DELIVERY SYSTEMS FOR MAINTENANCE TRAINING FOR THE UNITED STATES ARMY FOR THE 21ST CENTURY

by

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ABSTRACT

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The thesis paper on Delivery Systems for Training for the U.S. Army looked at various areas of delivery systems from the characteristics of the traditional classroom, web-based training, self-paced delivery methods, computer-based instruction (CBI), and video conferencing, which is often called Distance Education. It addressed the future use of delivery systems in Army Training.

The Army has standards of training set by the Ordnance Center and School for Maintenance Training. The Army is in the process of updating the new training methods of maintenance training that will be implemented within the next year in the U.S. Army. The new Army Training System (TATS) courseware will enable all Maintenance

Training Facilities to prepare our students and soldiers for the 21st century for maintaining the U.S. Army's equipment.

The Army School System (TASS) is a composite school system comprised of the Active Component (AC), Army Reserve National Guard (ARNG) and United States Army Reserve (USAR) institutional training systems. TASS, through the Army's training proponents, provides standard training courses to America's Army, focusing on three main points of effort—standards, efficiencies, and resources.

The Army Training System (TATS) courseware is designed to train the same Military Occupational Specialty (MOS), Area Of Concentration (AOC), skill level or Additional Skill Identifier (ASI), Language Identifier Code (LIC), Skill Qualification Identifier (SQI), and Skill Identifier (SI) within the Army. The course ensures standardization by training all critical tasks to task performance standard. It may be trained at different sites and may involve use of different media/methods to train the various phases/modules/lessons. The courseware is a requirements document that provides a general description of The Army Training System course content, duration of instruction, and methods of instruction and media. It also lists critical tasks taught and resources required to conduct peacetime and mobilization training (United States Army Training and Doctrine Command, 26 May 2000).

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CHAPTER 1

Introduction

It is essential to know how well a person will perform their job in the field. It will be imperative that the best training possible is offered to allow them to accomplish their mission of providing maintenance support. We must provide the students with knowledge and tools to be successful in the 21st Century. The Army is people. Soldiers—not equipment—are the centerpieces of our formation (United States Army Homepage, 2002). A Total Force is to be comprised of quality soldiers and civilians with the following values:

- A value-based organization
- An integrated part of the Joint Team
- Equipment with the most modern weapons and equipment the country can provide
- Able to respond to our nation's needs
- Changing to meet challenges of today…tomorrow…and the 21st Century

The Maintenance XXI training concept projects that future equipment will become so complex that mechanics and technicians will require extensive technical training or a college-equivalent education to maintain weapon systems. Maintaining skill proficiency will become increasingly more difficult. There is no single template for solving the training problem. The primary source of future training technicians will be junior colleges and technical schools where soldiers are grounded in physics, electronics, and basic mechanical skills (United States Army Combined Arms Support Command, 30 April 1997).

Army schools will familiarize recruits on Army-unique weapon systems and automated maintenance management tools. The military job classification is identified as Military Occupational Specialty (MOS) that supports current needs of the army. Today's U.S. Army has 21 maintenance MOSs that identify a specific maintenance function for maintaining and supporting the army's equipment (United States Army Publishing Agency Distribution Operations Facility, 31 March 1999).

The Army XXI maintenance unit, directly supporting a given customer, will diagnose faults and replace faulty components. These units will be manned with multicapable mechanics capable of performing what is known in the current maintenance system as a unit (organizational) direct support and general support capability.

Statement of the Problem

The statement of the problem is to develop a training program for maintenance instruction for soldiers in the United States Army for the 21st Century. It must first be determined what the current and future requirements will be needed to support the maintenance training. The second issue is to develop a training program that will provide all the necessary instruction for the soldier to be proficient in their Military Occupational Specialty (MOS). One must also look at cross training the soldier in other maintenance areas for them to be more proficient while supporting the mission and satisfying the customer. In the near future MOSs will be consolidated, making it imperative that the soldier receives cross training to meet the challenge.

Objectives of the Study

The primary objectives of the research problem are:

1. To review the training program used by the Army for maintenance personnel.

2. To describe the various delivery systems for training.
3. To review the Army's mission for maintenance personnel.
4. Provide instructors with recommended formats to instruct for training standards developed and utilized for the United States Army.

Assumptions of the Study

Some assumptions are made for the research study, including:

1. The student's research of the problem will have a positive approach for developing/utilizing the delivery system.
2. The delivery system for maintenance training would be accepted by both the instructor and the students as an additional tool for evaluating the training.

Definitions of Terms

The following definitions and terms are used in this study:

Classroom XXI – Classroom XXI is defined as the training environment in which the soldier of the 21st Century will train. The environment is built by leveraging information age technology to gain training efficiencies while maximizing training effectiveness (United States Army Training and Doctrine Command, 9 March 1999). Success of the Classroom XXI environment depends not only on the success of the Remaining Warrior XXI initiatives, but also technology modernization of the training institution itself (United States Army Combined Arms Support Command, 30 April 1997).

Computer-Based Training (CBT) – Training that is delivered through the medium of the computer. It is usually interactive and individualized in design (Barron & Orwig, 1995).

Distance Learning (DL) – The application of multiple means and techniques to deliver standardized training (individual, collective, self-development) to soldiers and units at the

right place and time. Distance Learning may involve both synchronous and asynchronous student-instructor interaction. It may also involve self-paced instruction without the benefit of access to an instructor (United States Army Training and Doctrine Command, 9 March 1999).

Family of Simulations (FAMSIM) – The general term for interactive simulations, both computer-assisted and fully computerized, through which command and staff elements are trained to perform their wartime mission-essential task. The U.S. Army FAMSIM Action Plan outlines the Army's strategy for developing, fielding, and managing computer-based training simulations for improving the battle command of total Army forces (United States Army Training and Doctrine Command, 9 March 1999).

Interactive Courseware (ICW) - The Department of Defense accepted term for Computer-Based Instruction. The computer-controlled courseware that relies on trainee input to determine the pace, sequence, and content of training delivery using more than one type of medium to convey the content of instruction (United States Army Training and Doctrine Command, 9 March 1999).

Computer-Based Instruction (CBI) - A means of delivery, by which a computer is used to enhance, deliver, develop, or manage instruction. CBI usually refers to course materials presented or controlled by a computer and which use multiple requirements for student responses as a primary means of facilitating mastery of a skill or task (United States Army Training and Doctrine Command, 9 March 1999). Subsets of ICW are:

Computer-Assisted Instruction (CAI) – A means of delivery by which a computer is used to actually present the instruction. There must be an interaction between the student and the computer (Reynolds, 1988).

Computer-Managed Instruction (CMI) - Instruction is managed by computer including registration, pre-testing, diagnostics counseling, progress testing, post–testing, and disenrollment (Reynolds, 1988).

Computer-Supported Instruction (CSI) - Computers used to develop or enhance classroom training (Reynolds, 1988).

Multimedia - More than one presentation medium. In training, the use of more than one medium to convey the context of instruction. Media available for use may include, but need not be limited to, text, programmed instruction, audiotapes, videotapes, slides, films, television, and computers. Multimedia is also an industry term used to define both presentation and training that is delivered via a multimedia workstation/personal computer. It uses text, graphics, digital audio, animation, and up to full motion digital video. Multimedia is delivered via hard disk, floppy disk, or CD-ROM (United States Army Training and Doctrine Command, 9 March 1999).

Electronic Technical Manuals (ETMs) - The U.S. Army is replacing the current hard copy publication manual with the ETMs soft copy manual. The same information will be found in both copies. The ETMs will utilize the CD-ROM disk as its storage space. Some of the justifications for converting to ETMs system are that they are more portable, take up less space than bulky manuals, and updating changes to the manual should be more cost effective and provided in a timely manner (United States Army Publications, 2002).

Summary

In this chapter, the researcher provided the essential information that can lead the reader to understand the purpose of the research study. The study includes: the statement of the problem, objectives of the study, review of the literature and a brief description of

the methodology. The problem statement identifies a need to develop a training program of instruction on development and implication of delivery system.

CHAPTER 2

Review of Literature

The purpose of this study is to review the current training maintenance delivery systems used by the Army to instruct maintenance soldiers in the United States Army for the 21st Century. One must first be able to determine/state *The Army's Vision* and be able to determine the current standard for training

The 21st Century Army will change the way its soldiers, leaders, units, and civilian employees train and obtain education. The Army will reengineer individual and collective training to support units to achieve readiness in battle-focused mission/essential tasks using information-age technology. The transformation will be assisted by the Department of Defense (DOD) high-level architecture (HLA), training aids, devices, simulators, and simulations. TASS—using standard terrain, threat, and icons databases embedded in material systems, synthetic environments, mission rehearsal capabilities, and distance learning—will revolutionize the Army's individual and collective training (Headquarters Department of the Army, 20 February 1997).

Philosophy and Goals (Purpose)

The philosophy and goals for developing and instructing maintenance training for soldiers had been in development during the 20th Century. The maintenance training material has a main goal of common sense training. That is a new approach for soldiers.

Identifying and Implementing the Maintenance Training Plan

Both the Ordnance Vision and Maintenance XXI concepts envision the need to establish an overreaching force sustainment command responsible for all elements of logistical and EOD support to the nation's military and civil agencies (United States

Army Combined Arms Support Command (2002). The ultimate design of the force sustainment command is evolving and may not be implemented by 2005.

The Maintenance XXI training concept projects the future equipment will become so complex that mechanics and technicians will require extensive training or a college equivalent education to maintain the weapons system. Keeping soldiers in the Army training base at entry level for an extended time is cost-prohibitive, increases the time required for mobilization, and is detrimental to reserve component training. Maintaining skill proficiency will become increasingly more difficult. There is no single template for solving the training problem.

The primary source of future training technicians will be junior colleges and technical schools where soldiers are grounded in physics, electronics, and basic mechanical skills. The Army schools will familiarize recruits on Army-unique weapon systems and automated maintenance management tools.

The Army is looking at various programs that have been successful, such as the National Automotive Technician Education Foundation (NATEF). Under the Automotive Service Excellence (ASE) direction, it has established a validated list of tasks that an automotive technician should be able to satisfactorily perform (National Automotive Technician Education Foundation, 2002). According to NATEF, "An essential element of any curriculum or training program is a validated task list. Automotive instructors need a well-developed task list that serves as a solid base for course of study outlines and facilitates communication and articulation of their training programs with other instruction in the region." Based upon these tasks, Megatech Corporation has developed competency-based training programs for automotive technology. In cooperation with the

Snap-On Corporation, we will now be able to provide a turnkey service (Snap-on-Corporation, 2001). Automotive manufacturers today use a similar system in junior and community colleges where they are sanctioned and support the individual school training curriculum.

Following graduation the mechanic or machinist works in a local automobile dealership. Mechanics needing additional updated training due to the changes in technology will attend specialized courses lasting from two days to two weeks.

Some of the benefits in using coursework at community colleges or technical schools include:

a. Operational and sustainment costs shifted from the Army institutions to the private sector.
b. Graduating students meet the National Industry Standard.
c. Department of Defense funds support the country's educational system and industrial base as well as the defense sector.
d. The Army provides resident training on an area basis, supporting the Reserve, National Guard, and local posts, camps and stations thereby reducing temporary duty costs.
e. New Maintenance XXI training strategies include using new organization modules/cellular teams to serve as training bases to mature mechanics and technicians.
f. Finally, the current training concept that personnel must go to an Army school as the primary training choice versus the schools going to the field will be challenged.

Future school trainers will visit individual units and remain there for prolonged periods, and train by helping personnel perform daily maintenance tasks.

Identifying the Plan for Implementing the Maintenance Training

The soldiers have been presently receiving training in their own military occupation specialty (MOS). The maintenance training institutions for the U.S. Army are divided into Active Duty Schools and Regional Training Site - Maintenance schools.

The active duty school site is Aberdeen-Proving Grounds, Maryland, the home of Ordnance Center and School where formal maintenance for training is conducted for the U.S. Army. A soldier would receive their advance individual training (ADT) at the Ordnance Center and School. The Ordnance Center and School is also a development and proving grounds for various training concepts and maintenance theories.

The Ordnance Center and School also offers all the MOSs for maintenance currently available in the U.S. Army. A soldier can determine what MOS they would like to pursue based on the General Maintenance (GM) or Mechanical Maintenance (MM) score. Some MOSs will also require a security clearance based on the equipment sensitivity (United States Army Publishing Agency Distribution Operations Facility, 31 March 1999).

The Maintenance MOSs that a soldier may pursue in their military career are as follows:

MOS 44B10 - Metal Worker

MOS 44E10 - Machinist

MOS 45B10 - Small Arms Repairer

MOS 45D10 – Self-Propelled Field Artillery Turret Repairer

MOS 45E10 - M1 Abrams Tank Turret Mechanic

MOS 45G10 - Fire Control Repairer

MOS 45K10 - Armament Repairer

MOS 45T10 - Bradley Turret Repairer

MOS 52C10 - Utilities Equipment Repairer

MOS 52D10 - Power-Generation Equipment Repairer

MOS 63B10 - Light Wheel Vehicle Mechanic

MOS 63D10 - Self-Propelled Field Artillery System Mechanic

MOS 63E10 - M1 Abrams Tank System Mechanic

MOS 63G10 - Fuel and Electric Systems Repairer

MOS 63H10 - Track Vehicle Mechanic

MOS 63J10 - Quartermaster and Chemical Equipment Repairer

MOS 63S10 - Heavy-Wheel Vehicle Mechanic

MOS 63T10 - Bradley Fighting Vehicle System Repairer

MOS 63W10 - Wheel Vehicle Mechanic

MOS 63Y10 – Track Vehicle Repairer

The courses identified for the soldier attending their Advance Individual Training (AIT) will vary from 8 weeks to 43 weeks depending on the MOS. This training is also considered initial maintenance training. Today, all soldiers who want to get a MOS in maintenance will attend Ordnance Center and School for their training. However, this may not be true based on the needs of the Army.

The Regional Training Site-Maintenance (RTS-M) concept was developed based on a critical requirement to conduct substainment maintenance training. It is common

knowledge that after the soldier received their initial advanced individual training and does not use these skills, that soldier could lose these skills over time. This was especially found in Army Reserve and National Guard soldiers where these talents and skills were only used during the one weekend a month and the two-week annual training. The one exception was if the soldier was conducting a civilian occupational specialty that mirrored their military MOS.

The Regional Training Site-Maintenance was initiated in the mid-1980s with establishment of the RTS-MS with the Army Reserve and National Guard. The word regional was developed to bring the maintenance training to the soldier in the area that they live and conduct maintenance training (Headquarters Department of the Army, 4 August 1986).

During the early 1990s the mission was changed from the initial concept of maintenance sustainment to MOS reclassification. This was due to the changes in unit missions and the U.S. Army downsizing. The mission of MOS reclassification of soldiers was incorporated into the RTS-M's mission statement. This allowed soldiers to be MOS reclassification of soldiers to Maintenance MOSs. This was identified as a means to get the soldiers retrained or retooled to the MOS that would support the needs of the U.S. Army.

Today, there are 19 sites throughout the United States that are Regional Training Site-Maintenance. The National Guard operates 13 of these facilities. The Army Reserve has six RTS-M facilities, with two of the sites identified as high technology. All other National Guard and Army Reserve sites identified are ground maintenance, where the maintenance training is conducted on the M16 Rifle to the M1 Tank.

During the mid-1990s the school divisions were developed from the former United States Army Reserve Schools. The school divisions had various Battalion Schools from Ordnance, Quartermaster, Administrative, and Professional Development. The Ordnance Battalion supported the maintenance and ammunition training. The Ordnance Battalion would have reserve soldiers trained as maintenance instructors that would conduct inactive duty training (IDT) on weekends for Army Reserve and National Guard soldiers. During this IDT training the Phase I of the MOS was conducted with the primary training being basic skills and knowledge for the maintenance MOSs. The major portion of the instruction was conducted in a classroom.

Phase II of the MOS training would be conducted during active duty training (ADT), a two-week training period at a Regional Training Site-Maintenance Facility.

Classroom Instruction

Informal studies show that perhaps 95 percent of adult training is done in the classroom—in many organizations the figure is 100 percent—and all of this in the face of such advances as computer-assisted instruction, closed-circuit television, teaching machines, self-instructed devices and the learner-controlled instruction (Broadwell, 1987).

There are many reasons for which neither time nor purpose permits listing all of them, but a few are important. There is an ease and convention about the classroom that does not exist with other techniques mentioned. It is somewhat easy to do classroom instruction, for all a person has to do is find a room, assemble an instructor and students, and have all the necessary instructional materials for carrying out the instruction.

Some of the advantages for classroom instruction are that everyone is exposed to the same message at the same time, everyone gets to start and stop at the same time and see the same film at the same time. A typical classroom setting has the advantage, too, of being flexible. There is an opportunity for small-group activity, individual work, and total group work. There can be screens, chalkboards, televisions, and easels, as well as models and demonstration gear.

There are hidden disadvantages to classroom instruction that have affected the successful outcome of instructions for centuries. If the learning ability of the group of trainees is below average, compounded with poor instructor and instructional material, the outcome is not going to be successful. If there are 10 to 20 students in a classroom, it may be hard to determine which students need additional assistance. Moreover, the instructor may have to cover a large area of instruction without any feedback from the soldier/student. Also knowing the limitations of the classroom, it is advisable to avoid trying to make the classroom do things it does not do very well.

The elements that make up the classroom are another important aspect of classroom instruction. The instructor with the actual years of experience and confidence is ready to share this experience with others.

A trainer needs expertise in methods that can increase participant knowledge and skills as well as foster involvement and growth. Many learning structures or training methods exist and can be adapted or tailored for specific programs. Exposure to different ways of presenting information and creating learning experiences can increase a trainer's options in designing a new program (Warshauer, 1988).

The next ingredient is the group itself, those individuals who make up the class to be trained. It is this ingredient that makes the training necessary. Without them, there would be no need for either the instructor or the classroom. The best instructors remind themselves of this fact frequently.

Another ingredient is the material to be taught. The purpose of training is to overcome a deficiency, to produce behavioral change. The ideal situation is one in which both the trainer and the trainees know exactly what the deficiencies are and what the specific behavioral change is going to be. Without a set of directions, training is like driving a car blindfolded, waiting for someone else to say when to start, stop, and turn. When talking about covering the material, no one talks about "covering the material", but rather reaching the objectives and overcoming deficiencies.

The last ingredient is the environment. This includes the tables and chairs, room temperature, ventilation and lighting. These are included into the climate for learning, which is difficult to measure but has a very significant impact on the learning situation. Even with the best instructor, it is difficult to concentrate if the room is smoky, hot, or noisy or if the chairs are hard or too soft.

The last area mentioned is the physical feature of the classroom. This covers the various designs for setting up a classroom and what effect(s) the classroom arrangement will have on learning.

In the traditional classroom the students sit in rows and face the front of the room. However, the implementation of the following classroom settings have helped to improve classroom instruction and student interaction and participation:

- The Chevron Classroom - designed with tables at an angle or V-shape around the podium.
- The circle classroom arrangement - designed for participation and interaction between students
- The U-Shaped classroom arrangement - often used for board of director meetings, committee meetings, and breakout sessions involving audio-visual presentations because all attendees can see the AV when the screen is placed at the open end of the U.
- The V-Shape – designed with V-shape around the podium.
- The Center table or hollow rectangle arrangement - used when interaction among 17-30 attendees/students is important.
- The Auditorium or theater arrangement - used when attendees take on the characteristics of an audience listening to a speaker or watching a slide presentation. This design is used to maximize the seating capacity of meeting rooms or allow the audience to be as close to the speaker as possible. All students are seated facing in one direction (Petrick, 1998). (See Appendix B.)

Computer-Based Learning

While computers have become increasingly important in many of our organizations during the past few decades, we only recently have begun to make significant use of them for human resource development (HRD)—that is, for learning. Although a few organizations have been doing this for some time, the number of organizations using computers for learning is relatively small. It is growing, however, at an exponential rate. The reason for this growth is that increasing numbers of training and

development professionals are becoming aware of, and interested in, computer-based learning (CBL).

Two major contributing factors are the ever-decreasing cost of CBL and the wide attention personal computers have attracted recently. Suddenly, great numbers of HRD professionals are finding themselves exposed to large doses of new jargon. If you have not yet been thrown into the alphabet soup sink or swim, you probably will be soon (Reynolds, 1988).

If we are not careful, we will make our work more difficult. As we begin to use computers for learning, we also are beginning to pick up and toss around some of the terminology that has been well established and understood by CBL users up to the present. That terminology is becoming muddled (Reynolds, 1988).

The current *veteran* users of CBL are destined to become only a tiny fraction of the eventual users of the terminology. It is important that we take at least as much care in the use of CBL as we take with other professional jargon.

The use of computers for learning was pioneered by university research. This origin spawned the term "computer-based education" or CBE. When industrial organizations began to use computer-based learning they substituted the more comfortable term "training" for the academically oriented "education." The result is CBT. Other organizations decided to use "instruction" resulting in CBI. This proliferation of terms may appear confusing but is easy to deal with because all three terms mean essentially the same. Real confusion—the kind that hampers communications—sets in only when we misuse terms that genuinely differ in meaning.

Only four basic terms need concern us: computer-based learning (CBL); computer-assisted instruction (CAI); computer-managed instruction (CMI); and computer-supported learning resources (CSLR) (Reynolds, 1988).

Computer-based learning is an "umbrella" term. It is synonymous with CBE, CBT, CBI and someone is bound to come up with it—CBHRD. It includes the activities described by CAI, CMI and CSLR. A definition is given by Donald Bitzer (University of Illinois) who has been called the "father of CBE." Bitzer says that CBE occurs "anytime a person and a computer get together and one of them learns something" (Reynolds, 1988).

The term "computer-based learning" is becoming increasingly popular, reflecting today's emphasis on learner-centered thinking. It also is appropriate in all settings: academic, business, industrial, and even the home. Regardless of their particular biases for one term or another, the aliases under which CBL travels create few problems for knowledgeable people, who realize that the names are interchangeable. The environment allows us to control outside factors without a lot of statistical fancy footwork (Delamontagne & Mack, 1988).

Computer-Assisted Instruction

The term is emerging as the main source of difficulty. Computer–assisted instruction (CAI) refers specifically to use of a computer in the actual instructional progress (Reynolds, 1988).

It is not synonymous with CAI. The various forms that CAI can take are called modes. The modes of CAI are:

- Tutorial – An instructional book or program that takes the user through a prescribed sequence of steps in order to learn a product. Contrast with documentation, which, although instructional, tends to group features and functions by category (Freeman, 1996).
- Drill and practice - A disciplined, repetitious exercise to teach and perfect a skill or procedure (action), i.e., a collective task or task step (United States Army Training and Doctrine Command, 9 March 1999).
- Instructional game - Is much like a simulation, but unlike a simulation, a game does not necessarily mimic reality. Games do, however, provide the student with entertaining challenges (University of Houston-College of Education, 2002).
- Modeling – Simulating a condition or activity by performing a set of equations on a set of data. Virtually any objects with known characteristics can be modeled and simulated (Freeman, 1996).
- Simulation – Any representation or imitation of reality, to include environment, facilities, equipment, mechanical and maneuver operations, motion, role-playing, and leadership (United States Army Training and Doctrine Command, 9 March 1999).
- Problem solving - Mathematical mechanisms that allow spreadsheets to perform goal seeking (Freeman, 1996).

Some trainers use CAI rather than Computer-Based Learning as the general description term, and this is largely responsible for the confusion. The main reason for the improper use of CAI is that many trainers assume the term covers the whole field.

Whenever the computer is used for educational delivery, whether in CAI or in the virtual classroom, the student is forced to actively participate, rather than passively listen

(or doodle or sleep or stare out window) (Hiltz, 1994). Typically, after every screen of information, the student must react and provide some input in order to continue. At the least, the student must press the carriage return key, which demands a watchful eye.

Computer-Managed Instruction

Computer-managed instruction (CMI) is indeed the management of instruction by a computer. The fact that it is not as familiar as computer-assisted instruction does not reflect on its inherent worth or frequency of its use (Reynolds, 1988). It probably reflects on the fact that there is less romance in managing instruction well than in teaching with the exotic technology.

The distinction is that computer-assisted instruction (CAI) always directly involves learning. Computer-managed instruction does not (Reynolds, 1988). The modes of computer-managed instruction are:

- Testing - Running new or revised programs to determine if they process all data properly (Freeman, 1996).
- Prescription generation – Based on comparison of completed training against competency requirements (Spence & Busine, 1996).
- Recording keeping - The ability to record the range of student details, training history, and skills profiles (Spence & Busine, 1996).

Computer-managed instruction is a powerful technique. An organization frequently can produce a bigger result with a smaller investment of resources in computer-managed instruction (CMI) than in computer-assisted instruction (CAI). In many cases, CMI may be the best way to initiate computer-based learning in an

organization. In the practical world of human resource development, CMI often can be used as an effective and cost efficient approach to projects and performance problems.

Computer-Supported Learning Resources

This is the component of computer-based learning least often seen. For those who are comfortable with the term, computer-supported learning resources (CSLR), it is usually a "database" (Reynolds, 1988). This means that CSLR is a pool of information, which does not itself teach. It provides information, which can be used to learn; for example, a library is a non-computer learning resource.

The computer-supported learning resource is used in the same way as a library, except that a computer program supports a CSLR. The program facilitates the retrieval, examinations and manipulation of the data.

The library today has the same characteristics as a computer-supported learning resource. The library computer catalogs all the information within the building and throughout the library network of other locations. Today's individual and home computer has a wealth of information and acts like the computer-supported learning resources programs of the 1980s.

Contact Test Set

The Contact Test Set (CTS), a component of the Integrated Family of Test Equipment (IFTE), is a ruggerized, man-portable, knowledge-based test set. The CTS is used at all levels of maintenance to diagnose faults to the line replaceable unit (LRU) parts. It also is used to augment weapon systems BIT/BITE, act as the Army's standard platform for electronic technical manuals, and as the Army's standard software downloader. The CTS is a modular tester and electronic information delivery device that

can be reconfigured to meet maintenance support requirements of different commodities and items at the unit level and above (United States Army Combined Arms Support Command, 30 April 1997).

Demonstration

The instructor and/or support personnel show and explain process or procedure to the student. The student is expected to be able to perform the operation or action after the demonstration.

This method of instruction shows how something is done. Some of its more important uses are to teach, illustrate principles, and set standards. During the instruction the students learn:

- Manipulative operations and/or procedures (How something is done.)
- Equipment operations or functions (How something works.)
- Safety procedures (How to incorporate training safety into Army Training.)
- Teamwork (How people work together to do something as a team.)
- Illustrate principles (Why something works.) (United States Army Training and Doctrine Command, 9 March 1999).

Distance Learning

Distance Learning is educational or training information, including the instruction and experience that learners gain, although they are physically distant from the source of that information and instruction. It can involve the use of new technologies, innovative materials, and interactive instructional methods. It can reach people of all ages and abilities who might otherwise find it difficult to further their education or get the training

they need for the future. It can help learners realize the importance of life-long education, whether for personal interest or career preparation or enhancement (Porter, 1997).

Distance Learning is an important way for educational institutions, from public elementary and secondary schools to state funded and private colleges and universities, to offer instruction to a new market of students. Distance learning programs can be designed to meet any group of learners' needs. The technologies used in distance learning, the structure of a course or a program, and the degree of supervision for a distance learning course can be varied to meet a particular group's need or interest.

Some distance learning programs offer highly structured courses, with deadlines for learners to be evaluated and include standards by which participants' progress is measured. These courses may be offered by a business, a university, or military institution but they follow a schedule of courses. Many courses lead to a degree or certificate; learners who take one or several courses may be required to take a certain number of courses within a time frame in order to complete the program. Courses that lead to a degree or a certification are monitored more closely than courses not taken for some type of credit.

Some courses have a proficiency type exam that learners can take at any time, as long as they can eventually show their mastery of a skill or a subject. In more highly structured courses, learners usually have more direct interaction with educators/trainers who may evaluate the learners' progress and provide a final grade or other signifier that learners have achieved course objectives (United States Army Training and Doctrine Command, 26 May 2000).

Electronic Technical Manuals

The purpose of Electronic Technical Manual (ETM) and Interactive Electronic Technical Manuals (IETMs) is to supplement—and eventually to replace—hard copy technical documentation with documentation in electronic form. IETMs walk technicians through complex troubleshooting and repairs.

Multimedia, audio, animation and video help to guide through difficult operation and maintenance procedures. IETMs can be linked to equipment diagnostics to provide faster troubleshooting and provide expert information to the entire organization (United States Army Training and Doctrine Command, 9 March 1999). This system will improve maintenance productivity, reduce training costs, streamline technical manual updates, and allow units to take multiple IETMs into the field.

CASCOM is providing functional user and concept support to the Ordnance School Combat Service Logistics (OSCSLOG) Integration Agency (LIA) efforts to digitize the Army Technical Manuals (TMs). The goal is to provide more accurate and timely access to technical information through ETMs and publish an Army Strategic Plan that will identify benefits to IETMs and select legacy weapons systems for migration to IETMs. Legacy systems ETMs interface with Standard Army Management Information Systems (STAMIS). The M1 Abrams Tank, M2/3 Bradley Fighting Vehicle, AH-64 APACHE Helicopter, Multiple Launcher Rocket System (MLRS), and PATRIOT Missile System are some of the high profile, high operational cost systems for which IETMs are being developed.

Embedded Training Systems

Embedded training (ET) provides the capability to train a soldier to standard using embedded training capabilities contained in operational equipment. The goal is that ET will be interoperable within a common operating environment linking geographically separated units in live, virtual, and user assistance, embedded emulation or simulation capabilities; embedded connections between the prime system and the training system; and training instrumentation (United States Army Training and Doctrine Command, 9 March 1999).

Field Trip

The students visit a place to acquire information required to support a specific learning objective. The instructor/guide may provide a discourse and/or written material concerning the site/equipment. Audio-video tapes may be used at the site.

The primary uses of a field trip are to motivate and show the relationship between provided information and the reality of the location. Field trips are quite useful with instruction of maintenance. Sometimes the equipment or subject matter expert on the equipment may not be available at the classroom site. Prior planning and coordination with site coordinator is crucial for a successful field trip (United States Army Training and Doctrine Command, 9 March 1999).

A field trip/site visit is described as visiting another maintenance facility or automotive manufacture plant (i.e., Oshkosh Truck) where the students can see the fabrication and assembly of a truck. The students gain plant operation knowledge and size of the equipment in perspective to the operation.

Individual Instruction

One of the most promising developments in training is a renewed emphasis on individualized instruction (Tracey, 1974). Trainers have long recognized that learning is highly individualized and have been searching for effective ways to utilize the fact.

Formal industrial training, patterned as it had been after the secondary and technical schools, often follows suit. Instruction en masse became the mode. Technology for individualizing instruction is available. It began with the discovery of programmed learning, became hardware-oriented with computer-assisted instruction, and has come of age with a variety of materials, means, and media at the disposal of the trainer.

Individualized instructions can have a tremendous impact on training. If it is used skillfully, it is more effective, more efficient, more personal, and hence more satisfying to both instructors and trainees (Tracey, 1974).

The term "individualized instruction" has many meanings. It has been used, for example, as a synonym for "self-pacing" but it is more than that. In its fullest sense, individualized instruction has the following characteristics: Each trainee (1) assumes some responsibility for his own learning; (2) progresses independently of other trainees; (3) learns at a rate that is best for him or her; (4) learns at a level that is appropriate for him or her; (5) learns in accordance with his or her own learning style; (6) selects options from among alternatives; (7) uses a variety of materials and media; (8) checks their own progress; and (9) is evaluated against absolute (not relative) standards (Tracey,1974).

The effective use of the technique of individualized instruction depends upon several critical factors. The trainer must be able to diagnose the trainee's aptitude, skills,

abilities, learning style, interests, and the like. The individual completes lessons at his/her own pace (United States Army Training and Doctrine Command, 9 March 1999).

The trainer must have a variety of training materials and the means of checking trainee progress in learning the skills and knowledge that are the objectives of the training program. The trainer must also have the ability to motivate, guide, and assist trainees with their individual learning problems and must have the ability to evaluate progress and results. These are challenges that are posed by the use of individualized instruction.

Lecture

During lecture process an individual verbally passes information to attending students. Students' participation is minimal. It has low training efficiency. It violates all three of the self-paced learning principles. Note that the dissemination of information in written format is usually more efficient and effective (United States Army Training and Doctrine Command, 9 March 1999). The lecturer's main purpose is to provide students information they need to know. Some of its' more important uses are to:

- Disseminate – give information that is not yet available in print.
- Motivate – set the stage for a demonstration, discussion, or performance.
- Orient - set right by adjusting to facts or principles.

Practical Exercise

The practical exercise (performance) requires the student to perform the action required by the learning objective under controlled conditions to the established standard (United States Army Training and Doctrine Command, 26 May 2000).

The most efficient way to learn to do something is to actually do it. This method of instruction is the best way for a student to learn to perform the required action to the

established standard. Some examples are operations and repair of equipment, exercises, i.e., field training exercises (FTX), and/or completion of forms.

The hardware-oriented method is performed on actual equipment to include simulators and training devices: engines, transmissions, and axles. This may be used when the actual hardware is available and the risk to individuals and equipment is kept to an acceptable level.

During the non-hardware oriented performance method, the equipment is not involved but it involves a paper-based exercise. This method may be used when the hardware is not required to perform the required actions as is in the planning of "Convoy Operations" (United States Army Training and Doctrine Command, 9 March 1999).

Simulator

The simulator is defined as substitute for, by emulation, the functions and environment of an actual process, equipment, or system. This includes any training device, machine or apparatus that can synthetically reproduce a desired set of conditions.

Used specifically for training, it is a relatively complete item or training equipment, using electronic/mechanical means to reproduce conditions necessary for an individual or a crew to practice tasks/learning objectives. It represents the operational equipment physically and functionally to varying degrees (United States Army Training and Doctrine Command, 9 March 1999).

Substitutes for real equipment save material and maintenance costs, frees real equipment for operational use, and increases training safety. An example of a simulator is an actual turret from a M1 Tank or Bradley Fighting Vehicle. In this case the primary end item represents mission operational status and is eight times the cost of a simulator.

SMART Board

The introduction of the SMART Board is just another step into the 21st Century technology with harnessing the power of a computer and the simplicity of a whiteboard with the SMART Board (SMART Technologies (USA) Incorporated, 2000). One has the ability to-simply touch the surface with a finger to choose any displayed computer application. To emphasize an important point, select a pen and highlight key information, then save, print or e-mail notes to personnel around the globe (see Appendix B).

Successful operation and decision-making within the armed forces requires clear and concise communication. Authorized personnel will be able to participate in briefings and training sessions and collaborate on strategic plans with personnel at various locations (bases) around the world. There also is a necessity to share detailed information, highlight critical material and keep personnel focused on mission. The need to access information from a variety of multimedia tools and provide notes to the group, all of this and more can be done with SMART Roomware software (SMART Technologies (USA) Incorporated, 2000). (See Appendix C.)

SPORT Program

The Soldiers' Portable On-System Repair Tool (SPORT) will be the next generation diagnostic tool. It will provide the field technician with capability to display, diagnose, and repair weapons systems utilizing Interface Electronic Technical Manuals (IETMs) through the use of the Controller/Diagnostic Aid (CDA).

The CDA is a lightweight portable computer with a range of sophisticated instrumentation capabilities allowing for intrusive diagnostics of weapon systems and vehicles for maintenance and repair operations (See Appendix D).

The SPORT Test Set, Electronic System AN/PSM-95, will be employed within divisional, corps and echelons above corps units. The SPORT is the Army's standard on system test equipment that supports all weapon systems, air and ground.

The SPORT Controller/Diagnostic Aid is configured with Windows 95 and above. This is a rugged, compact, lightweight portable computer, providing high performance and reliable operation under the most demanding environmental conditions. The CDA hosts interactive electronic technical manuals, as well as diagnostic modules (e.g., digital multimeter and internal combustion engine [ICE]), used to conduct intrusive testing in maintenance support of multi-commodity weapons/electronic systems. This unit provides the means to upload/download software and data from tactical weapon/electronic systems (Miltope Corporation, 2002).

Training Aids

They provide a means for reducing the training development/training costs and improving efficiency. Training aids clarify information and present it in a concise, efficient manner during training, whereas job aids actually replace training (United States Army Training and Doctrine Command, 9 March 1999). The advantages of use of training aids are as follows:

- Enable trainers to conduct and sustain task-based training in lieu of using extensive printed material or an expensive piece of equipment.
- May increase performance as on-the-job training or job aid.

During the instruction of a maintenance course a large number of the actual training aids are the replacement parts used to repair the piece of equipment. A critical task/learning objective may involve the use and description of repair parts for training.

The training aid may also have a cut out section, revealing the internal workings of this part. In many cases the training aids or repair parts can be parts of equipment that have been replaced due to operational failure. These training aids in most cases are the best training aids, since they may be dropped or mishandled during the training.

Training Devices

Training devices are three-dimensional objects and associated computer software developed, fabricated, or procured specifically for improving the learning process, and are categorized as either system or non-system devices (United States Army Training and Doctrine Command, 26 May 2000).

A system device is used with a system, family of systems, or item of equipment, including subassemblies and components. It may be stand-alone, embedded, or appended. A non-system device is used to support general military training and non-system specific training requirements.

The advantages in using a training device is that it provides a means to safely practice an action or activity under any condition. It also substitutes for real equipment thereby saving material and maintenance costs, frees real equipment for operational use, and increases training safety.

Teletraining

A videotape/film is not a method of instruction. It is used as the primary means to deliver the instruction. It is training delivered via communication links such as satellite or cable links (United States Army Training and Doctrine Command, 26 May 2000). The videotape/film is introduced verbally or with text. The students are informed as to what

they are to learn from the tape/film. A videotape/film image can be presented in computer-based instruction (CBI).

The use of videotape films shows action that is too dangerous, cannot normally be observed by the eye, or cannot be readily observed. They are specifically useful for showing things or actions that are very small or large, actions that occur too fast or slow, or things that are dangerous, such as destroying a bridge.

Video Teletraining

Video teletraining is an interactive transmission vehicle for training delivery. The U.S. Army uses two types of video teletraining (VTT) for broadcasting. TRADOC broadcast VTT consists of two networks: Teletraining Network (TNET) and Satellite Education Network (SEN). TNET equipment and communications are contractor owned and government operated. SEN uplinks and studio equipment are government owned and contractor operated, downlinks are government owned and operated (United States Army Training and Doctrine Command, 9 March 1999).

Video teletraining is used to simultaneously distribute training to a number of students and/or locations. Different methods of instruction may be used to present the material. The use of VTT proponents can increase class size and the span of coverage, including outside continental United States (OCONUS), reaches students in remote locations, reduces travel and per diem costs, and provides critical, short-notice training.

Virtual Classroom

A virtual classroom is a teaching and learning environment located within a computer-mediated communication system. Rather than being built of bricks and boards,

it consists of a set of group communication and work "spaces" and facilities that are constructed in software (Hiltz, 1994).

The virtual classroom can be thought of as means of "learning without limits." It was designed to overcome many of the limitations of traditional classrooms. There are no limitations on the time, place, or pace of learning; or on the ability to form a collaborative learning community that includes a diversity of people: different ages, different life experiences to share, from any part of the world (Hiltz, 1994).

The instructors affiliated with a virtual institution may be located within other businesses or academic institutions, or they may be consultants working from home or their own offices. The administrative staff may be located within a small office and there may be no real campus (Porter, 1997).

Web-Based Training

Web-based training is a distance learning (DL) method in which training applications residing on a central computer functioning as a network server are delivered across a public or private computer network (e.g., the Internet) to students at any location and displayed on a Web browser. Authorized students may access training applications on demand and download them for individual instruction. Web-based training can be updated very rapidly, and gives access to the training materials controlled by the training provider (United States Army Training and Doctrine Command, 9 March 1999).

CHAPTER 3

Methodolgy

The purpose of this study was to review the current delivery system used by the United States Army for maintenance training for the 21st Century. The delivery system should be designed that it could be utilized and implemented for maintenance training for Active Duty (AC) schools, Regional Training Site-Maintenance schools and Individual Development Training (IDT) conducted by Ordnance Battalion instructors. This chapter will discuss the types of delivery systems for maintenance training used today and what may be developed and implemented to enhance the 21st Century's technology.

Delivery System Design

The design will evaluate the effectiveness of the delivery system. The various delivery systems will expand the training concept being presented to the soldiers. The delivery system will assist in the development of the maintenance training being presented by the instructor. It will be crucial in development and utilization of a delivery system that will carry the interest of the instruction being presented to the soldier.

Instrument Development

The research instrument was based on formal classroom and hands-on training and evaluating various types of presentation techniques to enhance the maintenance training. The 21st Century Maintenance Instruction Survey was developed to help determine the type of instruction and presentation for present and future maintenance training. The survey helped to indicate and determine the best method of delivery system to be utilized for presentation of instruction for maintenance training. The survey

questions used the Mean and Standard Deviation. The Likert Scale was also used for developing statistics offered by the Mean and Standard Deviation.

Training Concept

This concept describes how the Army will maintain its combat and combat support equipment of the 21ST Century. It supports the overreaching concept outlined in TRADOC Pam 525-5, Force XXI Operations (1 October 1994). It also supports the concept for Integrated Sustainment Maintenance (ISM), Battlefield Distribution (BD), and Velocity Management (VM) by co-opting and taking advantage of the benefits of these concepts.

Over the next decade, a revolutionary change will occur in maintenance operations. Digitization of existing and future ground equipment coupled with modifications of the existing logistic automation systems will allow for revision of the doctrinal axiom: fix forward. The goal of providing support as close to the customer as possible and supporting all customers within a given area will continue to be the cornerstone of maintenance doctrine. A major difference between the current fix forward doctrine and the ARMY XXI maintenance system is the change in the actual repair site (United States Army Combined Arms Support Command, 30 April 1997).

Other major differences between Maintenance XXI and previous concepts are:

(a) **Multicapable Mechanics**: Acquisition, training and maintaining multicapable mechanics that are trained to National Skill Standards. Training to National Skill Standards allows the Ordnance Corps to support the missions outlined in Force XXI and integrate civilian and contractors into the workforce (United States Army Combined Arms Support Command, 30 April 1997).

(b) **Precision Maintenance**: The integration of sensor, TMDE, and multicapable mechanics that correctly diagnose system or equipment failures (United States Army Combined Arms Support Command, 30 April 1997).

(c) **Modular/Cellular Organizations**: Field maintenance activities (Divisional/Non-Divisional) will consist of a base maintenance company augmented with commodity specific teams. The composition of the supported customers and mission of the units will determine the type and number of teams assigned to the maintenance unit. The new team organization will draw minimum support from the parent activity (United States Army Combined Arms Support Command, 30 April 1997).

In ARMY XXI, maintenance units directly supporting known customers will diagnose faults and replace faulty components. These units will be manned with multicapable mechanics, capable of performing what is known in the current maintenance system as unit, direct support capability. Both the maintenance companies/platoons and motor pool activities will receive their supplies through the distribution system. Maintenance component repair units will be positioned near the division's rear boundary along the distribution system pipeline to repair and return repairable parts back to the supply system.

Implementation Guidance

The below mentioned course identifies a course map for soldiers enrolled into the Military Occupational Specialty (MOS) 63B – Light Vehicle Mechanic. This course is performance-oriented and designed to provide reclassification training and MOS certification to enlisted soldiers who are reclassifying to MOS 63B.

The course is divided into two Phases. Phase I Program of Instruction 091-63B, D, E, G, H, S, T, W, Y will be used for the IDT phase for MOSs 63B, 63D, 63E, 63G, 63H, 63S, 63T, 63W, and 63Y. Phase I has been referred to as the common core of initial maintenance training since the subject matter presented during this phase is common to all of the above MOSs. Phase I training is usually conducted during weekend training drills to accommodate the Army Reserve and National Guard Soldiers. Phase I may be taught also in Active Duty Training (ADT) (two weeks), as the need presents itself for required training.

Phase II is conducted in the ADT mode for 63B10. Actually all Phase II are conducted in the ADT mode at an RTS-Maintenance Facility. Refer to Program of Instruction 091-63B10-TATS for complete list of the tasks to be trained, the organization of lessons (task grouping), phases of training, and resources needed for support of the instruction (United States Army Combined Arms Support Command, 1998, December).

The procedures following explain which tasks the students will perform in order to advance in the course:

(a) All training is performance-oriented. Tasks are trained under the conditions and to the standards outlined in the objectives. At the end of training, students are expected to perform the task(s) under the conditions stated in the training objective and complete task(s) to standard. Performance measures are used as a training guide to ensure that the student learns how to do a task step by step.

(b) Student progress will be measured by their ability to perform each task as trained before going to the next task or series of tasks. Retraining and retesting will be a continuous requirement of the instructor to ensure student proficiency. The end-of-

class practical exercises, scheduled throughout the course, represent a method of ensuring that the student can perform the task prior to moving on to the next task. (United States Army Combined Arms Support Command, 1998, December).

The Evaluation Procedures mentioned below are used to assess the student's learning capabilities to the material being presented during the course of instruction:

(a) Testing of students, to assess and ensure proficiency in MOS tasks, will be a requirement for course completion and award of the MOS. The testing procedures come from the Course Management Plan (CMP) in the Program of Instruction (POI) MOS 63B10 Light Wheel Vehicle (10 September 2001). A student that fails the first test must be retrained, and retested. Normally, the student may be retrained and retested only twice. If a student fails after successive retesting, take appropriate administrative action to eliminate them from the course. Follow procedures outlined in Army Regulation 623-1 (Headquarters Department of the Army, 31 March 1992), when completing adverse Academic Evaluation Report (AER).

(b) Performance training evaluation. Performance measures of tasks are taken from the student guide. As the instructor trains students in the tasks, he reinforces this training by using a GO/NOGO standard for evaluating their ability to perform the task. The instructor instills confidence in the student by having them demonstrate their ability to perform the task. This evaluation also provides the instructor with valuable feedback regarding the effectiveness of instructional techniques.

(c) The instructor will maintain formal records as a basis for certifying the student's successful completion of course requirements.

(d) Evaluation of course material content will be done on a continuing basis, using feedback questionnaires and student performance results. (United States Army Combined Arms Support Command, 1998, December).

Recommendations for changes to course material will be forwarded through the appropriate channels for incorporation during course revision. Results of end-of-course testing may identify a need to revise course-supporting materials, change the method of instruction, and/or conduct performance-oriented training, when this method is not currently being used.

Course Map: This course is divided into phases, annexes and lessons. Table 1 is the course description of training for both Phase I and II. Training to be conducted in Phase I is described in Tables 2 through 6. Training to be conducted in Phase II is described in Tables 7 through 15.

Table 1

Course Map for Phase I (IDT) and Phase II (ADT)

Phase I – Inactive Duty Training (IDT)	Phase II – Active Duty Training (ADT)
Modules A, B, C, D, E and Administrative	Modules F, G, H, I, J, K, L, M and Administrative
Common Subjects Basic Knowledge and Skills Engine Systems Hydraulics, Brakes, and Steering Systems Basic Electricity and Automotive Electrical Systems General Maintenance Topics	Maintain Electrical Systems and TMDE Maintain Cooling Systems on a Wheel Vehicle Maintain Hydraulics Systems Maintain Brake Systems Repair Diesel Engines and Fuel Systems Maintenance of Drive Line Components Maintain Steering and Suspension Services Annex Administrative

Table 2

Module A

COMMON SUBJECTS	
Annex	Annex Description
CF63b10A01	Course Introduction/Orientation/OPSEC
CF63B10A02	Structure of the Army Maintenance Program
CF63B10A03	Shop Safety and Maintenance Discipline
CF63B10A04	Military Publications
CF63B10A05	Identification, Care, and Use of Hand and Power Tools
CF63B10A06	Job Knowledge Test and Review

Note: Lesson A01 will be taught first; Lessons A02-A05 may be taught in any order; and Lesson A06 will be taught last.

Table 3

Module B

BASIC KNOWLEDGE AND SKILLS	
Annex	Annex Description
CF63B10B01	Bearings, Gaskets, and Seals
CF63B10B02	Petroleum, Oil, and Lubricants
CF63B10B03	Fuels
CF63B10B04	Basic Operating and Design Principles of Mechanical Devices
CF63B10B05	Job Knowledge Test and Review

Note: Lessons B01-B04 may be taught in any order; and Lesson B05 will be taught last.

Table 4

Module C

ENGINE, ENGINE SYSTEMS, AND POWER TRAINS	
Annex	Annex Description
CF63B10C01	Construction and Operation of Engines
CF63B10C02	Principles of Engine Lubrication Systems
CF63B10C03	Principles of Air Induction and Exhaust Systems
CF63B10C04	Repair Single – Cylinder Engine
CF63B10C05	Fundamentals of Compression – Ignition Engine Fuel Systems
CF63B10C06	Job Knowledge Test and Review

Note: Lesson C01 will be taught first; Lessons C02-C05 may be taught in any order; and Lesson C06 will be taught last.

Table 5

Module D

BASIC AUTOMOTIVE ELECTRICAL SYSTEMS AND TMDE	
Annex	Annex Description
CF63B10D01	Principles of Electricity
CF63B10D02	Introduction to TMDE
CF63B10D03	Electronic Test Equipment
CF63B10D04	Interpret Wiring Diagrams and Schematics
CF63B10D05	Trouble Shooting Procedures and Techniques
CF63B10D06	Job Knowledge Test and Review

Note: All annexes should be taken in order.

Table 6

Module E

GENERAL MAINTENANCE TOPICS	
Annex	Annex Description
CF63B10E01	Battle Damage Assessment and Repair (BDAR)
CF63B10E02	Information Systems Security
CF63B10E03	Troubleshooting Procedures and Techniques
CF63B10E04	Hazard Communication

Note: This group of courses can be taught in any sequence according to the instructor.

The next section (Tables 7-15) is Phase II Course Map. The Phase I (IDT) training is conducted primarily during weekend training for two days with minimal equipment requirements. The Phase II (ADT) training is usually conducted over a two-week period requiring maintenance bays, tools, and military vehicles. The hands-on training on equipment and maintenance facility is imperative to the soldiers training and the advantage over Phase I (IDT) training.

Table 7

Module F

AUTOMOTIVE ELECTRICAL SYSTEMS AND TMDE

Annex	Annex Description
CF63B10F01	Course Introduction, IDT Recap, and Tool Box Issue
CF63B10F02	Principles of Basic Electricity
CF63B10F03	Test Measurement and Diagnostic Equipment (TMDE)
CF63B10F04	Interpret Wiring Diagrams and Schematics
CF63B10F05	Trouble Shooting Procedures and Techniques
CF63B10F06	Repair Glow Plug System
CF63B10F07	Electrical Interface Systems Repair (M984E1)
CF63B10F08	Job Performance Test and Review
CF63B10F09	Job Knowledge Test and Review

Note: All annexes should be taken in order.

Table 8

Module G

MAINTAIN COOLING SYSTEM ON A WHEEL VEHICLE	
Annex	Annex Description
CF63B10G01	Principles of Engine Cooling System
CF63B10G02	Remove/Install Water Pump Belts on a M925 –Medium Tactical Vehicle
CF63B10G03	Job Knowledge Test and Review

Note: All annexes should be taken in order.

Table 9

Module H

MAINTAIN HYDRAULIC SYSTEMS	
Annex	Annex Description
CF63B10H01	Principles of Hydraulics
CF63B10H02	Interpret Hydraulic Flow Schematics
CF63B10H03	Troubleshoot Hydraulic System on M923 Cargo Truck
CF63B10HO4	Hydraulic System Repair
CF63B10H05	Job Knowledge Test and Review

Note: All annexes should be taken in order.

Table 10

Module I

MAINTAIN BRAKE SYSTEMS	
Annex	Annex Description
CF63B10I01	Fundamentals of Brake Systems
CF63B10I02	Maintain the Disc Brake System on Wheel Vehicle
CF63B10I03	Replace the Master Cylinder and Brake Booster on a M998 Vehicle
CF63B10I04	Repair Air-Brake System on a M1000 Semi-trailer
CF63B10I05	Replace Hand Brake and Service Brake Shoes
CF63B10I06	Maintain Brake and Wheel Bearing System on a M1000 Semi-trailer
CF63B10I07	Troubleshoot Central Tire Inflation System (CTIS) on a Palletize Loading System (PLS)
CF63B10I08	Job Performance Test and Review

Note: All annexes should be taken in order.

Table 11

Module J

REPAIR DIESEL ENGINES AND FUEL SYSTEMS	
Annex	Annex Description
CF63B10J01	Diesel Engine Repair (6.5 Liter)
CF63B10J02	Fuel System Repair on (8V92TA) Engine
CF63B10J03	Replace the Injector Pump on a 6CTA, 8.3 Engine
CF63B10JO4	Engine Synchronization on an (3116 ATACC) Engine
CF63B10J05	Job Performance Test and Review
CF63B10J06	Job Knowledge Test and Review

Note: All annexes should be taken in order.

Table 12

Module K

MAINTENANCE OF DRIVE LINE COMPONENTS	
Annex	Annex Description
CF63B10K01	Principles of Drive Line Components
CF63B10K02	Correct Malfunction of Knuckle and Gear Hub on a Wheeled Vehicle (M988 –HUMWV)
CF63B10K03	Torque Geared Hub Spindle Bearing on a Wheeled Vehicle (M998-HUMWV)
CF63B10K04	Correct Malfunction of Driveline Assembly on a Wheeled Vehicle
CF63B10K05	Troubleshoot Differential, Transmission and Transfer on a Wheeled Vehicle
CF63B10K06	Replace Differential on a Wheeled Vehicle
CF63B10K07	Replace the Transfer and Transmission on FMTV-M1078 Vehicle
CF63B10K08	Job Knowledge Test and Review

Note: All annexes should be taken in order.

Table 13

Module L

MAINTAIN STEERING AND SUSPENSION	
Annex	Annex Description
CF63B10L01	Fundamentals of Suspension
CF63B10L02	Troubleshoot Steering Systems on 6000 Lb Variable Reach Forklift
CF63B10L03	Steering System Repair on M977 HEMIT Vehicle
CF63B10L04	Job Knowledge Test and Review

Note: All annexes should be taken in order.

Table 14

Module M

SERVICES ANNEX	
Annex	Annex Description
CF63B10M01	Schedule Biannual Services on M998/M1084 FMTV Vehicles

Table 15

In and Out Processing of Students Requirements

IN-PROCESSING	
OUT-PROCESSING	Annex Administrative
1. Commandant's time, open time, physical readiness time, and inprocessing/outprocessing times were not used to compute peacetime course length.	
2. Physical Readiness Training (PRT) to be accomplished before and/or after the academic day.	

CHAPTER 4

Analysis

In the state of recent world events, the researcher will reemphasize the importance of a person being able to perform their job in the field. It is imperative that U.S. Army offers the best training possible to assist in accomplishing their mission in providing maintenance support. The present and future equipment is more complex than the equipment of past generations. This will require extensive technical training and/or college-equivalent education to maintain this equipment.

The following analysis will aid in determining a training program for maintenance instruction for soldiers in the United States Army for the 21st Century. This study will facilitate in determining the best delivery systems for various methods of instruction, to assist the instructor with presentation, and provide the student with enhanced learning abilities for learning the presented instruction (See Appendix A).

The researcher sent out the survey to personnel who were later grouped by job positions and experience. The raw data was then divided into groups and the means and standard deviation were used to determine the importance of each question. The average or mean was then determined by dividing the groups.

The number 1.1 was determined to be the standard deviation for the study. If the numbers from the data were determined to be equal to or below 1.1 there was no requirement for an explanation on the standard deviation. However, if the numbers identified in the standard deviation column were greater than 1.1, an explanation was required. The questions listed after the tables then explain how the results may have been obtained above the 1.1 standard deviation.

The researcher analyzed information obtained from the Maintenance Survey to form Table 16 - classroom instruction. The questions stated referred to classroom instruction for education in the 21st Century. Some of the questions were common and utilized a standard classroom layout with training aids. A few of the questions were unique to military instruction. An example of this type of instruction was the utilization of Individual Development Training (IDT). This type of instruction is usually conducted on weekend drills for soldiers. The instruction presented during Phase I common core subject matter is not equipment intensive.

Table 16

Classroom Instruction

Question		Mean	Standard Deviation
1.	Is there a place for classroom instruction?	1.5246	0.67346
2.	Is classroom instruction more useful for introduction to the subject?	1.7869	0.81884
3.	Can classroom instruction be conducted during Individual Development Training?	1.8852	0.68553
4.	Can classroom instruction be conducted during Advance Development Training?	1.8033	0.81281
5.	Which type of classroom layout do you like best?	1.7705	1.0230
6.	Does the classroom layout determine the type of instruction to be presented?	2.3390	**1.1687**
7.	Will there be a need for incorporating the television into Classroom 21?	1.7869	1.0346
8.	Will there be a need for incorporating a VCR into Classroom 21?	1.8525	1.0929
9.	Will there be a need for incorporating an overhead projector into Classroom 21?	2.1148	**1.3916**
10.	Will there be a need for incorporating a Smartboard into Classroom 21?	1.8197	**1.3479**
11.	Will there be a need for incorporating Distance Learning into Classroom 21?	1.8033	**1.4355**
12.	Will there be a need for incorporating training aids into Classroom 21?	1.6393	**1.5059**
13.	Will there be a need for incorporating the computer as training aids into Classroom 21?	1.7541	**1.6089**

Question 6: This answer may have been determined due to the fact that a group of people had problems deciding the best type of classroom layout for presentation of instruction.

Question 9: This answer may have been determined due to the introduction of computers for presenting instruction during the 1990s, thus eliminating the need for overhead slides.

Question 10: The interaction between computers, proxima projectors and smartboards are currently just being introduced into Classroom 21. A large number of people taking the survey have probably never seen or known the capabilities of the smartboard.

Question 11: Various forms of Distance Learning have been around for a while, however instructors and students are still not comfortable with Distance Learning techniques and presentation. Distance Learning in the classroom relies on a lot of coordination of the presenter and the recipient of the instruction.

Question 12: There will always be a need for incorporating training aids into the classroom. Because this is a maintenance survey, one can only imagine that people can envision components of engines, transmissions and axles in the classroom.

Question 13: The computer is not new to the classroom, only the application. The computer is currently being used for presenting the material. The students are currently using the computer as a tool to assist them in learning methods and techniques to enhance instruction. Some students may still feel more comfortable in the formal classroom with the instructor presenting the instruction to the students.

The researcher used information obtained from the Maintenance Survey to form Table 17 - Maintenance Training for the U.S. Army in the 21st Century. This helped make the determination of a need and types of Delivery Systems required for maintenance training. Some of the questions are unique to utilization of the new Total Army Training

System (TATS), and Programs of Instruction (POI). The questions also identified the usage of the Regional Training Sites-Maintenance Facilities for training for the 21st Century.

The Maintenance Training may be conducted during either Phase I or Phase II training. During Phase I training most of the instruction is considered common core subject matter since the soldier is learning the basic knowledge and skills for maintenance. The Phase II training involves hands-on training and is very equipment intensive. The Phase II training will have a mixture of practical exercises, performance exams and written tests. Almost all questions were unique to military instruction.

Table 17

Maintenance Training

Question		Mean	Standard Deviation
14.	Do you agree with the plan of the Department of the Army to replace all printed technical manuals with electronic manuals?	3.0164	**2.0371**
15.	Do you agree that the Maintenance Bay is sometimes called the Large Classroom?	2.3115	**1.9454**
16	Is it critical to have the newest and most improved equipment for training?	2.1639	**2.0831**
17.	Do you agree that the Program of Instruction only provides the soldier with minimum level of training?	2.9508	**2.3125**
18.	Would you agree to incorporate current real world issues dealing with maintenance training?	1.8525	**2.2571**
19.	Should the Maintenance Training program identify the purpose of the maintenance training?	1.6885	**2.3348**
20.	Does the new Total Army Training System (TATS) Program of Instruction describe the standards for training?	2.6610	**2.4608**
21.	Is the delivery system of training a critical portion of the training program?	1.9672	**2.5947**
22.	Will the training the soldier receives at a Maintenance	2.0164	**2.6925**

	Training Facility be critical for the soldier to be able to accomplish their mission?		
23.	The Program of Instruction (POI) will give the Instructor the appropriate format for training standards. Should the Instructor be allowed to improve and develop the training?	2.0164	**2.8838**
24.	Do you feel there is a valid need for Regional Training Site-Maintenance Schools to fill the void for training from the U.S. Army Ordnance Center and School in the future?	1.8197	**2.9693**

Question 14: The researcher has concluded that this answer may have been determined due to the fact that soldiers are not comfortable with electronic manuals. The instructor and soldier wants to have a hard copy in their hands and not have to rely on a computer, internet, power shortages or the size of the monitor to research the material.

Question 15: Some people have a problem visualizing the Maintenance Bay as the Large Classroom. The concept of the Large Classroom is an enhancement of the regular classroom with exception that there is now the entire training aid or vehicle instead of the components of the vehicle.

Question 16: It is not always necessary to have the newest and greatest equipment for a training aid. However, it is important to know how and what to repair in the event the equipment becomes disabled. In most cases not all personnel will have the newest equipment in their unit due to the unit's mission.

Question 17: This answer was determined due to the fact that Programs of Instruction (POIs) are designed to teach the student everything they need to know to be able to support a task or mission.

Question 18: This answer was determined due to today's situation. People do not want to incorporate anything that may affect equipment readiness or the completion of a mission where equipment or people would have a chance to fail.

Question 19: The people may have misunderstood this question. The Maintenance Training Program identifies what one is trying to accomplish during the training. The use of Program of Instruction (POI) reinforces the training requirements to support the maintenance training.

Question 20: In the beginning of each annex of the Total Army Training System (TATS), Programs of Instruction, it describes the standards for training. This gives the instructor and students the expectations and guidance of what is to be accomplished in the annex and supporting tasks. This answer was determined due to the fact that not all personnel surveyed would have knowledge of this guidance.

Question 21: The people may have determined that the delivery system was not critical for instruction as long as some sort of training was being presented to accomplish the task. The delivery system is a critical part of instruction where it provides and enhances the learning and training being presented.

Question 22: The question asks if the training the soldier receives at a Maintenance Training Facility will be critical for the soldier to be able to accomplish their mission. This training will support the equipment readiness, which will affect the completion of

the unit's mission. It seems that the people completing the survey do not know how important equipment readiness is to supporting the unit's mission.

Question 23: The Program of Instruction (POI) provides the appropriate format and standard for training. Most people are comfortable with this standard and are not concerned or do not know that training can be enhanced by adding additional training aids or methods to improve the learning ability of the subject.

Question 24: The United States Army Ordnance Center and School is the main school for instruction of maintenance. However, the United States Army Ordnance Center and School currently is instructing only 35% of the maintenance training. The Regional Training Site-Maintenance Schools are providing 65% of the maintenance training. The Regional Training Site-Maintenance Schools are planning and projecting to continue expanding current capabilities for supporting maintenance training. The surveyed people were not aware that there are nineteen (19) Regional Training Site-Maintenance Schools geographically located throughout the continental United States.

The researcher used information obtained from the maintenance survey to form Table 18 – Regional Training Site–Maintenance – Maintenance Training for the Future. This table identifies possible training that could be conducted utilizing an RTS-Maintenance Facility for the 21st Century. This would allow a greater diversity training that could be conducted at an RTS-Maintenance Site based on the needs of the U.S. Army.

Table 18

RTS-Maintenance – Maintenance Training for the Future

Question		Mean	Standard Deviation
25-A.	The MOS Reclassification training utilizing a 4-week school compared to 8 weeks at an Active Duty School.	1.8814	0.69691
25-B.	Support Mobilization Mission for units deploying from Power Projection Platform Sites.	1.9833	0.89237
25-C.	Provide Unit Level Logistics System Ground (ULL-G) Sustainment Training.	1.7167	0.73857
25-D.	Support future GCSS-A Fielding Location.	1.9833	0.85354
25-E.	Conjunction of continuous training of NCOES training Phase I at the NCOES and Phase II being conducted at RTS-Maintenance.	2.1667	1.0918

25-F.	Incorporation of Distance Learning (DL) into 63CMF MOS Technical Training into 5 weeks of training compared to 8-12 week Active Duty training at U.S. Army Ordnance Center and School.	2.1333	0.94719

Table 19 identifies a potential requirement for military maintenance instructors to be ASE Certified in the future. The United States Army has schools to train soldiers in how to perform tasks to support their job and mission. The Ordnance Center and School is the home for maintenance training for the United States Army.

Table 19

ASE Certified Instructor for the Future

Question		Mean	Standard Deviation
26.	Do you feel that our maintenance personnel should be ASE Certified to instruct maintenance in the future?	2.9016	**3.2182**

Question 26: It seems a large number of surveyed personnel in the United States Army feel that the maintenance instructor will not need to be ASE Certified to instruct maintenance in the future. It is also perceived that the maintenance training the maintenance instructor receives at a military maintenance school is all the training needed to instruct soldiers. A primary requirement of an instructor is to be a graduate of the course or MOS and certified to teach the course.

The researcher used information acquired from the Maintenance Survey to form Table 20 identifying the civilian acquired skills for the future as a possible requirement. If a soldier has civilian acquired skills in the Military Occupational Specialty (MOS), this is an enhancement to the course material they are instructing or receiving.

Table 20

Civilian Acquired Skills for the Future

Question		Mean	Standard Deviation
27.	Will civilian acquired skills continue to enhance and improve the maintenance personnel for the future?	2.0984	**3.3452**

Question 27: The people completing the survey felt civilian acquired skills were not needed to enhance and improve the maintenance training. It seems to be a consensus that the training being presented to a new soldier at a maintenance training facility with the capability to learn the maintenance tasks is all the person needs at this time.

The researcher categorized the information received from all personnel having a Maintenance Military Occupational Specialty (MOS) to develop Table 21. The information and statistics identified how the maintenance personnel think maintenance instruction should be conducted in the future.

Table 21

Classroom Instruction – Maintenance Personnel

Question		Mean	Standard Deviation
1.	Is there a place for Classroom instruction?	1.6250	0.79312
2.	Is classroom instruction more useful for introduction to the subject?	2.0312	0.93272
3.	Can classroom instruction be conducted during Individual Development Training (IDT)?	1.9688	0.69488
4.	Can Classroom instruction be conducted during Advance Development Training?	1.9063	0.81752
5.	Which type of classroom layout do you like best?	1.7188	0.95830
6.	Does the classroom layout determine the type of instruction to be presented?	2.2258	**1.1463**
7.	Will there be a need for incorporating the television into Classroom 21?	1.6875	0.78030
8.	Will there be a need for incorporating a VCR into Classroom 21?	1.7188	0.68318
9.	Will there be a need for incorporating an overhead	1.9688	1.0621

	projector into Classroom 21?		
10.	Will there be a need for incorporating a Smartboard into Classroom 21?	1.7188	0.85135
11.	Will there be a need for incorporating Distance Learning into Classroom 21?	1.6250	0.65991
12.	Will there be a need for incorporating training aids into Classroom 21?	1.5000	0.67202
13.	Will there be a need for incorporating the computer as training aids into Classroom 21?	1.5313	0.71772

Question 6: The researcher concluded that this answer might have been obtained due to the fact that a group of people had problems determining the best type of classroom layout for presentation of instruction. Maintenance personnel are no different. The decision of the classroom layout will assist the instructor in presenting the course material to the soldier while allowing the soldier climate to learn.

The researcher used information received from the Maintenance Survey to form Table 22 - Maintenance Training. This table identifies the maintenance personnel perception on how maintenance training will be conducted for the 21st Century. Maintenance personnel are sometimes more critical of themselves with methods and concepts of training.

Table 22

Maintenance Training –Maintenance Personnel

Question		Mean	Standard Deviation
14.	Do you agree with the plan of the Department of the Army to replace all printed technical manuals with electronic manuals?	2.4375	**1.3898**
15.	Do you agree that the Maintenance Bay is sometimes called the Large Classroom?	2.0937	**1.1176**
16.	Is it critical to have the newest and most improved equipment for training?	2.2525	**1.1496**
17.	Do you agree that the Program of Instruction only provides the soldier with minimum level of training?	2.8125	**1.5332**
18.	Would you agree to incorporating current real world issues dealing with Maintenance Training?	1.5625	0.94826
19.	Should the Maintenance Training Program identify the purpose of the Maintenance Training?	1.3438	0.60158

20.	Does the new Total Army Training System (TATS) Program of Instruction describe the standards for training?	2.4333	0.85836
21.	Is the delivery system of training a critical portion of the training program?	1.6875	0.89578
22.	Will the training the soldier receives at a Maintenance Training Facility be critical for the soldier to be able to accomplish their mission?	1.6563	0.70066
23.	Will the Program of Instruction (POI) give the Instructor the appropriate format for training standards? Should the Instructor be allowed to improve and develop the training?	1.5938	0.87471
24.	Do you feel there is a valid need for Regional Training Site-Maintenance Schools to fill the void for training from the U.S. Army Ordnance Center and School in the future?	1.4063	0.66524

Question 14: People, in general, are more comfortable with a hard copy in front of them rather than researching for a subject matter on the Internet.

Question 15: Maintenance personnel view the classroom as a place where formal training is presented on a subject matter and the hands-on training is to be conducted on a vehicle in a maintenance bay. They do not visualize the use of the maintenance bay as the Large Classroom where all formal training can be incorporated. The Large Classroom

concept may only be the vision of a small group of personnel and not the norm for maintenance instruction.

Question 16: The researcher determined that maintenance personnel are not always impressed with newest equipment, but rather having the capability and knowledge to maintain existing equipment on hand in the unit.

Question 17: The Program of Instruction (POI) provides more than the minimum level of instruction. Maintenance personnel may have viewed this question as providing the soldier more than the minimum level of instruction.

The researcher used information obtained from the Maintenance Survey to form Table 23 – Regional Training Site –Maintenance – Maintenance Training for the Future Maintenance Personnel. The maintenance personnel are in agreement that RTS-Maintenance Facility could be utilized for more various missions that would allow for a greater diversity of training for the 21st Century.

Table 23

RTS-Maintenance – Maintenance Training for the Future-Maintenance Personnel

Question		Mean	Standard Deviation
25-A.	The MOS Reclassification Training utilizing a 4-week school compared to 8 weeks training at an Active Duty School.	1.8065	0.70329
25-B.	Support Mobilization Mission for units deploying from Power Projection Platform Sites.	1.9375	1.0758
25-C.	Provide Unit Level Logistics System-Ground (ULL-G) Sustainment Training.	1.7500	0.76200
25-D.	Support future GCSS-A Fielding Location.	1.8750	0.83280
25-E.	Conjunction of continuous training of NCOES training Phase I at the NCOES and Phase II being conducted at RTS-Maintenance.	1.9375	0.91361

25-F.	Incorporation of Distance Learning (DL) into 63CMF MOS Technical Training into 5 weeks of training compared to 8-12 week course of Active Duty training at US Army Ordnance Center and School.	2.0312	0.82244

The researcher obtained the necessary data from the Maintenance Survey to form Table 24 –ASE Certified Instructors for the Future – Maintenance Personnel. To acquire the ASE certification requires large amounts of time and effort on the individual and facility. Maintaining the ASE certification would cost additional funds and valuable time spent training for the Annual ASE Certification.

Table 24

ASE Certified Instructor for the Future – Maintenance Personnel

Question		Mean	Standard Deviation
26.	Do you feel that our maintenance personnel should be ASE certified to instruct maintenance in the future?	2.5937	**1.1601**

Question 26: The maintenance personnel in the survey indicated that there was no need for maintenance personnel to be ASE certified to instruct maintenance in the future. The current requirement for instructors is to be trained in the Military Occupation Specialty (MOS) and/or on the equipment the training is being instructed to the soldier.

The researcher used information acquired from the Maintenance Survey to form Table 25 identifying the civilian acquired skills for the future as a possible requirement. If a soldier has civilian acquired skills in the Military Occupational Specialty (MOS), this is an enhancement to the course material they are instructing or receiving. Most Active Duty Maintenance instructors do maintenance training for a profession. A large number of Army Reserve instructors may not use civilian acquired skills nor have a profession that utilizes these skills.

Table 25

Civilian Acquired Skills for the Future – Maintenance Personnel

Question		Mean	Standard Deviation
27.	Will Civilian Acquired Skills continue to enhance and improve the maintenance personnel for the future?	1.5000	0.71842

The researcher identified and segregated the instructors from the Maintenance Survey to develop Table 26 - Classroom Instruction- Instructors. The instructors can place emphasis on the usage of various types of training aids and classroom layout for different methods of instruction. A large group of instructors surveyed did not have a maintenance background. However, they did have extensive experience in various other Military Occupational Specialties or civilian professional educators. The requirements for classroom instruction for the military or civilian training should be the same in the 21st Century. Only the subject matter would differ from what is being presented. Some of the questions were peculiar to military training and would need some explanation to answer the Maintenance Survey questions.

Table 26

Classroom Instruction - Instructors

Question		Mean	Standard Deviation
1.	Is there a place for classroom instruction?	1.3125	0.47871
2.	Is classroom instruction more useful for introduction to the subject?	1.3750	0.50000
3.	Can classroom instruction be conducted during Individual Development Training (IDT)?	1.8125	0.65511
4.	Can classroom instruction be conducted during Advance Development Training?	1.5625	0.72744
5.	Which type of classroom layout do you like best?	1.7500	0.93095

6.	Does the classroom layout determine the type of instruction to be presented?	2.1875	0.83417
7.	Will there be a need for incorporating the television into Classroom 21?	1.7500	0.93095
8.	Will there be a need for incorporating a VCR into Classroom 21?	1.6875	0.94648
9.	Will there be a need for incorporating an overhead projector into Classroom 21?	1.8750	1.0878
10.	Will there be a need for incorporating a Smartboard into Classroom 21?	1.4375	0.72744
11.	Will there be a need for incorporating Distance Learning into Classroom 21?	1.6250	0.95743
12.	Will there be a need for incorporating training aids into Classroom 21?	1.1875	0.54391
13.	Will there be a need for incorporating the computer as a training aid into Classroom 21?	1.6250	0.71880

The researcher used information obtained from the Maintenance Survey to form Table 27- Maintenance Training – Instructors. This helped make the validity for instructors and types of delivery systems for maintenance training. Again, some of the questions were unique to utilization of the new Total Army Training System (TATS), Programs of Instruction (POI), and the utilization of Regional Training Sites-Maintenance Facilities for the 21st Century. The instructors may not have realized Maintenance Training may be conducted during either Phase I or Phase II training. Most of the Phase I training of the instruction is considered common core subject matter since the soldier is learning the basic knowledge and skills for maintenance. The Phase II training involves hands-on training and is very equipment intensive. The Phase II training will also have a mixture of practical exercises, performance exams, and written tests. Almost all questions were unique to military instruction.

Table 27

Maintenance Training – Instructors

Question		Mean	Standard Deviation
14.	Do you agree with the plan of the Department of the Army to replace all printed Technical Manuals with Electronic Manuals?	3.7500	**1.3904**
15.	Do you agree that the Maintenance Bay is sometimes called the Large Classroom?	2.0000	0.89443

16.	Is it critical to have the newest and most improved equipment for training?	1.6875	1.0145
17.	Do you agree that the Program of Instruction only provides the soldier with minimum level of training?	2.6250	**1.4083**
18.	Would you agree to incorporating current real world issues dealing with Maintenance Training?	1.5625	0.62915
19.	Should the Maintenance Training program identify the purpose of the Maintenance Training?	1.3125	0.47871
20.	Does the new Total Army Training System (TATS) Program of Instruction describe the standards for training?	2.2500	1.0646
21.	Is the delivery system of training a critical portion of the training program?	1.6875	0.70415
22.	Will the training the soldier receives at a Maintenance Training Facility be critical for the soldier to be able to accomplish their mission?	1.5625	0.72744
23.	Will the Program of Instruction (POI) give the Instructor the appropriate format for training standards? Should the Instructor be allowed to improve and develop the training?	1.5625	0.72744

24.	Do you feel there is a valid need for Regional Training Site-Maintenance Schools to fill the void for training from the US Army Ordnance Center and School in the future?	1.2500	0.44721

Question 14: The instructors surveyed indicated the need to have the hard copy for themselves and students for conducting the instruction. With many applications, the instructors still feel comfortable with a manual in front of them.

Question 17: The instructors indicated that the Program of Instruction provided *more than the minimum* standard for instructing the soldier to perform their repair tasks. The Program of Instruction provides various methods and equipment to be trained on to meet the requirements for the annex or task.

Table 28

RTS-Maintenance – Maintenance Training for the Future – Instructors

Question		Mean	Standard Deviation
25-A.	The MOS Reclassification training utilizing a 4-week school compared to 8 weeks training at an Active Duty School.	1.8125	0.54391
25-B.	Support Mobilization Mission for units deploying from Power Projection Platform Sites.	2.000	0.73030
25-C.	Provide Unit Level Logistics System-Ground (ULL-G) Sustainment Training.	1.5625	0.72744
25-D.	Support future GCSS-A Fielding Location.	2.1250	1.0247
25-E.	Conjunction of continuous training of NCOES training Phase I at the NCOES and Phase II being conducted at RTS-Maintenance.	2.5000	**1.5055**
25-F.	Incorporation of Distance Learning (DL) into 63CMF MOS Technical Training into 5 weeks of training compared to 8-12 week course at an Active Duty training at US Army Ordnance Center and School.	2.3125	**1.1955**

Question 25-E: The Instructors being surveyed may not have known of the additional transportation costs in training soldiers, i.e., Non-Commission Officer Education System (NCOES) training Phase I is taught at Fort Hood, Texas and the NCOES – Phase II technical training is conducted at RTS-Maintenance at Fort McCoy, Wisconsin. Currently

there are a few training sites that offer the opportunity to train both Phase I and Phase II. In the future more emphasis will be placed on training as a one-stop training site to save the transportation cost.

Question 25-F: The instructors may have not taken into consideration one of our most precious commodities -- Time. Time away from the unit, families, and the employer is a factor that drives dollars and training. The Distance Learning (DL) is a training initiative that would allow us to still meet the training standards. The correspondence courses are still available to the soldier and were one of the first Distance Learning (DL) methods used by the Department of the Army.

The researcher used information obtained from the Maintenance Survey to form Table 29 - ASE Certified Instructor for the Future – Instructors. Currently there is not a requirement for military maintenance instructors to be ASE certified to instruct in the future. The United States Army has schools to train soldiers in how to perform tasks to support their job and mission. This, however, may change with requirements for contractors to be in the field.

Table 29

ASE Certified Instructor for the Future - Instructors

Question		Mean	Standard Deviation
26.	Do you feel that our maintenance personnel should be ASE certified to instruct maintenance in the future?	2.5000	**1.3663**

Question 26: This was met with a negative response since the requirement for instructing a maintenance course is to be a graduate of the course and be licensed on the equipment currently instructing. Obtaining ASE certification is a lengthy process, much less maintaining the certification.

The researcher used information acquired from the Maintenance Survey to form Table 30 - Civilian Acquired Skills for the Future - Instructors. If a soldier has civilian acquired skills in the Military Occupational Specialty (MOS), this is an enhancement to the course material they are instructing or receiving. Instructors seem never to be fully trained in one area, they are constantly training and developing new methods of instruction.

Table 30

Civilian Acquired Skills for the Future - Instructors

Question		Mean	Standard Deviation
27.	Will Civilian Acquired Skills continue to enhance and improve the maintenance personnel for the future?	1.6250	0.95743

The researcher used information obtained from the Maintenance Survey to develop Table 31 - Classroom instruction - Non-Maintenance Personnel. This group of personnel was identified as in a unique category since they did not have any maintenance experience and was somewhat junior in experience than some of the other personnel surveyed. They may have used a lot of common sense and minimum experience to make the determination if there really was a need for classroom instruction for education in the 21st Century. Again, some of the questions were common and would be asked if utilizing a standard classroom layout with training aids.

Table 31

Classroom Instruction - Non-Maintenance Personnel

Question		Mean	Standard Deviation
1.	Is there a place for classroom instruction?	1.4286	0.50395
2.	Is classroom instruction more useful for introduction to the subject?	1.5000	0.57735
3.	Can classroom instruction be conducted during Individual Development Training (IDT)?	1.7500	0.64550
4.	Can classroom instruction be conducted during Advance Development Training?	1.6071	0.68526
5.	Which type of classroom layout do you like best?	1.7143	0.93718
6.	Does the classroom layout determine the type of instruction to be presented?	2.3333	1.0000

7.	Will there be a need for incorporating the television into Classroom 21?	1.7143	0.80999
8.	Will there be a need for incorporating a VCR into Classroom 21?	1.7857	0.83254
9.	Will there be a need for incorporating an overhead projector into Classroom 21?	2.0357	**1.1049**
10.	Will there be a need for incorporating a Smartboard into Classroom 21?	1.6429	0.82616
11.	Will there be a need for incorporating Distance Learning into Classroom 21?	1.6786	0.94491
12.	Will there be a need for incorporating training aids into Classroom 21?	1.4286	0.69007
13.	Will there be a need for incorporating the computer as training aids into Classroom 21?	1.6071	0.62889

Question 9: This answer may have been determined due to the introduction of computers for presenting instruction during the 1990s, eliminating the need for overhead slides. The introduction of the Smartboard, which is an interactive screen utilizing computers with the ability to write on them, may have identified the overhead projector into the endangered training aid category.

The researcher used information gathered from the Maintenance Survey to form Table 32 - Maintenance Training – Non-Maintenance Personnel to make the determination if there really was a need and types of Delivery Systems for maintenance training. Some of the questions were unique to utilization of the new Total Army Training System (TATS), Programs of Instruction (POI) and the utilization of Regional Training Sites-Maintenance Facilities for training for the 21st Century. The Non-Maintenance personnel more than likely did not know what TATS or POIs actually meant or the effect of training.

Table 32

Maintenance Training – Non-Maintenance Personnel

Question		Mean	Standard Deviation
14.	Do you agree with the plan of the Department of the Army to replace all printed technical manuals with electronic manuals?	3.2857	**1.4365**
15.	Do you agree that the Maintenance Bay is sometimes called the Large Classroom?	2.1071	0.95604
16.	Is it critical to have the newest and most improved equipment for training?	1.8929	0.95604
17.	Do you agree that the Program of Instruction only provides the soldier with minimum level of training?	2.6071	**1.3149**
18.	Would you agree to incorporate current real world issues dealing with Maintenance Training?	1.6071	0.68526

19.	Should the Maintenance Training program identify the purpose of the Maintenance Training?	1.4643	0.63725
20.	Does the new Total Army Training System (TATS) Program of Instruction describe the standards for training?	2.2857	0.93718
21.	Is the delivery system of training a critical portion of the training program?	1.6071	0.62889
22.	Will the training the soldier receives at a Maintenance Training Facility be critical for the soldier to be able to accomplish their mission?	1.7143	0.71270
23.	Will the Program of Instruction (POI) give the Instructor the appropriate format for training standards? Should the instructor be allowed to improve and develop the training?	1.7500	1.0046
24.	Do you feel there is a valid need for Regional Training Site-Maintenance Schools to fill the void for training from the US Army Ordnance Center and School in the future?	1.5000	0.74536

Question 14: Like maintenance personnel, the non-maintenance personnel are more comfortable with a hard copy in front of them rather than researching for a subject matter on the Internet.

Question 17: The non-maintenance personnel felt the Program of Instruction (POI) would provide *more than the minimum* level of instruction. These people indicated that

they have had training in the past where more than the minimum level instruction was presented to the student.

The researcher obtained information from the Maintenance Survey for Table 33 - RTS-Maintenance – Maintenance Training for the Future-Non-Maintenance Personnel. This group was unique in the fact they probably have never heard of an RTS-Maintenance Site or its potential other than in the survey they completed.

Table 33

RTS-Maintenance – Maintenance Training for the Future-Non-Maintenance Personnel

Question		Mean	Standard Deviation
25-A.	The MOS Reclassification training utilizes a 4-week school compared to 8-week course at an Active Duty School.	1.9643	0.69293
25-B.	Support Mobilization Mission for units deploying from Power Projection Platform Sites.	2.0357	0.63725
25-C.	Provide Unit Level Logistics System-Ground (ULL-G) Sustainment Training.	1.6786	0.72283
25-D.	Support future GCSS-A Fielding Location.	2.1071	0.87514
25-E.	Conjunction of continuous training of NCOES training Phase I at the NCOES and Phase II being conducted at RTS-Maintenance.	2.4286	**1.2301**

25-F.	Incorporation of Distance Learning (DL) into 63CMF MOS Technical Training into 5 weeks of training compared to 8-12 week course at an Active Duty training at US Army Ordnance Center and School.	2.2500	1.0758

Question 25-E: The non-maintenance personnel may not have been involved in the planning and scheduling of continuation courses. This is a budget issue where they are planning and estimating saving 50% additional travel funds due to one station training. This still involves planning, scheduling and coordination. The final factor is that we are determining the student will graduate from Phase I training.

The researcher used information gathered from the Maintenance Survey to form Table 34 - ASE Certified Instructor for the Future – Non-Maintenance Personnel. The non-maintenance personnel may have determined that the United States Army already has schools to train soldiers in how to perform tasks to support their job and mission. Does the ASE Instructor Certification meet the needs of the United States Army?

Table 34

ASE Certified Instructor for the Future – Non-Maintenance Personnel

Question		Mean	Standard Deviation
26.	Do you feel that our Maintenance personnel should be ASE certified to instruct maintenance in the future?	2.4286	**1.1684**

Question 26: The non-maintenance personnel in the survey indicated that there was no need for maintenance personnel to be ASE certified to instruct maintenance in the future. The current requirement for instructors is to be trained in the Military Occupation Specialty (MOS) and/or on the equipment that the training is being instructed to the soldier.

The researcher used information acquired from the Maintenance Survey to form Table 35-Civilian Acquired Skills for the Future – Non Maintenance Personnel. If a soldier has civilian acquired skills in the Military Occupational Specialty (MOS), this is an enhancement to the course material they are instructing or receiving. However, in most cases the personnel going into an MOS for training do not have the Civilian Acquired Skills, only the potential ability and aptitude to be able to complete the course of training and be successful in completing requirements for assigned job.

Table 35

Civilian Acquired Skills for the Future – Non-Maintenance Personnel

Question		Mean	Standard Deviation
27.	Will civilian acquired skills continue to enhance and improved the maintenance personnel for the future?	1.8929	0.97649

Question 27: This question may have been determined due to the fact that most soldiers entering service do not have civilian acquired skills. This is usually found in the more mature soldier in the Army Reserve or National Guard. These soldiers are usually older and may have been employed doing the identified skills to qualify for the civilian acquired skills.

The researcher used information obtained from the survey to form Table 36 - Classroom instruction–Supply Personnel to make the determination if there really was a need for classroom instruction for education in the 21st Century. Again, some of the questions were common and would be asked if utilizing a standard classroom layout with training aids. A few of the questions were unique to military instruction. Supply personnel understand maintenance personnel since they support them with procurement of necessary parts and supplies to perform their mission. The classroom training would be common to supply personnel.

Table 36

Classroom instruction - Supply Personnel

Question		Mean	Standard Deviation
1.	Is there a place for classroom instruction?	1.5833	0.51493
2.	Is classroom instruction more useful for introduction to the subject?	1.6667	0.65134
3.	Can classroom instruction be conducted during Individual Development Training (IDT)?	1.6667	0.65134
4.	Can classroom instruction be conducted during Advance Development Training?	1.6667	0.65134
5.	Which type of classroom layout do you like best?	1.6667	0.98473
6.	Does the classroom layout determine the type of instruction to be presented?	2.5455	**1.2136**

7.	Will there be a need for incorporating the television into Classroom 21?	1.6667	0.65134
8.	Will there be a need for incorporating a VCR into Classroom 21?	1.9167	0.66856
9.	Will there be a need for incorporating a overhead projector into Classroom 21?	2.2500	**1.1382**
10.	Will there be a need for incorporating a Smartboard into Classroom 21?	1.9167	0.90034
11.	Will there be a need for incorporating Distance Learning into Classroom 21?	1.7500	0.96531
12.	Will there be a need for incorporating training aids into Classroom 21?	1.7500	0.75378
13.	Will there be a need for incorporating the computer as training aids into Classroom 21?	1.5833	0.51493

The researcher used information gathered from the Maintenance Survey to form Table 37- Maintenance Training – Supply Personnel**.** The supply personnel are a separate group supporting knowledge in logistical issues and matters. The determination reveals if there really was a need and types of delivery system for maintenance training. Some of the questions are unique to utilization of the new Total Army Training System (TATS), Programs of Instruction (POI) and the utilization of Regional Training Sites-Maintenance Facilities for training for the 21st Century. The supply personnel may have or more than likely did not know what TATS or POIs actually meant on the effect of training.

Table 37

Maintenance Training – Supply Personnel

Question		Mean	Standard Deviation
14.	Do you agree with the plan the Department of the Army to replace all printed technical manuals with electronic manuals?	2.6667	**1.3027**
15.	Do you agree that the Maintenance Bay is sometimes called the Large Classroom?	2.2500	1.0553
16.	Is it critical to have the newest and most improved equipment for training?	2.1667	0.83485
17.	Do you agree that the Program of Instruction only provides the soldier with minimum level of training?	2.5833	**1.2401**

18.	Would you agree to incorporate current real world issues dealing with Maintenance Training?	1.6667	0.77850
19.	Should the Maintenance Training program identify the purpose of the Maintenance Training?	1.6667	0.77850
20.	Does the new Total Army Training System (TATS) Program of Instruction describe the standards for training?	2.3333	0.77850
21.	Is the delivery system of training a critical portion of the training program?	1.5000	0.52223
22.	Will the training the soldier receives at a Maintenance Training Facility be critical for the soldier to be able to accomplish their mission?	1.9167	0.66856
23.	Will the Program of Instruction (POI) give the Instructor the appropriate format for training standards? Should the Instructor be allowed to improve and develop the training?	2.0000	**1.2792**
24.	Do you feel there is a valid need for Regional Training Site-Maintenance Schools to fill the void for training from the US Army Ordnance Center and School in the future?	1.8333	0.93744

Question 14: The supply personnel surveyed indicated the need to have the hard copy for them and students for conducting the instruction. The instructors feel comfortable in many applications with a manual in front of them.

Question 17: The supply personnel indicated that the Program of Instruction provided *more than the minimum* standard for instructing the soldier to perform their repair task. The Program of Instruction provides various methods and equipment to be trained on to meet the requirements for the annex or task.

Question 23: The supply personnel interviewed felt the instructor should not have the authority to improve and develop the Program of Instruction (POI). However, the instructor does have the authority to recommend changes and improvements to the POI as instructional methods or equipment. The POI is the training standard for instructional training. The instructor should be allowed to initiate new delivery systems as they occur or are introduced to enhance his or her training method.

The researcher used information obtained from the Maintenance Survey to form Table 38- Regional Training Site – Maintenance – Maintenance Training for the Future – Supply Personnel. This table identifies potential training that could be conducted with maximum utilization of an RTS - Maintenance Facility in the 21st Century. This would allow a greater diversity training that could be conducted at an RTS-Maintenance Site based on the needs of the U.S. Army.

Table 38

RTS-Maintenance – Maintenance Training for the Future - Supply Personnel

Question		Mean	Standard Deviation
25-A.	The MOS Reclassification training utilizing a 4-week school compared to an 8-week course at an Active Duty School.	2.1667	0.83485
25-B.	Support Mobilization Mission for units deploying from Power Projection Platform Sites.	2.0833	0.51493
25-C.	Provide Unit Level Logistics System-Ground (ULL-G) Sustainment Training.	1.8333	0.71774
25-D.	Support future GCSS-A Fielding Location.	2.0833	0.66856
25-E.	Conjunction of continuous training of NCOES training Phase I at the NCOES and Phase II being conducted at RTS-Maintenance.	2.3333	0.77850

25-F.	Incorporation of Distance Learning (DL) into 63CMF MOS Technical Training into 5 weeks of training compared to 8-12 week course at an Active Duty training at US Army Ordnance Center and School.	2.1667	0.93744

The researcher used information obtained from the survey to form Table 39 - ASE Certified Instructor for the Future –Supply Personnel. The supply personnel indicated maintenance instructors that were ASE Certified would enhance the training being presented and the facility being utilized for the training; however, were not required to conduct the training to standard.

Table 39

ASE Certified Instructor for the Future – Supply Personnel

Question		Mean	Standard Deviation
26.	Do you feel that our maintenance personnel should be ASE certified to instruct maintenance in the future?	2.3333	0.88763

Question 26: The supply personnel surveyed indicated that there was no need for maintenance personnel to be ASE certified to instruct maintenance in the future. The current requirement for instructors is to be trained in the Military Occupation Specialty (MOS) and/or on the equipment that the training is being instructed to the soldier.

The researcher used information obtained from the survey to form Table 40 Civilian Acquired Skills for the Future – Supply Personnel. If a soldier has civilian acquired skills in the Military Occupational Specialty (MOS), this would enhance the course material they are instructing or receiving. Currently, there is no requirement for civilian acquired skills.

Table 40

Civilian Acquired Skills for the Future – Supply Personnel

Question		Mean	Standard Deviation
27.	Will civilian acquired skills continue to enhance and improve the maintenance personnel for the future?	2.2500	0.75378

Summary of Data

The findings of the research surveyed were obtained by utilizing various groups and backgrounds of personnel in the United States Army. The 21st Century Maintenance Instruction Survey was initiated with the emphasis being placed on maintenance personnel. The various delivery methods surveyed identified a consensus in some of the delivery systems. The below mentioned information were areas that not all personnel could agree on. The delivery systems areas of concern may have to be reviewed with emphasis being placed on training requirements.

The instruction material should help determine the type of classroom layout that would enhance the delivery system for the instruction. There is still a large group of instructors who prefer the traditional classroom layout. However, there are classroom layouts that would further enhance interaction between the students and instructor.

There was also a large group of personnel who indicated question 9 would not need to be a requirement for incorporating the overhead projector into Classroom 21. This was probably determined with introduction of computers, VCRs, Smartboard, and other computer aids. A large group of the instructional material is computer generated and would be utilized with the above-mentioned materials.

All four groups of personnel being surveyed in question 14 felt that *Electronic Technical Manuals* would never replace hard copies of technical manuals. They all like to have that 'hard copy" in their hands or their students' hands. There are pros and cons for both types of materials, however, it is the instructor's job to determine what will be available and enhance the delivery system. A large group of personnel being surveyed indicated that they did not have a lot of interaction with the Electronic Technical Manuals. The Department of Army receives all of their manuals as Electronic Technical Manuals. Then at this point it is determined if there is a need to make a hard copy for reference material.

Again, all four groups could not agree on question 17 on the Maintenance Survey. The issue was—would the Program of Instruction (POI) set the standard with minimum level of training? Actually the Program of Instruction gives the student all training that they will need to complete the task or mission. It also sets standards in which they need to be completed to be competent in performing their job or assigned task.

The survey results for question 25-E were obtained from personnel who may not have known that the Department of the Army is still trying to eliminate travel costs when feasible and cost effective. The Department of the Army has been conducting this one-station training for over twenty years. It is more commonly used with Basic Training

Courses and Advanced Individual Training Programs. This is an area that will be promoted more actively in the future.

The maintenance, non-maintenance and instructor personnel being surveyed felt that question 26 pertains to all maintenance personnel being ASE certified to instruct maintenance in the future. The Department of the Army currently has standards developed that are certified for instructors. The main emphasis being placed is that students need to be trained on the Department of the Army's equipment. There currently is not a requirement or need for maintenance instructors to be ASE certified. This would be an appealing credential that will not affect the unit's mission or instructor's requirements for training. The summary, conclusion, and recommendations for this study will be presented in Chapter 5.

CHAPTER 5

Summary, Conclusion, and Recommendations

This chapter will summarize all information that has been presented in the prior chapters. A summary of the study, conclusion based on the findings of the study, and recommendations related to the study are presented in this chapter.

Summary

The Delivery Systems for Maintenance Training for the United States Army must provide the soldier with the knowledge and tools to be successful in the 21st Century. It is imperative that the best training possible is offered to allow them to accomplish their mission of providing maintenance support. The training content presents many methods of instruction that could be used. The instructor delivers the course information from the Program of Instruction (POI), while using various traditional and technical methods.

The purpose of this research study was to review the training programs for maintenance training for soldiers in the United States Army for the 21st Century. The process described standards for training, introduced various delivery systems, and provided the soldier the means to accomplish their mission. It also allowed the instructor to present various types of delivery systems to enhance training while maintaining the standard of training.

Conclusions and Recommendations

The researcher had four purposes in reviewing and evaluating the effectiveness of delivery systems for maintenance training. The objectives for this study were identified as follows:

1. Determine the benefits of 21st Century Planned Maintenance Training.

2. Establish a common sense approach to training for common core training during Phase I MOS training.
3. Ascertain the objectives of Military Occupational Specialty consolidation.
4. Verify the importance of Leadership Development for "Today and Future."

The data from the 21st Century Maintenance Instruction Survey was presented in Chapter 4. The data analysis was used to address research objective of determining delivery systems for maintenance training. Some of the related conclusions are described in the following information.

Benefits of 21st Century Planned Maintenance Training

Soldiers would receive training in their own Military Occupation Specialty for both Phase I and Phase II training. After reviewing various MOSs for maintenance training, it was noted that during Phase I training the subject matter was 90% common in these MOSs. This did not pass the common sense rule training. The original developers of the courseware were no longer employed by the U.S. Army due to downsizing and movement of the department to another base. This alone hampered forwarding recommended changes to the approving authority for the maintenance courseware, much less receiving the answers.

Some other training distracters that affected the soldier and instructor had a major consequence in that the training was conducted on remote location (U.S. Army Reserve and National Guard facilities available for training). In some of the low-density maintenance MOSs the soldier would have to travel over a fifty-mile area range for training. The fifty-mile area range was developed by the U.S. Army as the limit for a soldier to travel without orders. Some soldiers would be placed on orders and travel over

several hundred miles, thus the need to be billeted and fed for training. This would place a burden on the soldier for traveling and making the start time for classes conducted at these locations. The instructor was also affected in the sense that certain instructors may have to travel great distances to accommodate the training of these soldiers (Headquarters Department of the Army, 1 September 1994).

The U.S. Army has taken two approaches to develop training for the future. These approaches are to conduct training as a business and use the common sense approach to training. Today's business world addresses three areas that affect the survival of the business. They are to make a profit, satisfy the customer, and improve the work environment for employees. The U.S. Army is not in the business of making a profit, however, if the training is consolidated in strategic (populated) areas, there will be a definite effect on the need for instructors' requirements and facilities to conduct training. This in turn will also satisfy the customer (soldiers), as they may not have to travel great distances to attend the required training. At this point, one cannot determine if this will have an effect on the environment for training; however with the small number of facilities needed to conduct training, it may be possible to choose from a number of facilities available for training.

Common Sense Approach to Training

The common sense approach to training will take place to consolidate the training for Phase I into a common core training package that will give the soldier training in common subjects, basic knowledge and skills, and principles and fundamentals for systems of military vehicles. It is estimated that six to ten of these MOS courses can be combined into the common core package for maintenance training. This led to

development of common core MOS which incorporates MOS 63B-63D-63E-63G-63H-63J-63S-63T-63W, and 63Y10 (United States Army Combined Arms Support Command, 1998, December).

The Objectives of Military Occupational Specialty Consolidation

The new multicapable maintainer will incorporate MOS 63E10, M1A1 Abrams Tank Mechanic and the MOS 45E10, M1A1 Abrams Turret Repairer into the MOS 63A10, M1A1 Tank Repairer. The MOS 45T10 Bradley Weapons Systems Mechanic and the MOS 63T10 Bradley Mechanic was incorporated into the MOS 63M10 Bradley Systems Mechanic. The third consolidation was MOS 63B10, Light Wheel Vehicle Mechanic, the MOS 63S10 Heavy Wheel Vehicle Mechanic and the MOS 63W10 Wheel Vehicle Mechanic into the MOS 63B10 Wheel Vehicle Mechanic (Stevenson, 2001, Winter, pp. 1-6).

The Phase II of MOS training will still need to be conducted on each MOS since the training pertains to equipment unique to the MOS at a Regional Training Site-Maintenance facility. The new multicapable mechanic's MOS of 63A, 63B, 63H and 63M are scheduled for implementation into RTS-Maintenance sites by 2005.

Table 41

MOS Skills Consolidation

Existing and Emerging Structure				
Current MOS	Current MOS	Future MOS	Future MOS Course Title	Projected Implementation Date
63E	63H	63A	M1 Abrams Multicapable Maintainer	19 Sep 00
45E	45K		(Org and On-Board DS)	
63T	63H	63M	Bradley Multicapable Maintainer	3 Oct 00
45T	45K		(Org and On-Board DS)	
63D	63H	63D	Self Propelled Artillery Maintainer	FY 2005
45D	45K		(Org and On Board DS)	
63B (Lt)	63W	63B	Wheeled Vehicle Maintenance	FY 2005
63S	(Hvy) 63G (F&E)		(Org and On Board DS)	
63Y	63Y	63H	Tracked Vehicle Mechanic	FY 2005
	63G (F&E)		(Org and DS less 63A & 63M Tasks)	

The objectives of the MOS skills consolidation are to:

a. Support two-level maintenance doctrine.

b. Further enhance with arrival of digital enablers.

c. Increase depth and flexibility.

d. Lessen evacuation requirements.

e. Return the equipment back to support mission quicker.

f. Minimize logistics footprint.

The Importance of Leadership Development

The Army must train leaders at all levels to adapt to the changing global situations. A heavier reliance on the industrial base suggests that services combine and expand the Training with Industry (TWI) program. Quality soldiers, civilians, and confident, competent leaders remain the Army's most valuable, yet perishable, commodity. The Army must continue to invest in long-term programs to groom future leaders. Maintenance missions and doctrinal responsibilities will be included in officer and noncommissioned officer (NCO), basic, and advanced courses of all branches.

The Army and the Ordnance Corps will be successful in attracting career soldiers only if the Army is perceived as a reasonable career opportunity. Therefore, a particular concern has to be taken to ensure that the Army, as a social system, provides a stable basis for career development. Erratic changes of the Active Army may be necessary in case of high-intensity conflicts.

It is essential that the Army Reserve and National Guard components be maintained in a high state of readiness. This is especially important to the Ordnance Corps and the majority of Ordnance soldiers assigned to Reserve Components units.

Research is required to improve training techniques to ensure readiness of the Reserve Component soldiers. While researching training techniques for the Army Reserve and National Guard, the Army must carefully assess the job-related skills of the Ordnance tasks and relate these skills as much as possible to civilian occupations and jobs, so that the skill training in both sectors—Army and private—reinforce one another.

The SPORT Program is an example of virtual reality for the future. The Soldiers Portable On System Repair Tool (SPORT) provides the field technician the capability to display, diagnose and repair weapon and vehicle systems utilizing Interactive Electronic Technical Manuals (IETMs) through the use of the Controller/Diagnostic Aid (CDA).

The Ordnance Corps of the future will require highly trained individuals. It will become more important than ever to consider career management schemes that will encourage the soldier's/civilian's long-term contribution to the U.S. Army. Embedded software, including diagnostics and prognostics, will enhance material reliability and maintainability. However, there will still be the need of someone to maintain and diagnose the equipment**.**

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Appendix A

21ST CENTURY MAINTENANCE INSTUCTION SURVEY

The survey you are being requested to fill out pertains to how you envision maintenance training or instruction will be conducted to our future soldiers. Our present doctrine has changed from fix as far forward as possible to change parts as far forward as possible. This may be any area of emphasis and interest for future to look at this procedure.

For each statement, please darken only one response:

(1) Strongly Agree
(2) Agree
(3) Neither Agree Nor Disagree
(4) Disagree)
(5) Strongly Disagree

CLASSROOM INSTRUCTION

1.	Is there a place for classroom instruction?	1	2	3	4	5
2.	Is classroom instruction more useful for introduction to the subject?	1	2	3	4	5
3.	Can classroom instruction be conducted during IDT Training?	1	2	3	4	5
4.	Can classroom instruction be conducted during ADT Training?	1	2	3	4	5
5.	Which type of classroom layout do you like best? ( ) U-Shape ( ) Center Table arrangement ( ) Traditional arrangement ( ) Theater arrangement ( ) Amphitheater arrangement					
6.	Does classroom layout determine the type of instruction to be presented? Explain:	1	2	3	4	5
7.	Will there be a need for incorporating television into Classroom 21?	1	2	3	4	5

8.	Will there be a need for incorporating a VCR into Classroom 21?	1	2	3	4	5
9.	Will there be a need for incorporating an Overhead Projector into Classroom 21?	1	2	3	4	5
10.	Will there be a need for incorporating a Smartboard into Classroom 21? What is a Smartboard? A Smartboard is an interactive media that enhances the way groups meet, teach, train and present. It is another method of Distance Learning utilizing the telephone systems for operations and presentations.	1	2	3	4	5
11.	Will there be a need for incorporating Distance Learning into Classroom 21?	1	2	3	4	5
12.	Will there be a need for incorporating Training Aids into Classroom 21?	1	2	3	4	5
13.	Will there be a need for incorporating the Computer as Training Aids into Classroom 21?	1	2	3	4	5
14.	In the future the Department of the Army will replace all printed technical manuals with Electronic Manuals. Do you agree with this plan? Explain:	1	2	3	4	5
15.	The Maintenance Bay is sometimes called the Large Classroom. Do you agree?	1	2	3	4	5
16.	Is it critical to have the newest and most improved equipment for training? Explain:	1	2	3	4	5
17.	The Program of Instruction presents the information that is needed to train the soldier to the Standard for this MOS. Do you agree that this is only a level of training for which the soldier will need to perform his job or mission?	1	2	3	4	5
18.	Would you agree to incorporating current real world issues dealing with Maintenance of Equipment	1	2	3	4	5

19.	Should the Maintenance Training program identify the purpose for the Maintenance Training?	1	2	3	4	5
20.	Does the new TATS Program of Instruction describe the standards for training?	1	2	3	4	5
21.	Is the delivery system of training a critical portion of the training program?	1	2	3	4	5
22.	Will the training the soldier receives at Maintenance Training Facility be critical for the soldier to be able to accomplish their mission?	1	2	3	4	5
23.	The Program of Instruction will give the Instructor the appropriate format for training Standards. Should the Instructor be allowed to improve and develop the training? Explain:	1	2	3	4	5
24.	The Regional Training Site-Maintenance Schools was developed to fill the void for training from the U.S. Army Ordnance Center & School. MOS Reclassification training is 4 weeks compared to 8 weeks Active Duty Training. Do you feel there is a valid need for these facilities in the future?	1	2	3	4	5
25.	The Regional Training Site-Maintenance Schools may some or all support the following Missions in the future:					
	(a) MOS Reclassification training 4 weeks compared to 8 weeks Active Duty Training?	1	2	3	4	5
	(b) Mobilization Mission for units deploying from Power Projection Platform Sites?	1	2	3	4	5
	(c) ULLS-G Sustainment Training?	1	2	3	4	5
	(d) Future GCSS-A Fielding Site?	1	2	3	4	5
	(e) NCOES BNCOC Courses Conducted in conjunction with the NCO Academy?	1	2	3	4	5

(f)	Distance Learning, and 63CMF MOS Technical Training- 5 weeks of training compared to 8-12 weeks Active Duty Training at U.S. Army Ordnance Center & School?	1	2	3	4	5

Comments:

26.	Do you feel that our Maintenance Personnel should be ASE certified to instruct maintenance in the future?	1	2	3	4	5
27.	Will civilian acquired skills continue to enhance and improve the maintenance personnel in the future?	1	2	3	4	5

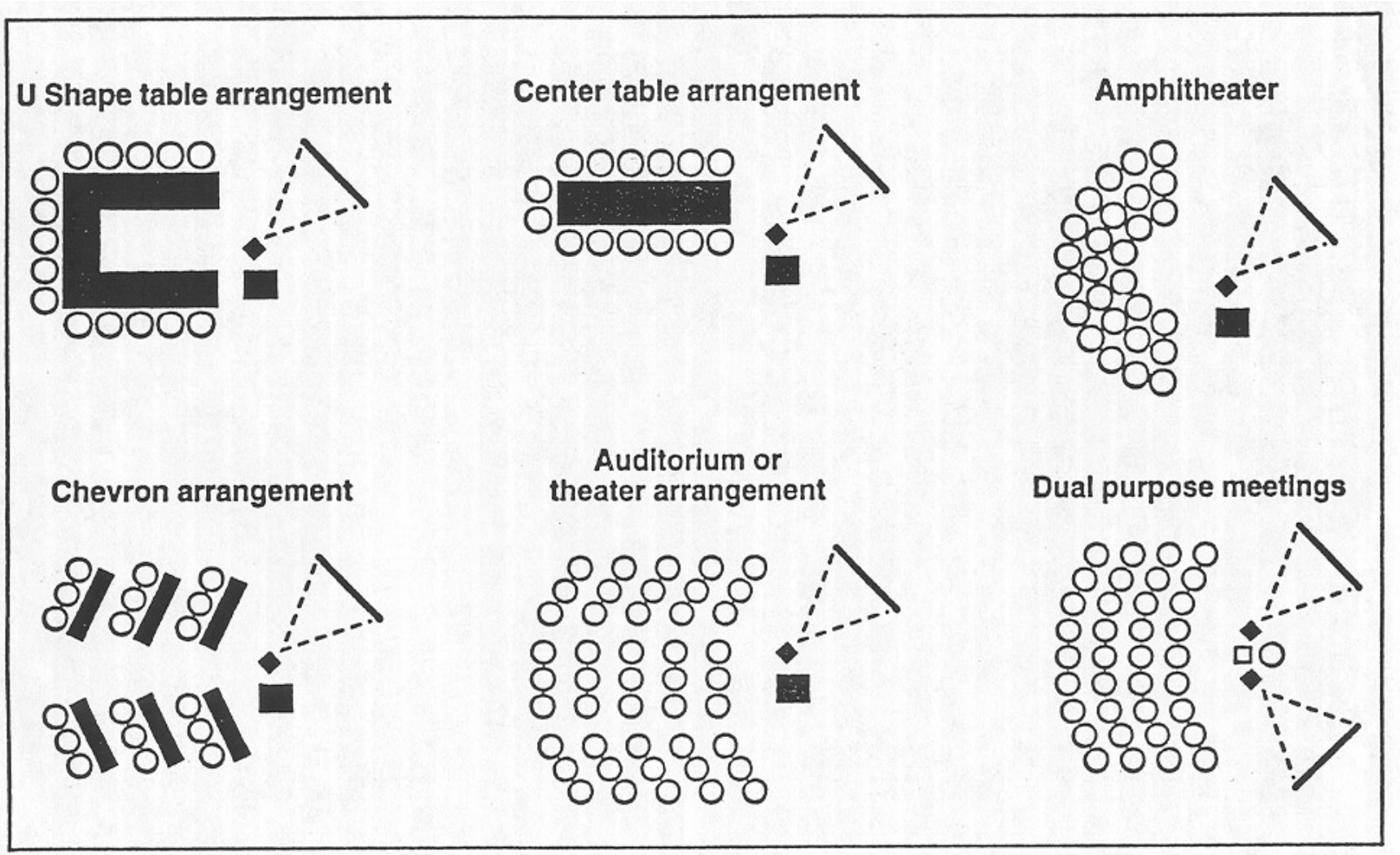
Comments:

Any general comments about the survey?

I would like to take a moment of your valuable time and thank you for filling out this survey. Please indicate if you would be interested in seeing a copy of the survey results. Please indicate this on the sheet and I will send the results to you.

Thank you again.

Appendix B


U Shape table arrangement
Center table arrangement
Amphitheater
Chevron arrangement
Auditorium or
theater arrangement
Dual purpose meetings

Appendix C

From the Briefing Room to the Battlefield

Successful operation and decision-making within the armed forces requires clear and concise communication. You participate in briefings and training sessions and collaborate on strategic plans with others on your base or around the world. You need to share detailed information, highlight critical material and keep personnel focused. You need to access information from a variety of multimedia tools and provide a copy of your notes to the group. You can do all that and more with SMART Roomware.

Harness the power of a computer and the simplicity of a whiteboard with the SMART Board, *Rear Projection* SMART Board and SMART Matisse. Simply touch the surface with your finger to control any displayed computer application. To emphasize an important point, select a pen and highlight key information. Then save, print or e-mail your notes to personnel around the globe.

SMART Board™

*Control any application directly from the Board's touch-sensitive surface simply by using your finger.**

Write over top of applications and save these notes.

* SMART Board and *Rear Projection* SMART Board require an LCD/DLP projector to display your computer image on the Board.

Rear Projection SMART Board™

*Display high-quality data and video images without light reflections or shadows.**

Cabinet or in-wall units available.

Matisse™

Matisse adds natural touch control and writing capabilities to your plasma display panel, transforming it into an easy-to-use presentation and group collaboration tool.

SMART Expression™

Integrate your training and presentation equipment in this mobile multimedia cabinet. Easily wheeled into place and requiring only one power-cord connection, SMART Expression gets you up and running quickly so personnel focus on the issue at hand, not on your equipment.

Control your session without running back and forth between your computer, VCR, projector and other equipment.

SynchronEyes™

Create a focused training environment with computer-lab instruction software. Monitor and control lab workstations or blank all screens to direct attention to the front of the room.

Broadcast your screen to all your training participants so they can follow along while you instruct.

Create Dynamic Learning Experiences

Achieving educational excellence requires the best tools and techniques to inspire students to learn. You need technology that helps you engage students' attention, enhance collaboration and improve comprehension. From the kindergarten classroom to the university lecture hall, SMART Roomware seamlessly brings together instructional tools and computer-based materials so you can increase interaction and support learning.

Join the thousands of schools, colleges and universities that are using SMART Boards to bring interactivity to their classrooms. Simply touch the surface with your finger to control any Windows® or Macintosh® application projected on the Board. Enhance teaching and learning in a single-site or distance-education environment with our interactive whiteboards.

SMART Board™

Access Web sites, explore CD-ROMs and run video – all from a single location.

Write over top of applications and save these notes. Then print them, e-mail them or post them on the Web.

Rear Projection SMART Board™

Interact with data and display high-quality video images without light reflections or shadows.

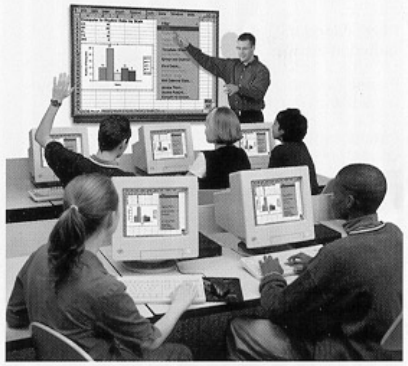
SMART Expression™

Simplify your setup with a mobile multimedia cabinet that seamlessly integrates your choice of instructional tools. With SMART Expression, simply plug in the single power cable and turn on the main power switch. Now you can focus on teaching, not on your equipment.

Keep all your multimedia tools in one secure, mobile cabinet.

SynchronEyes™

Capture your students' attention and monitor their progress with computer-lab instruction software. With SynchronEyes, you can demonstrate applications, monitor, assist and even lock student workstations to keep your students focused.



Broadcast your screen to all students so they can follow along while you instruct.

Need help funding your technology purchase?

The SMARTer Kids Foundation provides grants to educational institutions for SMART Roomware. Visit **www.smarterkids.org** for more information.

SMARTer Kids Foundation

Appendix D

TECHNICAL SPECIFICATIONS

CDA GENERAL CHARACTERISTCS

Processor/RAM (EDO Support)	Intel Pentium® 266 MHz w/512K Cache; 64 MB RAM	
Storage	Fixed, 12 GB Hard Drive, Integral CD ROM Drive	
Display	10.4" MILBRITE Sunlight Readable, Active Matrix, Backlit, Color (640 x 480)	
Keyboard		
Standard	Alphanumeric Key Pad with Integral Pointing Device and External Commercial QWERTY Keyboard	
Optional	External Rugged Keyboard	
Expansion	Four Type II / Two Type III PCMCIA Card Slots	
Standard	56.6 Modem and 8 MB Flash Memory	
Optional	Digital Multimeter, MIL-STD-1553, IEEE 488, Ethernet, Hard Disk, RS-422	
Interfaces	Serial RS-232, Centronics Parallel, VGA, and AT Keyboard	
Physical	Dimensions	12.0" W x 9.8" H x 3.2" D
	Weight	9 lbs.
Accessories		
Standard	Carry Strap, Hard Carry Case, European Power Adapter, NATO Power Cable, NATO Interconnect Cable, Spare Battery, AC/DC Power Adapter/Charger and AC Power Cord	
Optional	External Battery Pack (Can be purchased with none, one or two batteries)	
Software	Windows® 95, Built-in Diagnostics, Expansion Drivers, IETM, Anti-Virus, Computer Based Training, IADS Program and Internet Connectivity Provided on Bootable CD ROM Media	

POWER REQUIREMENTS

Internal	DC Operation	18-32 VDC
	Battery (Main)	2.5+ hrs. at 21° C
External Power Adapter & Main & Main Battery Charger	18-32 VDC, 110-220 VAC, 47-440 Hz	
Optional External Battery Pack	18-32 VDC, 110-220 VAC, 47-440 Hz	

S·P·O·R·T
MILTOPE • PM TMDE
TEAM

ENVIRONMENTAL DATA

Temperature	Operating	-25° C to +50° C
	Non-operating	-32° C to +65° C
Shock	Operating	15 Gs, 11 ms, 1/2 sine wave pulse
	Non-operating	Withstand drop shock from 18" height
EMI	Exceeds FCC Class B	

Contact factory for additional expansion and options. These specifications are subject to change without notice.

MILTOPE CORPORATION

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Hope Hull, Alabama 36043

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Product Support	1-888-577-6780 (1-888-5SPORT0)
Fax	(334) 613-6302
Web Site	http://www.miltope.com
E-Mail	info@miltope.com