Collective Simulation-Based Training in the U.S. Army
User Interface Fidelity, Costs, and Training Effectiveness

Susan G. Straus, Matthew W. Lewis, Kathryn Connor, Rick Eden, Matthew E. Boyer, Tim Marler,

Christopher M. Carson, Geoffrey E. Grimm, Heather Smigowski

www.rand.org/t/RR2250

The U.S. Army uses various virtual systems to help soldiers learn, practice, and demonstrate proficiency in collective skills. This report examines the fidelity of virtual systems to train U.S. Army platoon- and company-level collective skills and estimates the costs and effectiveness of using simulators with different degrees of fidelity for collective training.

RESEARCH QUESTIONS

- What types of platoon- and company-level collective simulation-based training (SBT) systems does the U.S. Army use?
- How do the types and levels of fidelity of SBT affect training outcomes?
- How do the costs and effectiveness of the various forms of SBT compare?

KEY FINDINGS

Army collective SBT uses physically simulated military equipment (PSME) or virtual military equipment (VME)

- PSME approaches, such as CCTT and AVCATT, attempt to replicate the physical environment, controls, and sensory cues of an actual tank or aircraft. PSME development, use, and maintenance are expensive, and soldiers' access to PSME equipment may be limited.
- VME uses personal computers and other equipment in ways similar to commercial first-person-shooter games. These have less physical realism but are easier and less expensive to operate, maintain, and upgrade and are more accessible to soldiers, allowing for more practice.

While stakeholders value physical fidelity, psychological fidelity may be most important

- High physical fidelity does not necessarily produce better training. Psychological fidelity—the degree to which the simulator prompts relevant cognitive, behavioral, and affective responses—is key to effective learning and training transfer.
- Low physical fidelity can be effective if psychological fidelity is high. This is especially the case for collective tasks that involve largely cognitive skills, such as monitoring others' actions and synchronizing activities.

Additional measures are needed to evaluate effectiveness of SBT

- Training evaluation has emphasized performance of the simulator and relies on users' reactions rather than on the performance of trainees and objective performance measures. Additionally, research on learning principles in SBT has lagged development of the technology.
- VME is much less expensive than CCTT and AVCATT once utilization is taken into account, however, the Army needs to collect consistent data on system utilization and training effectiveness to produce robust estimates of cost effectiveness.

RECOMMENDATIONS

- Revise training policy and strategy to require or encourage use of collective SBT, and begin to transition from PSME to VME.
- Ensure that company leadership has access to comprehensive, high-quality training support packages (TSPs) for SBT, along with institutional training and support in units on use of these TSPs.
- Improve and standardize measures of trainee performance in SBT.
- Improve and expand the collection of utilization data to evaluate effectiveness of SBT at the program level, and support research on the optimal mix of collective training modalities.
- Conduct one or more experiments or demonstration projects to test the relative effectiveness of PSME and VME, along with robust TSPs, for collective training.
- After implementing the previous recommendation, evaluate courses of action for continued use of CCTT, AVCATT, and VME approaches for collective training.