provide meaningful results to inform leaders. The experiment designers use the results of these steps to develop scenarios, organizations required, equipment requirements, and other items.

In an experiment, the Army defines success by the data collected and the resulting analysis informing future decisions. Key to resourcing an experiment is ensuring the data collection and analysis elements (e.g., electronic systems, personnel, data bases, data collection cards, etc.), necessary to get the data for later analysis. Free play, or the ability of participants to make choices, is limited in experimentation for necessary linkages to occur and be measured. For example, tying specific sensors to specific networks and applications and then on to a specific shooter. Experiment designers do this to experiment with how various elements working together can improve responsiveness.

In experimentation, the collectors/analysts derive lessons based upon the analysis of the observations made by collectors to answer the learning demands. Where possible, these questions are measured either in performance or effectiveness to provide measurable data. This may be quantitative data based upon a technologies capabilities or qualitative data based upon operational effectiveness. The derived data generally supports concept,

materiel, and organization development. Experiment leads post the results of experiments in various places. In order to consolidate experiment data, the Futures and Concepts Center is developing Forge. Forge is a “structure modular date environment facilitating the synchronization and integration of modernization processes enabling Army modernization enterprise collaboration and a common operation picture of progress.” Users can access Forge to find the final experiment reports. Forge provides a capability to see planned experiments, along with their learning demands and results. The lessons learned community can use Forge to understand what questions analysts asked. Based upon what the lessons learned community is seeing in operations and training, the community may be able to refine and/or help answer some of the learning demands.

Project Convergence as an Example

Project Convergence 21 (PC21) is a good example of what is described above. AFC designed PC21 based on what needed to be learned. The Army's cross-functional teams (CFTs) and capability development integration directorates (CDIDs), and others submitted learning demands based on questions they needed answered to inform senior leaders for decision making. Within PC21, there were two key areas the experiment needed to address. The first was the performance of the individual technologies. The second question was based on how these technologies when combined enhanced the capabilities of the operational force. To get after these questions, the Futures and Concepts Center and the Joint Modernization Command (JMC) developed use cases as experiment venues. Designers used specific areas such as sensor to shooter or integrated air and missile defense to develop the use cases. JMC developed execution checklists (EXCHECKs) that depicted step-by-step what was expected to happen. The EXCHECK was a critical piece in data collection to collect on each action to provide the basis of later analysis. PC21 ran multiple iterations, in order to observe and measure changes. Observation collectors conducted a root cause analysis to determine what factors contributed to events that took place during experiments. The analysis of these individual technologies was then combined with analysis of their use with other technologies to discover how they can improve force effectiveness.

Understanding what needed to be learned and focusing collection efforts was key to PC21 success. The PC21 data collection and analysis (DC&A) community comprised of The Research and Analysis Center (TRAC), U.S. Army Test and Evaluation Command (ATEC), the Army Combat Capabilities Development Command (DEVCOM) Analysis Center (DAC), along with the CFTs and CDIDs refined the learning demands into essential elements of analysis. The DC&A further broke the essential elements of analysis down to the measures of performance and measures of effectiveness. This provided the necessary baseline data requirement to show what collectors must go after in the experiment. The DC&A looked at how the data requirements could be collected. For quantitative data, electronic capabilities could collect some of the data. Where that was not possible, data collectors captured specific times or other numeric elements for later analysis. Data collectors and analysts captured additional qualitative data, such as

Soldier and leader thoughts on the utility of the technology or potential techniques for use through surveys, hotwashes, and other inputs. Data collectors and analysts input the raw data collected into the Army Experimentation Resource Data Repository (AERDR). AERDR provides a database for all Army experimentation data. Analysts representing the various elements of the PC21 data collection and analysis community were then able to use the data to derive findings that they input to the experimentation report. In the future, experiment sponsors will post these types of reports in Forge for use by the Army and joint partners. Senior leaders can use the analyzed findings to make decisions about the way forward on various technologies. Future Project Convergence experiments will further incorporate concepts and formations.

Conclusion

Army experimentation is critical to providing capability overmatch to the future force. Experiments such as Project Convergence provide a venue where the operational force can provide feedback on future capabilities. This feedback is critical to informing senior leaders in making resource decisions. Operational force commanders' understanding of how the experiment is designed and collected on helps them to better understand their critical role in this process.

[1] Office of the Under Secretary of Defense for Research and Engineering, Department of Defense Experimentation Guidebook, Oct 2021, https://www.dau.edu/tools/Lists/DAUTools/Attachments/381/DoD%20Experimentation%20Guidebook%20v2.0%202021.pdf