USING COMMERCIAL GAMES TO ENHANCE AGILITY AND FLEXIBILITY IN TRAINING

BY

COLONEL MALCOLM D. JOHNSON
AND
COLONEL MATTHEW J. FAIR

SENIOR SERVICE COLLEGE FELLOWS
AY00

U.S. ARMY WAR COLLEGE, CARLISLE BARRACKS, PA 17013-5050

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by

COL Malcolm D. Johnson Jr., AR
COL Matthew J. Fair, AR

Dr. Kenneth M. Matwiczak
Project Advisor

ABSTRACT

AUTHOR: COL Malcolm D. Johnson, COL Matthew J. Fair

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The transformation of the Army into a more versatile and agile land force must also be reflected in a training strategy that shares these traits. Training for both warfighting and Operations Other Than War (OOTW) is, however, leading to a tendency to let the unit Mission Essential Task List (METL) to grow out of proportion – with reduced standards of performance and readiness resulting. Live training remains the cornerstone of the Army's training strategy and although the growth of simulations reflects the emergence of a 2nd training revolution, most current simulations focus on combat operations with a limited ability to simulate OOTW or urban terrain. In particular, our virtual simulation tools are predominantly combat system focused, very specialized, expensive, have a long development cycles, and are economically hard to modify. The trend in industry and education is toward Personal Computer and Internet based applications that are more flexible cost effective and able to reach a broad audience. Commercial computer games already allow hundreds of players to compete as individuals or on teams in a virtual world. The ability to incorporate voice commands, improved graphics, mission-planning editors, and automated or semi-automated opposing forces are examples of recent innovations that significantly enhance realism. **The author's specific recommendations include:**

- **Taking advantage of innovations in commercial simulations industry.**
- **Developing a broader range of low cost tools in the virtual domain to provide the commander a greater variety of training alternatives.**
- **Focusing on more agile and flexible tools training tools for the future force.**
- **Ensuring training tools, regardless of the domain, remain focused on maintaining performance-oriented standards historically so successful in live training.**
- **Pursuing PC and Internet training as a way to increase agility and flexibility in training under the UAN initiative to ensure compatibility with the Army's overarching training vision.**
- **Using the power of virtual gaming to enhance learning as a low cost and readily available approach to training.**
- **Developing effective training tools that are supportable within our fiscal constraints.**

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INTRODUCTION

In the past decade the Army has experienced numerous changes in its role and employment throughout the world. The number of deployments has increased dramatically, encompasses a broader spectrum of operations and has been complicated by severe fiscal constraints as the Army continued to downsize. There are more challenges ahead as the Army continues to transform to meet the vision of being a more versatile and agile force capable of responding across a broad spectrum of threats and operational environments.

> *The Army's core competency remains fighting and winning our Nation's wars; however, the Army must be also capable of operating throughout the range of conflict – to include low intensity operations and countering asymmetric threats. It must therefore be more versatile, agile, lethal, and survivable.*[1]

> — *General Eric K. Shinseki, Chief of Staff of the Army*

Change continues to be a difficult challenge for any organization, especially in larger and older organizations where in place of inquiry and experimentation, ideas often are studied to death in hopes of ferreting out every possible weakness before making a commitment. The precondition for action in larger and older organizations is certain knowledge.[2] In the face of continued fiscal constraints, hard decisions and unenviable trade-offs are required between some older traditional programs and initiatives such as the Initial Combat Brigade Team (IBCT) and bringing the Army into the Information Age. While acknowledging the issue of an Army overcommitted and underresourced, the focus of this paper is to examine the extent to which our current training models and simulations (M&S) support the creation of a more versatile, agile, lethal and survivable land force.

Understanding the changes the Army implemented in the aftermath of the Viet Nam War and leading up to the overwhelming success in the Persian Gulf War plays a major role in the way we train. Innovations in information technology by business and academia have potential for application in the military. A February 2000 General Accounting Office (GAO) report in Combat in Urban areas found the need for improved training opportunities in either actual or simulated urban environments.[3] A Department of defense (DoD) Defense Science Board report, released in March 2000, said the Pentagon must better utilize the private sector's Internet technology, improving commercially available technologies.[4] Our goal is not that simulations replace other forms of training, but to look at potential commercial tools that may offer the commander more versatile and agile means to train in the current environment. **We recommend the Army take advantage of innovations from the commercial simulation industry for potential military applications.**

TRAINING AND THE IMPERATIVES OF A READY ARMY

Quality people, modern equipment, doctrine, leader development, force mix, and training are the essential imperatives of a trained and ready army. Although some imperatives have received a greater amount of publicity and recent debate than others, all are critical to balancing issues of affordability and risk.

All of these imperatives are crucial to create a ready Army, but it is training that molds the soldiers, leaders, equipment, and units into a force prepared to bring decisive victory to any mission – whether it be warfighting or any other endeavor. The roots of training in our army today stem from the late 1970s and early 1980s, when the US Army underwent what is universally regarded now as its first training revolution. The foundation of this revolution was a "battle focus", making leaders responsible to analyze, prioritize and resource only those tasks considered essential to their wartime mission. This battle focus brought order out of the broader context of multitudes of potentials tasks a unit might be called upon to do. The result is a Mission Essential Task List (METL) that commanders recognize should be fully resourced and trained to standard.

This focused Mission Essential Task List (METL) was strengthened by the introduction of a systems approach to training (SAT) which provided a doctrinal method to train each task to a common standard. This systems approach to training is used to analyze all aspects of complex tasks to determine the discrete collective and individual tasks to accomplish the mission – and the performance standards necessary to demonstrate proficiency in their tasks. The Army thus moved from a subjective assessment environment to an objective, competence-based environment based on common standards consistent throughout the Army. Unfortunately, in recent interviews, a number of senior army leaders acknowledge a growing tendency for the METL to grow to unmanageable proportions as commanders struggle to keep both wartime and peacekeeping tasks at the forefront[5].

Initially, training during the first training revolution occurred almost exclusively in the "live" domain. The Combat Training Centers (CTCs) epitomize our battle focus, "train as you fight concept" using Multiple Integrated Laser Systems (MILES), trained observer-controllers, skilled opposing forces and tough demanding after-action review (AAR).[6] This train as you fight concept remains the enduring emphasis behind live training.

From the 1970's until today, the Army has been steadily increasing the number of modeling and simulation tools used in training. Today, we are moving into a second training revolution fueled by the microprocessor and information age technology. The Army's bedrock, tough performance-oriented training, hasn't changed – we simply have more tools across the live, virtual and constructive training domains.

Regardless of the training domain our tools fall within, it is important to recognize all training systems are "partial task" trainers to varying degrees. Training in the live domain involves using actual equipment in the field. The virtual domain incorporates man into the loop at the system level, via two or

three-dimensional visual representations of the surrounding area of operations. Situations too dangerous for soldiers to train live are often accomplished through virtual means. Costly exercises, requiring lots of soldiers and equipment, are often much cheaper to accomplish in constructive simulations. The constructive domain simulates units using extensive rules and decision matrices with man in the loop for aggregated unit decisions making.

There are advantages and disadvantages to each of the training domains. The right tool for the right training event is usually a function of trading off between the cost of all resources required versus the benefits achieved by using a particular domain. Not surprising is that there is no common agreement on the right mix of training achieved by each of the domains. The potential cost savings of the virtual and constructive domains are often at odds with the cultural bias to discard non-live training as not sufficiently realistic to achieve training standards. Regardless of the training domain, small unit proficiency and that of their leaders lies at the core of readiness for the total force -- today and in the future.[8]

CONCEPTUAL MIX OF DOMAINS IN TRAINING

FIGURE 1 MIX OF TRAINING DOMAINS[7]

The appropriate mix of training in each of the domains in implicitly left to the commander to determine. There is little incentive however to change from the traditional emphasis on live training, especially at battalion and below. **We recommend the Army develop a broad range of low cost tools in the virtual domain to provide the commander a greater range of training alternatives.**

THE NEW OPERATIONAL ENVIRONMENT

As an Institution, the Army was beginning to appreciate that its missions were changing. We were being asked to do things that were largely unfamiliar to the generation of soldiers accustomed to facing the Soviet Union and the Warsaw Pact.[9]

— Gordon Sullivan and Michael Harper, <u>Hope is Not a Method</u>

In spite of the end of the Cold War and the lack of an apparent major military competitor in the near term, the operational tempo (OPTEMPO) of the Army in the last 10 years has been sixteen times greater than the 40 years between 1949 - 1989[10]. Recent operations in Kosovo, Bosnia, Macedonia, Haiti, Kuwait, Sinai, Somalia, and the Gulf War emphasize the broader geographical and geopolitical parameters the Army is expected to operate within compared to the Cold War era.

The increased OPTEMPO, expansion of missions and more varied operating environment has evolved at a time when the Army downsized by 33% and saw it's funding decrease by 37%.[11] The Army Reserves and National Guard have become essential partners in the strategy of engagement, which, like the active force must also cope, with the increased OPTEMPO, new missions and more varied operational environment.

This operational complexity is evident in the Marine Corps' "three block war" concept in which humanitarian assistance, peacekeeping and urban combat could be simultaneously occurring within three city blocks of each other[12]. Potential adversaries recognize the need to attack our ability to use superior mass, mobility and precision fires. As the Russians have painfully discovered in Chechnya, moving the "fight" into urban areas is increasingly seen as a way to achieve this neutralization. Historically, urban warfare has been one of the bloodiest and most damaging forms of warfare. The battle for Berlin cost the Russians over 300,000 casualties, while in the Vietnam War America lost more U.S. Marines in the battle for Hue than on Okinawa during WWII. In spite of our preference for alternative strategies such as avoidance or the "indirect approach" as proposed by Major General Scales[13]; the strategy of engagement that led to our intervention in the first place may likely prevent us from exiting and using one of these alternative strategies. Once engaged, however, our national sensitivity to world opinion and high aversion for casualties and collateral damage becomes a distinct vulnerability to be exploited by our foes.

For the leaders and soldiers on the ground, the challenge is one of transition from one mission to the next as the situation dictates. The lack of reference to military operations in urban terrain (MOUT) in training publications is being addressed in an ongoing TRADOC Combined Arms MOUT Task Force (CAMTF) study. Initiated in late 1998, the initial draft report acknowledges the lack of MOUT in our training publications but also notes an aggressive effort is underway to update many of the key training manuals by the end of FY00.[14] It cannot be overemphasized that a systems approach to training (SAT) is even more essential today than in the first training revolution. Today's more stringent resource

constraints, more technologically complicated weapons, and broader range and complexity of missions and tasks on the unit's METL all reinforces the need for a systematic approach to training development and execution. Without the task analysis and standards of performance which characterize the SAT process, we risk regressing to the vagaries and subjective assessment process we found ourselves in prior to the first training revolution. TRADOC, acknowledging the prioritization challenges, is proposing a fundamental change in *FM 25-100, Training the Force* by formally incorporating other than wartime missions and tasks in the METL development process as noted in the following figure.

PROPOSED 25-100/101
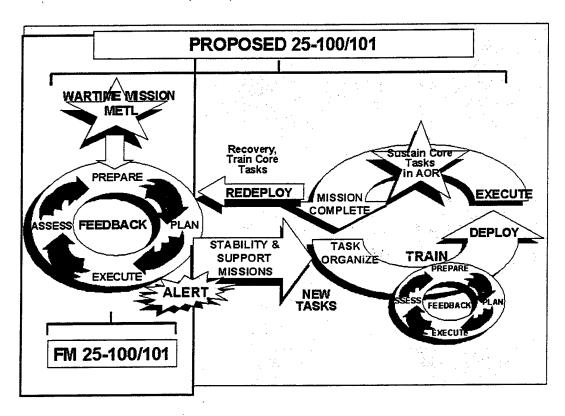
FIGURE 2 PROPOSED CHANGES TO FM 25-100/101[15]

The battlefield has always been complex, but Army leaders say U.S. soldiers in the 21st century are facing more variables than the monolithic threats they had during the last century.[16] It will only become more difficult for units to bounce between their overall training requirements and OOTW missions. Commanders "have to seize every opportunity to train, in between all the other details".[17] Significantly, many experts' caution that the military must first change the way it trains -- and there are signs that this is happening.[18] Whether the changes in training are keeping pace with the versatility and agility of the force in the field is the crucial concern. **Agility and versatility will be keys to the future operations, we recommend that our training tools necessary for this future force must have similar traits.**

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VERSATILITY AND AGILITY IN TRAINING TODAY

Although it is taken for granted today, there is and will continue to be great value in using simulation in training. In all three domains, live, virtual and constructive simulation has enhanced training, as well as made it possible to train in dangerous, cost prohibitive, and unique situations. An advantage that virtual and constructive simulations have over real or live simulations is that they can be executed over and over again in attempts to find a better solution, war game existing plans, or just to change the conditions of the battlefield. Simulations add flexibility and agility to the training spectrum; the ability to do detailed preparations for some missions can only be done using simulations. As the strategic spectrum changes, additional missions and personnel shortfalls often create new challenges.

> **With reduced manning and increased operational tempo, today's warfighter can't afford much time away from duty in the traditional classroom, while the increased speed of technology evolution requires more and more training.**[19]
>
> - *GEN John H. Campbell, Air Force Defense Information Systems Agency (DISA)*

Two of the areas that have increased OPTEMPO are OOTW and urban combat training. As mentioned earlier, a recent GAO report cited shortfalls in urban combat doctrine and training. The GAO report found that training standards have not been established for many types of Army units and that current standards are very general and need improvement.[20] Further, the report said that existing urban training areas do not fully simulate all aspects of urban operations. For example, the effects of medium and tall buildings, underground networks, and the impact of built up areas on communications equipment is not replicated in current training facilities.[21] To reinforce the importance of simulation I training, we will briefly discuss the three domains and their applicability in MOUT/urban combat operations.

LIVE TRAINING

Two notable advances in live training simulation were the development of force on force tactical engagement systems (TES - usually laser based systems like MILES, SAWE MILES, MILES 2000) and instrumentation of selected training sites like the Joint Readiness Training Center (JRTC) and the Ft. Benning MOUT site. TES allows soldiers to engage and score "kills" in a force-on-force battle using their assigned weapons with an acceptable level of negative training impact. It is recognized the lack of signatures comparable to "real" systems (noise, dust, muzzle flash, tracer track) is less than optimal for training. It does however, give the soldier almost immediate feedback on the accuracy of their fires, and on the measures they take to avoid becoming casualties. Instrumentation systems were a key element in the first training revolution. By taking information from TES systems, battlefield communications, vehicle and individual positions, video feeds and other data, the commander can watch, replay and critique unit actions. Instrumentation feeds the after action review (AAR) process, the critical piece of the training process. Instrumentation at CTCs is a big part of their success.

Today the JRTC is the premier training site for MOUT, in large part because its complex is heavily instrumented. This allows the trainers to capture the actions of the unit in training and provide powerful AARs to assist the unit in training. However, a significant disadvantage to such a superb system is the cost, which limits the number of sites and the ability to maintain unit skills across the entire force.

This reliance on training soldiers at the brigade level and below in the live domain, though very effective, is exceptionally resource intensive and is reflected in the CAMTF draft report on training facility resource requirements. Unlike our tank and other qualification ranges, there is not a standard or model for MOUT facilities – a shortcoming rectified in the CAMTF recommendations.[22] Although a common message from field units was the need to upgrade or establish home station training facilities for urban operations training, preliminary estimates indicate it would cost at least $500M to do so.[23]

Fort Carson spent over $500K to improve their MOUT training facilities and replicate the Bosnian area of operation atmosphere. European traffic signs and driving rules were enforced. Convoy training was made more realistic by using a fleet of "rent a wrecks" driven by role players to create typical incidents drivers, convoy commanders, the military police, and the chain of command would have to contend with. Spanish-speaking role players in crowds get in the faces at soldiers at checkpoints adding a language barrier to an already tense confrontation. These and numerous other innovative live training techniques were first-rate training events for the soldiers of the 3rd ACR stationed at Ft. Carson, Colorado.[24] Similar training occurred at Fort Hood, Texas for soldiers of the Texas National Guard 49th Armored Division Headquarters during their weekends of Individual Readiness Training. LTG Leon LaPorte, III Corps Commanding General, responsible for certifying these units prior to deployment, made it clear that regardless of the reserve or component status, the "standards and expectations for all the soldiers is the same."[25]

An even more critical training cost issue is manpower shortfalls and the time it takes a unit to achieve the standards necessary to be certified for deployment. When Active Components (AC) units prepare for deployments they tend to dedicate 3-6 months of training to the specific tasks associated with the mission. Throughout this time non-deploying units contribute almost as many soldiers to the task of training those scheduled to deploy as do the deploying units. The resulting challenges in Personnel Tempo (PERSTEMPO), quality of life, and career retention have been the source of much concern and debate. Our National Guard units are even further challenged. The average soldier from the Texas National Guard's 49th Armored Division exceeded the normal 39 days of annual training in preparation for deployment to Bosnia. In fact, many averaged 105-150 days prior to their deployment to Bosnia.[26] This is causing growing concern for the potential adverse impact upon reservists' civilian employment,[27] and contributed to the recent decision to reduce deployments to six months. The natural effect of this decision, however, is to actually increase the overall live training demands as more units than ever before will be required to rotate over time.

There is little doubt that live training is an effective, and certainly preferred, solution by field commanders. However, can we continue to pay this cost in the long term and are we adequately

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exploring potentially equally effective but less costly alternatives in the other training domains? **We believe there are alternative ways to train that do not simply replace live training, but rather enhance the entry level into our valuable live training opportunities and thus maximize the unique value that only live training brings.**

CONSTRUCTIVE TRAINING

Current constructive modeling and simulation capabilities are limited to primarily combat operations, with a limited ability to simulate operations other than war (OOTW). Current Army constructive systems, with one exception, lack the resolution desired for good MOUT play capability.[28] But the importance of constructive simulations is significant. Not only are simulations a cost-effective alternative to live training, but they offer some of the best alternatives to increased preparedness without incurring exorbitant live training costs.[29] In the second training revolution, "Constructive simulations are the most effective method we have to impart these qualities (demanding, realistic, evaluated, conducted repetitively enough to internalize training objectives) to staff training."[30]

Constructive training also lets commanders' plan and train in large city scenarios that cannot be done with current (or future) MOUT training sites. An observation from the Army Center for Lessons Learned is that "Training in villages will not prepare the Army for combat in the large metropolitan areas."[31] It goes on further to say that present live training sites are unrealistic and suggest that urban terrain can be isolated and cut off.[32] So, although many commanders are quick to chide simulations, they maybe the only way to routinely train in complex urban environments with commanders and staffs at all organizational levels.

The Corps Battle Simulation (CBS) and the Brigade-Battalion Battle Simulation (BBS) both are aggregate models that replicate units and sub-units in the simulation. This provides only a very limited MOUT capability due to the lack of resolution achieved within the model's boundaries, or "play box."[33]

JANUS and the Joint Conflict and Tactical Simulations (JCATS) are current entity-based combat simulation models, in which individual weapons systems and soldiers are replicated, giving higher resolution and better support for MOUT training simulations. JCATS, a product of the Joint Warfighting Center, is the newest and most powerful constructive simulation in the DOD inventory and is the only current model that provides high functionality coupled with high terrain resolution.[34] JCATS is currently the best constructive simulation available for MOUT training. It has excellent resolution, and has many capabilities that support MOUT M&S, for example, direct fire engagements of combat units in buildings. The Deputy Under Secretary of the Army for Operations Research (DUSA-OR) has also recommended that JCATS be the tool of choice for Army studies.[35] JCATS is currently being used at Ft. Benning to support numerous efforts at the Dismounted Battle Lab.[36]

Future constructive simulations will include WARSIM, One SAF (a standard semi-automated force [SAF] for Army simulations), JSIMS and updated versions of JCATS. The National Simulation

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Center (NSC), in conjunction with the CAMFT, are responsible for ensuring that additional MOUT requirements are incorporated into the development process and future updates to these simulations.[37] The NSC/CAMTF effort will ensure that future constructive simulations will have the required functionality to meet the Army's changing training needs. **Overall, constructive simulations supporting MOUT training are far from perfect, but heading in the right direction.**

VIRTUAL TRAINING

> **"Do the pilots believe this is real?"**
> **"Oh yea. They scream. They even urinate in the seat."[38]**
> **Comments about Northwest Airlines Flight Simulators**

Virtual training is one of the keys to the second training revolution. The power of the microprocessor allows us to train under almost any imaginable conditions, under stresses that in some cases are as real to the trainee as the real world. However, a current virtual M&S strategy supporting the MOUT training environment is almost non-existent. There is no overarching plan to integrate virtual training tools into a MOUT training strategy. This runs directly counter to the vision of the second training revolution that is based on achieving the proper balance of the live, virtual and constructive domains.[39] This may be due in part to reluctance on the part of commanders to embrace simulation in training, especially if commanders perceive it will be at the cost of live training opportunities. The following commentary from a future fictional conflict helps capture some of this frustration:

> *Pierce winced. "Off Simulation" meant being off the plan--out of sync with the computers. It was as bad a thing as could happen to a military commander in the twenty-first century... Virtual was not in synch with reality. He had never been off simulation before. Simulations reduced uncertainty to insignificance. Simulations controlled the planning process. Being "off sim" added chaos into the equation-- and chaos was anathema to the twenty-first-century military doctrinal tenets of precision fire, target sensing, and certainty.[40]*

This quote reflects the perspective heard from a number of leaders during the course of our research and is echoed in publication as well.[41] Commanders do not oppose M&S per se, but question the amount of simulations being added to the training plans and current M&S trends for more simulations to be used in training. At a recent MOUT working group meeting on December 3, 1999, a member of the CAMTF commented during his presentation that commanders rejected the M&S tools for MOUT training as poor and not doing the job[42] – when in fact there are none to be poor in the first place. Commanders don't seem to understand how M&S tools can assist them in MOUT training, and are concerned that more M&S may come at the expense of live training time and resources. A similar reaction by Armor Commanders occurred when the Conduct of Fire Trainer (COFT) was introduced, a gunnery-training device we believe few would part with today due to its capabilities.

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The M&S community is also working to integrate constructive and virtual simulations in the future that will allow even greater flexibility in simulations. The following chart shows the plan for integration.[43]

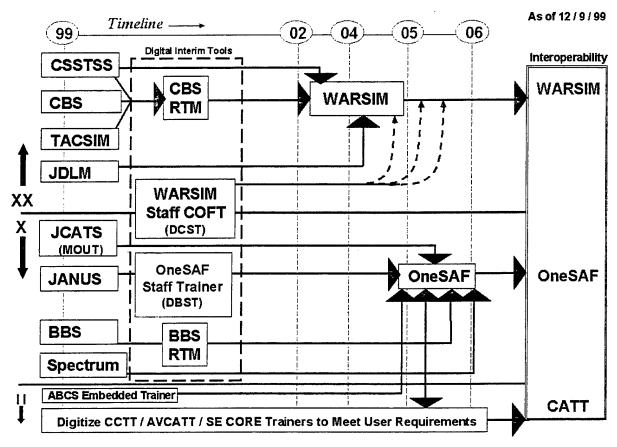## Army Virtual and Constructive Migration Plan

FIGURE 3 M&S MIGRATION PLAN

M&S products must be seen as enablers and tools for the trainer to build a more complete training package for our soldiers. It is important to note that most live collective training requires some simulation support for basic realism. Platoon and staff section training often depends on external simulation support for their command and control systems. Situational awareness expands the level and complexity of training. A brigade CPX requires access to theater, component, corps and dividion sources that support the commander's information requirements. Simulations can be considered as an "extender" - able to extend the available resources and make the best use of limited time in an environment that has not only many new/digital equipment challenges, but many new and complex missions as well. As an example of how simulation can extend the training available, a "heavy" unit on rotation in Kosovo has the day-to-day training requirements and activities for performing its peacekeeping mission, yet their primary "go to war" mission is a mid-to-high intensity fight. Only by maintaining their

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skill levels, by using virtual training devices like the M1A2 Advanced Gunnery Training System (AGTS) or the M1A2 Distributed Desktop Tactical Trainer (D2T2) during breaks in patrols, can the unit hope to maintain some of their primary M1A2 Abrams tank skills. The ability to perform one mission while training for another (the next mission), could significantly enhance readiness by reducing the subsequent post deployment training time between missions.

Currently, most of the Army's M&S products are large, specialized, expensive, have a long development cycles, and are hard to modify economically. CCTT and WARSIM are good examples. They will meet their demanding requirements, but also take considerable physical and fiscal overhead to operate effectively. By contrast, the trend in industry is toward PC-and Web-based applications that are more flexible, cost effective and available to many users to meet with the challenges of today's rapid business cycles. Current, large programs also provide limited opportunities to train, CCTT sites are regional, and this excludes the majority of the Army's soldiers from taking advantage of these simulations. By expanding our training tools to include commercially available products, a greater soldier audience can be reached without significant resource requirements. MG James M. Dubik put it this way, "...by **applying the right structure, doctrine, and methodology to simulations and simulators, the second training revolution will provide commanders choices and opportunities that they do not currently have."[44]**

FISCAL REALITIES

In the early 1990s, faced with force reductions and a declining budget, the Army embarked on a calculated risk-taking "spiral" development process intended to accelerate the fielding of near real time situational awareness to units on the battlefield. In less than five years, situational awareness (also known as "Digitization") went from a concept to a useable vertically and horizontally integrated battlefield information management system in the force. Tough fiscal choices led the Army to scale back the fielding of "Digitization" from the majority of the active Army to a single Corps along with a less costly fielding strategy that included a mix of imbedded digital systems along with the appliqué of digital technologies into some legacy systems.[45] This ongoing priority effort will result in the first "Digitized Division" in 2000, the second "Digital Division" in 2003 and a fully digitized Corps in 2004.[46]

The Army's transformation to a more versatile and agile force, spearheaded by the conversion of the two Initial Brigade Combat Teams, adds to the fiscal challenges. With $33B unfunded in requirements identified from FY01-05 budget time frame, the Army has cut or restructured a number of modernization programs to fund part of the transformation costs.[47] It is not clear however that Congress will provide all the funding needed to overcome the transition-related shortfalls, which could be as high as $2B per year.[48]

Clearly, much like the "Digitization" of the Army which had to be scaled back, fiscal constraints continue to prevent the Army from buying what the Army wants the most. This scenario is not likely to change in the foreseeable future and will continue the kind of tough choices we have seen in recent years. In all likelihood, the logical outcome will be a continued emphasis on achieving greater efficiencies in all phases of army operations. Training and training support activities will not be exempt. **We recommend that, to ensure training standards are properly maintained, it is critical that we find alternative ways that focus on achieving these standards, regardless of domain, within the current fiscal reality.**

EMERGING TRENDS IN THE CIVIL SECTOR

E-COMMERCE

Powerful economic arguments are driving the success of the e-commerce. Business to business commerce (B2B) was the first revolution in e-commerce and has matured to an estimated trillion dollars in 1999.[49] The exploding consumer segments of e-commerce could arguably be called the second revolution in e-commerce with Business to Consumer (B2C) focusing on the traditional retail sales market place. Businesses reduce cost by reducing storefronts and distribution costs. Economies of scale are easier to obtain since the Web's reach is global and no longer confined to physical space or geographic locations. An E-commerce web site can be scaled up or down at a low cost compared to its physical counterpart[50].

The way e-commerce has changed the traditional retailing rules of the game has been the largest stumbling block for traditional firms to cope with. The new rules threaten the comfortable way businesses have operated for years. To many, the Internet is a "disruptive technology" that overturns the traditional model and is a cultural shift for those who have who have invested substantial money, time, and effort in making the legacy business models successful. The fear that new distribution mediums will siphon off existing sales rather than create new sales commonly paralyzes legacy forms. The result is that traditional retailers have seen their market invaded by e-commerce business. After the success of a variety of upstart e-commerce firms, traditional retailers are just now beginning to make serious inroads on the Web with strategy that balances traditional storefront service with a complementary Web-based operation in an effort to provide the best of both to the market place. There is emerging evidence that such as strategy is beginning to pay off as many e-commerce sites have sacrificed profits to obtain market share[51].

> *By 2003, enterprises attempting to attract and retain people aged 30 or younger will need to offer virtual business simulation as a significant part of their learning programs (0.8 probability). Training is being "Amazon-ed" and "Schwab-ed". The traditional classroom model will represent less than 30 percent of all formal corporate learning programs by 2003.[52]*
>
> -Gartner Group, 12/99

The proliferation of personal computers and Internet access is not limited to the "dot COM" corporate phenomena. Recently, more traditional institutions such as Ford Motor Company and Delta Airlines have decided to underwrite home personal computers and Internet access benefits for all employees regardless of job description. Encompassing over 370,000 Ford workers and 72,000 Delta employees' word wide, the equivalent of 92% of the active Army end-strength[53]. These corporations recognize how the Internet is changing the way business is done and how this "benefit" will help develop or maintain skills in the digital world – skill sets the businesses are likely to be in need of in the future. These corporations are competing for the same target population as the Army and its commanders.

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The parallels between E-commerce and the potential of what might refer to as "E-training" in the Army are interesting to consider. Internet access changes the traditional retailing value chain. E training would increase soldier and organization accessibility to a greater number of training choices. Organizations could reduce costs by reducing the geographical requirements for some training events. Economies of scale are easier to obtain since the Web's reach is global and can provide a means to train regardless of geographic location or physical restrictions. E-training sites can be scaled up or down at low cost compared to physical training locations. While legacy businesses feared cannibalizing traditional sales if they used the Internet, many training organizations and leaders in the Army fear simulations will be at the expense of live training resources.

EDUCATION

Today's youth have accessibility to research and educational tools far beyond the physical boundaries of their local school or community library bookshelves. These youths, with their PC and Internet educational experience and expectations, are the same target population the Army must competitively recruit in a shrinking labor market. Browsing any local retail store will also reveal an incredible array of educational software for personal computers. In February 2000, the US Department of Education announced that 95% of the nation's public schools are now connected to the Internet, reflecting a 20-fold increase in classroom connections since 1994.[54] Although PC-based instruction is becoming more acceptable and commonplace, teachers in the classroom have not been done away with. Today's youth are, however, becoming increasingly comfortable with the PC and Internet as a key tool for learning in their overall educational experience.

The use of Web-based instruction varies greatly and consists of a number of progressions. The most familiar use of the Web today remains that of another tool, much how a blackboard, VCR or overhead projector is used to support existing educational methods. The next progression of use is as a repetitive tutor to master particular skills, thus freeing the teacher for greater one-on-one time with students. The conversion of traditional correspondence courses and a limited number of classroom courses to Web based instruction is also growing, albeit slowly because of the cost ($18k/course), time required (16 hours per Internet hour), and cultural resistance by faculty members more comfortable with traditional teaching methods.[55] These challenges are being aggressively addressed in an Advanced Distributed Learning (ADL) collaborative partnership involving DoD, the private sector, academia, and other government agencies. Cited by the President as a model in an Executive Memorandum entitled "Enhancing Learning and Education Through Technology", a major focus of the ADL partners is the development of industry-wide standards for interoperability, reuse, accessibility and durability of Web-based learning technologies. The trend in education is seen as shifting from "classroom-centric to one that is learner-centric."[56] Based on the experiential adult learning model, the integrated Web-based learning growth is depicted in the accompanying figure.

Next Generation of Learning Technology
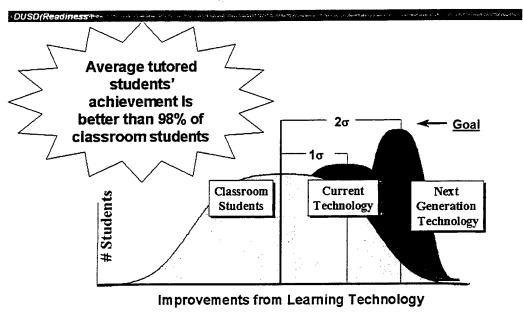# offers Potential for Greater Efficiency

FIGURE 4 IMPROVEMENTS IN LEARNING[57]

UNIVERSITY AFTER NEXT (UAN)

The target UAN [University after Next] will draw on advances in technology assisted learning, seamless tactical engagement simulation, interactive entertainment and full immersion in virtual experiences to prepare soldiers to learn, know, decide and act in analogous real life situations.[58]

Although live training remains the cornerstone of the Army's training strategy, the Army's University After Next (UAN) initiative is a recognition of the growing focus on information dominance and the fact knowledge-based operations will accelerate operating tempos and decision making. In a simplified form, the UAN concept first proposed in 1997 is a virtual university to develop leaders versatile in all missions and to provide online interactive libraries and simulations, as well providing an extended faculty serving as an a virtual staff.[59] Lest one think this means eliminating live training, the UAN's synthetic training environment is intended to decisively shape the requisite maturity and experience of leaders with "live training reserved for finishing exercises and soldier skill development maintenance."[60]

The future role of simulations in training is reflected in TRADOC proposed training strategy for the future, as seen in the accompanying figure. The UAN is currently a top-down driven initiative supported by the existing modeling and simulation strategy that appears to be predominately focused more at senior commanders and their staffs. With the majority of soldiers and trainers in the brigade and below, the Army

might consider a UAN strategy that simultaneously works from the bottom up—thus immediately targeting the largest training market of the Army and maximizing the overall potential training value. Today's young soldiers and their junior leaders stand to benefit the greatest from an immediate increased level of training proficiency, as well as inculcating them early in their careers the benefits of the changing ways we are learning and training for the future.

We recommend the Army aggressively pursues developing PC and Internet-based training tools as a way to increase agility and flexibility in training at all levels. Development and implementation should be done under the UAN initiative to ensure compatibility with the Army's overarching training vision.

Multi-Environment

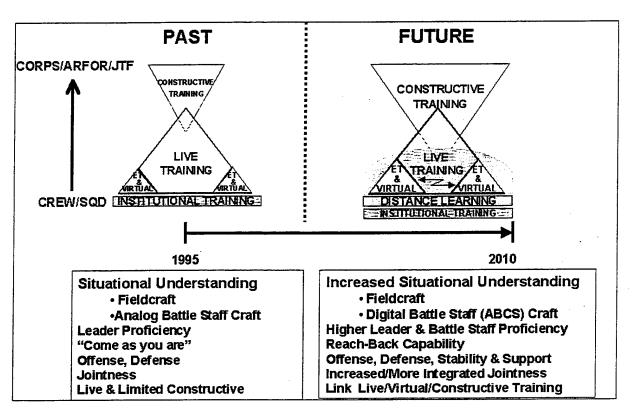| Situational Understanding	Increased Situational Understanding
• Fieldcraft	• Fieldcraft
•Analog Battle Staff Craft	• Digital Battle Staff (ABCS) Craft
Leader Proficiency	Higher Leader & Battle Staff Proficiency
"Come as you are"	Reach-Back Capability
Offense, Defense	Offense, Defense, Stability & Support
Jointness	Increased/More Integrated Jointness
Live & Limited Constructive	Link Live/Virtual/Constructive Training

FIGURE 5 UNIVERSITY AFTER NEXT CONCEPT[61]

DEFENSE AND INDUSTRY COOPERATION

Opportunities for flexible and agile training abound in the private sector. The Army needs to effectively tap into this work with industry to develop effective, low cost tools for training. Interestingly enough, both the services and the entertainment industry are looking at ways to use modeling and simulation to obtain their goals. The Army wants realistic training, the entertainment industry wants captivating, and heart-pounding games and rides—both need similar tools and technology.

The entertainment industry and the U.S. Department of Defense (DOD) – though differing wildly in their motivations, objectives, and cultures – share a growing interest in modeling and simulation.[62]

The Army needs to take advantage of this symbiotic relationship. Partnering with industry is becoming widely used throughout the acquisition community; it targets the efforts of the government-industry team on better communications, more responsive processes and a focus on goal or mission. Buying "off the shelf" is also a common refrain for those working to reform the bureaucratic military acquisition process. An extension of this partnership process is developing between the Army and the simulation/entertainment industry. These efforts need to be supported, and expanded, to leverage the power of the commercial marketplace.

"The potential exists for greater cooperation between the entertainment industry and DOD, but collaboration may not be easy to achieve. The entertainment industry and DOD have vastly different cultures that reflect different business models, capabilities, and objectives. Nevertheless, these differences can be a source of strength. DOD's research efforts and those of the entertainment industry are in many ways complementary rather than contradictory. Whereas DOD's research and development efforts are well funded (by industry standards), meticulously planned, and forward looking, the entertainment industry's efforts are diverse, fast paced, and market oriented."[63] To take advantage of this potential, there need to be strong ties between the Army and the computer gaming industry. The Army needs to become and stay engaged with the fast moving gaming and entertainment industry.

The creation of the Institute for Creative Technology (ICT) at the University of Southern California is a step in the right direction. While industry was interested in taking advantage of the investment the Army was willing to make, no companies wanted to enter into direct partnership with DoD. Academia was regarded as a safe neutral ground, and the Army determined the ICT was the best vehicle to reach out and work with the entertainment community.[64] Part of the draft research agenda for the ICT states: "The Army and the Entertainment Industry will be actively involved at each step in helping to ensure that what is done meets their needs."[65] The Army's Chief Scientist, Michael Andrews commented: "That's where we're bringing their [the entertainment industry] abilities to involve players or warfighters in environments that the warfighter, when he goes to get trained, will believe it, smell it, sense it, taste it, really be

immersed into that environment. We've brought industry in to look at how we make future investments ... We get insights, they get insights into how they might invest for the future."[66]

The Armor Schools and the U.S. Marines Corps are working with MAK Technologies (MAK) to modify an existing commercial product (Spearhead - an Armor tank battle game), or to develop a new game, which can subsequently also be sold on the commercial market.[67] This is the first video game to be co-developed and co-funded by the Department of Defense and the entertainment industry.[68] NovaLogic, a major computer game producer, has set up a business unit to market its technology to the military. Electronic Arts (EA), a maker and distributor of computer games, is heavily involved with Jane's Combat Simulations (Jane's) in the distribution of their series of computer games, marketing them to the U.S. Navy and working on more advanced games that may have training benefits to other services. EA distributes computer games for a wide variety of gaming companies; some of these games have military applications.

Commercial industry brings innovation and fresh thinking to the training arena. Military training, modeling, and simulations is overly constrained by requirements and in need of more "big ideas" according to Bran Ferren, president of research and development and creative technology at Walt Disney Imagineering.[69] "We've barely scratched the surface of what's possible,"[70] the entertainment industry has a lot to offer the training and simulation business, and the military training and simulation especially could benefit from the adoption of more commercial off the shelf technology, according to Ferren.[71]

Today it appears more luck or chance that we stumble across a valuable training tool from the commercial sector. We need to make the effort to work with and evaluate opportunities from the entertainment industry. By leveraging ongoing efforts, for example the ICT, we can create a "win-win" situation from which the Army and the commercial sector will both benefit. These efforts will also have the secondary impact of continuing to reinforce acquisition reform initiatives, buying COTS products, using commercial standards, and others, which will lead to cost savings that are critical in today's resource environment. **We need to look beyond current efforts, and to develop and support pilot programs out of the ICT or other partnerships that will help the Army achieve better, flexible and cost-effective training solutions for commanders.**

COMMERCIAL OFF-THE-SHELF TECHNOLOGY SYSTEMS (COTS)

The generation currently entering the Armed Forces grew up using computer and video games. By 1992, there was a Nintendo in seven out of ten households that included children between the ages of eight and twelve. The trend shows no sign of slowing.[72]

The commercial gaming industry is exploding with innovations focused on the PC market, but few that the military market currently appears to value. The Army's current simulation programs are big, expensive and unique. That is not a fault, but rather a result of our requirements system and apparent lack of agility to quickly bring in new technologies on such a massive scale. There are many efforts in the commercial sector that could be leveraged to increase training effectiveness. The commercial gaming industry is defining how the technology will grow.[73] A few of the technologies are described below:

Ultima Online - Interactive Internet games. The commercial gaming industry is using the Internet and putting thousands of players into the same virtual world—a goal of large military simulations. Although their technology is imperfect, they are rapidly refining it.[74] Interactive, Internet-based games are the fastest growing sector of the gaming industry. The entertainment industry is moving toward a richer multi-player environment that the military could benefit from in distributed simulations and training.

Voice over Internet. Many games now come with the capability to send voice commands over the net while participating in the simulation. This replicates command and control in a military environment. Small unit tactics in MOUT environments depend on communications, and there are games being played on the Internet today that have these tools.

Visual realism - Enhanced Graphics. The commercial gaming industry is improving graphics at an incredible rate, and the latest video games provide more advances, helping to create a more realistic and interactive synthetic environment. Improvements in "lip-sync" make the players (real or artificial) appear more realistic. The greater the realism, the greater the immersion in the game/simulation and the greater the learning experience. Advances in hardware, for example improved graphics boards, refresh the "state of the art" every 9 to 18 months.

Another reality of commercial games is their low cost. Most commercial games cost around $50 today and the market is so competitive that the current price point shows no sign of increasing. The Interactive Digital Software Association estimated last year that interactive games are the fastest growing form of entertainment in America, with sales surpassing those of books, CDs, and box office revenues.[75]

Research from education, psychology, and anthropology suggests that play is a powerful mediator for learning throughout a person's life. The time has come to couple the ever increasing processing capabilities of computers with the advantages of play.[76]

Commercial games are designed to be fun and challenging, they are designed to be "play" not "work." This is paradox of sorts in the education and training community—work is respectable, play is not.[77] Most government offices have a strict policy about having games, or a way to "play" on government computers. But learning environments should sometimes encourage people to play. One

advantage of "play" is that it is usually voluntary and intrinsically motivating, that is, it is pleasurable for its own sake and is not dependent on external rewards.[78] In training, "play" can be a powerful learning tool. Intrinsically motivating learning environments contain the characteristics of challenge, curiosity, fantasy and control, the same characteristics as most games.[79]

An example of how training can be fun and effective is illustrated in this letter to a gaming magazine:

> My son is eight years old and has been playing hockey since he was four. Up until this year he had never scored a goal. This year he scored his first goal on an amazing move that left all the coaches dumbfounded. Upon his return to the bench all the coaches asked him, "Where did you learn that?" He said, " tried it on Cujo, Belfour and Roy and it works every time." Of course, knowing these were NHL goalies, everyone thought he was delirious. When asked again he insisted that he did it every day on NHL '99 for Nintendo 64. Later, the coaches announced that our next on-ice practice would be cancelled so that the kids could spend more time with NHL '99. My son showed me the move on the Nintendo 64. He was absolutely right. Now he's one of the top scorers in the league![80]

An eight-year old boy turned his Nintendo game into a way to practice and hones his skills of a physical sport in a virtual environment. Many PC-based computer games come with learning options,[81] so players can learn to use the simulation and learn about the game. **The power of games, in learning and training, suggest that commercial games, given their low cost and availability, offer potential for military applications.**

COMMERCIAL "MILITARY" GAMES AND SIMULATIONS

THE BENEFITS OF COTS GAMES

Why use commercial off the shelf computer games for military training? Critics are quick to point out its flaws, such as exaggerated weapons performance in some games, but few ever look at the advantages of using COTS products, as a much more creative way to attack a training issue. Although MOUT training is our interest, there are applications across all operations, from peacekeeping through warfighting. The next training revolution is only limited by our imagination.

> **On Ensign Herb Lacy's first training flight, the aspiring naval aviator performed so well his instructor wanted to know how much previous flying he'd done...Lacy, however, had never flown a real plane -- but had logged many hours at home working the joystick of a $45 computer flight simulation program he customized to fit the demands of his training curriculum. [82]**
>
> **- Navy Times, March 29, 1999**

The most important reason to use COTS games is that they are an effective training tool that also happen to be relatively cheap. ENS Lacy went on to make the commodore's list and achieved unheard of perfect scores during the intermediate phase of flight training [83]. ENS Lacy didn't spend time on a $10 million dollar flight simulator; he learned using Microsoft Flight Simulator. This got the Navy's attention. The Navy won't throw away its "high-end" flight simulators, they still fit into the training strategy, but the PC games offer other advantages. They're portable, so pilots can practice aboard aircraft carriers during down time. They also give student pilots—who rarely if ever have the chance to use a full-scale simulator—a way to practice at home [84]. The Navy is now looking at how to leverage this success. They had other cockpits designed for use with MS Flight Simulator [85] and plan to make these templates for MS Flight Simulator available to any pilot who wants the information.

The Navy has been using a number of commercial games for training. Navy research in the past decade has empirically demonstrated that low cost "table top" PC-based simulations can support instructors in training students to learn complex individual team and knowledge skills [86]. The U.S. Naval Academy is integrating Jane's *Fleet Command* as the centerpiece for the midshipman Strategy and Tactics course.[87] The Navy is also looking into other games, like Jane's *688(I) Hunter Killer*, a popular strategy game from Electronic Arts in which players take the helm of a Los Angeles-class submarine.[88]

Currently a number of organizations believe that COTS games are at least part of the training solution. MAK, as mentioned earlier, is working with the Armor School at Ft. Knox, KY, and the USMC on a number of projects. Both of these efforts will make use of the Internet capability of today's PC games to enable distance learning as well as enhanced player interaction. Funding however is inconsistent and not part of a coordinated plan, thus the efforts are disjointed and time consuming.

The marketplace will only make PC games get better, and provide more training opportunities. Current games such as Delta Force 2, Rainbow Six, Team Fortress 2, and SWAT 3 have potential for urban operations training applications. Today's games are much improved from the days of DOOM where you simply shot everything that moved. These games require strategy, practice[89], and communications (via the Internet) and are adding increasing levels of realism: crisp graphics, interactive scenery and immersive sound.

Another advantage of COTS games is their low cost. They offer more "bang for the buck." A glaring example is the flight simulation ENS Lacey used above. The popularity of flight simulation among computer games enthusiasts has allowed the games sector to spend more, and develop more flexible techniques, than the military's traditional suppliers of simulations.[90] In the UK, military leaders noted the low cost of PC games and commented, "with a good flight simulation game costing about 100 [pounds], defense chiefs are asking why military simulation is costing so much."[91]

One of the U.S. Army's strengths lies in its ability to make use of industry innovations, and not just those of the defense industry. There are numerous technologies, methodologies and approaches in the commercial world that can serve the Army.[92]

Buying off-the-shelf is one of the goals of acquisition reform today. The Army will take advantage of commercial technology and innovation for training found in commercial simulation. Not only are game costs low, but the procurement process should be straightforward as well. Small purchases of commercial games could easily be made using a unit credit card (IMPAC card). If a large number of licenses are required, a site license could be procured. In either case, the traditional procurement system can be bypassed to quickly obtain the training capability for the commander in the field.

Commercial games, with the right support, give the commander an immediate tool to use for training. Different games and tools can greatly expand the training options for the commander at low overhead cost. Most units have standard PC hardware to run the programs. And many soldiers will also have computers or game units at home. This opens up an entirely new training opportunity—training from home, and wanting to because of the challenge and fun of computer gaming. The vision is to provide a game that is not only tactically sound, but fun and challenging so that soldiers will want to play on their own time. The commander gets more flexibility in training tools, and the soldiers get anytime, anywhere training. The advantage of the current COTS computer games is intense competition in the market that is driving each new game to be more engaging than its predecessor—offering even greater challenge, curiosity, fantasy, and control.[93]

This leads to another advantage of commercial games. Commercial games are portable. ENS Lacey's use of Microsoft Flight Simulator has created interest in having portable training devices for carrier-based pilots. This concept can be expanded to other training environments. With a portable training tool, a small unit could rehearse actions in a similar MOUT environment enroute to a mission.

Distributed training and distance learning are all part of the next training revolution—the Internet gives commercial games great flexibility.

A powerful intangible benefit of using COTS games is their ability to enhance teambuilding and foster competition in small units and teams. This can be seen as a subset of "play" above. Feedback, by scores or other measures (complete missions, etc.) is breeding grounds for competition between individuals, teams and larger units. Competition only enhances the motivation to learn and perform well, especially as a team in today's Internet linked games, which can improve communications between team members. Imagine a scenario where a squad is rehearsing for an urban operation. In one case, they are performing a "rock drill" using a toy village and plastic soldiers on a sand table. In the other, they are playing their parts on a commercial simulation in the dayroom. Which training method would give the squad more feedback, more challenge, and is more realistic? To go a step further, commanders could set up competitions, informal or formal, to reward the best players, increasing the motivation to excel. Teams can also practice over long distances, an advantage for National Guard and Reserve soldiers, with little or no change in their ability to communicate.

Commercial products with increased flexibility are emerging and would support military applications. A growing sector of the commercial gaming sector is the "add-on", conversions and modifications to existing games. In short, a third party modifies part of the existing game to create another game. This is how ENS Lacy created his trainer in Microsoft Flight Simulator; he modified the existing controls to replicate the aircraft he would be flying. This is important, because people are beginning to realize that you don't have to be limited by what the developers originally had in mind for a game.[94] The Navy contracted with multimedia developers to replicate other aircraft cockpits to create additional Navy aircraft for use in Microsoft Flight Simulator.[95] This was done at a low cost, without developing a new simulator or game. Add-ons and modifications are a quick and inexpensive way to create new training opportunities. The game "mod" and user add-on market is growing so quickly that a magazine dedicated to these areas is now in the marketplace.[96]

Games and simulations can be powerful training tools, but must be part of a tightly woven strategy. Commercial games will not train all the necessary tasks to perform the mission, very few simulations, if any, will. Therefor a complete task analysis will be critical to selecting the right commercial tools for training. Commercial games must also be reviewed to ensure that there is no negative training. This is true of all simulations, but due to the exaggerated performance found in many computer games (unlimited ammunition and fuel for example[97]) to add marketability, it may require special attention. However, negative-training concerns should not be overstated; for example, the Navy has yet to have a pilot in training look for a mouse in the cockpit.

The most difficult part of using COTS games is developing a solid training support package (TSP). The TSP will be the key, as it is today using any training tool, to effective training. The right tools, COTS or otherwise, are useless without proper documentation of the task, conditions and standards to be trained. An outstanding game, with no or a poor TSP will not train effectively and could turn into

unproductive "play" that doesn't support the commander. Much like the Navy's experience with Microsoft Flight Simulator, COTS requires us to reverse the process thus taking simulations and evaluating them against TSPs.

There are numerous opportunities for the Army to leverage commercial games for training. The products can do the job, but will still require effort from the training developers to fit the tools into the training plan. Commercial products/games are low cost, flexible, and engaging/fun for many training environments. Simulations can replicate many more environments and situations than are possible by any other means. Using the Internet for distance learning or training fits in with existing and future commercial products and allows enhanced small unit training for National Guard and Reserve units that are spread over wide geographical areas.

Traditionally the military has been at the forefront of technology development with the commercial sector spinning off viable applications. In this instance, the commercial sector is clearly in the lead. **We recommend the military take advantage of COTS games for training applications, thus increasing our flexibility and agility by avoiding long development cycles and excessive costs.**

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Today's Army is smaller, more frequently deployed and is called upon to perform a broader array of global missions than the Army of the 1980s. More than ever, Operations other than war (OOTW) are competing for training resources historically allocated to train and sustain warfighting skills. Operations in urban terrain are continuing to increase and the likelihood of potential conflict in this environment grows as adversaries seek to use the urban environment as a way to minimize our technological advantage. If the Army's goal is a more versatile and agile land force, it seems reasonable that its training strategy and supporting tools should be equally as versatile and agile.

Fiscal constraints continue to prevent the Army from buying the programs it believes are important. Affordability has led to some tough decisions such as scaling back the Army's digitization vision and of modernization of aging warfighting systems. The cost of transforming the Initial Brigade Combat teams (IBCT) and the Interim Armored Vehicle (IAV) are stressing the fiscal challenges even more but are necessarily the priority effort required to make a more versatile and agile land force. Although the Army may see some increases in funding, it is not likely to be of the magnitude to significantly reduce the overall challenges.

The concepts implemented in the first training revolution of a battle focused, Systems Approach to Training (SAT), with performance-oriented training, remains even more relevant today than when codified in the late 1970s and early 1980s. These concepts, which provide a process for focusing on what is truly mission-essential with a common understanding of the tasks, conditions and standard more important as OPTEMPO increase and resources decrease. The growing demands of including warfighting and OOTW requirements is leading to an increasing tendency to let the units METL grow out of proportion – with reduced standards of performance and readiness resulting.

Traditional training methods used by active component organizations present greater resource challenges for the Guard and Reserve components. The increasing complexity of our systems requires soldiers of all components to train much more frequently to obtain and sustain proficiency.

Although live training remains the cornerstone of the Army's training strategy, the growth of constructive and virtual simulations reflects the emergence of a 2nd training revolution. Most legacy M&S systems focus on combat operations with a limited ability to simulate OOTW or in urban terrain. Constructive simulations are being developed to rectify these deficiencies. Simulations can replicate many more environments and situations than are possible by any other means. The trend in industry and education is toward PC and Web-based applications that are more flexible, cost-effective and available to many users to meet with the challenges of today's rapid business cycles. Using the internet for distance learning or training fits in with existing and future commercial products and allows enhanced small unit

training for National Guard and Reserve units that are spread over wide geographical areas. The same applications would support deployed soldiers.

The University After Next (UAN) initiative is a future vision of Web-based interactive libraries and simulations to develop leaders versatile in all missions. A top-down driven program focused on commanders and their staffs it is most similar to the business to business model of E-commerce. The addition of a concurrent approach focusing on virtual training tools for the broader market of soldiers and junior leaders in the brigades could potentially replicate the success of the business to consumer (B2C) aspect seen in E-Commerce. Such an approach could provide an immediate benefit in the training and sustaining of skills. But more importantly, implementation would help test the viability of the UAN concept and assist in overcoming the institutional bias of the field towards simulations.

The entertainment industry and the military services can create a "win-win" alliance that benefits both parties. The Army, partnering with industry, can expand it's virtual simulation training tools to include PC and Internet based commercially oriented products that can reach a greater number of soldiers regardless of their geographic location or Army component. The creation of the Institute for Creative Technology, a cooperative partnership with DoD, academia and the entertainment industry is an effort to establish a win-win relationship to accelerate the development of virtual simulation tools. Industry is willing to work with the military, but not at the expense of giving up, or weakening their position in the highly profitable entertainment industry.

Tremendous innovations in software, hardware and communications technology have made the commercial gaming industry the fastest growing entertainment market. The entertainment industry is leading the defense industry, and is much more agile. We see increasing levels of PC based virtual realism in the commercial marketplace on a continuing basis. The nature of "playing" such games has found to be an exceptional learning environment. In the area of interactive training and technology, the Army is following the commercial sector, and we should recognize and take advantage of available tools, and not reinvent existing capabilities.

There are numerous opportunities for the Army to leverage commercial games for training. The products can do the job, but will require training developers to adapt the tools into the training strategy. Commercial products/games are low cost, flexible, and engaging/fun for many training environments. Overcoming tremendous initial internal cultural inertia, the Navy is starting to use commercially available "shrink-wrapped" games such as Microsoft's *Flight Simulator* and Jane's *Fleet Command* in various training programs. At an average cost below $50, the use of COTS military games has tremendous potential as partial task trainers across a variety of operational environments.

Intuitively, one knows there are many commercial opportunities to provide flexible training tools for commanders in the field. What one doesn't know is the magnitude of the benefit of COTS games. Given fiscal challenges, it is crucial that we carefully assess the potential benefits to avoid over-promising performance and assuage the fear that live training will become the loser, or source of funding for

simulation. **The focus should be on developing effective training tools that are supportable within our fiscal constraints.**

RECOMMENDATIONS

We recommend TRADOC conduct a phased pilot program to assess the viability of using commercial games to support training as a cooperative effort involving the University After Next (UAN) and selected TRADOC proponent schools and centers. A cooperative partnership between the "down in the mud" trainers from the field and the educational and technology visionaries of UAN would help ensure we maximize the potential for immediate training value within a framework supportable in the future. Thus, the pilot program serves both as an evaluation of the commercial gaming potential as well as beginning to test addressing the implementation challenges of the UAN concept as Web based knowledge center.

We strongly recommend that all efforts involving new training methods using simulation technology, COTS or otherwise, not lead to the creation of another office or organization. It is essential to use the existing training structure, or it will not transform itself into a more flexible and agile training supporter of the new operational environment.

The initial evaluation would be similar to an entrepreneur's quick look technology commercialization assessment used in industry to evaluate new technologies.[98] This approach essentially assesses if the various games warrant further consideration. The assessment should be done by trainers and soldiers in the field to add value to the evaluation. Five proponent schools, Aviation, Armor, Infantry, Military Police and Transportation, are a proposed audience. The goal would be to survey the current products and assess their value in three modes, stand alone, collective (multiple player Internet) and modified (if necessary, and what modifications are needed). The end state of this initial evaluation is a prioritized list of the games cross referenced to the tasks for which each game could serve as a partial task trainer. Further, TRADOC should provide incentives for the process by funding a more detailed evaluation of the most promising games.

The next phase of the pilot program would be to take the most promising games identified and perform a more extensive limited user test involving elements of the Active, Guard and Reserve components. Training support packages would be developed for each game to provide the necessary structure for training. Selected National Guard units, deployed forces, and units in preparation for a major training event (i.e. CTC rotation) would be target test populations. To encourage participation, software and hardware would be provided for the test, and remain with the unit after completion. Again, the UAN partnership would be leveraged, using it as the host server supporting the test, to include data collection and evaluation. In addition, the UAN would support accessibility to the server and training support packages by additional units wanting to participate on their own, using their own resources and other products (i.e. TSP, any software overlays) developed for training. This will allow feedback and data from

units not formally involved in this phase of the pilot program, allowing a comparison of open access users. The results of the LUT would be used to support decisions on the next phase of the program

A natural continuation of the UAN, distributed training and using commercial games and technology would be the Idea of a virtual training center. By using the commercial capabilities, like Ultima Online, where thousands of players play in the same virtual world, a large multi-player, distributed simulation could be developed for training. Commercial games, using standard Internet connections, could be the backbone to such a system. Commercial firms have experience with and could run the game servers for an Army application just like they do today for large interactive Internet games. An Internet based virtual training center would allow staff and unit interactions, give an opportunity to test courses of action against an automated OPFOR and allow AARs to facilitate training.

The Army needs to become more engaged with the commercial entertainment and gaming industry. This recommendation is being partially addressed by the current ICT effort. ICT technology goals should be linked to training needs, where possible, to ensure that new technology will result in better training products. In addition, the Army needs to have more soldiers involved in the gaming industry and industry forums. It should tout the value of the information, experience and innovation that the Army can provide.

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