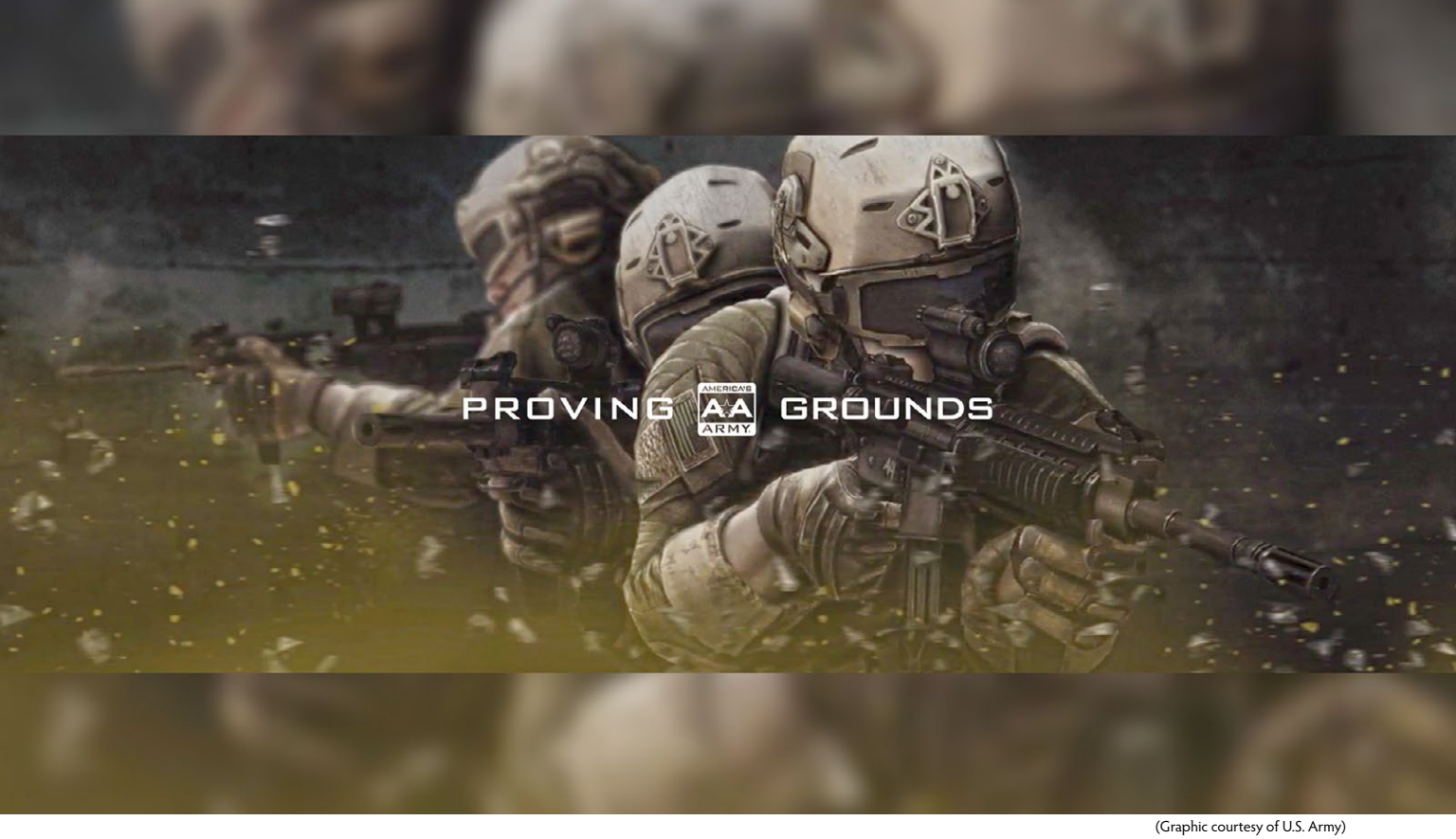

(Graphic courtesy of U.S. Army)

The U.S. Army launched *America's Army: Proving Grounds* August 2013 on Steam, an Internet-based digital distribution platform. More than 920,000 player accounts were created for the game during the beta period, and over 7.7 million hours of play have been logged since. *America's Army* is developed by the Army Game Studio, which falls under the Aviation and Missile Research, Development, and Engineering Center's Software Engineering Directorate. The studio operates in support of the Army Marketing and Research Group.

Force Agility through Crowdsourced Development of Tactics

Lt. Col. Chad Storlie, U.S. Army, Retired

The year is 2020. On a Navy aircraft carrier off the western coast of Africa, U.S. Army Col. Lisa Eversen, commander of Task Force Justice, reads the mission statement quickly:[1]

Who: Task Force Justice
What: Attack to destroy three terrorist training camps—conduct attacks simultaneously
When: Execute the missions in seven hours
Where: Per attached coordinates
Why: Help remove terrorist forces to enable the restoration of law and order in the democratically elected government

Eversen and her staff quickly begin a condensed Army *military decisionmaking process* (MDMP) to create an executable plan, per Field Manual 6-0, *Commander and Staff Organization and Operations*.[2]

(Image courtesy of Wikimedia Commons)

Soldiers from the British Royal Artillery inside a simulation tent 5 March 2015 during Exercise Steel Sabre at the Otterburn Training Area, Northumberland, United Kingdom. The simulation system uses 360-degree technology to enhance training realism.

The commander and staff have only seven hours until their mission commences. For planning, they need to assemble threat and friendly force information, intelligence products, environmental data, logistic requirements, and other planning material.

In the past, the development and evaluation of viable courses of action (COAs) would have largely been driven by experience, doctrine, and best practices contributed by a small staff group.[3] In 2020, however, Task Force Justice also uses the *force agility—crowdsourced development of tactics* (FA-CDT) technology, a new way to develop and analyze COAs. Using a structured process with the FA-CDT technology, the staff systematically produces five viable COAs, based on

- crowdsourced, tactical game play gathered from over one million global players using mobile platforms that incorporate the latest threat tactics,
- war-gaming of COAs against one hundred thousand threat simulations to produce success probabilities,
- big data to analyze and improve the five draft COAs for Task Force Justice, and
- a systematic twelve-step process.

After developing and analyzing COAs (in steps 3 and 4 of the MDMP), Task Force Justice begins comparing their COAs (in step 5) with tactical planning options created, tested, improved, and delivered for approval and final planning. Their technology integrates crowdsourcing, big data, and mobile-gaming technology from a global military user base to create the best chance of tactical success.

Effective Responses to Future Challenges

The Army needs an FA-CDT technology platform that will allow design, validation, war-gaming, and dynamic analysis for creating plans with the greatest probability of success in the shortest time possible. Three pieces of technology in use today that can drive the future of Army planning are crowdsourcing, big data, and mobile gaming. The way to revolutionize Army tactical mission planning is through a mobile-gaming platform that could be offered to thousands, or even millions, of users and then have the results analyzed using big data analytics.

The key question concerning military challenges in 2020 and beyond is what path do leaders take to prepare for a successful future? Two possible ways to prepare for future military operations are to (1) attempt to predict where future wars will be and why,

or (2) create agile systems to speed decision making for successful operations. The historical record of predicting the military future has shown that the chances for failure are high, and the chances for success are slim. On the other hand, agile systems like FA-CDT could help the Army accomplish missions that it might not be able to predict.

Prediction. The failure of the French Maginot Line, built during the pre-World War II years along the French and German border, offers a warning on the shortcomings of military prediction. The French built an extensive static defense, based mainly on experience and old technology. This approach did not predict or anticipate the rapid advance of technology (such as faster tanks and glider infantry) and new tactics (such as blitzkrieg) that rapidly neutralized static defense.[4] During the German invasion of France and the Low Countries at the start of World War II, the Nazis outflanked the Maginot Line and rendered years of effort useless.[5]

(Image courtesy of Wikimedia Commons)

Vainglory, a mobile multiplayer online battle arena game by Super Evil Megacorp being played on an iPad, 5 September 2014.

Agility. The path of trying to learn quickly how to defeat threat tactics also is challenging. For example, the Army discovered in Iraq that defeating the threat's weapon of choice, the improvised explosive device (IED), was a multiyear and multibillion dollar undertaking. The Army struggled with technology, tactics, intelligence, and procedures for nearly the entirety of Operation Iraqi Freedom to reduce the percentage of deaths from IED attacks to about less than half.[6] It was only the rapid fall in IED events after 2007 that helped reduce the number of U.S. military deaths from IEDs to about 10 percent.[7]

Technology. The dangers of ineffective prediction, as with the Maginot Line, and the difficulty of creating agile systems to defeat threat tactics, such as those developed to support counter-IED efforts in Iraq, illustrate the challenges in preparing for future conflict. Nonetheless, with technologies already available and with forward thinking, the Army can improve its agility for responding to threats it cannot predict.

Even if the Army could know where conflicts would occur and why, the knowledge would be insufficient to design, plan, and lead an effective military operation. Generalized prediction of the conditions where forces would be likely to fight and the causes of conflict in certain geographical areas are also insufficient for force-generation activities intended to ensure deployed forces are equipped, resourced, and trained to achieve military success.

To fulfill its mission, "to fight and win our Nation's wars," the Army must determine how it can rapidly understand, learn, adapt, and execute military operations to defeat future threats.[8] The objective of technological approaches like FA-CDT is to meet the Army's goal for agility, "the ability of friendly forces to react faster than the enemy."[9]

The Combination of Crowdsourcing, Big Data, and Mobile Gaming

For success in future conflicts, the Army needs to rapidly understand, create, test, revise, and implement new tactics and plans that will have the best probability of success. The FA-CDT technology offers the combination of crowdsourcing, big data, and mobile gaming to help achieve these goals. Additionally, the FA-CDT model can rapidly "learn" or adjust as it sees the threat implement new or modified tactics.

Crowdsourcing. *Crowdsourcing* is "the practice of obtaining needed services, ideas, content, or information by soliciting contributions from a large group of people and especially from the online community rather than from traditional employees or suppliers."[10] An example of crowdsourcing is the Netflix Prize, an open, global challenge announced in 2006 to improve Netflix's movie selection algorithm.[11] Netflix, an online content subscription company, offers entertainment content to its customers. Critical to Netflix's success is how well customers like and view Netflix's recommendations for entertainment. The Netflix Prize offered a $1 million award to improve Netflix's movie recommendation system.[12] By 2009, the contest had received 44,014 valid submissions from 5,169 teams based in

186 countries.[13] The winning team submitted an algorithm that could improve the existing Netflix movie selection algorithm by just over 10 percent.

Big data. The phrase *big data* refers to data sets too large for traditional programs, and the advanced analytics and speedy processing that can analyze them to help solve complex and multivariable organizational challenges. In "Big Data: What It Is and Why it Matters," the analytics company SAS Institute, Inc., shows big data's importance in relation to reducing costs and time, developing products, and making smart decisions.[14] One example of a company using big data to improve operations is UPS, a global delivery and logistics network. Critical to the company's success is how well its drivers pick up and deliver on time (customer satisfaction) and how efficiently they conduct operations (safety and cost savings). UPS introduced the Orion driver routing system in 2013, which designs, validates, and improves driver delivery routes. UPS estimates that Orion will save the company up to $400 million by 2017.[15]

Mobile gaming. By 2017, mobile gaming—gaming on handheld devices—is expected to account for approximately one-third of all gaming revenue, according to market research firm Newzoo.[16] Mobile gaming is growing at a rate of two times traditional electronic gaming platforms (such as consoles and personal computers).[17] Newzoo reports that, as of 2013, about 1.6 billion people around the world played games on mobile devices, with Asia, the Middle East, Africa, and Europe comprising the largest segments.[18]

Private companies are finding a variety of ways to use mobile-gaming technology for improving operations. For example, the insurance company Allstate is using gaming technology to teach and reinforce ethics and legal compliance in its business practices for over eighty thousand employees.[19] For the Army, mobile gaming offers maximum ability to rapidly design, test, and learn how different tactics, techniques, and procedures would succeed or fail when played against an engaged user base.

A Twelve-Step Process

The complete MDMP consists of step 1, receipt of mission; step 2, mission analysis; step 3, COA development; step 4, COA analysis; step 5, COA comparison; step 6, COA approval; and step 7, orders production, dissemination, and transition.[20] The complete FA-CDT process comprises twelve steps, nested primarily within steps 3, 4, and 5 of the MDMP. FA-CDT supports the most difficult aspects of planning—viable COA development and analysis. Planners can organize the process as a whole using the major mission command activities outlined in the Army's operations process: plan, prepare, execute, and assess.[21]

Plan. The first two FA-CDT process steps fall within the planning activity:

Step 1. Test and validate the game software and platform.

Step 2. Determine game and simulation objectives, friendly force capabilities, threat capabilities, and evaluation criteria.

The planning steps focus on creating the mobile gaming piece of the platform that enables full game play and simulation. The results of game play and simulation over millions of iterations drive the data for COA development (for step 3 of the MDMP).

Prepare. The third FA-CDT step falls within the prepare activity:

Step 3. Design mobile and individual technology interface with data collection, data storage, and data analytics capabilities.

The third step focuses on ensuring that the data collected via gaming can be stored, analyzed, and recalled. The purpose is to ensure it can be used for steps 3 and 4 of the MDMP, developing and analyzing complete and effective COAs.

Execute. The next four steps in the FA-CDT process fall within the execute activity:

Step 4. Run the game and identify pilot and control groups for game results validation.

Step 5. Analyze the initial results to meet development objective and evaluation criteria.

Step 6. Incorporate tactical learning and adaptation into the initial game results.

Step 7. Deliver proposed COAs in electronic format to the commander.

The execution steps involve running the game, employing crowdsourcing to select the game user base, and using big data to analyze and compare the results, supporting steps 4 and 5 of the MDMP. Finally, staffs recommend validated COAs with the greatest success probability to the field commander for COA approval.

Assess. The last five steps of the FA-CDT process fall within the assessment activity:

(Photo by Staff Sgt. Stacy L. Pearsall, U.S. Air Force)

Spc. Joshua Philbeck, 1st Cavalry Division, plays a video game after finishing guard duty 15 February 2007 at the Iraqi police station in Buhriz, Iraq.

Step 8. Test draft COAs with full live rehearsal testing or red team rehearsal.

Step 9. Conduct an after action review to analyze how the COAs performed in the rehearsal.

Step 10. Revise the COAs to account for rehearsal results and emergent threat tactics.

Step 11. Continue with recommended COA in steps 6 and 7 of the MDMP.

Step 12. Obtain final commander approval of a COA and final planning guidance, and produce an operation order.

The commander reviews the recommended FA-CDT COAs. Based on updated assumptions, the commander selects one or more for rehearsals and additional evaluation and modification. Once the commander approves a modified COA, the staff completes the MDMP. It is vital to remember that the FA-CDT process reinforces and supports the commander's authority and ultimate selection of a COA for implementation.

Benefits and Challenges of FA-CDT

The technology for FA-CDT is already available, and this article provides a comprehensive process to ensure its effective use, consistent with existing Army planning doctrine. Force 2020 could realize the benefits in terms of enhanced agility, but certain challenges would need to be overcome.

Benefits. The primary benefit of using FA-CDT technology is the rapid, dynamic creation of multiple COAs that are modeled, tested, and war-gamed against the most up-to-date threat tactics during the MDMP. Additional benefits include—

- an independent COA development platform outside traditional Army mission planning
- the ability to discover, test, and evaluate unexpected solutions quickly
- testing by gamers in the specific geographic area where Army units will operate to discover any threat strengths and vulnerabilities
- a cost-effective, dynamic, and adaptable solution for mission planning across a variety of mission sets and geographies

Challenges. The challenges of using FA-CDT revolve around creating a crowdsource user base large

enough to drive creation of innovative tactical solutions as well as the design, implementation, maintenance, and improvement of the FA-CDT technology.

First, there could be potentially misleading results if the crowdsourced gaming population is too small. The global gaming market is more than 1.6 billion users; the Army's gaming should include millions of users. Second, initial FA-CDT technology could be designed, tested, implemented, revalidated, and improved by 2020. The Netflix Prize, the UPS Orion project, and others have shown multiyear efforts can produce good initial results that are further improved over time to be ultimately successful. Third, the games would have to be constantly updated and revised to include new Army equipment; capabilities; threats; doctrine; tactics, techniques, and procedures; and environmental mission factors. Fourth, the games would have to effectively simulate and accurately evaluate the success probabilities of the Army missions being considered. Fifth, game software would have to maintain effective language, readability, cultural aspects, and underlying similarity of game results to allow big data analysis.

(Photo by Pamela Redford, Fort Riley PAO)

Soldiers use the Virtual Battle Space 2 program 10 April 2012 in the Mission Training Complex Gaming Lab at Fort Riley, Kansas. Using the program, soldiers create personal avatars and enter into a realistic virtual mission scenario that is tailored to meet their unit's training needs.

Finally, while operational security is of some concern, overall security would be for the totality of the evaluated gaming results—not for the individual games. Some strategy games may not even need to be military-style games.

The Approach to Developing the Technology for Army Use

The Army can use a systematic, sequential approach to developing and implementing FA-CDT technology. This type of development process would allow the FA-CDT to begin to win or fail at the lowest tactical level and then progress up the levels of operational complexity once it was producing winning solutions.

Initial testing. The Army should start with a low-level test to demonstrate that the concept of combining crowdsourcing, big data analytics, and mobile gaming works. There are three parts to this initial test. The first part is for the Army to create a squad-level tactical game playable on Android and iOS mobile operating platforms. The game must incorporate Army tactics and capabilities versus a threat competitor. The second part is to crowdsource an audience of soldiers who are given access to play the game through their Army Knowledge Online accounts. The third part is a big data analysis of the game results from an individual to an aggregated level to determine the patterns of the crowdsource gaming audience that allow them to successfully "win" the game. The end goal is for the crowdsourcing, big data analysis, and mobile-game platform to be able to produce game-winning squad-level tactics.

Expanded testing. The winning squad-level tactics would then be tested at the various Army Combat Training Centers (CTCs) using historical results as a control group and FA-CDT results as the test group. Once the squad-level analysis was successful, the FA-CDT process could be applied to platoon-, company-, battalion-, and brigade-level CTC operations following the same testing process. The final step would be to open the game to global crowdsource testing at squad through brigade levels to identify best practices and effective tactics. The game should also be played on both the Army side and the threat side to allow development, testing, and analysis of both Army tactics and threat tactics.

Success in Future Operations

The Army cannot predict exactly where or how conflicts will unfold beyond the short term, but it

can improve its agility when conflicts arise. Future conflicts will demand rapid and effective creation of plans and tactics that allow fast, effective operations using all available data for even faster execution. The technology that could help the Army achieve rapid tactical agility is already available through crowdsourcing, big data, and mobile gaming. The Army needs to embrace it to fight successfully in a complex world.[22] Agility, not prediction, is the prescription for success in future conflict. ■

Biography

Lt. Col. Chad Storlie, U.S. Army, retired, is a midlevel marketing executive at Union Pacific Railroad and an adjunct lecturer at Creighton University, Omaha, Nebraska. He holds a BA from Northwestern University and an MBA from Georgetown University. He served over twenty years in active and Army Reserve units in Iraq, Bosnia, Korea, and throughout the United States. He is the author of two books and has published articles in over eighty print and online publications.

Notes

1. The mission, the task force, and the commander represented in this vignette are fictitious; they are used for illustration purposes only.

2. Field Manual (FM) 6-0, *Commander and Staff Organization and Operations* (Washington, DC: U.S. Government Printing Office [GPO], 5 May 2014), 9-3.

3. For an example of a small staff group developing courses of action, see Matt Matthews, "Interview with LTC Peter A. Newell," *Operational Leadership Experiences in the Global War on Terrorism* (Combat Studies Institute, Fort Leavenworth, KS: Operational Leadership Experiences Project, 23 March 2006), 5, accessed 22 March 2016, http://cgsc.contentdm.oclc.org/cdm/singleitem/collection/p4013coll13/id/120/rec/128.

4. Harold L Chappell, "Fixed Permanent Fortifications at the Operational Level of War" (monograph, School of Advanced Military Studies, 10 May 1991), 14–17, accessed 22 March 2016, http://www.dtic.mil/dtic/tr/fulltext/u2/a240407.pdf.

5. Ibid.

6. Andrew Smith, *Improvised Explosive Devices in Iraq, 2003-09: A Case of Operational Surprise and Institutional Response* (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, April 2011), 12; Anthony Cordesman, Charles Loi, and Vivek Kocharlakota, *IED Metrics for Iraq: June 2003–September 2010* (Washington, DC: Center for Strategic and International Studies, 11 November 2010), 3–6; Michael O'Hanlon and Jason Campbell, *Iraq Index: Tracking Variables of Reconstruction & Security in Post-Saddam Iraq* (Washington, DC: Brookings Institute, 25 June 2009), 15. IED fatalities and IED event rates were calculated by the author using data from the sources cited in this note.

7. David H. Petraeus, "How We Won in Iraq: And Why all the Hard-Won Gains of the Surge are in Grave Danger of Being Lost Today," Foreign Policy website, 29 October 2013, accessed 22 March 2016, http://foreignpolicy.com/2013/10/29/how-we-won-in-iraq/.

8. "Army Mission Statement," Organization page of the U.S. Army homepage, accessed 22 March 2016, http://www.army.mil/info/organization/.

9. Army Doctrine Reference Publication (ADRP) 3-90, *Offense and Defense* (Washington, DC: U.S. GPO, 31 August 2012), 1–6.

10. Merriam-Webster Unabridged Dictionary online, s.v. "crowdsourcing."

11. "Netflix Prize," Netflix, Inc., 2009, accessed 22 March 2016, http://www.netflixprize.com/.

12. "The Netflix Prize Rules," Netflix, Inc., 2006, accessed 22 March 2016, http://www.netflixprize.com/rules.

13. "Netflix Prize: Leaderboard," Netflix, Inc., 2009, accessed 22 March 2016, http://www.netflixprize.com/leaderboard?showtest=t&limit=1000. Note: According to Mike Masnick, "Why Netflix Never Implemented the Algorithm that Won the Netflix $1 Million Challenge," *Innovation* (blog), www.techdirt.com, 13 April 2012, Netflix did not implement the winning solution for several reasons, but it did modify and adopt algorithms developed by one team.

14. "Big Data: What It Is and Why it Matters," SAS Institute Inc., accessed 22 March 2016, http://www.sas.com/en_us/insights/big-data/what-is-big-data.html.

15. Steven Rosenbush and Laura Stevens, "At UPS, the Algorithm Is the Driver," *Wall Street Journal* online, 16 February 2015, accessed 18 March 2016, http://www.wsj.com/articles/at-ups-the-algorithm-is-the-driver-1424136536.

16. Newzoo, "Global Games Market Will Reach $102.9 Billion in 2017," Newzoo.com, accessed 22 March 2016, http://www.newzoo.com/insights/global-games-market-will-reach-102-9-billion-2017-2/.

17. Ibid.

18. Ibid.

19. Kate Everson, "Allstate Is in Gamification's Hands," Chief Learning Officer online magazine, July 2014, accessed 23 March 2016, http://cedma-europe.org/newsletter%20articles/Clomedia/Allstate%20is%20in%20Gamifications%20Hands%20%28Jul%2014%29.pdf.

20. FM 6-0, *Commander and Staff Organization and Operations*, 9-3.

21. Army Doctrine Publication (ADP) 5-0, *The Operations Process* (Washington, DC: U.S. GPO, 17 May 2012), 1.

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