EVALUATING THE EFFECTIVENESS OF A DISTANCE LEARNING TRAINING COURSE FOR THE UH-60 BLACKHAWK HELICOPTER 67T-20 LEVEL MILITARY OCCUPATIONAL SPECIALTY

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PREFACE

This study was conducted to compare outcome test score data between a distance learning delivered class and a resident class in an aviation maintenance 67T-20 military occupational skill (MOS) producing course while maintaining U.S. Army course standards. Cost comparisons to attend the two classes were performed.

The course standards were maintained. The mean scores for distance learning and resident classes were 93% and 98% respectively. A t-test comparing two samples with unequal variance for means was [P(T<=t) two tail 0.000107]. The t-test course mean score results between the distance learning and resident classes were statistically significantly different; however, all students finishing the course exceeded the U.S. Army 70% minimum standard. The cost to attend the distance learning class was $861 per soldier, whereas it would have cost $8,262.28 per soldier to attend the resident class. The distance learning class was conducted at a cost avoidance savings of $66,612 for the nine soldiers from the Kansas Army National Guard (KSARNG).

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NOMENCLATURE

AT	annual training
ADSW	active duty for special work
ADT	active duty training
AH-64	attack helicopter model 64
AI	assistant instructor
ARNG	army national guard
ATM	asynchronous transfer mode
CH-47	cargo helicopter model 47
CSM	command sergeant major
CW2	chief warrant officer 2
df	degrees of freedom
DL	distance learning
EAATS	Eastern Army Aviation Training Site
ESSS	external stores support system
FY	fiscal year
HOR	home of record
IDT	inactive duty training
ISDN	integrated services digital network

IAARNG	Iowa Army National Guard
KSARNG	Kansas Army National Guard
KRTI	Kansas Regional Training Institute
MOS	military occupational speciality
NGB	National Guard Bureau
T-test	t-Test for two-samples
UH-60	utility helicopter model 60
USAALS	United States Army Aviation Logistics School
POC	privately owned conveyance
QDR	quadrennial defense review
VTT	video teletraining (once defined as only satellite delivered, it has expanded to mean any two way audio/visual communication)

CHAPTER I

INTRODUCTION

Background of the Problem

The role of the National Guard in the total defense force structure has increased, while the overall force structure in the United States is being reduced. Fogleman (1997) stated, "Force structure reductions are being mandated by the Department of Defense as a cost savings to the overall Defense budget" (p. 20). The Quadrennial Defense Review (QDR) in 1997 included a recommendation from the Department of the Air Force that the nation place a greater reliance on Air National Guard and Reserve forces. This recommendation was the focal point of an interview with General Fogleman (1997) wherein he stated,

> The reserve components can and need to be equal partners. Air Force active duty, Guard and Reserve units train to the same standards, so they can and do perform the same operational mission. This requires a commitment to fund for modernization, readiness and sustainment; just like our active units. (p. 21)

Over the last few years National Guard units have been reorganized to align with active duty units. Receiving modernized combat equipment as part of the new force structure requires training on this new equipment. Kansas Army National Guard (KSARNG) and Iowa Army National Guard units have received modernized UH-60

Blackhawk helicopters. All crew members in the reorganized units receiving these aircraft have to be re-trained.

The United States Army maintains several training schools across the United States. The schools are generally organized by branch. There are several different branches or arms in the U.S. Army. A few examples include Artillery, Infantry, Armor and Aviation. The Aviation branch is composed of many different aviation units. Soldiers assigned to specific jobs that make up those units are trained in specific military occupational specialty (MOS) areas. These specific and varied jobs are identified with many different MOS numbers, each number representing a different skill. In the 67T-20/30 MOS code the "67" identifies the job as a helicopter mechanic; the "T" identifies the model of helicopter, in this case a UH-60 Blackhawk utility helicopter; the "-20/30" identifies advanced training (the initial helicopter training would be "-10" level).

Researcher Involvement

Researcher involvement in this project started in 1996 as a Battalion Aviation Commander looking for alternate approaches to train soldiers on the UH-60 helicopter. Two trips were made to the National Guard Bureau (NGB) in Washington, D.C., and to the United States Army Aviation Logistics School (USAALS) at Fort Eustis, Virginia, to work out a "pilot" program and to gain approval for trying distance learning as a model for 67T-20 MOS helicopter mechanic training. This was the first time the U.S. Army had allowed the use of distance learning training for an aviation MOS. After a two year battalion command ended with the 1/108th Avn Regt, the researcher was asked to continue as the project officer for this unique distance learning program. Attending the

Video Teletraining (VTT) Instructor Training Course (ITC) conducted in Iowa and participating in a week long conference at USAALS for course coordination and content review provided valuable insights to the 67T course development. Attending all training weekends and annual training phases of the program provided firsthand experience and observations. In addition, direct involvement in contractor equipment specifications and set up assistance was experienced. A newly developed remote wireless camera located in the hangar facility away from the classroom was utilized. The camera did allow the distance instructors to see the students performing hands-on maintenance exercises on the helicopter in real time. The researcher presented a lessons learned briefing about the 67T pilot course to Brigadier General Roger C. Schultz, Director, Army National Guard on 15 November 1997 (see Appendix A). The success of the 67T pilot course presented at the briefing, in part, influenced the recent decision by the National Guard Bureau to support the nationwide distance learning initiative now under way.

Problem

The United States Army's 67T (UH-60 Helicopter maintenance) resident school cannot meet the Army National Guard's 67T training demand. The United States Army Aviation Logistics School (USAALS) located at Fort Eustis, Virginia, provides 67T MOS mechanic training on UH-60 helicopters. Alton Ray Jarman, Jr. (personal communication, February 11, 1997), Training Specialist, Department of Aviation Systems Training, revealed survey results identifying the UH60 67T MOS training demand exceeds USAALS's maximum yearly operating capacity by over 400 soldiers. Most 67T school training slots at USAALS were being filled by soldiers from active duty

units. The National Guard units receiving the UH-60 could not obtain enough 67T MOS training class dates at USAALS. Lieutenant Colonel Craig Bond (personal communication, November 14, 1997), Distance Learning Office, National Guard Bureau, estimated there were over 800 soldiers waiting for 67 MOS training. Moreover, Army National Guard training fund shortfalls would not financially support the required number of soldiers attending the USAALS courses even if class slots could be made available.

The United States Army Reserve had the previous mission to train Army National Guard and Reserve aviation MOSs using an exportable course taught at the unit. This mission was lost with the force structure reorganization in 1996. The aviation training mission was shifted to the Eastern Army Aviation Training Site (EAATS) located near Fort Indian Town Gap, Pennsylvania. EAATS did not have the equipment nor expertise to immediately provide the needed 67T MOS training. A solution to meet this identified 67T MOS training shortfall had to be found. The traditional resident approach at USAALS or EAATS would not solve the training shortfall problem.

Jelisavcic (1998) identified the National Guard's role in the Readiness section of the Distance Learning Planning Information Paper:

> The National Guard provides military training, Guard unique training, and professional development courses. The training demands for increased readiness, for support to changes in military occupational specialties in response to changes in force structure, and the increased need for professional development and educational opportunities cannot be met by conventional resident training. The National Guard can no longer afford to satisfy its training demands by sending soldiers to distant training academies and schools. Only distance learning offers the potential for the Guard to increase its state of readiness within the constraints of manpower and budget. (p. 5)

Distance Learning Solution

Colonel Floyd D. Parry, State Army Aviation Officer in Kansas, and Lieutenant Colonel Eddie Newman, Army Aviation Support Facility #3 Commander, Iowa National Guard, recognized this training shortfall problem and proposed a training solution to National Guard Bureau (NGB), the controlling headquarters for all National Guard units. Kansas and Iowa proposed using distance learning technology to train their 67T MOS soldiers in their respective states. No one had ever used distance learning in training aircraft mechanics requiring this unique hands-on type skill. Colonel Richard J. Hoppes, USAALS commander, also recognized that a distance learning option was a viable solution to the problem. Lieutenant Colonel Richard A. Enderle, Director, Department of Aviation Systems Training, had his staff at USAALS develop a 67T MOS distance learning model in October 1996. The distance learning course was designed to deliver the same information in the same amount of instruction time as the resident course. Resident course standards and student learning outcomes were to be maintained in the distance learning course.

Purpose

The purpose of the study was to evaluate and compare the class performance outcomes between the USAALS 67T-20 level MOS distance learning delivered course and resident course while maintaining U.S. Army course standards. A cost analysis comparison between attending the resident course versus distance learning delivered course for the Kansas Army National Guard soldiers was an additional objective.

Hypotheses

There is no significant difference between the mean of the means from the five exam score results of students for the USAALS resident and distance learning 67T-20 MOS producing classes.

There is no significant difference between the mean test score results from students taking the Fuel/Electrical/External Stores Support System exam in the USAALS resident and distance learning 67T-20 MOS producing classes.

There is no significant difference between the mean test score results from students taking the Landing Gear exam in the USAALS resident and distance learning 67T-20 MOS producing classes.

There is no significant difference between the mean test score results from students taking the Powerplant exam in the USAALS resident and distance learning 67T-20 MOS producing classes.

There is no significant difference between the mean test score results from students taking the Rotor System exam in the USAALS resident and distance learning 67T-20 MOS producing classes.

There is no significant difference between the mean test score results from students taking the Hydraulics exam in the USAALS resident and distance learning 67T-20 MOS producing classes.

Assumptions

The following assumptions were accepted:

1. The behavior of the students involved in the distance learning classes was not overly influenced by the notoriety of the project.

2. The students selected for the distance learning training were motivated at the same level as students in the U. S. Army resident course.

Limitations of the Study

Limitations included the following:

1. A small total number of 17 students started the course, ending with 15 fully participating in the distance learning course compared to a total of 33 students in the resident course.

2. Some of the distance learning equipment did not function as advertised all of the time.

3. Course length varied, from nine weeks for the resident course to nine months for the distance learning course.

4. The same five primary subject area exams were compared between groups; however, this small number could have been expanded to nine exams by including secondary subject area exams.

Scope

This pilot project was the first time the U.S. Army had allowed UH-60, 67T MOS training to be conducted anywhere outside USAALS. The scope of this problem is wide enough to cover all Army National Guard (ARNG) and Reserve aviation units in the United States. This UH-60 aviation training MOS problem widens as more ARNG aviation units receive UH-60 helicopters. The scope of this study was focused on UH-60 helicopter maintenance training in the states of Kansas and Iowa. There are approximately 800 soldiers in aviation units across the United States who need 67 MOS training. This training backlog continues to grow as the Army National Guard modernized aircraft fielding plan unfolds. The same distance learning MOS training model used in this study could be expanded to other states and used in other helicopter specific training requirements such as the CH-47, AH-64, and others.

CHAPTER II

REVIEW OF LITERATURE

Introduction to Distance Learning

Education and training of students, managers, and employees will depend more and more on technology to assist with this process. According to the United States Distance Learning Association, "Distance learning is the acquisition of knowledge and skills through electronically mediated information and instruction, encompassing all technologies and other forms of delivery at a distance" (USDLA, 1997, p.1). Several existing paradigms contribute to the popularity of distance learning. Among these are the high cost of building new schools, the low cost effectiveness of small student-teacher ratios, and the high cost of transportation from one area to another to teach and/or attend classes. The most prevalent reason for distance learning popularity lies in technology. According to Nadler and Nadler (1989) as our society has become more complex, there has been a growing need to provide people with appropriate learning experiences in relation to the changing economy.

With the advent of the 21st century, many improvements to technology have made distance learning possible. Some of these improvements include teleconferencing, distance learning and training, desktop and Internet video-conferences, tele-medicine, and data conferences. This advancement in technology has conveniently arrived at just the

right time for the learning necessary to keep military, corporations, educational institutions, and government agencies globally competitive. The downsizing, restructuring, and reorganization of work now require, more than ever before, that the individual quickly obtain new knowledge and skills. Distance learning meets these instant demands of the changing workforce and the push for continuous improvement of the workers. As recently as two years ago, corporate training buyers knew very little about distance learning, according to Christianne Moretti, manager of Information Technology (IT) training and education research at IDC Canada, as quoted by Morri (1997). In view of this concept one can look at the history of distance learning with greater appreciation. Distance learning/education is often viewed as a recent development when in fact it started in the 1870s with correspondence courses (Portway & Lane, 1992).

Several comparison studies on distance education dealing with classroom learning have found no significant difference between distance delivery and resident instruction (Ritchie & Newby, 1994; Weingand, 1984). Research indicates that instructional format itself (for example, interactive video versus videotape versus live instructor) has little effect on student achievement as long as the delivery technology is appropriate to the content being offered and all participants have access to the same technology (Trier, 1997). There was no conclusive evidence that computer based training was better or worse for gaining information than traditional classroom instruction (Maul, 1993). However, there was significant difference in instructional time, with the computer based training showing a large decrease. Effectiveness studies have been quite consistent in showing that when used in business, military training, and adult learning, there was no

significant difference in effectiveness between distance learning and traditional methods, and student attitudes are generally positive about the distance learning experience (USDLA, 1997).

Communication Technology

As public broadcasting continued to gain popularity, telecommunications moved to the forefront of the coming information age. Ninety percent of the American households had radios in the 1950s, and by the 1970s 90% had telephones (Linfield, 1995). Access to information was increasing in our society. Further implementing easy access to information was the debut of home computers in the late 1970s. As the price of computer equipment decreased, computers gained rapid popularity in the 1980s. Similar to telephones, radio, and television, one or more computers are now in most American homes, and Internet technology is user friendly enough for young and old alike. Linfield (1995) identified the next few decades as the age of information exploration where universal service and information access will become the foundation of the new information age.

Instructional Technology in Distance Learning

There is a movement underway that expands and changes the instructional roles of the traditional teaching model (Goggin, Finkenberg & Morrow, 1997). Instructional technology will continue to play a major role in higher education during the next century. Properly trained and prepared tutors support the distance learning model in a hands-on training environment (Lawton, 1997). Innovative models are proving successful as in the

Studio model: interactive, collaborative, multimedia, and distance learning techniques (Pipes & Wilson, 1996). This model provides a successful cooperative learning experience that integrates technology into all courses while reducing costs. Reed and Woodruff (1995) point out that technology expands the classroom experience; however, it also amplifies poor teaching styles and strategies. To be effective educators, distance learning instructors have to plan more than to just actively engage learners.

Equipment and the Medium Used in Distance Learning

The distance learning equipment improvements are moving toward faster systems with less cost. Bonini (1975) found that media methods have been important components of many training innovations, but effectiveness was moderated by relatively high costs. However, rapid changes in communications technology from communications satellites to sophisticated low-cost home computers and the resulting shifts in cost-effectiveness may shake the very roots of the training profession. The recent growth in computer use and the speed of the processors has been noteworthy. The cost of these ever faster machines continues to go down. The Next Generation Internet (1997) reported that one million server host sites were available on the Internet in 1993. Today there are over 16 million server host sites with one server site being added every second. The National Science Foundation is seeking $300 million in funding over the next three years to increase the Internet speed 1000 times. Today, the major growth is in Integrated Services Digital Network (ISDN) delivery for video teleconferencing (Jacobs, 1996). The next generation Internet II will support Multi point video conference at a fraction of the cost now required for ISDN lines; $100 to install, $75 per month line charge (using three

lines), and $12 per hour to use. Hybrid equipment combinations (Carpenter, Wolfe, Carpenter, Cox & Kohn 1997) provide for user training flexibility. Combination Compact Disk-Read Only Memory (CD-ROM), now read/write capable, or Digital Video Delivery (DVD) are good hybrid additions to Internet or ISDN use.

The future DVD holds 17 gigabytes of data, whereas the present CD-ROM holds only 650 megabytes. The future of the technology looks bright. Newcombe (1997) noted that distance learning usage in government is growing at a double digit pace. Ernesto Villilta, a government director at California's department of water resources stated, "It has been a tremendous productivity tool. Time spent traveling is time now used productively by employees" (p. 1). Roos (1997) interviewed General Hartzog, Commanding General U.S. Army Training and Doctrine Command (TRADOC) who identified National Guard and Reserve units as the real beneficiaries from tomorrow's distance learning concept. In a recent deployment of active duty and Reserve component soldiers serving in the Sinai, distance learning was successfully used. Certain military school classes were offered to meet promotion gate selections. Every soldier was given the opportunity to take personal development college courses, and when the satellite time was available, the soldiers used the network for maintaining contact with their families (1997). Roos (1997) identified General Hartzog as saying, "The real explosion in distance learning will come from a geometric increase in the capabilities of fiber-optic cable networks" (p. 28). The combination of satellite, ISDN, fiber-optic, and asynchronous transfer mode (ATM) networks will meet the immediate demand for information delivery.

Cognition and Distance Learning

There is a prevailing attitude in both the university and industry that suggests America's future prosperity rests upon the education of all our citizens; we no longer have disposable students or workers. In that light the workforce education TRIAD model, education, skills, and training (Cordon, 1997) is empowering work teams and integrating complex thinking into daily activities. Webber (1993) pointed out that people determine the success of a company and that knowledge resides in people. Ritchie and Newby (1989) found a direct relationship on the effects of student performance, attitude, and interaction with classroom lecture or live televised instruction. Linn (1996), as well as Pipes and Wilson (1996), point out that distance learning courses transform passive students into autonomous learners, and the students rate the distance learning higher in satisfaction over large traditional courses. Fusilero & Newcombe (1998) interviewed four governors: Terry Branstad from Iowa, John Engler from Michigan, Tom Ridge from Pennsylvania, and Pete Wilson from California. They all agreed that the virtual university/training has a major role to play in enhancing education and training opportunities. More importantly, distance learning technology provides increased access for more people to education and training while maintaining learning standards.

Distance Learning Versus Traditional Education

Payne (1997) found in his meta-analyses study that, "The results from the review show that students in instructional television learn as much or, in some cases, more than their counterparts in traditional face-to-face courses" (p. 1). Pipes and Wilson (1996)

conclude that just-in-time training using the appropriate technology provides the most effective training. As has been pointed out by many, including Reed and Woodruff (1995), technology only amplifies teaching effectiveness, good or bad. Robinson, Spencer, and Neal (1996) suggested that distance learning for medical training was most effective when qualified tutors complemented the training. One of the features that make distance learning an attractive option for training and educating managers is on site delivery. Local site delivery equates to more employees/soldiers available to attend training and the costs for out of state travel and per diem are reduced dramatically.

Deborah Roche Lee (1998), Assistant Secretary of Defense for Reserve Affairs, stated at the TeleCon East's (The 8th Annual International Distance Learning Conference) General Session, April 15, 1998, that the Department of Defense is moving away from the teacher centered traditional school house to the student centered school without walls. Moreover, Advanced Distributive Learning (distance learning) started with $35 million in funding in 1997 to start a National Guard Bureau distance learning network. Distance learning is ideal for National Guard and Reserve training because it is (1) time critical (only 40 days are typical for a training year); (2) distance related (time and travel dollars are saved when training is within 50 miles of soldiers' homes); (3) readiness (improves soldier's and unit's ability to do their mission); (4) Mission use (the "Re" has been taken out of Reserve and has left "serve"); the Reserve has come from the "last used" to the "first used" and serve alongside active duty units in time of need. The Reserves have become a vital part of our nation's total force structure. Using Distance learning as a tool, leveraging training, joint use, partnerships, and collaborations are all part of the Advanced Distance Learning Initiative.

Cooperative Activities in Interactive Distance Learning

In addition to Internet access, some of the higher education institutions, high schools, military, and industry are becoming partners. As partners in education, companies have benefitted from the positive community and school exposure, and the institutions have benefitted from the monetary assistance provided by the companies.

The number of colleges offering online courses further illustrates the popularity of distance learning today. Online courses allow the students to fit classes into their busy schedules as well as saving on travel time and expenses. Peters (1997) maintains that the government also uses distance learning for the ease of instruction and availability of courses to personnel. For example, since the mid-1980s the U.S. Army has gradually shifted from large group, centralized training experiences to small group instruction using distance learning (Roos, 1996). This shift came in part as a result of reduced training/education budgets and reduced time available for attending training. Travel and time away from the job and family are being reduced by distance learning which contributes to cost effective training and improved soldier morale. A very key point about distance learning is that more people are participating in the training who could not otherwise participate (Newcombe, 1997).

Jelisavcic (1998) in the Executive Summary section of the Distance Learning Planning Information Paper identified changing training roles to include shared use:

> Restructuring the Total Army will bring many mission changes to units of the National Guard. Each change in force structure, especially the pending Division restructuring, will precipitate a major change in the National Guard. While regarded as necessary, these evolutionary changes place a heavy burden on retraining soldiers from one military occupational specialty to another. Budget constraints and fiscal responsibility mean that the ARNG cannot afford such

> retraining through the traditional practice of sending soldiers to far away classrooms. Distance learning promises a significant opportunity the Guard can use to continue to maintain required readiness. The information technology infrastructure required to support such training in itself can be very expensive, but the concept of shared usage offers the promising opportunity to offset costs with commensurate benefit to local communities for education enhancement and economic development. (p. 1)

Company community support activities and cooperative ventures in distance learning are taking place on a routine basis. Shared equipment use reduces costs and benefits all users. Ameritech Education Network (1994) invested $150 million on a distance learning network with advanced communications. The company made the system available to all schools in Indiana. *The New York Times* (October, 1996) reported that MCI Telecommunications Corporation formed an alliance with Sylvan Learning, then invested $10 million in this new company which is called Caliber Learning Network. This new company will deliver university courses and corporate training to adults at over 50 interactive video classroom centers. Public access to catalog and remote on-line database searching at public libraries allows the distance learner to participate in research and on-line courses that just a few years ago was not possible (Nrenaissance Committee, 1994).

Evaluating Distance Learning

As the world continues on a course of rapid change, business, industry, and government alike will find it increasingly difficult to keep their productive workforces competitive and current. Classrooms are generally ill equipped to keep pace with the rate of change and skill-obsolescence projected for tomorrow. Further, "the imposition of time, distance, and other constraints on workers create a strong demand for more efficient

and expedient ways to distribute necessary information" (Chute, Hancock, & Balthazar, 1997, p. 1). Companies are searching for and implementing a just-in-time approach, that will enable the delivery of critical information where and when it is needed, in the customer expected quantity, quality, and in a cost-effective manner. According to Loren Parker (personal communication, October 13, 1997) Founder and President of Parker Training Institute, Stillwater, Oklahoma, distance learning delivery is a viable, effective, and efficient training medium for education and training. Case study methodology (Collis & Vingerhoets, 1996) identified key focus points for the evaluation of interest to all of the major stakeholders in the distance learning classroom. Jackson (1990) provided methods and strategies in evaluating learning. Collaborative learning integrating media-richness theory and activity theory (Lewis & Heern, 1997) found that selecting media for a particular task provides the best results. Watson and Sasse (1996) found that by evaluating learning on task specific quality assessment, the low-cost multimedia conference systems were cost effective. Hodgson quoted in *Personnel Management* (March 1985), "Stress the importance of some kind of face to face contact at some time during a distance learning course, either with a tutor, or a study group, as it brings a humanizing and socializing aspect to the learning process" (p. 35). This has been the theme throughout the literature and was very instrumental in the success of this hands-on distance learning 67T MOS training course.

Cost of Distance Learning

Many major corporations such as Anderson Accounting Consultants, Ford Motor Company, and Ernst and Young save millions of dollars each year using distance learning to train employees more time- and cost-effectively than with conventional teaching methods. Primary costs of distance learning training are in design and production, not replication and delivery; therefore, cost per trainee was reduced as the number of trainees rises (Miller, 1995). Additionally, the emergence of broadcast quality satellite networks at reasonable cost has made the distance learning strategy an attractive option to traditional classroom format. By offering training at the workplace, companies can eliminate expensive travel time and travel costs. A prime example was Anderson's distance learning delivered training program. It cost about $2 million to develop and resulted in savings of more than $4 million a year in transportation and lodging expenses alone (Rao, 1995). Ford's interactive learning system as described by Morri (1997) reaches all levels of employees from mechanics to managers within the corporate structure. Likewise, at Ernst and Young, a satellite network provides tremendous opportunities to educate both internal staff and the firm's clients (Brands, 1997). Carnevale and Schultz (1990) stressed accounting for training as essential to success and even survival in the business climate. In the current globally competitive environment, distance learning provides the ability to deliver more training to more people with higher impact in a timely and cost-effective way. Keates (1997) identified travel usage taken from a survey of 400 corporate travel managers between 1996 and 1997. The surveyed companies (1) cut the number of employees traveling by 50%, (2) increased the use of

video-conference by 46%, and (3) increased the use of tele-conference 35.5% (Keates, 1997). Wisher, Priest and Glover (1997) found that ARNG students in an audio teletraining distance learning unit clerk course had not only significantly higher performance results than those of the resident course, but the cost for delivering the distance learning course saved the Army National Guard travel costs of over $290,000 per year for this course alone. Jackson (1998) quoted Lieutenant Colonel Philip Vermeer, the National Guard Bureau Technical Division chief, in an article about renting access to a nationwide distance-learning network:

> We are in the process of switching over from the Reserve Component Automation System and moving everything to the ATM backbone. Plans call for wiring 112 classrooms by March and 600 more by 2000, putting all reservists within a 60-minute drive of an interactive distance-learning center. We plan to give all agencies access to the backbone that connects all 54 states and territories. The network pays for itself and offers the guard better training. (p. 41)

The use of distance learning is clearly increasing. It provides organizations a cost effective, time saving alternative to traditional training.

The cost effectiveness of technology use and distance learning delivery in the military has been previously documented (Orlansky & String, 1979; Wisher, Priest & Glover, 1997). Most reported technology-based training delivered synchronously or asynchronously provided no difference in learning or overall pass rates. There is general recognition (Fusilero & Newcombe, 1998) that distance learning increases availability for more participants. Cost savings using distance learning is primarily a function of reduced distance learning equipment outlay costs factored against increasing travel costs required to attend resident courses. Once the equipment and course delivery are in place for distance learning, the delivery cost per student is reduced as student numbers increase

over time to offset this one time equipment cost, whereas travel costs to resident courses remain fixed per student over time.

Grum, et al. (1995) identified a study conducted by the Army Science Board that recommended that the Army develop and acquire technology for training and education in a move toward distance learning technology in the classroom. Deborah Roche Lee, Assistant Secretary of Defense for Reserve Affairs, at the International Distance Learning Conference general session, April 15, 1998, commented that training policies are changing. Reduced training budgets are requiring innovative ways to stretch training resources. Distance learning delivered training costs are now being compared against resident course expenses (to include travel) before training requests are approved. The NGB's classroom distance learning equipment fielding plan is under way to field 712 distance learning classrooms across the National Guard by the year 2000. This clearly supports the trend toward distance learning in military education and training.

Summary

Continuous advancement and upgrading of hardware, networking, and multimedia software, as well as reduction in cost and improvements in reliability of technology, warrants continued research in distance learning as applied to the training of adult learners. As future education and training endeavors become increasingly knowledge based, the amount of information available to individuals will continue to accelerate. Rapid change will be the rule, not the exception. Inter- and intra-organizational partnerships, resource sharing and networking will improve information access and reduce delivery costs. Education and training methods have to adapt with the accelerated

change of the marketplace. Distance learning used as a tool can provide access to many different types of resources, including professional and educational training opportunities. Experts working at other locations, instructional materials, and other resources will be easily available using distance learning. In the decades ahead, the accumulated learning of all employees and application of that learning will be the organization's most valuable asset. Organizations will have to provide just-in-time and just-enough training in a convenient, consistent, and cost-effective manner to remain competitive in the global marketplace. Distance learning can help companies maximize the value of learning and foster success for everyone by providing the necessary knowledge and training. With increasing technological advances and globalization, distance learning is a viable training alternative for military, government, corporations, educational institutions, and the medical community. Distance learning has impacted and will continue to impact the total training program in many positive ways.

CHAPTER III

METHODOLOGY

Chapter Overview

The participants included 17 soldiers from the Kansas Army National Guard and Iowa Army National Guard units enrolled in the distance learning 67T-20 level MOS producing course. Central to this "pilot" program were the utilization of assistance instructors, aircraft, special maintenance tools, and facilities that were provided by the two participating National Guard units. Resident course requirements were maintained to include the use of the same course instructional materials, exams, subject sequence, and total number of delivered hours. USAALS resident instructors taught the course at a distance over fiber optic and ISDN phone lines using interactive video teleconferencing equipment/software. A wireless portable remote camera with separate wireless audio microphone was used in the aircraft hangar location (400 feet line of sight from the classroom), allowing the resident instructors at Fort Eustis to monitor and interact while the students were performing hands-on practical exercises. All phases of the training were actively participated in and/or monitored by the resident primary instructors at USAALS, Virginia. All exam results from the distance learning students were collected and summarized by USAALS.

Procedure

The 67T-20 resident course plan of instruction to include procedures, exams, time of instruction (310 hours), instructor and aircraft to student ratios (1:4 and 1:6 respectively) were used in the distance learning delivered class. The same standards for all aspects of the course were enforced in the distance learning class. The United States Army Aviation Logistics School (USAALS) primary instructor, Sergeant First Class Gregory J. Schade, met with the National Guard assistant instructors at Ft. Eustis, Virginia for a week long pre-training conference. The entire plan of instruction, lesson plans, exams, course curriculum review, training materials distribution, coordination of schedules, and contingency planning were reviewed at this pre-training conference. The course schedule included seven inactive duty training weekends where the instruction was given using the two-way interactive audio and visual distance learning equipment (VTT). Part of these two day periods of instruction were dedicated to hands-on training. There were two 15 day resident training periods conducted at Salina, Kansas, where the USAALS instructors taught the course face to face with the Iowa and Kansas National Guard students. The schedule of instruction, to include the subject category, scheduled delivery, and hours of instruction for each subject lessons was outlined in a schedule matrix (see Appendix C). Iowa and Kansas Army National Guard units provided the assistant instructors that attended and helped teach at all training sessions. The assistant instructors had to be military platform instructor trained and VTT qualified in addition to having 18 months experience as a qualified 67T crewchief. The equipment, special tools, and aircraft required to meet training standards were provided by the Iowa and Kansas

National Guard units. The Kansas Army National Guard hosted the two annual training periods at the Aviation Support Facility number two, located at Salina Kansas. The support facility provided aircraft, tools, classroom and hangar space for the training class. The Regional Training Institute, located at Salina Kansas, provided billeting and food service at a reasonable cost. The VTT training periods utilized phone bridge conductivity through a net control center in Virginia, a service provided by the National Guard Bureau.

Objective performance data were collected from written exams covering five major topic areas: (1) Landing Gear, (2) Powerplant, (3) Main Rotor, (4) Elect/Fuel/ESSS, (5) Hydraulics. The exam scores for the distance learning and resident classes were used to perform a t-test for means using two sample assuming unequal variances. Each of the five subject areas tested were compared by subject area using the t-test process. Each t-test results were compared to the null hypothesis. A cost analysis assessment was performed by comparing the costs to attend the distance learning delivered class to include travel and per diem expended by the Kansas Army National Guard to the amount it would have cost to attend the resident course at USAALS, Ft. Eustis, Virginia. The additional expense for ISDN line installation, assistant instructor's salary and travel, and coordinator's salary and travel were factored into the distance learning cost.

The following facts were used in the distance learning class cost calculations:

1. Nine soldiers from the Kansas Army National Guard (KSARNG) participated in (completed) the training.

2. Assistant instructors were required for the distance learning course at a 1:4 instructor/student ratio.

3. Soldiers' inactive duty training (IDT) and Annual Training pay was not an additional expense to the KSARNG.

4. Primary instructors' pay, per diem, and travel expense when attending the AT phases in Kansas were not charged to the KSARNG.

5. Video Teletraining (VTT) equipment was provided by the NGB distance learning equipment fielding initiative and was not charged to the KSARNG.

6. Soldiers attended seven IDT weekend VTT sessions and two AT sessions in resident at Salina, Kansas, for a total of 44 days training (the difference between 59 days resident and 44 days distance learning were the nontraining weekends in the resident course).

7. Assistant instructors were paid a total of nine additional pay periods for coordination and equipment preparation in support of the course.

8. Kansas Regional Training Institute (KRTI) lodging costs for the three assistant instructors for two AT periods at Salina, Kansas, were included.

9. POC mileage from home of record (HOR) to Salina, Kansas, and return for two annual training (AT) periods was offset by use of a government van costing $145.

10. Fourteen total additional ADSW days were paid to Command Sergeant Major Al Mueting and Chief Warrant Officer Ken Barnard course coordinators.

11. Integrated Service Digital Network (ISDN) phone line installation fee: $400.

12. Lodging costs at Kansas Regional Training Institute, Salina, were $10 per night for each of the nine students staying a total of 35 nights.

13. The two AT periods were in two consecutive but different fiscal year (FY) training periods (June 1997 and October 1997).

The following facts were used in the cost avoidance calculations if the KSARNG soldiers had attended the 67T-20 resident course:

1. Soldiers attending the resident course would require an additional 59 days of active duty for special work (ADSW) pay.

2. Soldiers would complete all inactive duty training (IDT) and active duty training (ADT) for annual training (AT) with their units.

3. Nonchargeable quarters would not be available at the resident school location because of current troop density.

4. Privately owned conveyance (POC) would be authorized to travel between Topeka, Kansas, and Norfolk, Virginia, because of the off-post housing transportation requirement.

Population

The total population size of 17 distance learning students was used at the beginning of the 67T-20 MOS distance learning course: 11 Kansas Army National Guard soldiers; six Iowa Army National Guard soldiers. There were two Kansas Army National Guard losses in the course: one for academic reasons, the other for a new employer requiring the student to move out of the state. The total number of students completing the course was 15. The resident comparison class at USAALS had a total population of 33 with no losses.

Course Length

The 67T-20 MOS distance learning course started April 14, 1997, and ended with the course completion and graduation on November 1, 1997, at Salina, Kansas. Six students graduated from the Iowa Army National Guard and nine students graduated from the Kansas Army National Guard. The resident class of 33 started September 5, 1997, and ended with the course completion and graduation on November 15, 1997, at USAALS, Fort Eustis, Virginia. There was some concern that the nine month length of the distance learning course, compared to the ten weeks resident course, might have an influence on long-term learning retention. The end of course comprehensive exam developed by USAALS for course retention purposes was given to the distance learning class but did not impact the students' graduation requirements.

Methods Used

The research was conducted in Kansas, Iowa, and Virginia. There were 11 students in the first 67T-20 MOS distance learning class in Kansas, six students in Iowa, and 33 students attending the 67T-20 level course at Ft. Eustis, Virginia. This method of evaluation used the total population in the Army National Guard classes, and one randomly selected 67T-20 class at USAALS, Virginia. Goal based evaluations were administered throughout the progression of the course. These objective exams were the same as those given at the resident course at USAALS. In addition to these exams, hands-on tagging exams on the helicopter were administered in both courses. The results of the written objective exams given to the students in the resident course at USAALS

were compared to those at the distance learning sites in Kansas and Iowa. These exams were administered with care under the supervision of the primary and/or assistant instructors and stood little to no chance of compromised standards. The five course examination scores were collected without reference to student name, compiled and averaged by category of subject area tested. The same exams were administered to both distance learning and resident students. The exams were objectively graded by answer keys provided by USAALS. A t-test using unequal variance was performed (Microsoft Excel data analysis tools for t-test: Two-Sample using Unequal Variance). The five test scores means from the two class groups, distance and resident were used.

The cost analysis figures were based on actual costs incurred in conducting the 67T distance delivered course. The resident course costs were determined by projecting travel, per diem, and pay rates for the same Kansas Army National Guard soldiers to attend the resident course. In comparing costs between the two training delivery methods, distance learning and resident, a cost avoidance approach was used. Cost avoidance and actual cost comparisons were confined to the Kansas Army National Guard. Training cost projection estimates to other states and nationwide could be made from this data.

Data Collected

Data gathering included using the programmed objective exam results provided by USAALS from both distance learning and resident classes. The data consisted of five subject area exam score results: (1) Fuel/Electrical/ESSS, (2) Landing Gear, (3) Powerplant, (4) Rotor System, (5) Hydraulics.

Analysis of Data

A t-test was performed on the two groups' overall mean scores taken from the five different subject exams mean scores to determine if there was a significant difference between the resident and distance learning classes in overall average exam results. A t-test was performed on each of the five subject exam mean results for subject performance comparison. Costs to attend the distance learning delivered class versus resident class were compared on a cost avoidance perspective.

CHAPTER IV

FINDINGS

Standards

The resident course standards were maintained in the distance learning delivered class. The distance learning instruction delivery and hours of instruction meet the 310 hours of resident instruction. Exams were given and graded to standard. A soldier in the Kansas class was dismissed for academic reasons because the minimum exam score standard was not achieved by the student. The distance learning class had a mean score of 93% compared to the resident class mean of 98%. Both means were substantially above the minimum U. S. Army standard of 70%. Fifteen soldiers completed the distance learning course and were awarded the 67T MOS. A t-test (two-sample assuming unequal variances) was performed on the two class mean scores. A statistically significant difference was found: P(T<=t) two tail 0.000107, therefore, the mean of the means null hypothesis was rejected.

Average Course Completion

The distance learning class had a mean score of 93% and the resident class had a mean score of 98% (see Tables I, II, and III). Both classes scored well above the minimum mean score of 70% to meet U.S. Army standards and pass the course.

TABLE I

EXAM SCORES FOR THE DISTANCE LEARNING CLASS

Fuel/ Electric	Landing Gear	Powerplant	Rotor Systems	Hydraulic	Average	Student
98	80	80	90	94	88.4	1
98	100	84	100	96	95.6	2
100	100	94	92	100	97.2	3
100	100	86	98	100	96.8	4
100	84	92	86	94	91.2	5
100	96	94	100	86	95.2	6
98	100	84	96	96	94.8	7
98	88	92	98	90	93.2	8
98	92	86	94	98	93.6	9
98	84	82	98	94	91.2	10
98	96	80	90	96	92.0	11
98	84	96	100	92	94.0	12
98	92	98	100	96	96.8	13
96	80	92	80	94	88.4	14
90	88	70	88	94	86.0	15
—	—	—	—	—	—	—
97.9	90.9	87.3	94.0	94.7	92.6	Average
100	100	98	100	100	97.2	High
90	80	70	80	86	86	Low
10	20	28	20	14	11.2	Range

TABLE II

EXAM SCORES FOR THE RESIDENT CLASS

Fuel/ Electric	Landing Gear	Powerplant	Rotor Systems	Hydraulic	Average	Student
100	100	100	100	100	100.0	1
96	100	98	100	100	98.8	2
100	100	94	96	98	97.6	3
98	92	88	88	98	92.8	4
90	92	94	84	88	89.6	5
100	100	98	100	100	99.6	6
98	100	100	100	100	99.6	7
100	96	98	100	100	98.8	8
98	98	98	100	96	98.0	9
98	98	92	100	100	97.6	10
99	100	98	100	100	99.4	11
100	98	100	100	100	99.6	12
99	98	100	100	100	99.4	13
99	98	100	100	100	99.4	14
97	100	98	100	100	99.0	15
94	98	94	100	100	97.2	16
97	98	100	100	100	99.0	17
97	100	98	100	98	98.6	18
100	100	96	100	100	99.2	19
98	98	98	100	98	98.4	20
95	94	98	100	96	96.6	21
93	96	98	100	100	97.4	22
100	92	100	100	100	98.4	23
98	94	100	100	96	97.6	24
100	92	96	100	97	97.0	25

TABLE II (continued)

Fuel/ Electric	Landing Gear	Powerplant	Rotor Systems	Hydraulic	Average	Student
100	92	96	100	100	97.6	26
97	96	96	100	94	96.6	27
98	92	96	96	94	95.2	28
99	92	98	100	100	98.2	29
100	96	98	100	98	98.4	30
97	90	96	100	95	95.6	31
99	86	96	100	96	95.4	32
99	96	92	96	94	95.4	33
98	96.2	97	98.8	98.1	97.6	Average
100	100	100	100	100	100	High
90	86	88	84	88	89.6	Low
10	14	12	16	12	10.4	Range

TABLE III

T-TEST TWO SAMPLE ASSUMING UNEQUAL VARIANCES
MEAN SCORE RESULTS BETWEEN THE DISTANCE
AND RESIDENT CLASSES

	Variable 1	Variable 2
Mean	92.96	97.60606
Variance	11.53829	4.666212
Observations	15	33
Hypothesized Mean Difference	0	
df	19	
t Stat	-4.86874	
P(T<=t) one-tail	5.33E-05	
t Critical one-tail	1.729131	
P(T<=t) two-tail	0.000107	
t Critical two-tail	2.093025	

Individual Subject Areas

Comparing the five individual exam subject areas: (1) Fuel/Electrical/ESSS, (2) Landing Gear, (3) Powerplant, (4) Rotor Systems, (5) Hydraulics (see Tables IV-VIII respectively), only Fuel/Electrical/ESSS (see Table IV) had no statistically significant difference, P(T<=t) two-tail 0.891433.

TABLE IV

T-TEST TWO SAMPLE ASSUMING EQUAL VARIANCES BETWEEN THE DISTANCE LEARNING AND THE RESIDENT CLASS ON THE FUEL/ELECTRICAL/ESSS EXAM

	Variable 1	Variable 2
Mean	97.86667	97.9697
Variance	5.980952	5.280303
Observations	15	33
Pooled Variance	5.493544	
Hypothesized Mean Difference	0	
df	46	
t Stat	-0.14116	
P(T<=t) one-tail	0.444179	
t Critical one-tail	1.678659	
P(T<=t) two-tail	0.888358	
t Critical two-tail	2.012894	

Fuel/Electrical/ESSS

TABLE V

T-TEST TWO SAMPLE ASSUMING UNEQUAL VARIANCES BETWEEN THE DISTANCE LEARNING AND THE RESIDENT CLASS ON THE LANDING GEAR EXAM

	Variable 1	Variable 2
Mean	90.93333	96.18182
Variance	55.92381	13.09091
Observations	15	33
Hypothesized Mean Difference	0	
df	17	
t Stat	-2.58419	
P(T<=t) one-tail	0.00965	
t Critical one-tail	1.739606	
P(T<=t) two-tail	0.0193	
t Critical two-tail	2.109819	

Landing Gear

TABLE VI

T-TEST TWO SAMPLE ASSUMING UNEQUAL VARIANCES BETWEEN THE DISTANCE LEARNING AND THE RESIDENT CLASS ON THE POWERPLANT EXAM

	Variable 1	Variable 2
Mean	87.33333	97.0303
Variance	57.52381	7.780303
Observations	15	33
Hypothesized Mean Difference	0	
df	16	
t Stat	-4.8062	
P(T<=t) one-tail	9.69E-05	
t Critical one-tail	1.745884	
P(T<=t) two-tail	0.000194	
t Critical two-tail	2.119905	

Powerplant

TABLE VII

T-TEST TWO SAMPLE ASSUMING UNEQUAL VARIANCES BETWEEN THE DISTANCE LEARNING AND THE RESIDENT CLASS ON THE ROTOR SYSTEM EXAM

	Variable 1	Variable 2
Mean	94	98.78788
Variance	37.71429	12.48485
Observations	15	33
Hypothesized Mean Difference	0	
df	18	
t Stat	-2.81513	
P(T<=t) one-tail	0.005729	
t Critical one-tail	1.734063	
P(T<=t) two-tail	0.011459	
t Critical two-tail	2.100924	

Rotor system

TABLE VIII

T-TEST TWO SAMPLE ASSUMING UNEQUAL VARIANCES BETWEEN THE DISTANCE LEARNING AND THE RESIDENT CLASS ON THE HYDRAULICS EXAM

	Variable 1	Variable 2
Mean	94.66667	98.06061
Variance	12.95238	7.683712
Observations	15	33
Hypothesized Mean Difference	0	
df	22	
t Stat	-3.2414	
P(T<=t) one-tail	0.001874	
t Critical one-tail	1.717144	
P(T<=t) two-tail	0.003748	
t Critical two-tail	2.073875	

Hydraulics

Comparing Costs

In comparing costs, the distance learning group had lower training costs. The class of nine Kansas Army National Guard distance learning students provided for a course cost avoidance savings of $66,612 for the Kansas Army National Guard ($8262.28 - $861.00 = $7401.28 x 9 = $66,612, see Tables IX and X).

TABLE IX

COSTS TO ATTEND 67T-20 MOS RESIDENT COURSE

	Cost Factors per Soldier	Subtotals
1.	Days average pay $55 x 59 days of training	$3245.00
2.	Travel 1221 miles @$0.33/mile= $403 x 2 (both ways)	$ 806.00
3.	In and around miles (10 miles/day)	$ 194.70
4.	Per diem for 59 days plus 4 days travel @ $25.66	$1616.58
5.	Lodging 58 nights plus 2 nights travel @ $40	$2400.00
	Total	$8262.28

TABLE X

COSTS TO ATTEND THE 67T-20 MOS DISTANCE LEARNING COURSE

	Course Cost Factors per Soldier	Subtotals
1.	Transportation for AT	$ 16.11
2.	Course coordinators pay	$ 183.56
3.	IA pay, lodging, per diem	$ 266.89
4.	Soldier lodging	$ 350.00
5.	ISDN installation	$ 44.00
	Total	$ 861.00

Tables IX and X provide the specific figures in each category used to determine the cost of training for the resident and distant learning courses respectively. Note that the resident course cost was estimated on a per soldier basis and is recognized as a cost avoidance amount to the Kansas Army National training budget. The distance learning cost was determined by using actual cost incurred in delivering the course to the Kansas Army National Guard soldiers. Total costs divided by the number of students attending the class determined the per student cost.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of the study was to evaluate and compare distance learning delivered training that involved hands-on skill performance factors to that of a resident delivered course while maintaining U.S. Army course standards. A secondary objective was to review the cost effectiveness of the distance versus resident learning course. Participants included 11 students from Kansas Army National Guard and six students from Iowa Army National Guard at distance locations of Salina, Kansas, and Boone, Iowa, respectively. There were two students that did not complete the course from Kansas, one for academic reasons, one for a change in civilian employment that required an immediate out of state move, which left a total of 15 participants from the two National Guard states. Participants numbered 33 students from the resident school site in the U.S. Army Aviation Logistic School, Fort Eustis, Virginia. All students completed the training at the resident class. The resident course standards were maintained by using an approved 67T-20 plan of instruction, course objective exams, qualified instructors, course hours of instruction (310), instructor to student (1:4) and equipment to student (1:6) ratios. The distance learning course was delivered on seven weekends via two-way audiovisual equipment and two 15-day Annual Training resident (face to face with the primary

instructors) periods at Salina, Kansas, for a total of nine months. The resident course was conducted over a continuous ten week period. T-tests were used to test a null hypothesis of no significant difference in test mean scores between the distance learning and resident students.

The t-test results showed there was a statistically significant difference between the distance learning and resident groups' scores: P(T<=t) two-tail 0.000107. Perhaps more important, the mean in achievement scores of 93% for the distance learning class and 98% for the resident class was substantially greater than the 70% minimum U.S. Army course passing standard.

The distance learning costs were $861 per student for the KSARNG soldiers. The cost per soldier to attend the resident course would have been $8,262.28. This cost avoidance difference of $7,401 per soldier was primarily due to travel, per diem, and extra days required to attend the resident course.

Discussion of Research Findings

Although a statistically significant difference was found for the mean scores between the distance learning and resident delivered course, it is important to note that both classes achieved mean scores well above the U. S. Army minimum standard. In addition, each guardsman benefitted from the distance learning delivered class by being able to stay at home with his or her family. Avoiding the potential problems associated with obtaining nine consecutive weeks leave from his/her employer is another important factor in favor of distance learning delivery for the guardsman. As mentioned earlier, all students from KSARNG could not take this required time off from their employment.

The distance delivered class provided KSARNG a cost avoidance savings of $7,401 for each of the nine participating soldiers. An added benefit to KSARNG was the utilization of new state billeting and classroom facilities. These benefits help offset the 5% difference between the 93% mean for distance learning versus 98% mean for resident instruction.

All of the distance learning students in this course could not attend training in residence. Therefore, the distance learning delivered course saved 15 experienced soldiers in a critical aviation field. Distance learning allowed home station training which boosted morale. Moreover, family separation problems were minimized. The per student travel and per diem expenses attending the resident course would have been higher than the distance learning expenses. This was primarily due to an avoidance of travel costs and extra days pay for training that was not required for the distance learning group.

Projected potential savings using distance learning delivered 67 MOS courses for the estimated 800 plus 67 MOS soldiers waiting training in the National Guard nation wide would be over $5,921,000.

Discussion of the Hypotheses

The mean of the means Null Hypothesis was rejected, P(T<=t) two-tail 0.000107. There was a statistically significant difference between the resident and distance learning class test scores. The resident and distance learning class mean scores of 98% and 93% respectively were well above the 70% minimum for the successful completion of the course. The resident mean scores were clustered and provided little variance (4.666212), whereas the distance learning class mean scores had more variance (11.53829). The

extended time between course material presentations and the testing of that material may have contributed to this fact of reduced test results and increased score variance for the distance learning students.

Conclusions

The use of distance learning in a hands-on-training course such as 67T-20 MOS exceeded U. S. Army standards and was very cost effective. More importantly, distance learning delivery allowed 15 soldiers the opportunity to be MOS qualified. All of the soldiers attending the course could not have gone to the resident course. A cost avoidance savings of $7,401 per soldier is noteworthy. The cost of delivering the distance learning course was very reasonable at $861 per student (the distance learning equipment was provided). To put the resident costs on an equal comparison (adding the extra 59 ADSW days to the distance learning costs) the distance learning savings of $4,356 per soldier remains impressive. Reduced training budgets and increased training requirements require innovative training initiatives. Soldiers are finding it more difficult to obtain the required consecutive leave days from their employers to attend resident courses. Distance learning used as a tool from a toolbox of training options can help commanders meet their training objectives.

Recommendations

Further study needs to be done on this subject to provide more data using greater numbers of students and increased test areas in the distance learning classes. Ray Jarman, Training specialist at USAALS, developed a comprehension exam for the purpose of

testing the 67T-20 course subject retention. This exam was administered to the distance learning class but was not administered to the resident class because of resident class time constraints. The comparison of comprehension exam scores between the distance learning and resident classes may have provided information that addressed the difference in course length. A follow up study a year after the distance learning and resident classes have graduated would provide insight to any long term performance differences between the two groups.

Implications

Reduced training budgets are moving the military, government, and industry alike toward a cost effective alternative to resident training. Distance learning delivery can meet the same standards as resident delivered training. Course outcomes in learning objectives are achieved in both delivery methods. Distance learning is cost effective. The expansion of technology is effectually reducing distance learning delivery costs. Distance learning will continue to expand because it meets the conditions of just-in-time training at an affordable cost compared to the traditional resident training option that offers very limited student training seats at a very high price. Distance learning received at a local site has many secondary advantages to include limited time away from family and employment. With any "pilot" test program there will be hurdles to clear, and distance learning is no exception. The most important lesson learned is to put the soldiers' needs first and take the initiative to do whatever it takes to make the training successful. With any new technology, familiarity and improvement come with usage and

experience. Distance learning is not new, but the technology is improving to allow new instruction delivery at a reasonable cost to meet the customers' needs.

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APPENDIXES

APPENDIX A

BG SCHULTZ 67T MOS DISTANCE LEARNING BRIEFING

- 67T MOS Distance Learning Course KSARNG Perspective

  CWO Ken Barnard
  COL Dennis Parry

- Purpose

  Maintain standards
  Compare outcomes
  Cost of delivery

- ADVANTAGES

  1. State funding shortfall
  2. Unit readiness
  3. MOS in 18 months or reassign
  4. Increased attendance
  5. Increased utilization of facilities
  6. Reduced travel cost
  7. Cooperative relationships
  8. Unit aircraft use
  9. Assistant instructors
  10. ISDN phone lines
  11. Affordable equipment
  12. Instructor/ student interaction

- PROBLEM AREAS

  1. Non-standardized equipment
  2. NGB oversight
  3. Contractor delivery

- OUTCOMES

  1. Met U.S. Army standards
  2. 93% average exam score
  3. Cost savings

- RECOMMENDATIONS

  1. Standardized equipment
  2. Fund start up costs
  3. Instructor support
  4. Course preparation
  5. Knowledgeable project manager
  6. Strategic planning
  7. Explore use of pre-test modules, CBT
  8. EAATS/ WAATS involvement
  9. Model application to other MOS

- WE BELIEVE IN THE PROCESS

APPENDIX B

ADDITIONAL DISTANCE LEARNING RESOURCES

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APPENDIX C

67T-20/30 COURSE DEVELOPMENT MATRIX

VIDEO TELE-TRAINING (VTT) DEVELOPMENT EFFORT

Dated January 10, 1997

BLOCK/CATEGORY	BROADCAST *DATE	BLOCK HOURS**	SLIDES	LESSON PLAN***
Introduction/ IDT	15 Mar 97	1.0	Comp	Comp
Publications/ IDT	15 Mar 97	8.0	Comp	Comp
Publications/ IDT	16 Mar 97	7.0	Comp	Comp
Construction, Capabilities and Mission Equipment/ IDT ("Flex" Block. See Internal SOP)	12 Apr 97	2.0	Comp	Comp
Electrical System/ IDT ("Flex" Block. See Internal SOP)	12 Apr 97	6.0	80%	Comp
Ground Support/ Acft Handling/ IDT ("Flex" Block. See Internal SOP)	13 Apr 97	8.0		
Landing Gear/ IDT	10, 11 May 97	17.0		Comp
Powerplant & Related Systems/ ADT	31 May 97 thru 14 Jun 97	30.0	Comp	Comp
Main Rotor System/ ADT	Same	32.0	Comp	Comp
Transmission System/ ADT	Same	8.0	Comp	Comp

BLOCK/ CATEGORY*	BROADCAST DATE	BLOCK HOURS**	SLIDES	LESSON PLAN***
Troubleshooting/ ADT (Also: Make-up work/testing & Individual Tutoring)	Same	24.0	Comp	Comp
Fuel System/ ESSS/ Crew Duties/ IDT	28, 29 Jun 97	16.0		
Utility Systems/ IDT	12 Jul 97	8.0		
Electrical System/ IDT (If not "Flexed", begin Hydraulics and Flight Controls)	13 Jul 97	6.0		
Hydraulics & Flight Controls/ IDT	9, 10 Aug 97	16.0		
Hydraulics & Flight Controls/IDT	13, 14 Sep 97	16.0		
Hydraulics & Flight Controls/ADT1	8 Oct 97 Thru 1 Nov 97	12.0		
Tail Rotor/ Powertrain/ ADT (Also: Make-up work/ testing and Individual Tutoring)		32.0	Comp	Comp
Inspections and Unscheduled Maintenance	Same	45.0	Comp	Comp
CE Duties	Same	4.0		Comp
End of Course Practical Exam and AI Course Improvement Workshop	Same	TBD		

* Blocks identified as "ADT" are taught as resident instruction.

** Block examination and critique time not reflected.

*** Slides are being developed directly from the resident UH-60 Transition course. Only one, "Nonrated Crewmember Duties", is being developed specifically for this training effort. The remaining lesson plans (mainly IDT blocks) will require some minor adjustment.

APPENDIX D

INSTITUTIONAL REVIEW BOARD APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 11-25-97 **IRB#:** ED-98-042

Proposal Title: EVALUATING THE EFFECTIVENESS OF A DISTANT LEARNING TRAINING PROGRAM FOR THE UH-60 BLACKHAWK HELICOPTER 20 LEVEL 67T MILITARY OCCUPATION SKILL

Principal Investigator(s): Kenneth E. Wiggins, Kenneth W. Barnard

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Disapproval are as follows:
As the reviewer interpreted the protocol for this study, names and other identifiers are not to be used on any written documents. Therefore, it should not be possible to associate participants with their individual responses.

On the last page of the proposal, in the "Researcher" section, mention is made of video equipment. Will there be video taping of the individuals in the distance education mode? If so, there should be some procedures specified as to how these responses are to be handled and what protections are to be provided for those being video-taped.

If only unidentifiable written materials are to be examined, the study should be allowed to proceed under an "Exempt" status.

Signature: John H. Wyckoff

Date: December 1, 1997

Chair of Institutional Review Board
cc: Kenneth W. Barnard

VITA

Kenneth W. Barnard

Candidate for the Degree of

Doctor of Education

Thesis: EVALUATING THE EFFECTIVENESS OF A DISTANCE LEARNING TRAINING COURSE FOR THE UH-60 BLACKHAWK HELICOPTER 67T-20 LEVEL MILITARY OCCUPATIONAL SPECIALTY

Major Field: Applied Educational Studies

Biographical:

Education: Graduated from Riverside High School, Riverside, California, May 1965; received Associate of Arts degree in Liberal Arts from Riverside City College, Riverside, California, May 1967. Received Associate of Technology degree in Aviation Maintenance from Kansas Technical Institute, Salina, Kansas, December 1977; Bachelor of Science degree in Adult Education from Kansas State University, Manhattan, Kansas, May 1977; and Master of Science degree with a major in Teacher Technical Education at Pittsburg State University, Pittsburg, Kansas, May 1981. Completed the requirements for the Doctor of Education degree in Applied Educational Studies at Oklahoma State University in December, 1998.

Experience: Thirty years in the U.S. Army and Kansas Army National Guard. Rank included E-1 through Lieutenant Colonel, assignments included helicopter pilot, several company commands and an aviation battalion command. Served as an aviation faculty member and aviation department head for 20 years at Kansas Technical Institute, Kansas College of Technology and Kansas State University. Current Federal Aviation Administration certificates include Airline Transport Pilot: Single and Multi-engine Land; Commercial: Helicopter, Certified Flight Instructor: Airplane, Single and Multi-engine Land, Helicopter, Instrument; Airframe and Powerplant Mechanic. Received the Governor's Aviation Honor award in 1995. Current assignment in the KSARNG is POC for distance learning.

Professional Memberships: University Aviation Association, Professional Aviation Maintenance Association, American Bonanza Society, Aircraft Owners & Pilot Association, Experimental Aircraft Association, National Guard Association of Kansas and United States.