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Supporting Training Strategies for Brigade Combat Teams Using Future Combat Systems (FCS) Technologies

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Summary

The U.S. Army is adapting its organizations, operational concepts, and systems to meet the needs of the current demanding security environment while also maintaining a focus on the changes needed to transform over the longer term. Ongoing and future challenges include frequent deployment rotations, a more adaptive enemy, and an expanded array of missions. Others include the need to rapidly transition from combat operations to stability operations and support operations (SOSO), the increased use of joint and combined arms capabilities at lower echelons, more self-contained and leaner unit designs, and the continuing introduction of new technologies. These changes are placing increased demands on the Army's collective and leader training programs now, and these demands could increase in the future. Future training will need to provide soldiers at all grade and experience levels with sufficient technical expertise to use new systems as well as the complex skills necessary to achieve mission success; training will also need to cover a larger range of skills and adapt quickly to changing needs and conditions. Training must help units achieve readiness quickly and sustain higher levels of readiness over time. All this must be achieved, moreover, despite constraints on training resources.

This study seeks to help the Army address these challenges by identifying options for improving support to the Army's future training strategy for Brigade Combat Teams (BCTs) equipped with Future Combat Systems (FCS) technologies. The project seeks to assess the effectiveness of future planned enhancements to the Army's capabilities to train FCS-equipped BCTs in light of future training requirements, and to identify key improvements to training capabilities that

the study's sponsor, the Unit of Action Maneuver Battle Lab (UAMBL), might champion to increase the effectiveness of the emerging training strategy. The study focused chiefly on leadership training rather than soldier skills because leadership decisionmaking will be increasingly important for the future force, including lower echelons.

Challenges for Current Army Training Strategies

To establish a baseline, we first examined the content and output of current training programs. We used this information to determine the training that units were able to conduct, constraints on training programs, and areas in which current training could be improved. The results reveal a highly effective training system but also point to enduring challenges. For example, units have had difficulty completing the recommended number of training events. A study of BCT training programs in 2001 and 2002 found that units did significantly fewer events than recommended in the Tank Battalion Combined Arms Training Strategy (CATS). Similar results were found for leader training exercises. Moreover, relatively few virtual and constructive simulation exercises were performed at home station. Similar findings emerged across maneuver unit types and for training programs in the post-OIF period, where time was an even greater constraint.

Despite completing fewer events, units appeared to have achieved reasonable proficiency across many skill areas once a CTC rotation was completed. Research consistent with this conclusion was reported for units in the pre-OIF period, supporting the contention that the Army's training system has been fundamentally sound.

However, despite overall success, this same research shows that most units are not as successful at achieving collective training proficiency at the battalion and brigade levels as they are at the platoon and company levels. Moreover, adequate levels of proficiency were not reached by most units even at the NTC in some significant skill areas, including synchronization and intelligence-surveillance-reconnaissance (ISR), which are important to achieving the full potential of

modular operational concepts and modernization of command, control, communications, computers, and ISR (C4ISR).

Future Training Requirements

We also examined the organizational designs and operational concepts of FCS-equipped BCTs, as well as the ARFORGEN training strategy, to identify specific areas in which training requirements could become more challenging. We concluded that all three concepts lead to a need for the training system to continually evolve and adapt. The evolving ARFORGEN training strategy implies a need for training to better cover the full spectrum of operations. Transformational initiatives including modernization, modularity, and lifecycle manning are all likely to change training requirements. For example, modernization will increase the number of systems requiring operator training and may add to system technical requirements (e.g., for C4ISR equipment), thus necessitating more complex skills training. Modularity will add to the BCT's menu of functions and tasks that were formerly performed at division level and by separate specialty units. Moreover, the greater number of brigades will increase competition for maneuver areas and ranges. Perhaps of greatest consequence to the training system, the ongoing evolution of Army transformation makes predicting the effects of transformational initiatives on training and readiness requirements an uncertain and ambiguous process.

Assessment of Training System Enhancements

The Army has set targets for large improvements to the training system as applied to BCTs equipped with FCS systems. The goals of the improved training system include significantly shorter timelines to achieve readiness and high standards on maintaining that readiness; the capability to address a much wider range of conditions in the operating environment; and the synchronization of a much wider range of information systems and other technologies in an expanded battle

space. To achieve these goals, the Army has proposed a set of training system enhancements. In this study, we assessed the potential value of 12 types of enhancements for training at brigade level and below in the 2010–2016 timeframe (see Table S.1).

To assess the planned enhancements, we first evaluated each individual enhancement in Table S.1 against three key metrics:

- **Training quality.** The potential of the enhancement to increase the desired training effect, as determined by increased training event realism, complexity, and feedback.
- **Quantity of training events.** The potential of the enhancement to increase the number and duration of training events or the number of soldiers or leaders trained.
- **Adaptability of training events.** The potential of the enhancement to allow training events to be adapted to a wide range of missions, enemies, conditions, and other considerations.

In addition, the benefits of each enhancement were evaluated in relation to "limiting factors," including constraints on unit time, technology risk (of being able to provide an affordable capability within the period), and the risk of less than full funding for the entire capability envisioned.

Table S.1
Planned Enhancements for Training

Category of Enhancement	Enhancements Evaluated
Live Training	• Live training technologies • Maneuver CTC-specific enhancements
Simulation-Supported Training	• Constructive • Virtual • Simulation-based leader tactical skills trainers
Integrating Enhancements for Training	• Embedded training • Live-virtual-constructive (LVC) training integration and tools • Training manpower support (home station)
Other	• Lifecycle manning • Institutional training initiatives • Collective training support products • Initial fielding of BCTs equipped with FCS

To assess the aggregate value of the enhancements as well as the balance of investment across categories, we first bring together the individual assessments of the enhancements to present a summary view of benefits in terms of their contribution to improving the quality, quantity, and adaptability of training. To complement the broader look, we also provide a more focused comparative assessment of enhancements in the context of two substantive areas: training of battle command skills and training requirements of Army modernization. Finally, we examine aspects of the Army's budget process with regard to training enhancements and the process's ability to facilitate tradeoff decisions in a resource-constrained environment.

Assessment of Individual Training Enhancements

Assessments of each enhancement area appear below. The evaluations were based on reviews of various requirements documents, discussions with training and materiel developers as well as Army staff responsible for training funding programs, and the experience of RAND staff members working in related areas.

Enhanced Live Training Technologies. All the live enhancements offer some potential to improve the quality of training. We conclude that improving the live capabilities is critical because live training will remain the cornerstone of maneuver unit training. Especially important are initiatives to increase the realism of close-in live-fire engagements and MOUT (military operations on urban terrain) facilities. The only potential improvement for training quantity comes from the increased number of live-fire ranges and MOUT facilities, but given the costs of these facilities and limitations on training area size, this benefit will be achieved slowly.

Maneuver CTC-Specific Enhancements. The CTCs have been critical components of maneuver training programs, and we think this will continue. Enhancements do not affect the quantity metric there, as they do not affect throughput. However, we do see some improvement in terms of quality. The instrumentation and maneuver area enhancements can help the CTCs effectively train modular, modernized BCTs in the contemporary operating environment (COE). This is especially important considering the increased difficulty of conducting

such training at home stations. The ability of the CTCs to maintain event quality and a capability to adapt events will depend on maintaining an adequate level of training manpower support for the CTCs. In the past, the CTCs have proven capable of effective adaptation due to the capabilities of their trainers and opposing force (OPFOR). Additionally, the enhancement of the CTC MOUT training capabilities will benefit adaptation.

Constructive Battle Command Simulations. The OneSAF and WARSIM technologies[1] by themselves will provide limited improvement in training quality and adaptability. While the technologies will provide quality improvements in some areas (e.g., the physics of realistic MOUT combat), limitations in SAF in the 2016 timeframe will make it difficult to simulate close combat and COE conditions. Achieving realism and providing training feedback will still be largely a function of expert trainers, and exercise execution will require an adequate number of observer/controllers and role players. For this same reason, simulation technologies are also not likely to increase the quantity of this type of training.

Virtual Simulations. Technology for individual, operator, and maintainer trainers will likely improve considerably and thus has great potential to enhance this type of training (assuming that adequate funding is provided).[2] The same will likely be true of crew trainers, but the potential of squad trainers is likely limited.[3] With regard to multi-echelon collective training, we see few improvements in the close combat tactical trainer (CCTT) capabilities relative to our metrics in

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[1]   One Semi-Automated Force (OneSAF) and Warfighter's Simulation (WARSIM).

[2]   The potential will be more limited for individual skills where replication of movement or similar physical activity is needed for positive training transfer.

[3]   EST (Engagement Skills Trainer) has reportedly proven to be a valuable training tool for squads in the past, but proposed enhancements, to include greater movement and other needed physical realism aspects, have not yet been sufficiently demonstrated to estimate benefits or costs.

the 2016 timeframe, given what we judge to be their limitations in simulating dismounted close combat and other COE conditions.[4]

Simulation-Based Trainers of Leader Tactical Skills. We see great but unproven potential for "serious games" types of leader trainers to improve the quantity of this type of training, especially for small-unit direct fire skills. These trainers for leader skills will grow in both complexity and breadth of application, but the potential for improving training quality and adaptability will be limited by the same factors discussed for constructive simulations. The value of these leader skills trainers has to be closely monitored and assessed.

LVC Training Integration and Tools. The Army's efforts to allow its training simulations to be linked together will provide some important training quality improvements in the timeframe of this analysis. The ability for constructive simulations to stimulate operational hardware[5] (a part of the integration effort) is important for maintaining the relevance of constructive-supported training and allows a means for providing greater realism to live training. But there will likely be fewer gains in the areas of quantity and adaptability in the 2016 timeframe.

With regard to "integrated tools," we see only small improvements to support the design, development, execution, and conduct of after action reviews (AARs) of training events that have integrated some aspects of LVC simulations. There will be training development resource issues surrounding the design of such complex tools.

Embedded Training. In determining our ratings for embedded training, we considered only the benefit and potential of *embedding* the capability itself; however, the quality and adaptability benefits of embedding a training capability can be no greater than the benefit of that capability itself. We found that embedded training will increase some, but not all, types of training. The major increase will be for individual and crew-level training.

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[4] Indeed, the usage and benefit of this type of trainer could potentially decrease, given these limitations and the costs of upgrading the tank/infantry fighting vehicle simulators (to include upgraded battle command systems) or to replace them with FCS simulators.

[5] "Stimulation" increases training value because the results of constructive simulations can be transmitted to, and followed on, organic equipment, such as the Army Battle Command Systems (ABCS) and other C4ISR systems.

Direct Support to Home Station Training. The enhancements proposed under these initiatives will provide some improvements across the areas of quality, quantity, and adaptability. Increased training manpower can potentially help units address the constraint of leader time to plan, prepare, and execute training events.

Lifecycle Manning. To the degree that positional stability is achieved, this enhancement could significantly reduce the amount of time needed to retrain unit-specific individual and collective skills and thus could lead to indirect but nonetheless important improvement in all three metric areas, especially quantity.

Institutional Training Initiatives. While all these initiatives offer likely quantity improvements, training development resource constraints are likely to limit the benefit of these initiatives because it will be difficult to develop and adapt new content. The exception could be the Battle Command Knowledge System, which, given its collaboration concept, could result in better sharing of lessons learned across the Army.

TRADOC Collective Training Products. Training development resource constraints and limited use of mission training plans (MTPs), combined arms training strategies (CATS), and training support products are likely to limit the benefit of these products.

TRADOC Execution of FCS BCT Fielding. This enhancement could provide benefits across all areas and support spiral development of training methods and products. However, these benefits are not yet programmed, and do not cover training needs beyond the initial fielding period.

Integrated Assessment of Enhancements

Our integrated assessment of enhancements leads to the following conclusions:

- In the face of challenging operational requirements, the planned enhancements as a whole provide important improvements for the training system across a wide spectrum. Further, while the amount varies greatly, all enhancements provide some potential benefit. Of particular note is the degree to which the enhance-

ments focus on technology with large potential payoffs in the long term.

- At the same time, we found no "silver bullet" among the enhancements that would revolutionize training strategies for BCTs within the 2016 timeframe. Indeed, the study concluded that live training will remain the cornerstone of FCS-equipped BCT training programs, even though there is limited potential for increasing the amount of this type of training. This conclusion implies that live training enhancements (such as CTC modernization, home station improvements, and an exportable training capability [ETC]) remain critical and deserve continued emphasis.

- Despite continuing improvements to the training system and adaptations made by unit leaders and trainers, we find that, in the 2016 timeframe, the training capability achieved under currently planned enhancements is likely to remain substantially less than that needed to fully meet future training requirements, especially those generated by the COE. This gap in achievements relative to requirements reflects both how difficult new training requirements are and how high the prior standard was.

- We also conclude that some further shaping and balancing of enhancements could likely improve overall benefits and reduce the gap prior to 2016. The idea that further shaping might improve benefits stems from the following observations:

  - The area of leader training exercises used to train battle command represents the Army's best chance for significant near-term improvement in the training strategy within the 2016 timeframe. Pursuit of this goal could potentially lead to significant improvements not only in training quality, but also in the quantity of events and the adaptability of the training system. However, a greater emphasis on training manpower support relative to training technologies is likely needed to produce a large improvement in overall benefits. More generally, we found a tendency to overestimate what training technologies could accomplish, especially relative to less technological and more traditional means of adding support.

- – We found what appeared to be some imbalances in what train-
ing enhancements were trying to accomplish. For example, we
noted that while many enhancements appeared to be geared
toward improving the quality of training, fewer seemed aimed
at increasing the quantity of training or producing greater
training event adaptability. Moreover, much of this imbal-
ance seemed to derive from an inadequate consideration of
key training system constraints, especially limitations in unit
leader time.
- – We found the training support system (TSS) process some-
what constrained in terms of the information it has available,
its analytic capability, and its ability to cross-level resources (see
further discussion in bullet below). We believe that more infor-
mation and better capabilities would have changed its ultimate
decisions.

- • Successful evolution of the TSS process to identify and defend
the most important enablers will be key to the Army's success in
making effective use of training dollars. The process the Army
currently uses to select, fund, and prioritize training enhance-
ments would benefit from more feedback from units on their cur-
rent training programs and constraints, and a greater evaluative
capability (including effective training metrics) to assess relative
costs and benefits across enhancement categories. More mecha-
nisms might also be needed to effect changes in investment strate-
gies once imbalances are discovered.

Recommendations for Effecting Critical Training System Improvements

Despite the challenges faced by the Army's training community, we
see possibilities for significant gains in the present environment. To
achieve these gains, UAMBL (and the Army) should consider several
initiatives.

More Closely Monitor and Manage the Program to Support Training Strategies for BCTs Equipped with FCS Technologies

Certain actions will increase the likelihood of achieving critical training system improvements in the 2016 timeframe. Our recommendations include implementing metrics for the training Key Performance Parameters (KPPs) aimed at quality, quantity, and adaptability improvements in training; and working more closely to monitor existing Key Complementary Programs (KCPs) for the FCS. Two new KCPs should be added: the Battle Command Training Center (BCTC) and U.S. Army Training and Doctrine Command (TRADOC) ability to produce training content.

In addition, the Army should work to obtain or protect critical resources needed to support training enhancements. These resources would include embedded operator and crew trainers and tutorials, training manpower support resources, new operator/maintainer training, and other resources needed to support training deriving from Army modernization, including the spiral-outs.

Continue to Shape Enhancements Within Available Resources

Given the expected gap we identified between training requirements and training system improvements, the key challenge for the Army is to select and effectively develop enhancements that provide the most benefit given the likelihood of considerably constrained training resources. To increase the benefits of the enhancements as a whole, we recommend the Army undertake new spiral development processes to implement TSS initiatives and to effectively evolve training capabilities. Spiral development includes continual observation, assessment, and analysis. If aggressively pursued, spiral development can produce significant benefits from promising training methods and products even when large uncertainties exist.

Greater customer input and increased analytic capability would facilitate a more formalized spiral development process. The process would start with an acquisition and evaluation roadmap associated with each training enhancement designed to provide a basis for recommending updates and changes to programs as they develop. The roadmap would include an evaluation of enhancements during the

development phase, as well as longitudinal studies providing feedback from the field on their ongoing impact in later phases. Greater analytic capability would include evolving improved metrics to develop TSS priorities. The metrics would include (1) metrics related to the effect of the enhancements on the quality, quantity, and adaptability of training, (2) cost metrics that allow a more complete identification of the full costs of given capabilities, and (3) field performance metrics that measure the effect of the enhancement and training on actual unit performance.

As an initial step, we recommend a spiral development process to evolve training capabilities in the area of battle command training. While this improved capability would be supported by constructive simulations, the key to the proposal is to increase and better organize training support manpower to take full advantage of the constructive technologies.

Other investigations might also help to better balance training enhancements. For example, training enhancements currently emphasize new technologies with large potential payoffs in the longer term. The Army might balance this emphasis by increasing its focus on potentially high-benefit enhancements to training aids, devices, simulators, and simulations (TADSS) that best meet COE needs but also carry lower risk, involve shorter timelines, and require more modest investments.

Wider Implications

Need for Integrated Funding Strategy

There appear to be structural impediments within the current programming and budgeting process that impede identification of all the relevant resources needed to achieve an integrated and balanced training strategy. Visibility of the costs and benefits of training initiatives and integration of investments across all the initiatives will be especially important in the future. As a first order of business, the Army should strive to consolidate and provide wider visibility of financial information across the training enhancement categories described in

this report. Forming "capability modules" in the financial process to correspond to the enhancements identified in this report would allow integration of the total training program across the Program Evaluation Groups (PEGs) and allow the balancing of capabilities across programs.

Trading Off Operational Capability with Training Capability

Our suggestions for improvement also imply the need for increased resources to enable a more expansive training strategy. Without adequate resources for training, the Army is likely to have operational units with advanced technological capabilities and operational concepts that cannot be utilized to their full potential because the units are not fully trained. The training resource strategy should also be integrated with the FCS-equipped BCT program and Army Transformation as a whole to get the right balance of resources between operational capacity and training.